AD-A279 198

*DA PAM 5-6-1

Supporting Data FY 1995
Budget Estimates

Submitted to Congress - February 1994

Descriptive Summaries Of The

RESEARCH, DEVELOPMENT, TEST AND EVALUATION, Army Appropriation

"READINESS THROUGH MODERNIZATION"

DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT
SECRETARY OF THE ARMY (FINANCIAL MANAGEMENT)
INVESTMENT DIRECTORATE, RDTE DIVISION

*This pamphlet supersedes DA PAM 5-6-1, April 1993

94-13925

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REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY (Leave Blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	April 1994	January 1994 - January 1995

4. TITLE AND SUBTITLE
Supporting Data FY 1995 Budget Estimates Submitted to Congress - Descriptive Summaries of the RDTE,A Appropriation

5. FUNDING NUMBERS

6. AUTHOR(S)

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
HQDA (SAFM-BUI-S)
Pentagon, Room 3E457
Washington, DC 20310-0109

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
HQDA (SAFM-BUI-S)
Pentagon, Room 3E457
Washington, DC 20310-0109

DTIC ELECTE MAY 10 1994 S G D

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT
DISTRIBUTION STATEMENT A: Approved for public release; distribution is unlimited and can be sold.

12b. DISTRIBUTION CODE

13. ABSTRACT (Maximum 200 words)

14. SUBJECT TERMS
RDTE RDDS
RDTE,A Descriptive Summaries
PEDS

15. NUMBER OF PAGES
1062

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABST
UNCLASSIFIED	UNCLASSIFIED		

NSN 7540-01-280-5500

DTIC QUALITY INSPECTED 1

Standard Form 298 (Rev. 2-
prescribed by ANSI Std. Z39-18
298-102)

UNCLASSIFIED

DESCRIPTIVE SUMMARIES FOR PROGRAM ELEMENTS OF THE RESEARCH, DEVELOPMENT, TEST AND EVALUATION, ARMY FY 1995 FEBRUARY 1994

This page contains no classified information.

Department of the Army
Office of the Assistant Secretary of the Army (Financial Management)

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Unannounced
Justification
By
Distribution /
Availability Codes
Dist | Avail and / or Special
A-1

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FY 1995 RDT&E, ARMY
PROGRAM ELEMENT DESCRIPTIVE SUMMARIES

INTRODUCTION AND EXPLANATION OF CONTENTS

1. **General.** This section has been prepared for the purpose of providing information concerning the US Army Research, Development, Test and Evaluation program. The Descriptive Summaries provide narrative information on all RDT&E,A program elements and projects.

2. **Relationship of FY 1995 Budget to the FY 1994 Budget submitted to Congress.** This paragraph provides a list of program elements restructured, transitioned, or established to provide specific program identification.

A. Program Element Restructures

OLD PE/PROJECT	TITLE	NEW PE/PROJECT
0203735/332	Bradley Base Sustaining	0203735/371
0303140/491	Army Key Management System	0303140/501
0303152/H86	AWIS	0203740/C49
0305889/910	Airborne Reconnaissance Low (ARL)	0305150/914
0602211/H85	C2 and Platform Integration Technology	0602782/779
0602727/230	Distribution Interactive Simulation Technology	0602308/C90
0603003/B39	Distribution Interactive Simulation Technology	0602308/C90
0603003/313	TRACTOR WILL	0603003/391
0603005/440	TRACTOR HIP	0603122/B95
0603006/492	Space Application Technology	0603006/592
0603322/B60	TRACTOR CAGE	0603322/BB1
0603604/153	Enhanced Fiber Optic Guided Missile (EFOG-M) ATD	0603313/496
0603606/006	Landmine Warfare Development	0603004/L95
0603734/T08	Total Distribution ATD	0603734/T10
0603747/669	Enhanced Land Warrior	0603747/603
0603806/601	Joint Biological Defense - Non-Medical	0208051/BD1
0603807/837	Soldier System Protection, AD	0603807/836
0604270/L12	ARAT-TSS	0604270/L15
0604713/L40	Enhanced Land Warrior	0604713/667
0604715/241	Distributive Interactive Simulations	0604715/C91

OLD PE/PROJECT	TITLE	NEW PE/PROJECT
0604805/488	C4I Interoperability Standardization and Certification	0604805/485
0604806/020	Joint Biological Defense - Medical	0208051/BD2
0604807/834	Soldier System Protection, ED	0603807/837
0605604/067	Aircraft Certification	0605604/089
0605712/001	AGS Operational Test	0604645/2AT
0605712/001	JSTARS Operational Test	0604770/2CT
0605712/001	LBA Operational Test	0604816/2DT
0605712/001	AFATDS Operational Test	0203726/2ET
0605712/001	ASAS Operational Test	0603805/2GT
0605712/001	MCS Operational Test	0203740/2HT
0605712/001	FAAD C2I Operational Test	0604741/2JT
0605712/001	FAAD C3I Operational Test	0604820/2IT

B. Developmental Transitions of Major Programs

OLD PE/PROJECT	TITLE	NEW PE/PROJECT
0602303/214	Multi-Platform Launcher	0603313/380
0602303/214	Multi-Purpose Individual Munition	0603313/387
0603649/G24	MI Breacher Dev	0604649/G25

C. Establishment of New Program Elements/Projects

TITLE	NEW PE/PROJECT
Fire Support Team Vehicle Integration	0203735/344
CH47D Product Improvement	0203744/179
Horizontal Battlefield Digitization	0203758/374
Distributive Interactive Simulations - Advanced Development	0603760/C80
Distributive Interactive Simulations - Engineering Development	0604760/C81
Mine Neutralization/Detection	0604808/415

TITLE	NEW PE/PROJECT
LAMPF/LANSC	0605104/E48
Pollution Prevention	0605801/AC4
Acquisition Technology Activities	0605803/733

D. Terminations

TITLE	PE/PROJECT
AVENGER Product Improvement Program	0203801/038
Directed Energy Technology	0602307/139
Nuclear Effects Support Team (Nest)	0603604/153
Landmine Advanced Development	0603619/005
Combat Engineer Equipment Adv Development	0603804/G01
Medium Truck Service Life Extension Program (SLEP)	0604604/H08
Non-Cooperative Target Recognition-Electronic Support Measures (NCTR-ESM)	0604817/356
DoD High Energy Laser Systems Test Facility	0605605/E97
Field Smoke Assessment	0605710/204
TRADOC P2NBC2	0605712/V03
Chicken Little Follow-on	0605805/C38

3. The following program elements are **Classified/Special** Access Programs and are submitted off line through OSD. Details will be furnished upon request.

0203744A, Project DB45	0603012A
0203806A	0603013A
0203808A	0603017A
0301359A	0603018A
0305127A	0603019A
0602104A	0603020A
0602122A	0603122A
0602788A	0603322A
0603003A, Project DB38, Project D391	0603639A
0603009A	0603647A

4. Program element #0603639A is classified SECRET and will be provided as Appendix B upon approved request.

5. RDTE Army has recently undergone a budget activity restructure. A crosswalk between the old and new budget activities follows.

6. **Classification.** Classified information is identified by use of brackets [ ]. The abbreviation OADR used in the classification block throughout this document means Originating Agency Determination Required.

RDTE,A RESTRUCTURE CROSSWALK

PROGRAM ELEMENT	PROGRAM ELEMENT TITLE	OLD BA	NEW BA
0203726A	Advanced Field Artillery Tactical Data System	4	7
0203735A	Combat Vehicle Improvement Programs	4	7
0203740A	Maneuver Control System	4	7
0203744A	Aircraft Modifications/Product Improvement Programs	4	7
0203752A	Aircraft Engine Component Improvement Program	4	7
0203758A	Horizontal Battlefield Digitization	4	7
0203801A	Missile/Air Defense Product Improvement Program	4	7
0203802A	Other Missile Product Improvement Programs	4	7
0203806A	TRACTOR RIG	4	7
0203808A	TRACTOR CARD	4	7
0208010A	Joint Tactical Communications Program (TRI-TAC)	4	7
0208051A	Joint Biological Defense Program	-	7
0301359A	Special Army Program	5	7
0303140A	Communications Security (COMSEC) Equipment	5	7
0303142A	Satellite Communications Ground Environment	5	7
0303152A	World-Wide Military Command and Control Systems, Information System	3	7
0305127A	Foreign Counterintelligence Activities	5	7
0305150A	Air Reconnaissance Low (ARL)	-	7
0601101A	In-House Laboratory Independent Research .	1	1
0601102A	Defense Research Sciences	1	1
0601104A	Federally-Funded Research and Development Center Electromechanics and Hypervelocity Physics	1	1
0602104A	TRACTOR ROSE	1	2
0602105A	Materials Technology	1	2
0602120A	Electronic Survivability and Fuzing Technology	1	2
0602122A	TRACTOR HIP	1	2
0602211A	Aviation Technology	1	2
0602270A	Electronic Warfare Technology	1	2
0602303A	Missile Technology	1	2
0602307A	Advanced Weapons Technology	1	2
0602308A	Modeling and Simulation Technology	1	2

RDTE,A RESTRUCTURE CROSSWALK

PROGRAM ELEMENT	PROGRAM ELEMENT TITLE	OLD BA	NEW BA
0602601A	Combat Vehicle and Automotive Technology	1	2
0602618A	Ballistics Technology	1	2
0602622A	Chemical, Smoke and Equipment Defeating Technology	1	2
0602623A	Joint Service Small Arms Program	1	2
0602624A	Weapons and Munitions Technology	1	2
0602705A	Electronics and Electronic Devices	1	2
0602709A	Night Vision Technology	1	2
0602716A	Human Factors Engineering Technology	1	2
0602720A	Environmental Quality Technology	1	2
0602727A	Non-System Training Device Technology	1	2
0602782A	Command, Control and Communications (C3) Technology	1	2
0602783A	Computer and Software Technology	1	2
0602784A	Military Engineering Technology	1	2
0602785A	Manpower, Personnel and Training Technology	1	2
0602786A	Logistics Technology	1	2
0602787A	Medical Technology	1	2
0602788A	TRACTOR FLOP	1	2
0602789A	Army Artificial Intelligence Technology	1	2
0603001A	Logistics Advanced Technology	2	3
0603002A	Medical Advanced Technology	2	3
0603003A	Aviation Advanced Technology	2	3
0603004A	Weapons and Munitions Advanced Technology	2	3
0603005A	Combat Vehicle and Automotive Advanced Technology	2	3
0603006A	Command, Control and Communications Advanced Technology	2	3
0603007A	Manpower, Personnel and Training Advanced Technology	2	3
0603009A	TRACTOR HIKE	2	3
0603012A	TRACTOR HOLE	2	3
0603013A	TRACTOR DIRT	2	3
0603017A	TRACTOR RED	2	3
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0603019A	TRACTOR DUMP	4	4

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PROGRAM ELEMENT	PROGRAM ELEMENT TITLE	OLD BA	NEW BA
0603020A	TRACTOR ROSE	2	3
0603105A	Military Human Immunodeficiency Virus (HIV) Research	2	3
0603122A	TRACTOR HIP	2	3
0603238A	Air Defense/Precision Strike Technology Demonstration	2	3
0603270A	Electronic Warfare Technology	2	3
0603313A	Missile and Rocket Advanced Technology	2	3
0603322A	TRACTOR CAGE	2	3
0603604A	Nuclear Munitions - Advanced Development	4	4
0603606A	Landmine Warfare and Barrier Advanced Technology	2	3
0603607A	Joint Service Small Arms Program	2	3
0603617A	Non-Line of Sight (N-LOS)	4	4
0603619A	Landmine Warfare and Barrier - Advanced Development	4	4
0603627A	Smoke, Obscurant and Target Defeating Systems - Advanced Development	4	4
0603639A	Armament Enhancement Initiative	4	4
0603640A	Artillery Propellant Development	4	4
0603645A	Armored Systems Modernization - Advanced Development	4	4
0603647A	TRACTOR DIRT	4	4
0603649A	Engineer Mobility Equipment - Advanced Development	4	4
0603653A	Advanced Tank Armament System	4	4
0603654A	Line-of-Sight Antitank (LOSAT) Technology Demonstration	2	3
0603710A	Night Vision Advanced Technology	2	3
0603713A	Army Data Distribution System (ADDS)	4	4
0603730A	Tactical Surveillance System - Advanced Development	4	4
0603734A	Military Engineering Advanced Technology	2	3
0603745A	Tactical Electronic Support Systems - Advanced Development	4	4
0603746A	Single Channel Ground and Airborne Radio Systems - Advanced Development	4	4
0603747A	Soldier Support and Survivability	4	4
0603759A	Chemical Biological Defense and Smoke Advanced Technology	2	3
0603760A	Distributive Interactive Simulations - Advanced Development	-	4
0603766A	Tactical Electronic Surveillance Systems - Advanced Development	4	4

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PROGRAM ELEMENT	PROGRAM ELEMENT TITLE	OLD BA	NEW BA
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0603774A	Night Vision Systems - Advanced Development	4	4
0603778A	MLRS Product Improvement Programs	4	7
0603801A	Aviation - Advanced Development	4	4
0603802A	Weapons and Munitions - Advanced Development	4	4
0603804A	Logistics and Engineer Equipment - Advanced Development	4	4
0603805A	Combat Service Support Control System Evaluation and Analysis	4	4
0603806A	NBC Defense Systems - Advanced Development	4	4
0603807A	Medical Systems - Advanced Development	4	4
0604201A	Aircraft Avionics	4	5
0604223A	Comanche	4	5
0604256A	Threat Simulator Development	6	5
0604258A	Target Systems Development	6	5
0604270A	Electronic Warfare Development	4	5
0604315A	Tri-Service Standoff Attack Missile	4	5
0604321A	All Source Analysis System	4	5
0604604A	Medium Tactical Vehicles	4	5
0604609A	Smoke, Obscurant and Target Defeating Systems - Engineering Development	4	5
0604611A	JAVELIN (AAWS-M)	4	5
0604619A	Landmine Warfare	4	5
0604622A	Family of Heavy Tactical Vehicles	4	5
0604633A	Air Traffic Control	4	5
0604640A	Advanced Command and Control Vehicle	4	5
0604642A	Light Tactical Wheeled Vehicles	4	5
0604645A	Armored Systems Modernization - Engineering Development	4	5
0604649A	Engineer Mobility Equipment Development	4	5
0604710A	Night Vision Systems - Engineering Development	4	5
0604713A	Combat Feeding, Clothing, and Equipment	4	5
0604715A	Non-System Training Devices - Engineering Development	4	5
0604716A	Terrain Information - Engineering Development	5	5
0604726A	Integrated Meteorological Support System	4	5

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PROGRAM ELEMENT	PROGRAM ELEMENT TITLE	OLD BA	NEW BA
0604740A	Tactical Surveillance System - Engineering Development	4	5
0604741A	Air Defense Command, Control and Intelligence - Engineering Development	4	5
0604746A	Automatic Test Equipment Development	4	5
0604759A	Major Test and Evaluation Investment	6	5
0604760A	Distributive Interactive Simulations - Engineering Development	-	5
0604766A	Tactical Electronic Surveillance Systems - Engineering Development	4	5
0604768A	BAT	4	5
0604770A	Joint Surveillance and Target Attack Radar System	4	5
0604778A	Positioning Systems Development	5	5
0604780A	Combined Arms Tactical Trainer	4	5
0604801A	Aviation - Engineering Development	4	5
0604802A	Weapons and Munitions - Engineering Development	4	5
0604804A	Logistics and Engineer Equipment - Engineering Development	4	5
0604805A	Command, Control and Communications Systems - Engineering Development	4	5
0604806A	NBC Defense Systems - Engineering Development	4	5
0604807A	Medical Materiel/Medical Biological Defense Equipment - Engineering Development	4	5
0604808A	Landmine Warfare/Barrier - Engineering Development	4	5
0604814A	Sense and Destroy Armor (SADARM) - Engineering Development	4	5
0604816A	LONGBOW	4	5
0604817A	Non-Cooperative Target Recognition - Engineering Development	4	5
0604818A	Army Tactical Command and Control Hardware and Software	4	5
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0605103A	RAND Arroyo Center	6	6
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0605601A	Army Test Ranges and Facilities	6	6
0605602A	Army Technical Test Instrumentation and Targets	6	6
0605604A	Survivability and Lethality Analysis	6	6
0605605A	DoD High Energy Laser Systems Test Facility (HELSTF)	6	6
0605702A	Meteorological Support to RDT&E Activities	6	6

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PROGRAM ELEMENT	PROGRAM ELEMENT TITLE	OLD BA	NEW BA
0605706A	Materiel Systems Analysis	6	6
0605709A	Exploitation of Foreign Items	6	6
0605710A	Joint Chemical/Biological Point of Contact, Test and Assessment, Smoke Assessment,NBC Survivability	6	6
0605712A	Support of Operational Testing	6	6
0605801A	Programwide Activities	6	6
0605802A	International Cooperative Research and Development	6	6
0605803A	Technical Information Activities	6	6
0605805A	Munitions Standardization, Effectiveness and Safety	6	6
0605810A	RDT&E Support for Non-Developmental Items	6	6
0605856A	Environmental Compliance - RDT&E	6	6
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FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0203726A**
PE Title: **Advanced Field Artillery Tactical Data System (AFATDS)** Budget Activity: **#7**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D2ET AFATDS Operational Test	0	0	3125	0	0	0	0	0	3125
D322 Advanced Field Artillery Tactical Data System	40285	45860	45600	31797	31441	3097	3065	3500	418046
PE Total	40285	45860	48725	31797	31441	3097	3065	3500	421171

B. (U) BRIEF DESCRIPTION OF ELEMENT: Project D2ET finances the direct costs of planning and conducting operational testing and evaluation of the Advanced Field Artillery Tactical Data System (AFATDS) by the Operational Test and Evaluation Command (OPTEC). Project D322, AFATDS is a battle management system that will provide automated fire support in the Army Tactical Command and Control System (ATCCS) architecture in support of close, rear and deep operations, fire planning and the coordination and employment of all service/combined fire support assets to complement the commander's scheme of maneuver. AFATDS will accomplish this by providing fully automated support for planning, coordination and control of all fire support assets in the execution of close support, counterfire, interdiction, suppression of enemy air defense and deep operations.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:

(U) **Project D2ET - AFATDS Operational Test:** Project D2ET finances the direct costs of planning and conducting operational testing and evaluation of the AFATDS. The AFATDS is an Acquisition Category (ACAT) I system with dedicated Initial Operational Test and Evaluation in FY95 to support a Milestone III full production decision. In FY95, funding for operational testing of Acquisition Category (ACAT) I systems is programmed with the PE funding development for each system. Future fiscal years will be reprogrammed when system information becomes available.

(U) FY 1993 Accomplishments:
- (U) Not applicable

UNCLASSIFIED

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203726A
PE Title: Advanced Field Artillery Tactical Data System (AFATDS)

Budget Activity: #7

(U) FY 1994 Planned Program:
- (U) Not applicable.

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Complete AFATDS Initial Operational Test and Evaluation (IOTE) (OPTEC portion)	1Q95	3125
TOTAL		3125

(U) Work Performed By: A majority of Project D2ET work is performed by Test and Evaluation Directorates of the Operational Test and Evaluation Command (OPTEC) from Alexandria, VA, Fort Hood, TX and Fort Sill, OK. Work is also performed by the Electronic Proving Grounds (EPG), Fort Huachuca, AZ. All organizations are staffed by military and civilian government personnel. Contractors expected to perform work for this project include: BDM International Inc., McLean, VA; Test and Experimentation Services Company, Albuquerque, NM; Computer Science Corporation, San Diego, CA; and Computer Data Systems Inc., Fort Worth, TX.

(U) Related Activities: Project D2ET is reprogrammed from PE #0605712A, Project D001. There is no unnecessary duplication of effort within the Army or DoD. The Army staff monitors all tests for material development and activities to avoid duplication of effort. The Director Test and Evaluation, and Director of Operational Test and Evaluation, Office of the Secretary of Defense, also review planned testing and development of support equipment to ensure integration of testing by the services and to avoid duplicative testing. High-level staff management of resources for user testing is provided by the U.S. Army Test Schedule and Review Committee which is chaired by OPTEC. Unnecessary duplication of like items is prevented by coordination with Program Manager, Instrumentation, Targets and Threat Simulators (PM-ITTS), the Operational Test and Evaluation Coordinating Council, review by the Army Test and Evaluation Committee and by coordination with the Test Scheduling and Review Committee.

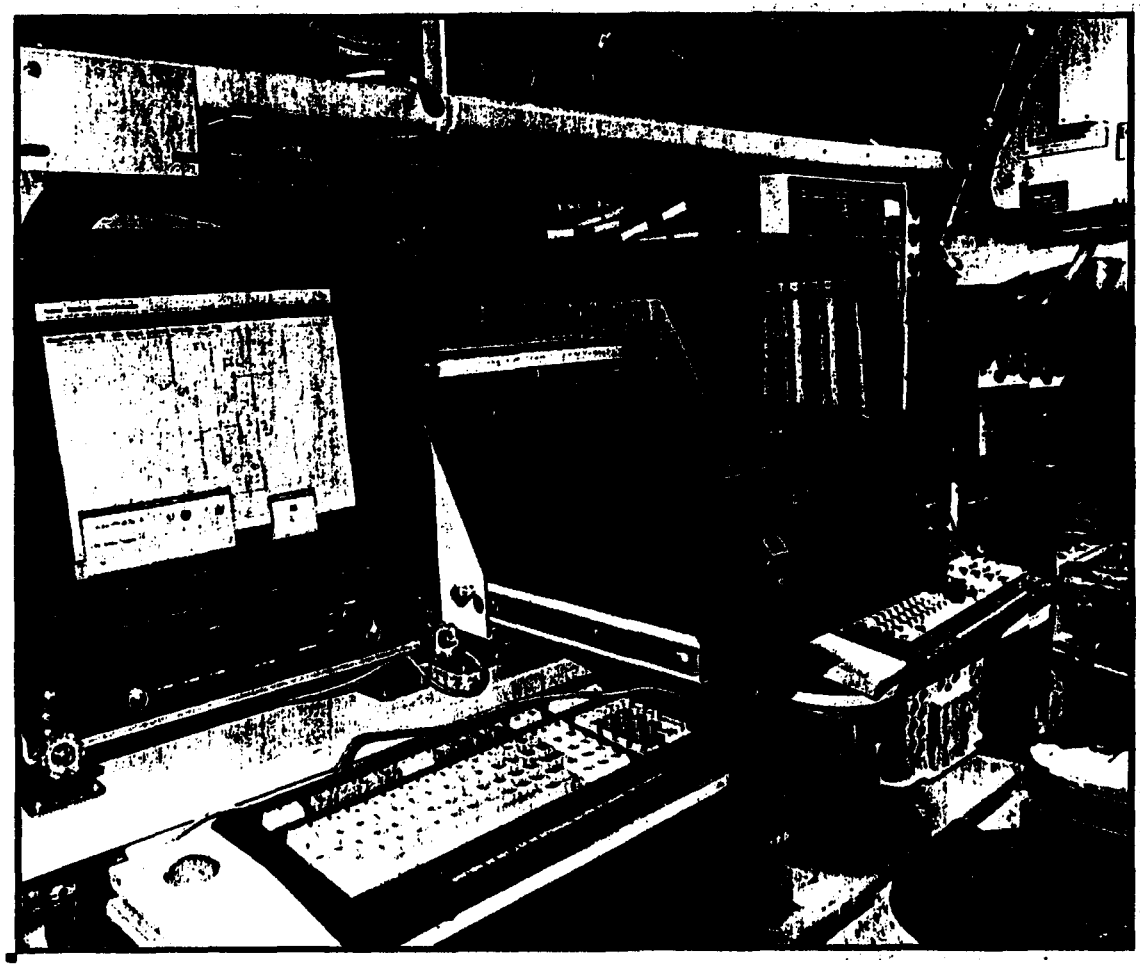
(U) Other Appropriation Funds: ($ in Thousands) Not applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203726A
PE Title: Advanced Field Artillery Tactical Data System
Project Title: Advanced Field Artillery Tactical Data System

Project Number: D322
Budget Activity: #7



POPULAR NAME: AFATDS

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203726A
PE Title: Advanced Field Artillery Tactical Data System
Project Title: Advanced Field Artillery Tactical Data System

Project Number: D322
Budget Activity: #7

A. (U) SCHEDULE/BUDGET INFORMATION: ($ In Thousands)

SCHEDULE	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	To Complete
Program Milestones	Begin V2 10/92		ASARC III 12/94	Start Fielding V1 10/95	Start Fielding V2.0	Start Fielding V2.1	Complete V3	
Engineering Milestones		V2.0 PDR 6/94	V2.0 Critical Design Review (CDR) 1/95	V2.1 PDR V2.1 CDR	V3 PDR	V3 CDR		
T&E Milestones	FQT 9/93	V1 SSAT 10/93 FDTE 2/94 IOTE 9/94		V2.0 OP Test 2/96	V2.1 OP Test	Start V3 OP Test	Complete V3 OP Test	
Contract Milestones	V2 Option 10/92		V2.1 Start 10/94	V3 Start				
BUDGET ($000)	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	Program Total (To Complete)
Major Contract	26353	31239	36568	24640	24432	2171	2182	236079 (0)
Support Contract	5648	5434	4891	3143	2891	310	290	88225 (0)
In-House Support	3629	4588	3942	3287	3382	550	530	40738 (0)
GFE/ Other	4655	4599	199	727	736	66	63	53004 (0)
Total	40285	45860	45600	31797	31441	3097	3065	418046 (0)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203726A
PE Title: Advanced Field Artillery Tactical Data System
Project Title: Advanced Field Artillery Tactical Data System

Project Number: D322
Budget Activity: #7

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The Advanced Field Artillery Tactical Data System (AFATDS) will broaden and modernize the US Army fire support command, control and communications (C3) system. As a battle management system, AFATDS will provide automated fire support in the Army Tactical Command and Control System (ATCCS) architecture in support of close, rear and deep operations, fire planning and the coordination and employment of all service/combined fire support assets to complement the commander's scheme of maneuver. AFATDS will accomplish this by providing fully automated support for planning, coordination and control of all fire support assets (mortars, close air support, naval gunfire, attack helicopters, offensive electronic warfare, field artillery cannons, rockets and guided missiles) in the execution of close support, counterfire, interdiction, suppression of enemy air defense and deep operations. AFATDS will automatically implement detailed commander's guidance in the automation of operational planning, movement control, targeting, target value analysis and fire support planning. AFATDS is composed of a common suite of hardware and software (ATCCS Common Hardware/Software (CHS)) employed in varying configurations at different operational facilities (or nodes) interconnected by tactical communications in the form of a software-driven, automated network. Both hardware and software will be capable of being tailored to perform the fire support command, control and coordination requirements at any level of command. This will permit variable command and control relationships and full fire support functionality at all echelons of field artillery and maneuver, from corps to battery or company in support of all levels of conflict. The Marine Corps will also utilize AFATDS. AFATDS will interoperate with the German fire support system (ADLER) and British fire support system (BATES).

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Completed Version 1 critical design phase	2Q93	18985
• (U) Completed code and integration of Version 1	4Q93	12700
• (U) Conducted Version 1 Formal Qualification Test (FQT)	4Q93	5800
• (U) Awarded Version 2.0	1Q93	2800
TOTAL		**40285**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Conduct System Software Acceptance Test (SSAT)	1Q94	2800
• (U) Conduct Force Development Test and Experimentation (FDTE) of Version 1 system	2Q94	6000
• (U) Prepare for and conduct the Initial Operational Test and Evaluation (IOTE) of Version 1	4Q94	5800
• (U) Version 1 test unit equipped	4Q94	5100

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203726A
PE Title: Advanced Field Artillery Tactical Data System
Project Title: Advanced Field Artillery Tactical Data System

Project Number: D322
Budget Activity: #7

• (U) Version 2 Software Design and Preliminary Design Review (PDR)	3Q94	18860
• (U) Continue Version 2.0 Software Development	4Q94	7300
TOTAL		**45860**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Conduct AFATDS Army System Acquisition Review Council (ASARC) III	1Q95	400
• (U) Complete Version 2.0 Code	4Q95	24200
• (U) Completed Version 2.1 System Design and Conduct System Design and Software Specification Reviews	3Q95	14000
• (U) Start Version 3.0	3Q95	7000
TOTAL		**45600**

(U) Program Plan to Completion:	
• (U) Conduct Version 2.0 Operational Testing and Begin Fielding	3Q96
• (U) Complete Version 2.1, Test and Field	3Q97
• (U) Design Code Test and Field Version 3	3Q98
• (U) Complete Fielding of AFATDS	4Q98

D. (U) WORK PERFORMED BY: The support contract was awarded to ARC Professional Service Group, Shrewsbury, NJ in Dec 91. The AFATDS Version 1 software development contract with option for Version 2 was awarded to Magnavox Government and Industrial Electronics Company, Ft. Wayne, IN in Apr 90. The Version 2 option was awarded in Oct 92. The in-house developing agency is the Project Manager, Field Artillery Tactical Data System (FATDS) and the Program Executive Office, Command and Control Systems, Ft Monmouth, NJ.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: Version 1 FDTE delayed three months. Initial Operational Test and Evaluation (IOTE) similarly delayed to allow time for corrections from FDTE. ASARC also adjusted based on test schedule.
3. COST CHANGES: None

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203726A
PE Title: Advanced Field Artillery Tactical Data System
Project Title: Advanced Field Artillery Tactical Data System

Project Number: D322
Budget Activity: #7

F. (U) PROGRAM DOCUMENTATION:

Mission Element Need Statement	03/81
Approved Operational & Organizational Plan	01/89
Approved Required Operational Capability (ROC)	01/91
AFATDS Test Evaluation Master Plan (TEMP)	06/91
System specification	01/93
Approved Operational Requirements Document (ORD)	09/93
Draft Revised Temp	09/93
PLANNED:	
Program Baseline Document	06/94
Program Office Estimate	06/94
Cost and Operational Effective Analysis	09/94
Integrated Program Summary	09/94
Acquisition Decision Memorandum	01/95

G. (U) RELATED ACTIVITIES: USMC AFATDS Program, PM Common Hardware/Software (PE#0602783A) and Standardized Integrated Command Post System (SICPS) Program. AFATDS is part of the overall Army Tactical Command and Control System (ATCCS), which is managed by the Program Executive Command And Control Systems. There is no unnecessary duplication within the Army or DoD.

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
OPA3 (MA9708)	0	0	5848	3264	3400	2139	2706
OPA2 (B28600)	0	11992	32610	38902	42609	0	0

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable

J. (U) TEST AND EVALUATION DATA: Government acceptance of Version 1 will be accomplished with a System Acceptance Test in Dec 93. A Force Development Test and Experimentation will be conducted on Version 1 in Jan-Feb 94 to review tactics and doctrine and will include Marine Corp units. An Initial Operational Test and Evaluation will be conducted by Operational Test and Evaluation Command (OPTEC) on AFATDS Version 1 in Jul-Sep 94 with 1ST Cavalry Division.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0203735A
PE Title: Combat Vehicle Improvement Programs **Budget Activity: #7**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D280 Recovery Vehicle Improvement Program (IRV)	7169	11377	4717	0	0	0	0	0	51575
D330 M1A1 Block Improvement Program	7805	40000	11833	19806	10726	2314	0	0	709846
D332 M2/M3 Fighting Vehicle Improvement Program	14902	63569	0	0	0	0	0	0	235158
D344 Fire Support Team Vehicle Integration	0	0	18608	23508	23858	9460	0	0	75100
D359 IVIS Demonstration	8695	0	0	0	0	0	0	0	8695
D371 Bradley Base Sustainment	0	0	76121	110595	80644	18894	0	0	285053
D392 AGS Improvements	0	0	0	9053	10255	6038	302	0	25550
PE TOTAL	38571	114946	111279	162962	125453	36706	302	0	1339402

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0203735A
PE Title: Combat Vehicle Improvement Programs

Budget Activity: **#7**

B. (U) BRIEF DESCRIPTION OF ELEMENT: These programs respond to deficiencies highlighted during Desert Storm, continue evolutionary technological advancements and enhance the combat capability of today's force. This program element provides combat effectiveness enhancements for the Abrams Tank and the Bradley Fighting Vehicle System (BFVS) through a series of product improvements in the current fielded vehicles. This includes a requirement for a Bradley Based Fire Support Vehicle (FIST-V). The Recovery Vehicle Program is one initiative to address Operation Desert Storm deficiencies.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995: NA

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203735A
PE Title: Combat Vehicle Improvement Program

Project Number: D280
Budget Activity: #4

A. (U) RESOURCES: ($ in Thousands)
Project Title: Recovery Vehicle Improvement Program

Popular Name	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
Improved Recovery Vehicle Program	7169	11377	4717	0	0	0	0	0	51,365

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The M88A1E1 is intended to replace the existing M88A1 in selected heavy forces for the recovery of heavy combat vehicles, to include the M1 series tanks. The M88A1E1 is an improved version of the M88A1 and consists of an upgraded power pack, improved main winch, improved hoist winch capability and enhanced towing capacity, and increased armor protection. The M88A1E1 mounts a .50 caliber machine gun for self-protection.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) PreProduction Qualification Test	3QFY93	$2104M
• (U) Operational Test and Evaluation	4QFY93	$ 356K
• (U) Draft Equipment Publications	4QFY93	$2093M
• (U) Program Management (Matrix spt., spt. contract, PMO salaries)	4QFY93	$2.616M

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Contract Mod for Logistics & Tech Data	4QFY94	$10332M
• (U) Program Management (Matrix spt., spt. contract, modeling, PMO salaries)	4QFY94	$ 868K

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203735A
PE Title: Combat Vehicle Improvement Program

Project Number: D280
Budget Activity: #4

(U) FY 1995 Planned Program:

• (U) PQT Performance/RAM Test	3QFY95	$3740M
• (U) Initial Operational Test	4QFY95	$ 321K
• (U) Program Management (Matrix spt., spt. contract, PMO salaries)	4QFY95	$ 602K

D. (U) WORK PERFORMED BY: As an ACAT III system, management of the Recovery Vehicle Improvement Program is provided by the Project Manager, Combat Mobility Vehicles, within the overall structure of the Program Executive Office, Armored Systems Modernization, Warren, MI. The major supporting government technical organizations are the US Army Tank-Automotive Command, Warren, MI; the Combat Systems Test Activity (CSTA), Aberdeen Proving Ground, MD; the Test and Experimentation Command (TEXCOM), Fort Hood, Texas and Yuma Proving Ground, AZ. The contractor for the Engineering and Manufacturing Development (EMD) and Production is BMY Combat Systems, York, PA.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: Program Milestones have been adjusted to support a September 1995 MS III decision.
3. COST CHANGES: FY 92/93 funds were adjusted to support September 1995 MS III.

F. (U) PROGRAM DOCUMENTATION:

Acquisition Strategy	3QFY93
Test and Evaluation Master Plan (TEMP)	3QFY93
Required Operational Capability (ROC)(updated)	2QFY92

G. (U) RELATED ACTIVITIES:
The USMC is planning to upgrade M88A1s to the IRV configuration. Schedule and funding information for this program is unavailable at this time. There is no unnecessary duplication of effort within the Army or Department of Defense.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203735A
PE Title: Combat Vehicle Improvement Program

Project Number: D280
Budget Activity: #4

H. (U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Procurement: SSN GAO570	0	31,200	17,141	23,378	14,066	61,439	59,921
SSN GAO170 (spares)	0	0	293	191	1,924	1,990	2,509

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None. Israel, Kuwait, Egypt and France have expressed interest in buying the M88A1E1.

J. (U) PROGRAM MILESTONES:

Milestones	Dates
Teardown/Analysis/Fixes	4QFY91-4QFY92
Baseline Test	3QFY92
Go/No-Go Decision	4QFY92
Order Long Lead Items/Refurbish Vehicles and Spares	4QFY91-3QFY92
Pre-Production Qualification Test	1-3QFY93
Limited User Test (LUT)	1-3QFY93
Low Rate Initial Production IPR	2QFY94
Production Qualification Test	2-3QFY95
Initial Operational Test and Evaluation	3QFY95
Milestone III	4QFY95

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203735A
PE Title: Combat Vehicle Improvement Programs
Project Title: M1A1 Block Improvement Program

Project Number: D330
Budget Activity: #7

POPULAR NAME: Abrams Tank

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203735A
PE Title: Combat Vehicle Improvement Programs
Project Title: M1A1 Block Improvement Program

Project Number: D330
Budget Activity: #7

A. (U) SCHEDULE/BUDGET INFORMATION: ($ In Thousands)

SCHEDULE	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	To Complete
Program Milestones	1st Del 11/92	MSIII 5/94	UPGRADE FUE 5/95			COMPLETE 2ND GEN FLIR INTEGRATION		
Engineering Milestones	Conversion TDP 5/93	PDR "B" 9/94	CDR "B" 12/94					
T&E Milestones	LIVE FIRE 1Q94 IOTE 1Q94							
Contract Milestones			2ND GEN FLIR 3Q95					
BUDGET ($000)	**FY 1993**	**FY 1994**	**FY 1995**	**FY 1996**	**FY 1997**	**FY 1998**	**FY 1999**	**Program Total (To Complete)**
Major Contract	4,005	37,097	9,833	15,006	3,226	0		504415 (0)
Support Contract								102341 (0)
In-House Support	2,072	1,603	1,500	2,000	1,500	500		33946 (0)
GFE/ Other	1,728	1,300	500	2,800	6,000	1,800		69114 (0)
Total	7,805	40,000	11,833	19,806	10,726	2,314		709846 (0)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203735A
PE Title: Combat Vehicle Improvement Programs
Project Title: M1A1 Block Improvement Program

Project Number: D330
Budget Activity: #7

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The Abrams Main Battle Tank incorporates significant advances in crew protection, firepower and mobility and was designed with growth potential in mind. The Abrams Block Improvement Program (BIP) provides for timely initiation of evolutionary improvements which anticipate threat changes and capitalizes on technological opportunities. The BIP introduces time-phased product improvements to the production line in groups called "Blocks" to minimize production costs while providing effective configuration control. The FY 1978-1985 block improvements resulted in the M1A1 Abrams Tank which incorporates the 120mm gun system, a hybrid nuclear, biological and chemical (NBC) overpressure system, upgraded armor, and suspension/final-drive upgrades. The FY 1985-1994 block improvement (M1A2/Block II) includes the Commander's Independent Thermal Viewer, Improved Commander's Weapons Station (ICWS), Position Navigation Unit and Inter-Vehicular Information System (IVIS). The M1A2 design is founded upon a core digital electronics architecture that interconnects the vehicle's enhanced components via power and data busses. The digital architecture and modular design enables rapid system enhancements without major hardware changes.

FY95 EFFORT:
In support of the Army's "Horizontal Technology Integration" effort, we are initiating efforts to integrate Second Generation Forward Looking Infra-Red (2nd Gen FLIR) into the Abrams Tank. Currently, the M1A2 employs a first generation Thermal Imaging System (TIS) and Commander's Independent Thermal Viewer (CITV) to provide the crew with all-weather, day/night surveillance, target acquisition and target engagement sighting systems. The TIS and CITV are based on 1970's technology in the areas of image processing electronics and thermal detector design. Recent advances in these areas have demonstrated the ability to build detectors containing many more detector elements and to integrate image processing electronics directly into the detector chip. 2nd Gen FLIR systems are capable of imagery possessing significantly higher resolution, improving the ability to detect, recognize and identify targets at longer ranges over present FLIRs. Updating the current TIS and CITV with 2nd Gen FLIR technology will extend the tank's engagement envelope under all weather conditions, reduce fratricide due to misidentification of targets and increase situational awareness.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Tank Integration		$4005
Delivered one pilot		
• (U) Engineering Support		$2072
• (U) Test Support		$1728
Began Live Fire Test	(6/93)	
Began Initial Operational Test	(9/93)	

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203735A
PE Title: Combat Vehicle Improvement Programs
Project Title: M1A1 Block Improvement Program

Project Number: D330
Budget Activity: #7

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Tank Integration		$37097
• (U) Engineering Support		$ 1603
MS III Decision	(3Q94)	
• (U) Test Support		$ 1300
Complete Live Fire	(10/93)	
Complete IOT&E	(12/93)	
IVIS Demonstration-NTC 94-7	(4/94)	

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Tank Integration		$9833
Delivery of 1st upgrade	(10/94)	
Begin 2nd Gen FLIR effort	(10/94)	
M1A2 First Unit Equipped	(5/95)	
• (U) Engineering Support		$1500
• (U) Test Support		$ 500

D. (U) WORK PERFORMED BY: Prime Contractor is Land Systems Division, General Dynamics, Sterling Heights, MI. In house effort is provided by Tank-Automotive Command, Warren, MI.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** Added 2nd Gen FLIR
2. **SCHEDULE CHANGES:** MSIII - moved from April 1994 to May 1994 to allow time to evaluate operational test data.
3. **COST CHANGES:** Added 2nd Gen FLIR development costs

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203735A
PE Title: Combat Vehicle Improvement Programs
Project Title: M1A1 Block Improvement Program

Project Number: D330
Budget Activity: #7

F. (U) PROGRAM DOCUMENTATION:

Mission Need Statement - Abrams	05/87
Mission Need Statement - 2nd Gen FLIR	07/93
Test and Evaluation Master Plan	1Q94
Integrated Program Summary	2Q94

G. (U) RELATED ACTIVITIES:
PE #0602601A (Combat Vehicle and Automotive Technology)
PE #0603005A (Combat Vehicle and Automotive Advanced Technology)
PE #0603645A (Armored Systems Modernization - Future)
PE #06047102 (Horizontal Technology Integration - 2nd Gen FLIR)
PE #0203758A (Horizontal Battlefield Digitization)
There is no unnecessary duplication of effort within the Army or Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
WEAPONS, TRACKED COMBAT VEHICLES (Procurement)							
SSN G82917 M1A1 Abrams Tank	31712	24967	22089	475	0	0	0
SSN GA0700 M1 Abrams (MOD)	25120	48998	40291	77728	53295	43700	24640
SSN GA0750 Abrams Tank Upgrade	155976	96701	175129	567611	579294	604037	623635
SSN GB1300 Training Devices	0	24585	17103	13288	12223	14137	0

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203735A
PE Title: Combat Vehicle Improvement Programs
Project Title: M1A1 Block Improvement Program

Project Number: D330
Budget Activity: #7

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS:

A. US/UK Agreement concerning Armor technology, 9 March 1990. Project is active with biannual meetings. The funding, schedules and program structure are classified.

B. US/GE Agreement concerning the harmonization of Abrams and Leopard2 MBT to include the 120mm smoothbore gun and ammo; Addendum 3 adds emerging technologies to the areas of cooperation.

C. US/GE Combat Vehicle Command and Control (CVC2) MOU, 12 Sep 88, to define symbology, develop bilateral concept joint simulation experiments, maximize interoperability and possibly develop common hardware.

J. (U) TEST AND EVALUATION DATA:

Milestones	Dates
Test and Evaluation Master Plan (TEMP)	3/91
Army Program Review (DUSA(OR))	12/91
Early User Test & Evaluation (EUT&E)	12/91
Customer Test (CT)	4/92
Live Fire Test	3/93-10/93
Initial Operational Test & Evaluation	9/93-12/93
TEMP Revision	11/93
Milestone III Review	5/94

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203735A
PE Title: Combat Vehicle Improvement Programs
Project Title: M2/M3 Bradley Fighting Vehicle

Project Number: **D332**
Budget Activity: **#7**

POPULAR NAME: M2/M3 Fighting Vehicle

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203735A
PE Title: Combat Vehicle Improvement Programs
Project Title: M2/M3 Bradley Fighting Vehicle

Project Number: D332
Budget Activity: #7

A.(U) SCHEDULE/BUDGET INFORMATION: ($ In Thousands)

SCHEDULE	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	To Complete
Program Milestones		MS IV ASARC REVIEW						
Engineering Milestones	INTEGRATION OF ODS FIXES	BEGIN ENGINEERING MANUFACTURING DEVELOPMENT						
T&E Milestones								
Contract Milestones		DEVELOPMENT CONTRACT AWARDS						
BUDGET ($000)	**FY 1993**	**FY 1994**	**FY 1995**	**FY 1996**	**FY 1997**	**FY 1998**	**FY 1999**	**Program Total (To Complete)**
Major Contract	12121	57369						222867 (0)
Support Contract								(0)
In-House Support	1520	4433						18153 (0)
GFE/ Other	1261	1767						11743 (0)
Total	14902	63569						252763 (0)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203735A
PE Title: Combat Vehicle Improvement Programs
Project Title: M2/M3 Bradley Fighting Vehicle

Project Number: D332
Budget Activity: #7

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Operational Systems Development funding provides for material improvements identified as a result of Desert Storm. Funding will provide for the integration of a Laser Range Finder and Global Positioning System (GPS) System with compass into the Bradley Fighting Vehicle System. The Laser Range Finder will improve first round hit capability with the 25mm gun and prevent TOW engagement of targets which are out of range thereby reducing ammo expenditure and cost. The Global Positioning System (GPS) with compass will enhance command and control and help prevent incidents of fratricide by improving precision in land navigation. In FY94 and beyond the Bradley M2A3/M3A3 configuration vehicles will be a major upgrade to give the system upgraded electronics, digital command and control compatible with the M1A2 tank and second generation FLIR's for enhanced target acquisition. Major improvements will include a 1553 based, databus core electronics architecture, digital information displays, software packages for C2, navigation, communications, autotracking, diagnostics, embedded training and fire control, second generation focal plane array FLIR's for Gunner and Commander as well as full digital integration of all Desert Storm Improvements. Program restructured and is funded under Project D371.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Integration of ODS improvements	4Q FY94	$12063K
• (U) Award of Laser Range Finder Contract	3Q FY93	$1500K
• (U) Award of Vehicle Integration Testing of ODS Improvements	4Q FY94	$1339K

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Begin A3 Design Engineering	4Q FY94	$48469K
• (U) Begin Prototype MFG	4Q FY94	$8900K
• (U) Minor Tasks Including In House Support	4Q FY94	$6200K

(U) FY 1995 Planned Program: See Project 371

(U) Program to Completion: See Project 371

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203735A
PE Title: Combat Vehicle Improvement Programs
Project Title: M2/M3 Bradley Fighting Vehicle

Project Number: D332
Budget Activity: #7

D. WORK PERFORMED BY: The Bradley program manger in the Program Executive Office for Armored Systems Modernization, Warren, MI is assigned the responsibility of program management. The major supporting government technical organizations are the US Army Tank-Automotive Command, Warren, MI; Aberdeen Proving Ground, MD; and Yuma Proving Ground, AZ. The contractor for the Engineering Manufacturing Development (EMD) phase will be FMC Corp, San Jose, CA. and Texas Instruments, Dallas, TX.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:
NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** None
2. **SCHEDULE CHANGES:** None
3. **COST CHANGES:** None

F. (U) PROGRAM DOCUMENTATION: Program documentation has been prepared for a 1/94 Milestone IV decision. Documentation includes:

- Acquisition Plan
- Army Cost Position
- Cost and Operational Effectiveness Analysis
- Integrated Program Summary
- Test And Evaluation Master Plan

G. (U) RELATED ACTIVITIES: Bradley block upgrade will make maximum utilization of technologies developed for the M1A2 tank and incorporated in the M1A2 block upgrade program. Possible systems include the 1553 data bus technology, position navigation system, core vetronics architecture and stabilized commander's independent thermal viewer. There is no unnecessary duplication of effort within the Army or DOD.

H. (U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203735A | **Project Number: D332**
PE Title: Combat Vehicle Improvement Programs | **Budget Activity: #7**
Project Title: M2/M3 Bradley Fighting Vehicle

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
WEAPONS, TRACKED COMBAT VEHICLES (Procurement)							
GZ2400 Bradley Mods	44346	29894	72512	74996	87820	65405	56504
G80718 Bradley Base Sustainment	124593	192437	145438	147602	149089	176853	233725
G80702 BFVS Family (MYP)	93484	71100	14133	12939	11523	3751	0

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. (U) TEST AND EVALUATION DATA: Test and Evaluation Plan, as part of TEMP is being developed as part of documentation for Milestone IV decision on 1/94.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203735A
PE Title: Combat Vehicle Improvement Programs

Project Number: D344
Budget Activity: #7

A. (U) RESOURCES: ($ in Thousands)
Project Title: Fire Support Team Integration

Popular Name	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
Fire Support Team Integration	0	0	18608	23508	23858	9460	0	0	75100

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Operational Systems Development funding provides for material improvements to support conversion of the Bradley Fighting Vehicles to the Bradley Fire Support Vehicle. Fire Support Teams (FIST) currently equipped with M981's were incompatible with Bradley/Abrams equipped maneuver forces during Operation Desert Storm. This project will integrate a significant portion of the current M981 FIST-V mission equipment to the Bradley Fighting Vehicle System. Mission equipment integration will include Laser Designator North Seeking Gyro, Global Position System, FIST-V radios, combat identification and related command and control hardware. System is a new start.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments: None

(U) FY 1994 Planned Program: None

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• Award and Manage EMD Contract	4Q FY95	$1100K
• Begin Engineering, Manufacturing, Development and Design	4Q FY95	$15293K
• Begin Logistics Support, Provisioning, Technical manuals	4Q FY95	$2215K

D. (U) WORK PERFORMED BY: PM Bradley, Warren, MI will be the material developer. Mission equipment managed by MICOM, Huntsville, AL. No RDT&E contracts have been established to date.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203735A
PE Title: Combat Vehicle Improvement Programs

Project Number: D344
Budget Activity: #7

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:
NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** None
2. **SCHEDULE CHANGES:** None
3. **COST CHANGES:** None

F. (U) PROGRAM DOCUMENTATION: Requirements document currently under development by Artillery School at Fort Sill.

G. (U) RELATED ACTIVITIES: None. There is no unnecessary duplication of effort within the Army or DOD.

H. (U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
WEAPONS, TRACKED COMBAT VEHICLES (Procurement)							
Procure FIST-V Mod kit	0	0	0	0	0	41464	41013

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. (U) TEST AND EVALUATION DATA: Currently under development.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203735A
PE Title: Combat Vehicle Improvement Programs
Project Title: Bradley Base Sustainment Program

Project Number: D371
Budget Activity: #7

POPULAR NAME: BRADLEY BASE SUSTAINMENT

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203735A
PE Title: Combat Vehicle Improvement Programs
Project Title: Bradley Base Sustainment Program

Project Number: D371
Budget Activity: #7

A. (U) SCHEDULE/BUDGET INFORMATION: ($ In Thousands)

SCHEDULE	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	To Complete
Program Milestones					LRIP IPR		MS III	
Engineering Milestones			CRITICAL DESIGN REVIEW	COMPONENT QUALIFICATION				
T&E Milestones					PRE-PRODUCTION QUALIFICATION TEST (PPQT)		INITIAL OPERATIONAL TEST AND EVALUATION (IOT&E)	
Contract Milestones					LRIP AWARD	2ND LRIP AWARD	3RD LRIP AWARD	PRODUCTION AWARD
BUDGET ($000)	**FY 1993**	**FY 1994**	**FY 1995**	**FY 1996**	**FY 1997**	**FY 1998**	**FY 1999**	**Program Total (To Complete)**
Major Contract			68841	100199	62224	8946		240210 (0)
Support Contract								(0)
In-House Support			6000	6144	6110	3848		22102 (0)
GFE/ Other			1280	4252	12310	6100		23942 (0)
Total			76121	110595	80644	18894		286254 (0)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203735A
PE Title: Combat Vehicle Improvement Programs
Project Title: Bradley Base Sustainment Program

Project Number: **D371**
Budget Activity: **#7**

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: In FY94 and beyond the Bradley M2A3/M3A3 configuration vehicles will be a major upgrade to give the system upgraded electronics, digital command and control compatible with the M1A2 tank and second generation FLIR's for enhanced target acquisition. Major improvements will include a 1553 based, databus core electronics architecture, digital information displays, software packages for C2, navigation, communications, autotracking, diagnostics, embedded training and fire control, second generation focal plane array FLIR's for Gunner and Commander as well as full digital integration of all Desert Storm Improvements. Restructured from Project D332.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments: None

(U) FY 1994 Planned Program: See Project 332

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) A3 Design Engineering	4Q FY95	$54674K
• (U) Prototype Manufacturing	4Q FY95	$14167K
• (U) Minor Tasks	4Q FY95	$7280K

D. (U) WORK PERFORMED BY: The Bradley program manger in the Program Executive Office for Armored Systems Modernization, Warren, MI is assigned the responsibility of program management. The major supporting government technical organizations are MICOM, PM TOW, Huntsville, AL, U.S. Army Tank-Automotive Command, Warren MI, Aberdeen Proving Ground, MD; and Yuma Proving Ground, AZ. The contractor for the Engineering Manufacturing Development (EMD) phase will be FMC Corp, San Jose, CA. and Texas Instruments, Dallas, TX.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** None
2. **SCHEDULE CHANGES:** None
3. **COST CHANGES:** None

F. (U) PROGRAM DOCUMENTATION: See Project D332

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0203735A**
PE Title: **Combat Vehicle Improvement Programs**
Project Title: **Bradley Base Sustainment Program**

Project Number: **D371**
Budget Activity: **#7**

G. (U) RELATED ACTIVITIES: Bradley block upgrade will make maximum utilization of technologies developed for the M1A2 tank and incorporated in the M1A2 block upgrade program. Possible systems include the 1553 data bus technology, position navigation system, core vetronics architecture and stabilized commander's independent thermal viewer. There is no unnecessary duplication of effort within the Army or DOD.

H. (U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
WEAPONS, TRACKED COMBAT VEHICLES (Procurement)							
GZ2400 Bradley Mods	44346	29894	72512	74996	87820	65405	56505
G80716 Bradley Base Sustainment	124593	192437	145438	147602	149089	176853	233725

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. (U) TEST AND EVALUATION DATA: See Project D332

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0203740A
PE Title: Maneuver Control System

Budget Activity: #7

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DC49 Standard Theater Army Command and Control System	0	12953	20637	18342	8183	9518	9308	CONT	CONT
D2HT MCS Operational Test	0	0	91	0	0	0	0	0	91
D484 Maneuver Control System	26890	16140	17208	14144	12947	12744	8755	50000	384318
PE TOTAL	26890	29093	37936	32486	21130	22262	18063	CONT	CONT

B. (U) BRIEF DESCRIPTION OF ELEMENT: Project DC49, Standard Theater Army Command and Control System (STACCS) is a theater level secret high C2 system for U.S. Army Europe (USAREUR), U.S. Army Central Command (ARCENT), U.S. Army South (USARSO), U.S. Army Pacific (USARPAC), and 8th U.S. Army and their major sub-commands. STACCS provides a common picture through the use of 18 integrated functional (logistics, personnel, friendly/enemy, etc.) information databases available for automated decision support tools. This facilitates the forecasting of capabilities, gathering and distribution of information and analysis and planning in support of unit missions. This is a continuation of a multi-theater initiative. Project D2HT, MCS Operational Test, will support planned Initial Operational Test & Evaluation (IOT&E) of MCS. Project D484, Maneuver Control System (MCS), automates command and control (C2) functions previously performed manually. It provides secure, automated assistance to the G3/S3 and other key staff to meet the information needs of commanders for quicker decisions and application of battlefield resources. MCS provides standardized message sets, acquires commander's critical information requirements, and displays status screens and battlefield graphics.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:

(U) Project D2HT - MCS Operational Test: Project D2HT finances the direct costs of planning and conducting operational testing and evaluation of the Maneuver Control System (MCS) by the Operational Test and Evaluation Command (OPTEC) in conjunction with other Army Tactical Command and Control Systems (ATCCS) IOTEs in FY94, to include the Advanced Field Artillery Tactical Data System (AFATDS) and the Combat Service Support Control System (CSSCS). The AFATDS and CSSCS are Acquisition Category (ACAT) I systems with dedicated Initial Operational Tests and Evaluations (IOTE) in 4Q94 in support of Milestone III full production decisions. Operational testing is conducted under conditions, as close as possible, to those encountered in actual combat with typical user troops trained to employ the system. OPTEC

provides Army leadership with an independent test and evaluation of effectiveness and suitability of the system. Project D2HT is not a new start. It is reprogrammed from PE 0605712, Support of Operational Testing, Project D001, OPTEC Initial Operational Test and Evaluation (IOTE). In FY95, funding for operational testing of Acquisition Category (ACAT) I systems is programmed with the PE funding development for each system. Future fiscal years will be reprogrammed when system information becomes available.

	Complete	Cost
(U) FY 1993 Accomplishments:		
• (U) Not applicable	N/A	0
(U) FY 1994 Planned Program:		
• (U) Not applicable.	N/A	0
(U) FY 1995 Planned Program:		
• (U) MCS IOTE	1Q95	91

(U) Work Performed By: A majority of Project D2HT work is performed by Test and Evaluation Directorates of the Operational Test and Evaluation Command (OPTEC) from Alexandria, VA, and Fort Hood, TX. Work is also performed by the Electronic Proving Grounds (EPG), Fort Huachuca, AZ. All organizations are staffed by military and civilian government personnel. Contractors expected to perform work for this project include: BDM International Inc., McLean, VA; United International Engineering, Fort Bliss, TX; Test and Experimentation Services Company, Albuquerque, NM; Computer Science Corporation, San Diego, CA; and Computer Data Systems Inc., Fort Worth, TX.

(U) Related Activities: Project D2HT is reprogrammed from PE 0605712, Project D001. There is no unnecessary duplication of effort within the Army or DoD. The Army staff monitors all tests for material development and activities to avoid duplication of effort. The Deputy Director of Defense Research and Engineering (Test and Evaluation), and Director of Operational Test and Evaluation, Office of the Secretary of Defense, also review planned testing and development of support equipment to ensure integration of testing by the services and to avoid duplicative testing. High-level staff management of resources for user testing is provided by the U.S. Army Test Schedule and Review Committee which is chaired by OPTEC. Unnecessary duplication of like items is prevented by coordination with Program Manager, Instrumentation, Targets and Threat Simulators (PM-ITTS), the Operational Test and Evaluation Coordinating Council, review by the Army Test and Evaluation Committee and by coordination with the Test Scheduling and Review Committee.

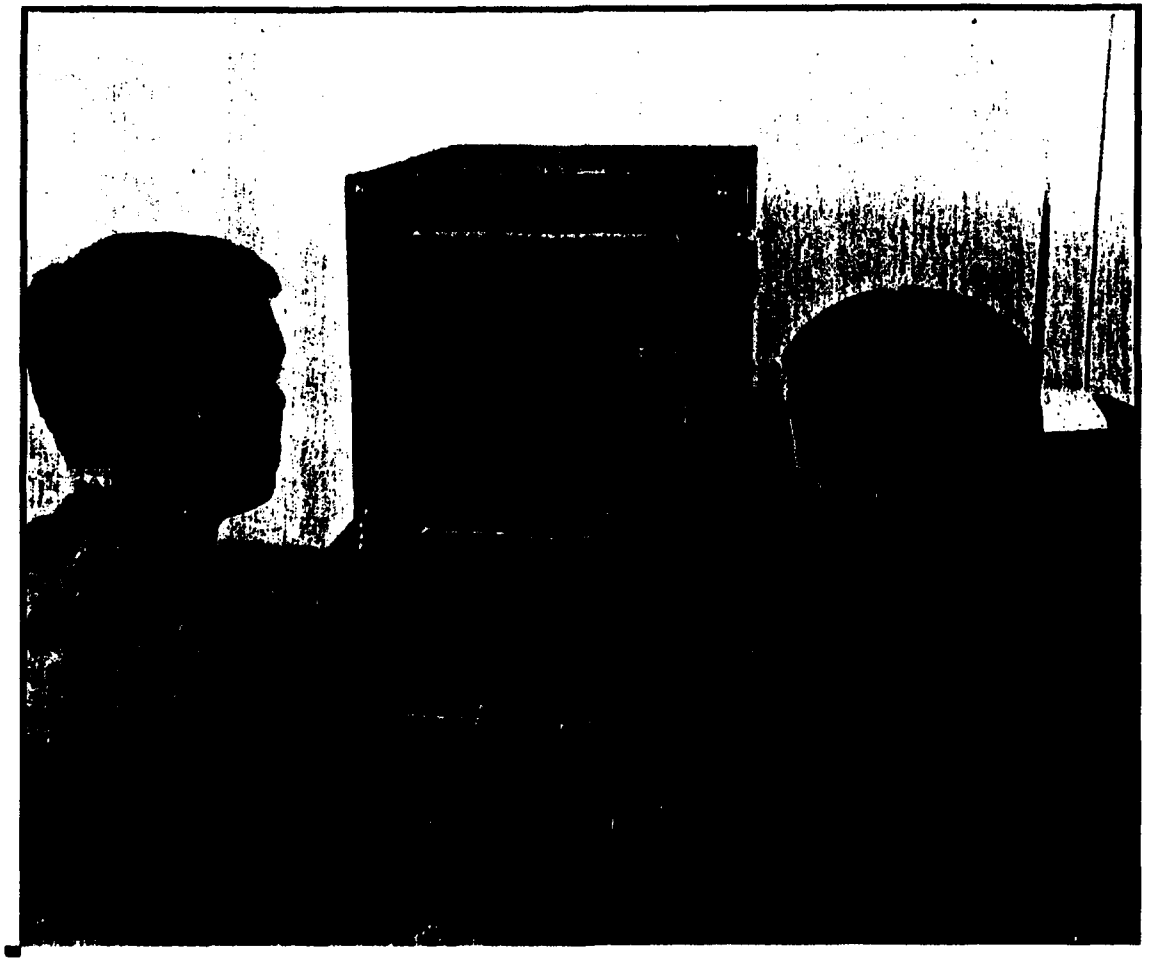
(U) Other Appropriation Funds: ($ in Thousands) Not applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203740A
PE Title: Maneuver Control System
Project Title: MCS-Maneuver Control System

Project Number: #D484
Budget Activity: #7



POPULAR NAME: Maneuver Control System (MCS)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203740A
PE Title: Maneuver Control System
Project Title: MCS-Maneuver Control System

Project Number: #D484
Budget Activity: #7

A. (U) SCHEDULE/BUDGET INFORMATION: ($ In Thousands)

SCHEDULE	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	To Complete
Program Milestones		Acq Pgm Baseline approval 3/94	TEMP approval 10/94	ASARC 3/96 MS III DAB 4/96				Convert to PDSS
Engineering Milestones	V11 re-integration 3/93-9/93	V.12.0 Acceptance 5/94 Initiate V12.1 SW 8/94	Initiate V12.2 SW development 5/95	V12.1 Completed 2/96	V12.2 Completed 2/97	V12.3 Completed 2/98		Complete Block IV Software Development
T&E Milestones	Integration & Validation Compliance Demonstration 9/93	ATCCS III Integrated Interoperability Demonstration 7/94-9/94		IOT&E 10/95 V12.1 FOT&E 9/96	V12.2 FOT&E 9/97	V12.3 FOT&E 9/98		
Contract Milestones		Award Contract for Block IV SW Dev 8/94						
BUDGET ($000)	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	Program Total (To Complete)
Major Contract	14156	8844	10636	8226	9347	9813	6059	286591 (35000)
Support Contract	1105	850	517	446	425	429	284	18939 (2000)
In-House Support	3410	3557	3713	3456	1854	1532	1502	55118 (8000)
GFE/ Other	8219	2.889	2342	2016	1321	970	910	23667 (5000)
Total	26890	16140	17208	14144	12947	12744	8755	384318 (50000)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203740A
PE Title: Maneuver Control System
Project Title: MCS-Maneuver Control System

Project Number: #D484
Budget Activity: #7

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The Maneuver Control System (MCS) satisfies an urgent need for efficient command and control of tactical operations on the battlefield. MCS supports the operational concepts of initiative, agility, depth, synchronization and versatility. MCS provides commanders and staffs, at corps through battalion, accurate, up-to-date information for quicker decisions and effective utilization of firepower and maneuver resources. The MCS data base provides decision support information and functional tools in both text and map graphics form. The system also automates the preparation and distribution of operations orders and reports to facilitate the initiation and execution of the commander's decision. Reports received through MCS automatically update the data base ensuring that current tactical information is available whenever and wherever it is needed. Since the initial MCS was introduced in Europe in 1981, this program has been and will continue to be, evolutionary development. The MCS capability continues to expand in pre-planned, time-phased steps toward the objective system. The use of a non-developmental item (NDI) tactical computer processor enables the MCS to capitalize on state of the art, ruggedized, commercial equipment and reduce life cycle costs. Commencement of the transition to common hardware/software (CHS) began in FY 1989 with the initiation of the porting of software as well as the initiation of the integration of CHS into both the Standardized Integrated Command Post System (SICPS) and the existing Command and Control Unit vehicle.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Quadrilateral Operational Demonstration successfully completed.	3Q93	100
• (U) Replan infrastructure for the MCS program based on reuse of V11 and modular application packages.	1Q94	24090
• (U) Began development of Brigade and Below Command and Control (B2C2), Operation Order (OPORD) and Terrain Evaluation Module (TEM) prototypes for MCS and supported ATCCS common software application modules.	1Q94	2700
TOTAL		**26890**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Implement replan of MCS program based on Common ATCCS Support Software (CASS) foundation.	3Q94	400
• (U) Continue MCS V12 software development.	1Q95	12464
• (U) Source Selection and award contract for Block IV Software Development.	4Q94	676
• (U) Conduct MCS Operational Assessment on Common Hardware Software using MCS V12 prototype.	4Q94	1000
• (U) Continue B2C2, OPORD and TEM development.	1Q95	1600
TOTAL		**16140**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203740A
PE Title: Maneuver Control System
Project Title: MCS-Maneuver Control System

Project Number: #D484
Budget Activity: #7

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Begin subsystem engineering, integration and test for the Maneuver functional areas.	3Q95	500
• (U) Conduct Initial Operational Test & Evaluation at Ft. Hood, TX.	1Q96	900
• (U) Continue MCS V12 development/integration/prototyping.	1Q96	15508
• (U) Establish and update documentation to support Army Systems Acquisition Review Committee (ASARC)/Defense Acquisition Board (DAB) Milestone III decision.	4Q95	300
TOTAL		**17208**

D. (U) WORK PERFORMED BY: Project Manager, Operations Tactical Data Systems, Program Executive Office, Command and Control Systems, Fort Monmouth, NJ. Computer Science Corporation, P.O. Box 8048, Philadelphia, PA 19101, Telos Corp, 3420 Ocean Park Blvd, Suite 3050, Santa Monica, CA 90405-3304, and the Mitre Corp, 145 Wyckoff Road, Suite 201, Eatontown, NJ 07724. Support services are provided by SBA contract Modern Technologies Corporation, 4032 Linden Ave., Dayton OH 45432-3015. The MCS Block IV RFP for software development is in process.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** None
2. **SCHEDULE CHANGES:** None
3. **COST CHANGES:** None

F. (U) PROGRAM DOCUMENTATION:

	Date
Required Operational Capability (ROC)	07/82
Decision Coordinating Paper (DCP)	05/83
Updated ROC	06/88
Test and Evaluation Master Plan (TEMP) Service Approved	07/88
Acquisition Program Baseline (APB) Change 1 approved	06/92
Operational Requirements Document (ORD) HQDA approved	10/92
System Threat Assessment Report (STAR) HQDA approved	05/93
Revised Operational Requirements Document (ORD) approval	11/93
Acquisition Program Baseline Document (APB) Change 2 approval	03/94
Revised Acquisition Strategy Report (ASR) approval	03/94

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203740A
PE Title: Maneuver Control System
Project Title: MCS-Maneuver Control System

Project Number: #D484
Budget Activity: #7

Cost & Operational Effectiveness Analysis (COEA) approval	07/94
Revised Test and Evaluation Master Plan (TEMP) approval	10/94
Acquisition Decision Memorandum, MS III	04/96

G. (U) RELATED ACTIVITIES: The Maneuver Control System is part of the overall Army Tactical Command and Control System which is managed by the Program Executive Office, Command and Control Systems who ensures there is no unnecessary duplication of effort within the Army or DoD.

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Other Procurement, Army							
BA9320	16780	0	0	34635	35507	35759	0
MA9710	0	0	0	101	0	0	0

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS:
There are Memoranda of Agreement with United Kingdom, Federal Republic of Germany, and France.

J. (U) TEST AND EVALUATION DATA:

Test and Evaluation Activity Event	Planned Date	Actual Date	Remarks
Quadrilateral Interoperability Demonstration Material release		5/90	Demo interface with British, French and German Systems
ATCCS III Demonstration	7/94-9/94		
IOT&E	1Q96		

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203740A
PE Title: Maneuver Control System

Project Number: #DC49
Budget Activity: #7

A. (U) RESOURCES: ($ in Thousands)
Project Title: Standard Theater Army Command and Control System (STACCS)

Popula Name	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
STACCS	0	12953	20637	18342	8183	9518	9308	CONT	CONT

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: STACCS is a theater level, secret high command and control (C2) system. Initial operational capability is currently fielded to U.S. Army Europe (USAREUR) and U.S. Army Central Command (ARCENT). Pilot fielding to U.S. Army Pacific (USARPAC), U.S. ARMY South (USARSO) and 8th U.S. Army are planned to begin in FY94. STACCS provides a common picture for the theater commander and his major subordinate commands through the use of information projected on map background, automated briefing and reporting systems, and automated decision support capabilities, all tied to available database information. This is accomplished by automated update and query of 18 functionally oriented databases which are replicated and distributed to enhance survivability. In the aggregate, the system provides the ability to analyze, forecast, plan and execute. Utilizes Common Hardware (CHS) and Non-Developmental Item (NDI) hardware for workstation, gateways, packet switches and fiber optic local area networks. Maximum reuse of software packages (Commercial Off-The-Shelf and Government Off-The-Shelf) in a layered, open architecture provide efficiency and flexibility. STACCS operates over strategic, tactical and commercial communication systems (Defense Secure Network, Mobile Subscriber Equipment Packet and Host Nation Systems). Interfaces have been developed or are planned with strategic systems, other service systems and Army systems which facilitate STACCS operational employment in joint and combined force activities. This is a continuation of a multi-theater initiative in FY94. Beginning in FY95, the STACCS program will be consolidated with Army World-wide Military Command and Control System Information System (AWIS) to take advantage of commonalities between the systems.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 ACCOMPLISHMENTS:	Complete	Cost
• (U) Not funded in RDT&E.	N/A	0

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203740A
PE Title: Maneuver Control System

Project Number: #DC49
Budget Activity: #7

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Develop incremental enhancements to Version 1.1 (V1.1).	3Q94	1500
• (U) Start new applications for Version 1.2 (V1.2) software release.	1Q94	10953
• (U) Conduct Source Selection Evaluation Board for consolidated AWIS-STACCS-CSSCS contract for software development.	1Q95	500
TOTAL		12953

(U) FY 1995 Planned Program:		
• (U) Install STACCS V1.2 software, five theaters.	1Q95	1935
• (U) Fix Software Problem Reports on STACCS V1.2, install V1.2.1.	2Q95	2500
• (U) Develop and field STACCS V1.3 software.	4Q95	15802
• (U) Efforts leading to Award of consolidated AWIS-STACCS-CSSCS contract for software development.	1Q95	400
TOTAL		20637

D. (U) WORK PERFORMED BY: Project Manager, Operations Tactical Data Systems, Program Executive Office, Command and Control Systems, Fort Monmouth, NJ. , and TRW Inc., Redondo Beach, CA

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: Award of recompete contract changed from 3Q94 to combined AWIS-STACCS-CSSCS in 1Q95
3. COST CHANGES: Plus-ups in FY95 - FY99 due to redirection of program

F. (U) PROGRAM DOCUMENTATION:

Operational Requirements Document (ORD) (Combined Arms Center, DRAFT)	Jan 92
Test and Evaluation Master Plan (TEMP) (DRAFT)	Nov 91
Integrated Logistics Support Plan (ILSP) (DRAFT)	Feb 92
Configuration Management Plan (CMP)(DRAFT)	Undated
Acquisition Procurement Request, Submitted to ISSAA	All acquisition documentation is currently being redeveloped as a result of DA direction to consolidate the procurement of the STACCS AWIS & CSSCS systems.
Acquisition Baseline Documentation - Currently in development	
Acquisition Plan - Currently in development	

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203740A
PE Title: Maneuver Control System

Project Number: #DC49
Budget Activity: #7

G. (U) RELATED ACTIVITIES:

PE #0604818A (Army Tactical Command and Control, Hardware and Software)
There is no unnecessary duplication of effort within the Army or DoD.

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Other Procurement, Army BA8250	2701	5744	12095	8623	15285	15613	19569

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. (U) *MILESTONE SCHEDULE:*

Milestones	Dates
Established STACCS V1.0 baseline, Reforger 92	1Q93
Award AWIS-STACCS-CSSCS contract for software development	1Q95

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203744A
PE Aircraft Modifications/Product Improvement Programs

Budget Activity: #7

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DB75 Tractor Check	6405	8753	5574	0	0	0	0	0	29414
D179 CH-47D Product Improvement	0	0	2850	1837	0	0	0	0	4687
D423 AH-64 PIP	0	4957	1140	0	0	0	0	0	6097
PE TOTAL	6405	13710	9564	1837	0	0	0	0	40198

B. (U) BRIEF DESCRIPTION OF ELEMENT: This PE includes the classified project TRACTOR CHECK and funds the CH-47D Product Improvement Program (PIP) and the AH-64 PIP. In FY95, the CH-47D PIP is a new start for the development of 1050-Gallon Self-Sealing Tactical Fuel Tanks for long range self-deployment which will extend flight range of the CH-47D. The AH-64 PIP will develop, test and integrate the Alternate Laser Code (ALC) to the Apache. Impacted hardware includes the Laser Electronics Unit Remote Hellfire Electronics, Fire Control Computer, Back-up BUS Controller, and Data Transfer System. The addition of the ALC will ensure optimum Hellfire performance on a battlefield with known countermeasures and will allow optimal use of planned electro-optical countermeasures (EOCM) on the Hellfire missile.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN 1995:

(U) Project DB75 - Tractor Check: This is a classified program.

(U) Project D179 - CH-47D Product Improvement: This PIP is a new start in FY95 for the development of 1050-Gallon Self-Sealing Tactical Fuel Tanks for long range self-deployment of the CH-47D.

(U) FY 1993 Accomplishments:
- (U) Project not funded

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203744A **Budget Activity: #7**
PE Aircraft Modifications/Product Improvement Programs

(U) FY 1994 Planned Program:
- **(U) Project not funded**

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• **(U) Develop engineering change proposal for a self-deployment system**	1Q94	50
• **(U) Design fuel tank to provide for rapid deployment and extended range**	3Q95	1350
• **(U) Prototype fuel tank**	2Q96	1450
TOTAL		**2850**

(U) Project D423 - AH-64 PIP: This project will develop, test and integrate the Alternate Laser Code (ALC) on the Apache. The developmental effort will define exact nature of needed modifications to hardware currently installed on the AH-64 (i.e., fire control computer, laser electronics unit, and remote Hellfire electronics). The addition of ALC will allow optimal use of planned electro-optic countermeasures (EOCM) on the Hellfire II missile.

(U) FY 1993 Accomplishments:
- **(U) Project not funded**

(U) FY 1994 Planned Program:		
• **(U) Design hardware/software to integrate Alternate Laser Code in the AH-64**	1Q95	1621
• **(U) Develop test plans to ensure adequate testing of replaced/changed hardware**	1Q95	476
• **(U) Review design to ensure proper integration of equipment and software**	4Q95	950
• **(U) Procure test equipment/hardware needed to complete required tests**	4Q95	1100
• **(U) Test LRU/Systems to ensure compatibility with existing electronic equipment and software**	1Q96	810
TOTAL		**4957**

(U) FY 1995 Planned Program:		
• **(U) Develop first hardware/software prototype for aircraft testing**	1Q96	180
• **(U) Integrate hardware/software in aircraft and ground test**	2Q96	300
• **(U) Perform flight test using new hardware/software**	2Q96	660
TOTAL		**1140**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203744A **Budget Activity: #7**
PE Aircraft Modifications/Product Improvement Programs

(U) Work Performed By: Project D179 contractor unknown. Project D423 - McDonnell Douglas Helicopter Systems, Mesa, AZ; Martin Marietta Fire Control Systems, Orlando, FL; Rockwell International Corporation, Cedar Rapids, Ia.

(U) Related Activities: There is no unnecessary duplication of effort within the Army or DoD.

(U) Other Appropriation Funds:

($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
APA (AA6606)							
AH-64 Apache Mods	0	0	0	7267	11436	8782	8975
APA (AA0252)							
CH-47D Cargo Helicopter Mods	0	0	0	0	4600	5000	6000

(U) International Cooperative Agreements: Not Applicable

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203752A
PE Title: **Aircraft Engine Component Improvement Program** Budget Activity: #7

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D106 Aircraft Component Improvement Program (CIP)	6303	6559	3035	3001	3007	3019	3032	Cont	Cont

(U) BRIEF DESCRIPTION OF ELEMENT: Aircraft Engine Component Improvement Program (CIP) develops, test, and qualifies improvements to aircraft components to correct service revealed deficiencies, improve safety, enhance readiness, and reduce Operating and Support (O&S) costs.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project D106 - Aircraft Component Improvement Program (CIP): The Aircraft Engine Component Improvement Program (CIP) corrects service revealed problems. CIP investigates, analyzes, develops, tests, and qualifies engine components to improve readiness. In addition, CIP includes redesign, test, and requalification of engine components identified as part of the Army's new flight safety parts service life surveillance program. CIP included in the RDT&E vice procurement appropriations in accordance with Congressional direction.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) T700 Engine: Woodward HMU/interrupted fuel flow pump AH-64 and H-60 flight testing completed (safety); completed 300+ hours endurance testing on 212107-15; qualified improved blade tip corrosion (readiness/cost); qualified Hamilton Standard Fuel Control with higher temperature external O-rings (readiness/cost); completed substantiation of Woodward Governor HMU torque motor water intrusion improvements (readiness/cost); initiation of test program to evaluate turbine blade curling problem (readiness/cost); initiation of Apache altitude strat program (safety); initiated NSV test program on field engine (readiness/cost) buildup of T700 engine for 300 cycle LCF test; completed qualification of improved stage 1 turbine blades (readiness); initiated improved boost pump program (safety); performed testing of H-60 DECU's for EMI/EMV susceptibility (safety).	3Q93	3200
• (U) T55 Engine: Continued development of the composite inlet housing (cost/readiness); initiated structural analysis and design of a cost 4th stage nozzle (safety/readiness/cost).	2Q93	1619

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203752A
PE Title: Aircraft Engine Component Improvement Program — Budget Activity: #7

• (U) T53 Engine: Completed fabrication and testing of turbine parts redesigned in new material (readiness/cost); completed machining of inlet housing redesigned in new material (readiness/cost); completed design of integral torque meter ring in reduction gearbox (readiness/cost); completed analysis and evaluation of casting sources for improved accessory drive carrier (safety/readiness/cost); completed analysis and design for improved exhaust diffuser (readiness/cost); fabricated composite engine front cover and began composite front cover testing (readiness/cost).	4Q93	701
• (U) GTCP36 Auxiliary Power Unit (APU): Continued development testing and design of the Power takeoff (PTO) clutch for AH-64 (safety/readiness).	1Q93	783
TOTAL		6303

(U) FY 1994 Planned Program:

• (U) T700 Engine: Development of improved DECU (safety/readiness/cost); T700 mission profile update from field data readiness/cost); development of improved yellow harness (safety/readiness/cost); update of critical engine part component life limits (safety/readiness/cost); develop ceramic shroud durability improvements (readiness/cost); improve Garrett Anti-Ice Start Value (readiness/cost).	4Q94	2856
• (U) T55 Engine: Continue development of the composite inlet housing (cost/readiness); complete development of cost 4th nozzle (safety/reliability/cost); initiate program for a machined combustor liner (cost/reliability/durability); redesign mainshaft and accessory bearings (cost/reliability/readiness).	4Q94	1849
• (U) T53 Engine: Complete development and casting evaluation of integrated torque meter ring (readiness/cost); procure and evaluate castings and bearings for improved accessory drive carrier (safety/readiness/cost); fabricate improved exhaust diffuser (readiness/cost).	4Q94	484
• (U) GTCP36 APU: Complete development and qualification of improved PTO clutch for the AH-64.	1Q94	1370
TOTAL		6559

(U) FY 1995 Planned Program:

• (U) T700 Engine: Qualify improved Digital Electronic Control Unit (safety/readiness/cost); develop updated critical engine component life limits (safety/readiness/cost); qualify improved yellow harness (safety/readiness/cost); develop improved durability shroud (readiness/cost); update mission life profiles from field data (readiness/cost); qualify improvements to Garrett AISBV (readiness/cost).	4Q95	1900

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203752A
PE Title: Aircraft Engine Component Improvement Program
Budget Activity: #7

• (U) T55 Engine: Continued development of the composite inlet housing (cost/readiness); complete design and rig testing of machines combustor liner (cost/reliability/durability); complete redesign of mainshaft bearings (cost/reliability/readiness); redesign the gas producer blade retention (safety/reliability/readiness).	2Q95	1135
TOTAL		3035

(U) Work Performed By: In-house efforts performed by ATCOM, St. Louis, MO. Contractors Listed below:

ENGINE	CONTRACTOR
T700	General Electric, Lynn, Massachusetts
T55 & T53	Textron Lycoming, Stratford, Connecticut
GTCP36 APU	Garrett, Auxiliary Power Division, Phoenix, Arizona

(U) Related Activities: The Aircraft Engine CIP is a tri-service effort. When more than one service utilizes the same engine, funds from all using services are consolidated into one program. This program is managed by the lead service having the largest inventory. Coordination meetings and "lead service" contracting preclude unnecessary duplication of efforts within the Army or DoD.

(U) Other Appropriation Funds: ($ in Thousands) Not applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0203758A**
PE Title: **Horizontal Battlefield Digitization**

Project Number: **#D374**
Budget Activity: **#7**

A. (U) RESOURCES: ($ in Thousands)
Project Title: Horizontal Battlefield Digitization

Popular Name Program	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
Horizontal Battlefield Digitization	0	20000	75857	25007	13031	0	0	0	133895

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This program element integrates dissimilar weapons systems (tanks, armored vehicles, aircraft, command and control vehicles) with common technology through either new acquisitions, Pre-Planned Product Improvements (P3I), or system-component upgrades. The application of common technologies across multiple systems through an integrated and seamless battlefield architecture improves the capabilities of weapon systems that fight together as units or task forces, providing exponential improvement to the force. Battlefield Digitization allows the Army's primary weapons systems and others to see, acquire, and engage threats while sharing the same information with equal clarity, using advanced technologies and digital communications. To prove out concepts and requirements, near-term efforts will focus on developing a seamless battlefield architecture and appliqué systems to support live experimentation and fielding of a maneuver brigade in FY 1996 and a division in FY 1997. A FY 1994 Digitization Special Task Force (STF) will refine requirements and programmatics. In late FY 1994 the Digitization STF will transition into an Army Digitization Office (ADO) which will coordinate and implement all Army digitization efforts.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments:
- **(U)** No planned program.

(U) FY 1994 Planned Program:

	Complete	Cost
• **(U)** Conduct Advanced Warfighter Demonstration (AWD) at National Training Center (NTC 94-7).	3QFY94	8000
• **(U)** Conduct Army Tactical Command and Control System (ATCCS) Operational Test (OT).	4QFY94	9000
• **(U)** Fund a Digitization Special Task Force (STF) transitioning to an Army Digitization Office (ADO).	4QFY94	3000
Total		**20000**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0203758A**
PE Title: **Horizontal Battlefield Digitization**

Project Number: **#D374**
Budget Activity: **#7**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Develop data radio interfaces.	4QFY95	15000
• (U) Develop Brigade and Below Command and Control (B2C2) system software.	4QFY95	6000
• (U) Develop appliqué hardware (common interface, mounting kit, and computer unit) to support brigade live experimentation in FY 1996 and division live experimentation in FY 1997.	4QFY95	20000
• (U) Conduct live, virtual and constructive simulation and experimentation.	4QFY95	10000
• (U) Integrate appliqués on system platforms.	4QFY95	21000
• (U) Fund Army Digitization Office (ADO) program management and technical support.	4QFY95	2857
Total		**74857**

D. (U) WORK PERFORMED BY: Army Program Executive Offices (PEOs) and commodity commands and their technical, administrative and prime contractors.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY: This program was a FY 1994 Congressionally directed new start program, therefore, there was no FY 1994 Descriptive Summary submitted.

NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** Not applicable.
2. **SCHEDULE CHANGES:** Not applicable.
3. **COST CHANGES:** Not applicable.

F. (U) PROGRAM DOCUMENTATION: None.

G. (U) RELATED ACTIVITIES: All Army RDT&E and procurement programs that have, or will have, digital components.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203758A
PE Title: Horizontal Battlefield Digitization

Project Number: #D374
Budget Activity: #7

H. (U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
WTCV	0	0	0	64000	68000	64000	62000

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. (U) MILESTONE SCHEDULE:

Milestones	Dates
TBD.	

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203801A
PE Title: Missile/Air Defense Product Improvement Program

Budget Activity: #7

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D036 PATRIOT Product Improvement Program	36249	37326	24610	12859	12652	9721	8728	35000	177145
D038 AVENGER Product Improvement Program	11195	8385	0	0	0	2213	2190	0	23983
D303 STINGER-RMP Product Improvement Program	10390	19519	0	4967	4985	0	0	2500	42361
D690 HAWK Product Improvement Program	7540	0	0	0	0	0	0	0	7540
PE TOTAL	65374	65230	24610	17826	17637	11934	10918	37500	251029

B. (U) BRIEF DESCRIPTION OF ELEMENT: Threat forces modernization and proliferation require an evolutionary product improvement program to maintain the effectiveness of ground based anti-air tactical missile defense systems. This program element develops improvements to PATRIOT, HAWK, AVENGER, and STINGER-RMP.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:

(U) Project D038 - AVENGER Product Improvement Program (PIP): The AVENGER PIP will permit worldwide employment of AVENGER through the addition of an Environmental Control Unit (ECU, with cooling for hot desert climates)/Prime Power Unit (PPU, to provide power needed to operate ECU under all climatic conditions). Additionally, the AVENGER PIP will increase the lethality and survivability of the total system through the addition of the Command and Control/Manual, Fire Control-1, Command and Control/Automatic, and improved Remote Control Unit (RCU) subsystems. These subsystems will increase AVENGER's probability of target detection and identification by cueing the gunner to the target location using air track data reported by Army and USMC C2 systems. The gunner can then launch (without delay for visual identification), using the ID data in the C2 report and locally obtained passive sensor data. The STINGER-RMP missile will be far more lethal since the improved fire control can upload software at launch time which is optimized for the specific target of interest. The system will be more survivable because the improved RCU will allow the gunner to engage with full system capability from protected positions such as bunkers.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0203801A**
PE Title: **Missile/Air Defense Product Improvement Program**

Budget Activity: **#7**

(U) Project D038 - AVENGER Product Improvement Program

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) ECU/PPU design, development, and test	4Q93	200
• (U) Defined Command, Control and Intelligence interfaces and initiate development of C3I manual	4Q93	1000
• (U) Initiated development of Integrated Weapons Control System (IWCS)	4Q93	450
• (U) Initiated development of Integrated training devices	4Q93	800
• (U) Reviewed candidate missiles for an adjunct or complementary missile on AVENGER, BRADLEY, and LAV-AD air defense platform	4Q93	7750
• (U) Initiated FC-1 design and development	4Q93	995
• **TOTAL**		**11195**
(U) FY 1994 Planned Program:		
• (U) Continue FC-1 design and development	4Q94	890
• (U) Integrate IWCS and incorporate test finding	4Q94	795
• (U) Conduct test programs and assess system performance through technical and operational tests	4Q94	700
• (U) Conduct live firings of the AVENGER complementary missile	4Q94	6000
• **TOTAL**		**8385**

(U) FY 1995 Planned Program: Not Applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203801A
PE Title: Missile/Air Defense Product Improvement Program **Budget Activity: #7**

(U) Project D690 - HAWK Product Improvement Program

(U) FY93 Accomplishments:	**Complete**	**Cost**
• (U) Completed Field Maintenance Equipment (FME) upgrade development	4Q93	1840
• (U) Continued mobility enhancement development	4Q93	1200
• (U) Processor Upgrade	4Q93	4500
• **TOTAL**		7540

(U) Work Performed By: PATRIOT-The prime contractor for PATRIOT is Raytheon Company, Bedford, MA, With Martin Marietta Corp, Orlando, FL, as missile subcontractor. In-House work to be performed by US Army Program Executive Office (PEO), Missile Defense, PATRIOT Project Office, US Army Missile Command, Redstone Arsenal, AL, and US Army Air Defense School, FT. Bliss, TX. **AVENGER**-In-house technical efforts performed by Program Executive Officer for Tactical Missile; Project Manager, Forward Area Air Defense (FAAD) Redstone Arsenal, AL; U. S. Army Air Defense School, Fort Bliss, TX; U. S. Army Missile Command, and Research, Development, and Engineering Center at Redstone Arsenal, AL. Boeing Aerospace of Huntsville, AL is the prime contractor for the AVENGER. **STINGER-RMP:** The prime contractor for the STINGER-RMP is Hughes Missile Systems Company, Tucson, A. In-house technical efforts performed by Program Executive Officer for Tactical Missiles; Project Manager, Forward Area Air Defense, Redstone Arsenal, AL; Research and Development Engineering Center, Redstone Arsenal, AL; and U.S. Army Air Defense School, Fort Bliss, TX. **BSFV:** In-house technical efforts are provided by Program Executive Officer for Tactical Missiles; Project Manager, Forward Area Air Defense; Research and Development Engineering Center, Redstone Arsenal, AL; Director of Combat Development, USAADASCH; and Battlefield Distributed Integrated Simulation Battle Labs. Contractors for the BSFV studies are Nichols Research Corporation and Sigmatech, Inc. Sole source conracts have been awarded to FMC, Inc, Boeing Aerospace Co, and Martin-Marietta for turret analysis. **HAWK**-The prime contractor is Raytheon Co., West Andover, MA The first increment of test program sets (pre-phase III) was developed and produced by Harris Corporation. Phase III test program sets are being developed by Summa Technologies. In-house technical efforts will be performed at U.S. Army Missile Command, by U.S. Army Research, Development and Engineering Center, Weapon Systems Management Directorate, Redstone Arsenal, AL, and U.S. Army Air Defense School, Ft. Bliss, TX.

(U) Related Activities: PATRIOT-PATRIOT Anti-Tactical Missile (ATM) upgrade project under PEs #0603216C and #0604225C (BMDO Programs) There is no unnecessary duplication of effort within the Army or DoD. **AVENGER/STINGER-RMP**-There is no unnecessary duplication of effort within the Army or DoD. This is assured by continuous coordination with other services and agencies. In addition, the Forward Area Air Defense Project Manager is responsible for the procurement of all STINGER missiles within DoD. **HAWK** - Not Applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203801A
PE Title: Missile/Air Defense Product Improvement Program

Budget Activity: #7

H. (U) Other Appropriation Funds:

Appropriation	($ in Thousands) FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Missile Procurement, Army							
Patriot C49100	25151	40587	8861	5092	2986	0	0
Patriot Mods C50700	9987	18526	26160	19419	19259	19768	20582
Military Construction	0	0	0	0	0	0	0
Avenger C14900	158808	149856	18338	16288	0	0	0
Avenger Mods CE8710	4117	9318	10925	1021	0	0	0
Stinger C18500	34652	33356	0	0	0	0	0
Stinger Mods C20000				10140	10202	10280	10353
Other Missile Support A0275		1353	0	0	0	0	0
HAWK C25400	1675	2760	330	0	0	0	0
HAWK Mods C35200	1498	0	0	0	0	0	0

(U) **International Cooperative Agreements**: **PATRIOT**-Under the cooperative agreements with NATO countries (Federal Republic of Germany, Netherlands and Italy) and other Non-NATO COUNTRIES (Saudi Arabia, Japan and Israel) Product improvements are available to those countries). **AVENGER**-Not applicable. **STINGER-RMP**-The European STINGER Project Group and the Swiss Government are scheduled to produce the STINGER-Reprogrammable Microprocessor missile (less reprogrammable module). The reprogrammable external module is not releasable to foreign nations at this time. **HAWK**-A memorandum of agreement was signed 19 June 1987 between the U.S. and the Netherlands.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0203801A**
PE Title: **Missile/Air Defense Product Improvement Program**
Project Title: **PATRIOT Product Improvement Program**

Project Number: **DO36**
Budget Activity: **#7**

POPULAR NAME: **PATRIOT**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203801A
PE Title: Missile/Air Defense Product Improvement Program
Project Title: PATRIOT Product Improvement Program

Project Number: DO36
Budget Activity: #7

A. (U) SCHEDULE/BUDGET INFORMATION: ($ IN THOUSANDS)

SCHEDULE	FY93	FY94	FY95	FY96	FY97	FY98	FY99	TO COMPLETE
PROGRAM MILESTONES								
ENGINEERING MILESTONES	P3I TEST PROG COMMO PHI P3I TEST PROG SET RESPONSIVE THREAT	GENERATOR COMMO PH I P3I TEST PROG P3I TEST PROG SET RESPONSIVE THREAT	GENERATOR COMMO PH I P3I TEST PROG P3I TEST PROG SET RESPONSIVE THREAT	COMMO PH I P3I TEST PROG P3I TEST PROG SET RESPONSIVE THREAT	CDI PH III P3I TEST PROG P3I TEST PROG SET RESPONSIVE THREAT	CDI PH III P3I TEST PROG P3I TEST PROG SET RESPONSIVE THREAT	CDI PH III P3I TEST PROG P3I TEST PROG SET RESPONSIVE THREAT	CONT
T & E MILESTONES	ENG & PROD TESTS	ENG & PROD TESTS	ENG & PROD TESTS	ENG & PROD TESTS	ENG & PROD TESTS	ENG & PROD TESTS	ENG & PROD TESTS	CONT
CONTRACT MILESTONES								
BUDGET $ 000	FY93	FY94	FY95	FY96	FY97	FY98	FY99	PROGRAM TOTAL (TO COMPLETE)
MAJOR CONTRACT	28110	24696	12024	9802	9899	7614	6808	CONT
SUPPORT CONTRACT	2432	1572	1500	1000	700	500	450	CONT
IN-HOUSE SUPPORT	5707	11058	11086	2057	2053	1607	1470	CONT
GFE/OTHER	0	0	0	0	0	0	0	0
TOTAL	36249	37326	24610	12859	12652	9721	8728	CONT

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203801A
PE Title: Missile/Air Defense Product Improvement Program
Project Title: PATRIOT Product Improvement Program

Project Number: DO36
Budget Activity: #7

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: PATRIOT is an advanced medium-to-high altitude surface-to-air guided missile air defense system with a high single-shot kill probability, capable of operation in an intense electronic countermeasures (ECM) Environment, and able to conduct multiple, simultaneous engagements against high-performance aircraft and tactical missiles likely to be encountered during the 1990'S and beyond. This project keeps PATRIOT current with the evolving threat by increasing capabilities during and after deployment, upgrading basic PATRIOT technology as technological breakthroughs occur, enhancing operational capabilities, and accommodating new missions. This effort is based upon a PrePlanned Product Improvement (P^3I) Program developed to overcome operational deficiencies and to upgrade capabilities. additionally, because European nations have selected or are considering PATRIOT as their future surface-to-air missile system, development efforts are continuing in support of NATO rationalization, standardization and interoperability.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

	Complete	Cost
(U) FY 1993 Accomplishments:		
• (U) P3I Test Program	4Q93	12485
• (U) Communications Upgrade PH I	4Q93	21405
• (U) Responsive Threat Analysis	4Q93	750
• (U) P3I Test Program Sets	4Q93	1609
• **TOTAL**		**36249**
(U) FY 1994 Planned Program:		
• (U) P3I Test Program	4Q94	12562
• (U) Communications Upgrade PH I	4Q94	17630
• (U) P3I Test Program Sets	4Q94	1741
• (U) Generators	4Q94	4643
• (U) Responsive Threat Analysis	4Q94	750
• **TOTAL**		**37326**
(U) FY 1995 Planned Program:		
• (U) P3I Test Program	4Q95	12699
• (U) Communication Upgrade PH I	3Q95	3869

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203801A
PE Title: Missile/Air Defense Product Improvement Program
Project Title: PATRIOT Product Improvement Program

Project Number: DO36
Budget Activity: #7

• (U) P3I Test Program Sets	4Q95	1793
• (U) Generators	4Q95	5499
• (U) Responsive Threat Analysis	4Q95	750
• TOTAL		24610

D. (U) WORK PERFORMED BY: The prime contractor for PATRIOT is Raytheon Company, Bedford, MA, With Martin Marietta Corp, Orlando, FL, as missile subcontractor. In-House work to be performed by US Army Program Executive Office (PEO), Missile Defense, PATRIOT Project Office, US Army Missile Command, Redstone Arsenal, AL, and US Army Air Defense School, FT. Bliss, TX.

E. (U) COMPARISON WITH FY94 AMENDED RDT&E DESCRIPTIVE SUMMARY:
NARRATIVE DESCRIPTION OF CHANGES

1. **(U) Technical changes:** None
2. **(U) Schedule Changes:** None
3. **(U) Cost Changes:** None

F. (U) PROGRAM DOCUMENTATION: Decision coordinating paper 8/80

G. (U) RELATED ACTIVITIES: PATRIOT Anti-Tactical Missile (ATM) upgrade project under PEs #0603216C and #0604225C (BMDO Programs). There is no duplication of effort within the army of DoD.

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Missile Procurement, Army							
PATRIOT C49100	25151	40587	8861	5092	2986	0	0
PATRIOT Mods C50700	9987	18526	26160	19419	19259	19768	20582
Military Construction	0	0	0	0	0	0	0

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0203801A**
PE Title: **Missile/Air Defense Product Improvement Program**
Project Title: **PATRIOT Product Improvement Program**

Project Number: **DO36**
Budget Activity: **#7**

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Under the cooperative agreements with NATO countries (Federal Republic of Germany, Netherlands and Italy) and other Non-NATO countries (Saudi Arabia, Japan, and Israel) Product improvements are available to those countries.

J. (U) TEST AND EVALUATION DATA: Not available

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0203801A**
PE Title: **Missile/Air Defense Product Improvement Program**
Project Title: **STINGER-RMP Product Improvement Program**

Project Number: **D303**
Budget Activity: **#7**

POPULAR NAME: **STINGER-RMP**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0203801A**
PE Title: Missile/Air Defense Product Improvement Program
Project Title: STINGER-RMP Product Improvement Program

Project Number: **D303**
Budget Activity: **#7**

A. (U) SCHEDULE/BUDGET INFORMATION: ($ In Thousands)

SCHEDULE	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	Total Program
Program Milestones	Finalize RS Integ BSFV: Conc Sel	Finalize Blk 1 Hdw Prod Cut-in		Perf Assessment 4QFY96	Initiate Future S/W			
Engineering Milestones	*CDR 2QFY93;* S/W Dev; BSFV: Govt Eval	*Continue S/W Dev* Dev/Flight Tests		*Final S/W Release* 3QFY96				
T&E Milestones	Comp POP on Prototype BSFV: Cert Sim	Initiate Dev Tests		Complete Dev Tests				
Contract Milestones	BSFV: Prototype RFP/& Awd Con							
BUDGET ($000)	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	Program Total (To Complete)
Major Contract	9151	13593		2980	2991			30001 (1500)
Support Contract	172							444 (0)
In-House Support	1067	5926		1987	1994			11916 (1000)
GFE/ Other								0
Total	10390	19519	0	4967	4985	0	0	42361 (2500)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203801A
PE Title: Missile/Air Defense Product Improvement Program
Project Title: STINGER-RMP Product Improvement Program

Project Number: D303
Budget Activity: #7

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The STINGER-RMP PIP is a product evolution to improve countermeasures capability via externally loaded software, which is downloaded from a reprogrammable module in the gripstock. This concept allows for timely upgrades to correct system deficiencies, rapid reaction to new threats or threat countermeasures, development of specialty software programs where full capability may not be desired, and accommodation of new missions. The Block I upgrade project, which adds a roll sensor and enhanced software, solves the recognized system performance deficiencies in countermeasures and other engagement conditions and increases terminal accuracy. This project extends the missile service life and will also establish a government post deployment software support posture.
BRADLEY STINGER FIGHTING VEHICLE (BSFV): A Congressionally-directed study has been initiated to review the cost and operational effectiveness of mounting existing Air Defense turrets on the Bradley Fighting Vehicle and a BSFV Growth Study initiated to assess potential modifications and implementation strategies for BSFV to provide near-term heavy divisional air defense capability which maximizes system performance and is technically feasible and cost effective. These projects will provide viable alternatives to fill the void left by the cancellation of the ADATS program. The growth study will result in a plan to evolve the BSFV into a fully capable air defense system. The turret survey will evaluate the available suite of hardware to determine the operational effectiveness of each turret.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments:

	Complete	Cost
RMP:		
• (U) Finalized Roll Sensor Design	1Q93	3900
• (U) Block 1 Hardware and Software Critical Design Reviews	2Q93	150
• (U) Initiated Software Development	4Q93	762
• (U) Completed Proof of Principal Prototype Flight Tests	4Q93	200
BSFV:		
• (U) Initiated Turret Survey & Select Virtual Prototype Integration Concepts	3Q93	225
• (U) Completed Virtual Prototype Integration RFP	4Q93	425
• (U) Initiated Combined Arms Simulation	3Q94	400
• (U) Battlefield Distributed Integration Simulations	3Q94	1850
• (U) Developed BSFV Crew Stations	3Q94	100
• (U) Simulation Certification	3Q94	250
• (U) Virtual Prototype Integration Contract	4Q94	1684
• (U) Government Evaluation of Turrets	4Q94	409

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203801A
PE Title: Missile/Air Defense Product Improvement Program
Project Title: STINGER-RMP Product Improvement Program

Project Number: D303
Budget Activity: #7

	Complete	Cost
• (U) Congressional Briefing	4Q94	035
TOTAL		10390

(U) FY 1994 Planned Program:

RMP:

• (U) Finalize Block I Hardware Design and Documentation	4Q94	2519
• (U) Complete Phase I (Reactive Countermeasures & Low Beta)	2Q94	4000
• (U) Perform Hardware Integration Testing	2Q94	2000
• (U) Complete Phase II Software Concepts	1Q95	7000
• (U) Conduct Testing of Phase I Software Design	1Q95	2500
• (U) Perform Phase II Software Checkout	3Q95	1500
TOTAL		19519

(U) FY 1995 Planned Program: Not Applicable

D. (U) WORK PERFORMED BY: STINGER-RMP: The prime contractor for the STINGER-RMP is Hughes Missile Systems Company, Tucson, AZ. In-house technical efforts performed by Program Executive Officer for Tactical Missiles; Project Manager, Forward Area Air Defense, Redstone Arsenal, AL; Research and Development Engineering Center, Redstone Arsenal, AL; and U.S. Army Air Defense School, Fort Bliss, TX.

BSFV: In-house technical efforts are provided by Program Executive Officer for Tactical Missiles; Project Manager, Forward Area Air Defense; Research and Development Engineering Center, Redstone Arsenal, AL; Director of Combat Development, USAADASCH; and Battlefield Distributed Integrated Simulation Battle Labs. Contractors for the BSFV studies are Nichols Research Corporation and Sigmatech, Inc. Sole source conracts have been awarded to FMC, Inc, Boeing Aerospace Co, and Martin-Marietta for turret analysis.

E. (U) COMPARISON WITH FY 1994 AMENDED DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. TECHNICAL CHANGES: Technical realignment is in process to accomplish maximum technology within current funding profile.
2. SCHEDULE CHANGES: With withdrawal of FY 1995 funds, restructure is in process based on the technical realignment.
3. COST CHANGES: Funding was redirected from AVENGER PIP to the STINGER PIP in FY 1994 and increased in FY 1996-1999.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203801A
PE Title: Missile/Air Defense Product Improvement Program
Project Title: STINGER-RMP Product Improvement Program

Project Number: D303
Budget Activity: #7

F. (U) PROGRAM DOCUMENTATION: MN (BASIC) 5/72
ASARC (Production) 6/83

G. (U) RELATED ACTIVITIES: There is no unnecessary duplication of effort within the Army or DoD. This is assured by continuous coordination with other services and agencies. In addition, the Forward Area Air Defense Project Manager is responsible for the procurement of all STINGER missiles within DoD.

H. (U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Missile Procurement, Army							
STINGER C18500	34652	33356					
STINGER MODs C20000				10140	10202	10280	10353

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: The European STINGER Project Group and the Swiss Government are scheduled to produce the STINGER-Reprogrammable Microprocessor missile (less reprogrammable module). The reprogrammable external module is not releasable to foreign nations at this time.

J. (U) TEST AND EVALUATION DATA: Flight tests to verify Block I hardware integration, responsive countermeasure and shallow aspect algorithms will be initiated in FY 1994.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203802A
PE Title: Other Missile Product Improvement Program

Budget Activity: #7

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D045 HELLFIRE Product Improvement Program	4519	5138	0	0	0	0	0	0	459618
D304 Army TACMS Pre-planned Product Improvement Program	0	25759	37789	19330	4530	1500	1500	Cont	Cont
D336 TOW Product Improvement Program	1950	37541	26477	31059	1364	1267	1256	Cont	351798
D685 BAT CARRIER	0	0	10114	57417	80092	70436	43012	0	261071
D686 ER BAT CARRIER	0	0	0	0	0	10100	29300	Cont	Cont
PE TOTAL	6469	68438	74380	107806	85986	83303	75068		

B. (U) BRIEF DESCRIPTION OF ELEMENT: Expanding Regional Power Threats require an evolutionary improvement program to maintain the effectiveness of the HELLFIRE, Army TACMS, TOW, and Brilliant Anti-Armor (BAT) Carrier Systems. The HELLFIRE PIP consists of the HELLFIRE II Missile System (formerly HELLFIRE Optimized Missile System (HOMS)) development and insensitive munitions development program. Threat assessments indicate that both an enhanced robust warhead and an improved electro-optical countermeasure (EOCM) seeker will be required to maintain HELLFIRE as an effective system. Funding will provide for development and qualification of the precursor and main warheads at the component level, and to continue development of the Congressionally directed training missile. The Army TACMS P^{3}I development effort will integrate Global Positioning System (GPS) technology into the guidance system of the Army TACMS Block I missile to provide more accurate information for orientation of the missile in position and azimuth. The payload quantity of M74 anti-personnel/anti-materiel (APAM) bomblets will be reduced resulting in a range approximately twice that of the current Block I missile. These funds will also support participation by P^{3}I APAM prototype missiles in the Joint Precision Strike Demonstration. Further, these funds allow for future improvement program studies/demonstrations. The TOW Materiel Changes (MC) provides advances in the day/night sight improvements, fire control and missile improvements. Improvements are

required to maintain the Infantry's capability to support the US Army mission of crisis response to regionally based threat and allows for TOW to continue to be integral to the strategic principle of forward presence. TOW Improved Target Acquisition System (ITAS) is a technology insertion program using 2nd Gen Forward Looking Infrared (FLIR) technology to upgrade the current TOW Target Acquisition and Fire Control subsystems. The TOW ITAS will provide improved target detection and acquisition range, improved probability of hit and enhanced fire control capabilities that will upgrade the anti-armor capability of light forces using the TOW system, allowing the Army to own the night and providing compatibility with TOW next generation missile. Included in this MC are missile improvements to include lethality, aerodynamics, guidance and control. The Brilliant Anti-Armor (BAT) Carrier, the Army Tactical Missile System (TACMS) Block II, will be a ground launched solid propellant inertially guided missile system with 13 BATs as its payload. The mission of the BAT carrier is to delay, disrupt, neutralize, or destroy armored combat vehicles and other postulated high-payoff targets. The BAT carrier will be capable of effectively engaging enemy targets separated by friendly forces by as little as 25 KM without unacceptable risk. The BAT carrier will carry and dispense BAT submunitions deep into enemy territory where these submunitions will autonomously track and destroy numerous high-payoff targets. The BAT carrier will be launched from the M270 launcher. The Extended Range (ER) Brilliant Anti-Armor Submunition (BAT) Carrier, the Pre-Planned Product Improvement (P3I) for the Army Tactical Missile System (TACMS), will be a ground launched solid propellant inertially guided missile system with 6 Improved BATs (IBAT) as its payload. The mission of the ER BAT Carrier is to delay, disrupt, neutralize, or destroy armored combat vehicles and other postulated high payoff targets. The ER BAT Carrier will carry and dispense IBAT submunitions deep into enemy territory at ranges beyond existing cannon/rocket capabilities. Global Positioning System (GPS) technology will increase accuracy in flight reducing target location errors. IBAT submunitions will autonomously track and destroy high-payoff targets to include cold stationary targets, dug-in targets, Surface-to-Surface Missile (SSM) Transporter Erector Launchers (TELs) and others. The ER BAT carrier will be launched from the M270 launcher.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:

(U) Project #D045 - HELLFIRE Product Improvement Program: The HELLFIRE II program consists of a combined digital autopilot/electro-optical countermeasure (EOCM) hardened laser seeker and a more robust warhead which will defeat the threat of the foreseeable future. The HELLFIRE II program provides a missile bus that will be used by the Longbow HELLFIRE missile system. The insensitive munitions effort is to develop a motor and warheads that are highly resistant to external stimuli that could cause unsafe detonation. Tri-service requirements call for weapons that exhibit reactions no more violent than burning when excited by external stimuli. Funding will provide for development and qualification of the precursor and main warheads at the component level.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Initiated Insensitive Main and Phase I Precursor Warhead Program	4Q/2Q94	2721
• (U) OGA, In-House General Support and Support Contracts	2Q94	1142

• (U) Completed HELLFIRE II Development Program	3Q93	656
Total		4519

(U) FY 1994 Planned Program:

• (U) Initiate Phase II Insensitive Precursor Warhead Program	4Q94	1335
• (U) Complete Warhead qualification testing (OGA) and In-House Gen Support	4Q94	1803
• (U) Continue Congressionally directed Training Missile Program	4Q95	2000
Total		5138

(U) FY 1995 Planned Program: N/A

(U) Project #D304 - Army TACMS Preplanned Product Improvement Program: The Army TACMS P³I development effort will integrate Global Positioning System (GPS) technology into the guidance system of the Army TACMS Block I missile to provide more accurate information for orientation of the missile in position and azimuth. The payload quantity of M74 anti-personnel/anti-materiel (APAM) bomblets will be reduced resulting in a range approximately twice that of the current Block I missile. These funds will also support participation by P³I APAM prototype missiles in the Joint Precision Strike Demonstration. Further, these funds allow for future improvement program studies/demonstrations.

(U) FY 1993 Accomplishments: N/A

	Complete	Cost

(U) FY 1994 Planned Program:

• (U) GPS Integration/Interface Preliminary Design Support and Technology Demonstration Support for JPSD	2Q95	8900
• (U) Initiate EMD for P³I APAM (first increment)	4Q94	16658
• (U) Studies, development, and validation of future improvement program	4Q94	201
Total		25759

(U) FY 1995 Planned Program:

• (U) GPS Integration/Interface Preliminary Design Support	2Q95	1930
• (U) Begin P³I APAM Production Prove-out Test (PPT), lab, static, warhead vibration, and road tests	4Q95	2064

• (U) P³I APAM EMD (second increment)	4Q95	33458
• (U) Studies, development, and validation of future improvement program	4Q95	337
Total		37789

(U) Project #D336 - TOW Product Improvement Program: TOW Improved Target Acquisition System (ITAS) is a technology insertion program using 2nd Gen Forward Looking Infrared (FLIR) technology to upgrade the current TOW Target Acquisition and Fire Control subsystems. The TOW ITAS will provide improved target detection and acquisition range, improved probability of hit and enhanced fire control capabilities that will upgrade the anti-armor capability of light forces using the TOW system, allowing the Army to own the night and providing compatibility with TOW next generation missile.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Awarded incrementally funded contract - TOW Improved Target Acquisition System (ITAS) and initiated Engineering and Manufacturing Development	4Q96	14614
• (U) Completed TOW ITAS early user demonstration	4Q93	500
• (U) Completed preliminary design review for TOW ITAS	1Q94	1000
• (U) Completed TOW ITAS trade studies	4Q93	308
• (U) Extended Phase 1, additional warhead liner metallurgy and design studies for TOW 2B	4Q93	512
• (U) Completed enhanced lethality warhead Phase 3 development validation	2Q94	1438
• (U) Completed development of Hazards of Electro Magnetic Radiation to Ordnance,(HERO) on missile case	4Q93	482
• (U) Completed upgraded version 3.0 of TOW 2B Target Sensor Software	3Q93	470
• (U) Completed Phase 1 of Tungsten warhead study and development	3Q94	2098
Total		21422

(U) FY 1994 Planned Program:		
• (U) Proceed TOW ITAS Engineering and Manufacturing Development (EMD)	4Q96	23259
• (U) Complete critical design review for TOW ITAS	3Q94	3500
• (U) Initiate TOW ITAS pre-production test (PPT), part 1, of components and sub assemblies	1Q95	3500

• (U) Initiate planning for ITAS pilot line	2Q96	721
• (U) Procure prototypes for system level tests	1Q95	3200
• (U) Begin software coding and testing	1Q96	1745
• (U) Complete enhanced lethality warhead qualification testing, and studies on technology insertion	2Q94	150
• (U) Test and certify software upgrade for Ground TOW	4Q94	1466
Total		37541

(U) FY 1995 Planned Program:

• (U) Continue TOW ITAS EMD	4Q96	10568
• (U) Complete ITAS PPT part 1	1Q95	1000
• (U) Initiate and complete PPT part 2, system level tests of prototypes	4Q95	2783
• (U) Procure prototypes for Pre-Production Qualification Tests (PPQT) and Initial Operational Testing Evaluation	3Q95	6781
• (U) Initiate and complete the limited User Test (LUT)	3Q95	1000
• (U) Test Standardized Advanced Dewar Assembly (SADA II)	1Q96	2946
• (U) Proceed with warhead lethality and technology studies for further insertion	4Q95	1399
Total		26477

(U) Project #D685 - BAT CARRIER: The Brilliant Anti-Armor (BAT) Carrier, the Army Tactical Missile System (TACMS) Block II, will be a ground launched solid propellant inertially guided missile system with 13 BATs as its payload. The mission of the BAT carrier is to delay, disrupt, neutralize, or destroy armored combat vehicles and other postulated high-payoff targets. The BAT carrier will be capable of effectively engaging enemy targets separated by friendly forces by as little as 25 KM without unacceptable risk. The BAT carrier will carry and dispense BAT submunitions deep into enemy territory where these submunitions will autonomously track and destroy numerous high-payoff targets. The BAT carrier will be launched from the M270 launcher.

	Complete	Cost
(U) FY 1993 Accomplishments: None		
(U) FY 1994 Planned Program: None		
(U) FY 1995 Planned Program:		

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203802A
PE Title: Other Missile Product Improvement Program

Budget Activity: #7

• (U) MS IV	2Q95	0
• (U) EMD Contract Award	2Q95	0
• (U) Complete preliminary design support	3Q95	0
• (U) Conduct Wind Tunnel and Sled Testing	1Q96	10114
• (U) Conduct BAT integration activities	3Q99	0
Total		10114

(U) **Project #D686 - ER BAT CARRIER**: R&D funded activities for this initial submittal begin in FY 98.

(U) **Work Performed By: HELLFIRE** - The prime contractor for HELLFIRE II missile development program was Martin Marietta Technologies, Inc., Orlando, FL. Mason and Hanger-Silas Mason Company, Inc., at Iowa Army Ammunition Plant, and Conventional Munitions Systems, Tampa, FL, are the contractors for the insensitive warheads. LORAL Control Systems, Archbald, PA, is the contractor for the congressionally directed training missile. In-house effort for the insensitive munitions will be conducted by the Research, Development, and Engineering Center, US Army Missile Command, Redstone Arsenal, AL. **Army TACMS** - The prime contractor for Army TACMS is Loral Vought Systems Corporation, Dallas, TX. The program is managed by the Army TACMS Project Office. **TOW** - Texas Instruments, McKinney, TX, is contractor for ITAS. Army management of all TOW programs is performed by Project Manager, TOW, and Program Executive Officer, Tactical Missiles, Redstone Arsenal, AL. Contractors for the tungsten warhead effort are Physics International, San Leandro, CA, Aerojet Electro Systems, Azusa, CA, and California Research and Technology, Inc., Pleasanton, CA. Contractor for HERO missile case is Hughes Aircraft, Tucson, AZ. Contractor for enhanced lethality is Aerojet. **BAT CARRIER** - This program will be managed by the Army BAT Project Manager. Loral Vought Systems of Dallas, Texas will develop and produce the BAT carrier missile. **ER BAT CARRIER** - This program will be managed by the Army BAT Project Manager. Loral Vought Systems of Dallas, TX will develop and produce the ER BAT Carrier missile.

(U) **Related Activities:**

HELLFIRE:
PE #0604816A (Longbow)
PE #0603810A (Advanced Missile System-Heavy (AMS-H))
PE #0603757A (Forward Area Air Defense System)
PE #0602303A (Missile Technology)
PE #0602120A (Electronic Survivability and Fuzing Tech)
PE #0602624A (Weapons and Munitions Technology)
PE #0602618A (Ballistics Technology)

PE #0602709A (Night Vision Technology)
PE #0603710A (Night Vision Advanced Technology)

Army TACMS: PE #0603778 (D050, Multiple Launch Rocket System (MLRS))
PE #0603772 (D289, Joint Precision Strike Demo)
PE #0604768 (D641, BAT)
PE #0203726 (D322, Advanced Field Artillery Tactical Data System)
PE #0603238N(Navy Cooperative effort for Navy TACMS Advanced Tech Demo)

TOW: PE#0602120A(Electronic Survivability and Fuzing Technology)
PE#0602303A(Missile Technology)
PE#0602618A(Ballistics Technology)
PE#0602624A(Weapons and Munitions Technology)
PE#0603612A(Advanced Anti-Tank Weapon System)
PE#0603810A(Advanced Missile System-Heavy)

BAT CARRIER: PE#0604768A/D641, BAT
PE#0203802A/D686, Extended Range BAT Carrier
PE#0604768A/D687, BAT P3I
PE#0203802A/D304, Army TACMS P3I
PE#0603778A/D050, Multiple Launch Rocket System (MLRS)

ER BAT CR: PE#64768A/D641, BAT
PE#0604768A/D687, BAT P3I
PE#0203802A/D685, BAT Carrier
PE#0203802A/D304, Army TACMS P3I
PE#0603778A/D050, Multiple Launch Rocket System (MLRS)

There is no unnecessary duplication of effort within the Army or the Department of Defense.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203802A
PE Title: Other Missile Product Improvement Program

Budget Activity: **#7**

(U) Other Appropriation Funds: ($ in Thousands)

APPROPRIATION	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Missile Procurement, Army							
Hellfire C7000	85350	64835	121641	198389	263927	281756	303772
ATACMS C98510	190606	152559	115858	129345	99762	102178	177028
TOW 2 C59300	133859	25282	27808	9411	9595	0	0
TOW MODS C61700	14849	7250	0	26636	55499	72558	80465
Military Construction	0	0	0	0	0	0	0

(U) International Cooperative Agreements:

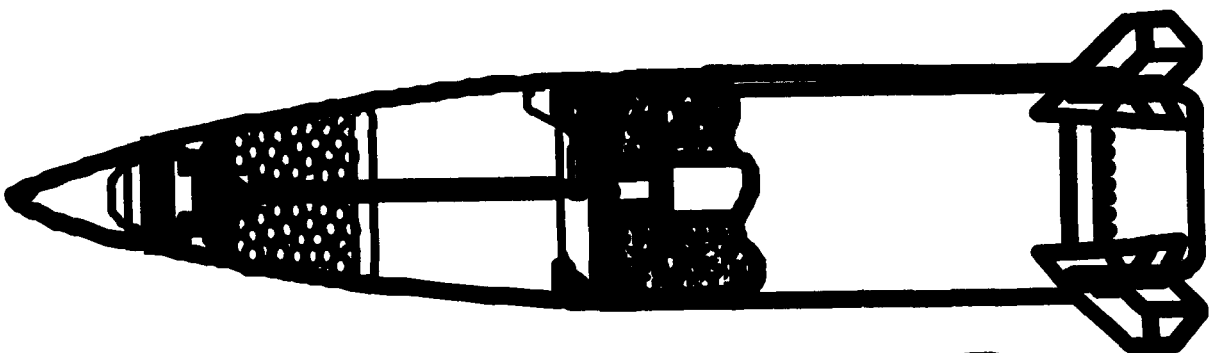
Army TACMS - Data Exchange Agreement with France and Information Exchange Agreement with the United Kingdom.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203802A
PE Title: Other Missile Product Improvement Program (PIP)
Project Title: Army Tactical Missile System (Army TACMS) Pre-Planned Product Improvement (P^3I)

Project Number: D304
Budget Activity: #7

ATACMS P3I /APAM (IMPROVED ATACMS)



- Carries 275 M74s
- FUE FY98

POPULAR NAME: Army TACMS P^3I

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203802A
PE Title: Other Missile Product Improvement Program (PIP)
Project Title: Army Tactical Missile System (Army TACMS) Pre-Planned Product Improvement (P^3I)

Project Number: D304
Budget Activity: #7

A. (U) SCHEDULE/BUDGET INFORMATION: ($ In Thousands)

SCHEDULE	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	To Complete
Program Milestones	ASARC BK I Restruct - Feb 93 SSC/CSC P^3I Approval - Feb 93	P^3I APAM Milestone IV Decision - Feb 94		P^3I APAM Production Decision - Jul 96	Complete P^3I APAM EMD Effort	Conduct future improvement studies/demos	Conduct future improvement studies/demos	Conduct future improvement studies/demos
Engineering Milestones	SECDEF directed participation in JPSD - Jan 92	Army Participation in JPS Demo - Aug 94	Continue Army Participation in JPSD Demo					
T&E Milestones			Begin PPT - Jun 95	Complete PPT - Jan 96 PPQT - Jan-Jun 96				
Contract Milestones		CA JPSD DD&T - Dec 93 CA P^3I APAM EMD - Feb 94						
BUDGET ($000)	**FY 1993**	**FY 1994**	**FY 1995**	**FY 1996**	**FY 1997**	**FY 1998**	**FY 1999**	**Program Total (To Complete)**
Major Contract	0	16600	25100	11600	2900	0	0	56200 (0)
Support Contract	0	2091	1814	365	0	1125	1125	9895 (3375)
In-House Support	0	5505	8684	5225	1615	300	300	22529 (900)
GFE/ Other	0	1563	2191	2140	15	75	75	6284 (225)
Total	0	25759	37789	19330	4530	1500	1500	94908 (4500)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203802A
PE Title: Other Missile Product Improvement Program (PIP)
Project Title: Army Tactical Missile System (Army TACMS) Pre-Planned Product Improvement (P^3I)

Project Number: D304
Budget Activity: #7

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This P^3I development effort will integrate Global Positioning System (GPS) technology into the guidance system of the Army TACMS Block I missile to provide more accurate information for orientation of the missile in position and azimuth. The payload quantity of M74 anti-personnel/anti-materiel (APAM) bomblets will be reduced resulting in a range approximately twice that of the current Block I missile. The inherent GPS accuracies will be achievable independent of range, thereby enhancing system performance. These funds will also support participation by P^3I APAM prototype missiles in the Joint Precision Strike Demonstration. A P^3I Engineering, Manufacturing, and Development (EMD) program will incorporate the improved APAM warhead capability. The improved missile will destroy high value targets and will be especially suited for destroying enemy surface-to-surface missile system launchers. Further, these funds allow for future improvement program studies/demonstrations pertaining to technology advancements, payload variants, propulsion, guidance and control, and fire control improvements.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments: Not applicable.

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) GPS Integration/Interface Preliminary Design Support and Technology Demonstration Support for JPSD	2Q95	8900
• (U) Initiate EMD for P^3I APAM (first increment)	4Q94	16658
• (U) Studies, development, and validation of future improvement program	4Q94	201
Total		**25759**

(U) FY 1995 Planned Program:		
• (U) GPS Integration/Interface Preliminary Design Support	2Q95	1930
• (U) Begin P^3I APAM Production Prove-out Test (PPT), lab, static, warhead vibration, and road tests	4Q95	2064
• (U) P^3I APAM EMD (second increment)	4Q95	33458
• (U) Studies, development, and validation of future improvement program	4Q95	337
Total		**37789**

D. (U) WORK PERFORMED BY: Loral Vought Systems, Dallas, TX, the Army TACMS prime contractor. The program will be managed by the Army TACMS Program Office

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203802A
PE Title: Other Missile Product Improvement Program (PIP)
Project Title: Army Tactical Missile System (Army TACMS) Pre-Planned Product Improvement (P^3I)

Project Number: D304
Budget Activity: #7

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:
NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** None
2. **SCHEDULE CHANGES:** None
3. **COST CHANGES:** None

F. (U) PROGRAM DOCUMENTATION:
Mission Element Need Statement (MENS) 4/81
Required Operational Capability (ROC) 1/89 (P^3I changes approved 10/93)
Secretary of Defense Decision Memo (SDDM) 3/86
Decision Coordinating Paper (DCP) (now Intg Prog Sum updated 10/93) 5/86
Test and Evaluation Master Plan (TEMP) (updated 12/93) 5/91

G. (U) RELATED ACTIVITIES: Program element #0603778, D050 Multiple Launch Rocket System (MLRS); program element #0603772, D289 Joint Precision Strike Demo; program element #0604768, D641 BAT; program element #0203726, D322, Advanced Field Artillery Tactical Data System; and Navy cooperative effort for Navy TACMS Advanced Technology Demo in FY 94. There is no unnecessary duplication of effort within the Army or Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS:

Appropriation	($ in Thousands) FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Missile Procurement,Army ATACMS C98510	190606	152559	115858	129345	99762	102178	177028
Military Construction	0						

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Data Exchange Agreement with France and Information Exchange Agreement with the United Kingdom.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203802A
PE Title: Other Missile Product Improvement Program

Project Number: #D336
Budget Activity: #7

A. (U) RESOURCES: ($ in Thousands)
Project Title: TOW Product Improvement Program

Popular Name	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
TOW PIP	1950 *	37541	26477	31059	1364	1267	1256	Cont	351798

*FY 92 19472 Approved Carry-over

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Provides for continued development of improvements to the TOW missile system. Improvements are required to maintain the Infantry's capability to support the US Army mission of crisis response to regionally based threat and allows for TOW to continue to be integral to the strategic principle of forward presence. TOW Improved Target Acquisition System (ITAS) is a technology insertion program utilizing 2nd Gen Flir technology to upgrade the current TOW Target Acquisition and Fire Control subsystems. The TOW ITAS will provide improved target detection and acquisition range, improved probability of hit and enhanced fire control capabilities that will upgrade the anti-armor capability of light forces using the TOW system, allowing the Army to own the night and providing compatibility with TOW next generation missile. Also included in this MC are missile improvements to include lethality, aerodynamics, guidance and control.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:	Complete	Cost
(U) FY 1993 Accomplishments:		
• (U) Awarded incremental funded contract - TOW Improved Target Acquisition System (ITAS) and initiated Engineering and Manufacturing Development.	4Q96	14614
• (U) Completed TOW ITAS early user demonstration.	4Q93	500
• (U) Completed preliminary design review for TOW ITAS.	1Q94	1000
• (U) Completed TOW ITAS trade studies.	4Q93	308
• (U) Extended Phase 1, additional warhead liner metallurgy and design studies for TOW 2B.	4Q93	512
• (U) Completed enhanced lethality warhead Phase 3 development validation.	2Q94	1438
• (U) Completed development of Hazards of Electro Magnetic Radiation to Ordnance,(HERO) on missile case.	4Q93	482

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203802A
PE Title: Other Missile Product Improvement Program

Project Number: #D336
Budget Activity: #7

	Complete	Cost
• (U) Completed upgraded version 3.0 of TOW 2B Target Sensor Software.	3Q93	470
• (U) Completed Phase 1 of Tungsten warhead study and development.	3Q94	2098
TOTAL		***21422**
* Includes $19,472 carried over from FY1992 and $1,950 FY 1993 funds.		
(U) FY 1994 Planned Program:		
• (U) Proceed TOW ITAS Engineering and Manufacturing Development (EMD).	4Q96	23259
• (U) Complete critical design review for TOW ITAS.	3Q94	3500
• (U) Initiate TOW ITAS pre-production test (PPT), part 1, of components and sub assemblies.	1Q95	3500
• (U) Initiate planning for ITAS pilot line.	2Q96	721
• (U) Procure prototypes for system level tests.	1Q95	3200
• (U) Begin software coding and testing.	1Q96	1745
• (U) Complete enhanced lethality warhead qualification testing, and studies on technology insertion.	2Q94	150
• (U) Test and certify software upgrade for Ground TOW.	4Q94	1466
TOTAL		**37541**
(U) FY 1995 Planned Program:		
• (U) Continue TOW ITAS EMD.	4Q96	10568
• (U) Complete ITAS PPT part 1.	1Q95	1000
• (U) Initiate and complete PPT part 2, system level tests of prototypes.	4Q95	2783
• (U) Procure prototypes for Pre-Production Qualification Tests (PPQT) and Initial Operational Testing Evaluation.	3Q95	6781
• (U) Initiate and complete the limited User Test (LUT).	3Q95	1000
• (U) Test Standardized Advanced Dewar Assembly (SADA II).	1Q96	2946

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203802A
PE Title: Other Missile Product Improvement Program

Project Number: #D336
Budget Activity: #7

• (U) Proceed with warhead lethality and technology studies for further insertion.	4Q95	1399
TOTAL		26477

D. (U) WORK PERFORMED BY: Texas Instruments, McKinney Texas, is contractor for ITAS. Army management of all TOW programs is performed by Project Manager, TOW and Program Executive Officer, Tactical Missiles, Redstone Arsenal, AL. Contractors for the Tungsten Warhead effort are Physics International, San Leandro, CA, Aerojet Electro System, Azusa, CA, and California Research and Technology Inc., Pleasanton, CA. Contractor for HERO missile case is Hughes Aircraft, Tucson, AZ. Contractor for enhanced lethality is Aerojet.

E. (U) COMPARISON WITH FY 1994 AMENDED DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

No changes from previous submission.

F. (U) PROGRAM DOCUMENTATION:

- (U) TOW ITAS support from Assistant Secretary of the Army, 29 Jan 92.
- (U) TOW ITAS material change #1-89-03-3028.
- (U) TOW 2B user requirements message - 6/85.
- (U) (PIP 1-86-03-3026) TOW 2B - 12/85.
- (U) Product improvement management information report - 12/86.
- (U) (PIP 1-88-03-3027) TOW 2 to TOW 2A retrofit - 5/88.

G. (U) RELATED ACTIVITIES:

PE#0602120A, Electronic Survivability and Fuzing Technology.
PE#0602303A, Missile Technology.
PE#0602618A, Ballistics Technology.
PE#0602624A, Weapons and Munitions Technology.
PE#0603612A, Advanced Anti-Tank Weapon System.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203802A
PE Title: Other Missile Product Improvement Program

Project Number: #D336
Budget Activity: #7

PE#0603810A, Advanced Missile System-Heavy.

There is no unnecessary duplication of effort within the Army or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Missile Procurement Army							
TOW 2 (C59300)	133859	25282	27808	9411	9595	0	0
TOW MODs (C61700)	14849	7250	0	26636	55499	72558	80465
Military Construction	0	0	0	0	0	0	0

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

J. (U) MILESTONE SCHEDULE:

Milestones (T&E)	Dates
ITAS	
• Designated ACAT III Program	Jan 92
• TEMP designated for OSD oversight	Jul 92
• RFP Released	Oct 92
• M/S II IPR completed	Dec 92
• TEMP approved OSD	May 93
• TOW ITAS EMD Contract Award	Apr 93
• TOW ITAS Early User Demonstration (EUD)	Aug 93
• Preliminary Design Review (PDR)	Oct 93
• PPT part 1	May - Nov 94
• Critical Design Review	May 94
• Missile Flight Test (PPT, part 2)	Dec 94 - Sep 95
• Limited User Tests (LUT)	Feb-Apr 95

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203802A
PE Title: Other Missile Product Improvement Program

Project Number: #D336
Budget Activity: #7

• SADA II Testing	May 95
• Pre-Product Qualification Test (PPQT)	Oct 95 - Jul 96
• Initial Operational Tests and Evaluation (IOTE)	May - Jul 96

TOW 2B

• Production configuration verification test completed	Mar 92
• MRRB conducted, full release granted for Ground Platform and BFVS	Jul 92
• First production acceptance test samples received	Aug 92

TOW 2B IMPROVEMENTS

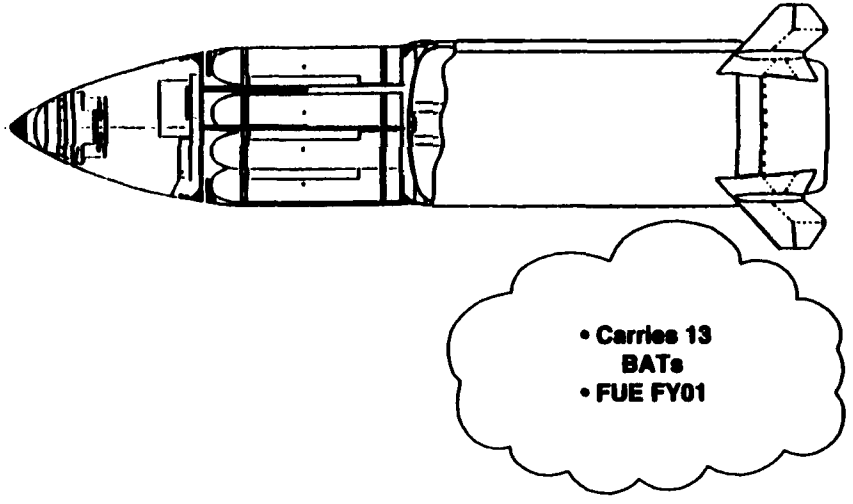
• TOW 2B Version 3 Sensor Software	
• Flight Tests	Mar 93
• ECP Approval	Jun 93
• Missile Case Upgrade E^3 Testing Complete	Apr 93
• ECP Approval	Oct 93
• Tungsten Warhead Phase 2 Award	May 93

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203802A
PE Title: Other Missile Product Improvement Program
Project Title: BAT CARRIER

Project Number: D685
Budget Activity: #7

ATACMS BLOCK II (BAT CARRIER)



POPULAR NAME: BLOCK II ATACMS

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0203802A**
PE Title: **Other Missile Product Improvement Program**
Project Title: **BAT CARRIER**

Project Number **D685**
Budget Activity **#7**

A.(U) SCHEDULE/BUDGET INFORMATION: ($ In Thousands)

SCHEDULE	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	To Complete
Program Milestones			MS IV- 2d Qtr					FUE- 3d QTR 01
Engineering Milestones			PDS - 3d Qtr	CDR - 3d Qtr	Dispenser Qual- 1st Qtr			
T&E Milestones		Sled Tests - 4d QTR	Static eject test compl- 3d Qtr		PPT - compl 4d Qtr	PPQT compl- 4th Qtr	OT compl- 3d Qtr	
Contract Milestones		Preliminary Design Support (PDS) CA- 3d QTR	EMD CA- 3d Qtr				LLI CA- 2d Qtr LRIP CA-3dQtr	PROD CA- 3d qtr 00
BUDGET ($000)	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	Program Total (To Complete)
Major Contract	0	0	6630	32600	52300	36363	25426	153319 (0)
Support Contract	0	0	996	2928	5689	5504	2125	17242 (0)
In-House Support	0	0	2488	21889	22103	28569	15461	90510 (0)
Total	0	0	10114	57417	80092	70436	43012	261071 (0)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203802A
PE Title: Other Missile Product Improvement Program
Project Title: BAT CARRIER

Project Number: D685
Budget Activity: #7

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The Brilliant Anti-Armor (BAT) Carrier, the Army Tactical Missile System (TACMS) Block II, will be a ground launched solid propellant inertially guided missile system with 13 BATs as its payload. The mission of the BAT carrier is to delay, disrupt, neutralize, or destroy armored combat vehicles and other postulated high-payoff targets. The BAT carrier will be capable of effectively engaging enemy targets separated by friendly forces by as little as 25 KM without unacceptable risk. The BAT carrier will carry and dispense BAT submunitions deep into enemy territory where these submunitions will autonomously track and destroy numerous high-payoff targets. The BAT carrier will be launched from the M270 launcher.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments: None.

(U) FY 1994 Planned Program: None.

(U) FY 1995 Planned Program:

	Complete	Cost
• MS IV	2d Qtr 95	0
• EMD Contrat Award	2d Qtr 95	0
• Complete preliminary design support	3d Qtr 95	0
• Conduct Wind Tunnel and Sled Testing	1st Qtr 96	10114
• Conduct BAT integration activities	3d Qtr 99	0
Total		**10114**

D. (U) WORK PERFORMED BY: This program will be managed by the Army BAT Project Manager. Loral Vought Systems of Dallas, Texas will develop and produce the BAT carrier missile.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203802A Project Number: **D685**
PE Title: Other Missile Product Improvement Program Budget Activity: **#7**
Project Title: BAT CARRIER

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY: This is the initial submittal for this project.

F. (U) PROGRAM DOCUMENTATION: None.

G. (U) RELATED ACTIVITIES: The BAT Carrier integrates with the following Weapon Systems:

Program Element/Project #0604768A/D641, BAT
Program Element/Project #0203802A/D686, Extended Range BAT Carrier
Program Element/Project #0604768A/D687, BAT P3I
Program Element/Project #0203802A/D304, Army TACMS P3I
Program Element/Project #0603778A/D050, Multiple Launch Rocket System (MLRS)

There is no unnecessary duplication of effort within the Army or DOD

H. (U) OTHER APPROPRIATION FUNDS: None.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. (U) TEST AND EVALUATION DATA: Completed BAT Carrier integration studies and analysis. Validated the warhead design for 13 BAT configuration. Demonstrated a high velocity dispense. Completed BAT integration risk reduction program.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0208010A
PE Title: Joint Tactical Communications Program (TRI-TAC)

Project Number: D107
Budget Activity: #7

A. (U) RESOURCES: ($ in Thousands)
Project Title: Eachelons Above Corps (EAC) Communications

Popular Name	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
EAC Communications	7160	16446	19542	13434	15308	9759	10863	Cont	Cont

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: A requirement exists to automate Signal units's capability to manage multiple tactical communications systems in support of battlefield operations. The Integrated System Control (ISYSCON) facility will provide an automated, integrated method for managing the tactical communications network, establish an interface with each technical control facility in the Army Tactical Command and Control System (ATCCS) architecture, and enable automation assisted configuration and management of a dynamic battlefield. This program element also supports any development required for other Echelons Above Corps (EAC) equipment such as the family of 39 Switches, Communications System Control Element (CSCE), and Material Changes to transmission equipment. ISYSCON is being developed in an evolutionary manner with three software blocks: Block I, II and III. The blocks are developed in priority order as determined by the user.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Prepared Block 1 System Segment Specifications	3Q93	$2500
• (U) Conducted System Requirements Review (SRR)	3Q93	$2870
• (U) Completed Top Level Design	4Q93	$1790
Total		$7160

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Complete System Design Review (SDR)	1Q94	$2740
• (U) Deliver Draft Software Requirements specification and conduct Software Specification Review (SSR)	2Q94	$6856
• (U) Complete Software Requirements Specification and conduct Preliminary Design Review (PDR)	3Q94	$4110
• (U) Initiate Detail Design	4Q94	$2740
Total		$16446

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0208010A
PE Title: Joint Tactical Communications Program (TRI-TAC)

Project Number: D107
Budget Activity: #7

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Complete Block I Design and Conduct Critical Design Review (CDR)	1Q95	$4885
• (U) Code and test Block I Software and assemble hardware prototype	4Q95	$12702
• (U) Implement Block II Option and begin Preliminary Design	4Q95	$1955
Total		$19542

D. (U) WORK PERFORMED BY: Development of Echelons Above Corps equipment and software modifications are performed by the tasked Service or agency as assigned by the Secretary of Defense. Current Army contractor is GTE, Taunton, MA (ISYSCON) and GTE, Needham Heights, MA (39 Family of Switches). In-house developing organization for Echelons Above Corps tasks assigned to the Army is the Program Executive Office for Communications (PEO COMM) and Project Manager, Joint Tactical Area Communications Systems (PM JTACS).

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:
NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** None
2. **SCHEDULE CHANGES:** None
3. **COST CHANGES:** None

F. (U) PROGRAM DOCUMENTATION:

(U)	ISYSCON Operational & Organizational Plan (O&O)	10/89
(U)	ISYSCON Required Operational Capability (ROC)	12/90
(U)	ISYSCON Baseline Cost Estimate (BCE)	05/92
(U)	ISYSCON Test and Evaluation Master Plan	05/92

G. (U) RELATED ACTIVITIES:

Program Element #0208010F (Joint Tactical Communications Program (TRI-TAC Air Force))
Program Element #0208010M (Joint Tactical Communications Program (TRI-TAC Marines))
Program Element $0303401A (Communications Security Equipment)

Assignment of tasks is monitored by the Joint Tactical Command, Control And Communications Agency and DOD to insure there is no unnecessary duplication of effort within the Army and DOD.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0208010A
PE Title: Joint Tactical Communications Program (TRI-TAC)

Project Number: D107
Budget Activity: #7

H. (U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Other Procurement, Army - 2							
ISYSCON (SSN BX0007)	0	958	0	13266	10297	16917	17916

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable

J. (U) MILESTONE SCHEDULE:

Milestones	Dates
ISYSCON	
MS I & II In-Process Review (IPR) Approved	1Q92
Software Development Award (Block I)	4Q92
Software Development Award (Block II)	3Q95

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0208051A
PE Title: **Joint Biological Defense Program**

Budget Activity: #7

A. (U) RESOURCES: ($ in Thousands)

Project Number Title	FY1993 Actual	FY1994 Estimate	FY1995 Estimate	FY1996 Estimate	FY1997 Estimate	FY1998 Estimate	FY1999 Estimate	To Complete	Total Program
DBD1 Joint biological Defense - Non-Medical	0	0	45960	34209	39696	48001	43242	cont'd	cont'd
DBD2 Joint Biological Defense-Medical	0	0	6935	6852	6806	6844	6910	cont'd	cont'd
PE Total	0	0	52895	41061	46502	54845	50152		

B. (U) BRIEF DESCRIPTION OF ELEMENT: Operational forces, across the continuum of global, contingency, special operations/low intensity conflict, counternarcotics, and other high risk missions, have an immediate need to safely operate, survive and sustain operations in a biological agent threat environment. Operating forces have a critical need for defense from worldwide proliferation of biological warfare capabilities and medical treatment of biological warfare related casualties. DoD Biological Warfare defense mission area needs are: (1) Protection Vaccines - vaccination capability against the most probable threat biological agents, obtain and stockpile sufficient stocks of vaccines, antitoxins and other medical biological defense products for current and emerging biological threats; (2) Detection - detection of biological threat agents to provide agent identification early warning capabilities at land & ship based platforms.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10M IN FY 1995:

(U) DBD2 - Joint Biological Defense - Medical: Resources advanced research on vaccines and theraputics being developed against validated Biological Warfare (BW) threat agentsto provide an effective medical defense against BW agents to include bacteria, toxins, viruses, and other agents of biological origin. The research applies biotechnology methods to develop rapid identification capabilities, diagnostics, prophylactic and therapeutic vaccines and drugs against BW agents.

(U) FY1993 Accomplishments: N/A
- (U) Efforts funded in PE 0603807A (project #D809) and PE 0604807A (project #D847)

(U) FY 1994 Planned Program: N/A
- (U) Efforts funded in PE#0208051A, PE 0603807A (project #D809) and PE 0604807A (project #D847)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0208051A
PE Title: **Joint Biological Defense Program**

Budget Activity: #7

(U) FY 1995 Planned Program		Cost
• (U) Complete phase I trials of Vaccinia vaccine	4Q95	355
• (U) Complete phase I trials of Ricin Toxoid	3Q95	660
• (U) Conduct phase II trials of Ricin Toxoid	*	143
• (U) Submit Investigational New Drug (IND) application for improved Anthrax vaccine	1Q95	115
• (U) Development of Rapid Biological Agent identification system	*	1889
• (U) Conduct phase I trials of Botulism Immune Globulin (F(ab')2) heptavalent, equine	*	367
• (U) Produce Botulinum Toxoid type G	4Q95	1839
• (U) Conduct Botulinum Toxoid type F phase II clinical trials	4Q95	425
• (U) Determine efficacy of Q-fever chloroform/methanol residue vaccine vs aerosol challenge	3Q95	172
• (U) Expand clinical data base on Q-fever chloroform/methanol residue vaccine for licensure	4Q95	185
• (U) Submit tularemia product license applications	1Q95	25
• (U) Produce new lots of Botulinum toxoid pentavalent	*	760
*** Completion date after FY1995**		
Total		**6935**

(U) WORK PERFORMED BY: U.S. Army Medical Research Institute of Infectious Diseases, Walter Reed Army Institute of Research, Naval Medical Research Institute, and by extramural nonprofit organizations. Major contractors are The Salk Institute, Government Services Division, Porton International, and Oganon-Technicon.

(U) RELATED ACTIVITIES:

PE # 0601102A (Defense Medical Sciences)
PE # 0603002A (Medical Advance Technology)
PE # 0603807A (Medical Systems Advanced Development)
PE # 0604807A (Medical Materiel/Medical Biological Defense Equipment)

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: A Memorandum of Understanding with the United Kingdom is being developed and is currently in staffing.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0208051A | **Project Number: DBD1**
PE Title: Joint Biological Defense Program | **Budget Activity: #7**

A. (U) RESOURCES: ($ in Thousands)
Project Title: Joint Biological Defense: Non-Medical

Popular Name Program	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DBD1 Joint Biological Defense - Non-Medical									
	0	0	45960	34209	39696	48001	43242	cont'd	cont'd

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Operating forces have a critical need for a biological agent detection capability for current and emerging threats to U.S. forces in the field. Detection and warning devices will limit personnel exposure to agents. Agent identification is required to permit efficient treatment of exposed soldiers. Detection system capability will provide a tiered detection-warning strategy comprising of Point Detection and Stand-off Detection to provide theater protection against a large area attack. The point detection system concept will provide detection, identification, warning and sample collection for verification of a biological agent attack. The Army's on-going core program will provide a near term non-developmental item (NDI) point Biological Integrated Detection System (BIDS), until the upgraded objective system is developed through a concurrent product improvement program. Long Range Biological Stand-off Detection System (LR-BSDS) rapid prototype fielding capability, utilizing near-infrared laser technology to identify the presence of an aerosol cloud without a discrimination capability in excess of 30 Km range for an air platform, in FY96. BIDS will include a military standard vehicle mounted with standard collective protection and environmental control equipment, navigation, meteorological and communication systems, power distribution system and a shelter for a biological agent detection suite. The detection suite will contain multiple complementary biological detection technologies. The core NDI detection suite will be upgraded, incorporating biological detection technologies rolled over from concurrent developmental efforts and continued market investigations. These will be automated and computer integrated. Multiple biological technologies have become the international standard (international task force 21 (ITF-21)) and are required to minimize the effect of false positive alarms. The Army Long Range Biological Stand-off Detection System (LR-BSDS) will be a near-infrared laser detection and ranging system (LIDAR) mounted on an aerial platform which is capable of detecting and mapping an aerosol cloud at distances to 100 Km, using elastic backscattering technology. The Short Range Biological Stand-off Detection System (SR-BSDS) will use laser induced fluorescence (LIF) by ultraviolet laser irradiation for operation in the 3-5 Km range. The SR-BSDS will be employed on a ground or aerial vehicle. The Navy's effort will provide a rapid prototype point detection system for ship platforms. The rapid prototype Navy point Interim Biological Agent Detection System (IBADS) uses a particle sizer/counter to alarm, and a sampler to provide input to a flow-through antibody based assay for identification. The IBADS will be installed for short term or emergency deployment on surface combatant ships. Interim detection systems do not provide objective capabilities in the number of agents to be detected or in the automation of operations. The Navy Biological Agent Detection System (BADS) consists of three systems: a point detector system, product improved IBADS

(through the automation of the identifier biological detector), a portable monitor for post-attack and decontamination surveys of ships and installations, and a stand-off detector capability (potentially the Army LIDAR and/or LIF systems described above). A concurrent developmental effort will utilize on-going biological detection technology programs and commercial products to provide automated detection and computer integrated phased product improvement of core Army NDI BIDS and rapid prototype Navy point detection capabilities. An agent discriminating capability will be added to the LR-BSDS, and a SR-BSDS capability will be fielded. FY1995 efforts are to be centered on the point detector effort.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY1993 Accomplishments: N/A

- (U) Funded in PE#0603806/Project Number D601, (Bio Detector Task), and Navy PE#0603514N (Task S2053) and PE#0604506N (Task S0410).

(U) FY1994 Planned Program: N/A

- (U) Funded in PE#0603806/Project Number D601, (Bio Detector Task), PE#0604806A/Project D020 (Bio Kit Task), and in Navy PE#0603514N (Task S2053) and PE#0604506N (Task S0410).

(U) FY 1995 Planned Program	Complete	Cost
• (U) Army Biological Integrated Detection System (BIDS) development of automated biological detection technology/computer integrated detection system	*	35100
• (U) Army Stand-off - conduct critical design review of LR-SBDS and initiate product improved concept fabrication	4Q95	7160
• (U) Fabricate Navy Interim Biological Agent Detection System (IBADS)	4Q95	2500
• (U) Navy BADS - develop fully automated, point detection system and build 2 concept models	4Q95	1000
• (U) Investigate other developmental point detection concepts	4Q95	200
*** Completion date after FY1995**		
Total		**45960**

D. (U) WORK PERFORMED BY: Edgewood Research, Development and Engineering Center, Aberdeen Proving Ground, MD; Los Alamos National Laboratory, Los Alamos, NM; Science and Technology Corp., Hampton, VA; US Army Dugway Proving Ground, Dugway, UT; US Army White Sands Missile Range, NM; US Army Research Laboratory, Aberdeen Proving Ground, MD; US. Army Belvoir Research, Development and Engineering Center, Fort Belvoir, VA; Battelle Corp., Columbus, OH; Environmental Technologies Group, Baltimore, MD; Bruker Instruments, Billerica, MA; Dahlgren Naval Systems Warfare Center, Dahlgren, MD; NAVSEA 03R1, Arlington, VA; HSC/YAE Brooks Air Force Base, TX; Marine Corps Systems Command, Quantico, VA.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0208051A
PE Title: Joint Biological Defense Program

Project Number: **DBD1**
Budget Activity: **#7**

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY: N/A - This is a new start program. See paragraph C above.

F. (U) PROGRAM DOCUMENTATION:

Army BIDS

• Joint Mission Needs Statement (VCJCS, 31 Aug 92)	Aug 92
• Acquisition Strategy	Jun 93
• Operational Requirement Document	Jun 93
• Test and Evaluation Master Plan (TEMP)(Draft)	Nov 93

Navy IBADS

• Joint Mission Needs Statement	Aug 92
• Acquisition Plan	Feb 94
• Independent Assessment Report	Jul 96

Navy BADS

• Joint Mission Needs Statement	Aug 92
• Test and Evaluation Master Plan (TEMP)	Nov 94
• Acquisition Strategy	Nov 94

Army LR-SBDS and SR-SBDS

• Joint Mission Needs Statement	Aug 92
• Acquisition Strategy	Jun 93
• Acquisition Plan	Sep 93
• Test and Evaluation Master Plan (TEMP)	Feb 94
• Joint Operational Requirement (ORD)	Sept 94

G. (U) RELATED ACTIVITIES:

- PE #0603806A (Chemical Smoke and Equipment Defeating Technology and Technology of Biological Detection)
- PE #0603759A (CB Defense System Advanced Technology)
- PE #0604516N (Ship Survivability)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0208051A
PE Title: Joint Biological Defense Program

Project Number: DBD1
Budget Activity: #7

- PE #0602233N (Mission Support Technology)

H. (U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Other Procurement Army: MA0810 - Biological Integrated Detection System							
	0	0	14583	56413	59811	41748	28299
Other Procurement Army: MA0820 - Biological Strategic Standoff Detector							
	0	0	5833	10065	15164	5083	5114

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Annex A-6 (Bio-Chemical Detector Demonstration and Validation Program) to Memorandum of Understanding with Canada and the United Kingdom signed in 1980 for research, development, production and procurement of chemical and biological defense materiel.

J. (U) MILESTONE SCHEDULE:

	Date(s)
• JPO-BD	
• LR-SBDS	
DAB Reviews	Aug 94
Milestone I/II	Sep 96
	Feb 95
• SR-SBDS	
Milestone I/II	Sep 96
• Army NDI/Product Improved BIDS	
Milestone I/II	Feb 94
Milestone III	Sep 95
Milestone IV	Sep 96

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0208051A
PE Title: Joint Biological Defense Program

Project Number: DBD1
Budget Activity: #7

- **Navy BADS/IBADS**

Milestone I	Oct 95

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303140A
PE Title: Communications Security (COMSEC) Equipment

Budget Activity: #7

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D491 Communications Security Equipment Technology	6103	7091	5266	4486	4829	1596	2242	Cont	Cont
D501 Army Key Management System	0	0	2423	1281	603	606	609	Cont	Cont
PE TOTAL	6103	7091	7689	5767	5432	2202	2851	Cont	Cont

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program develops Information Systems Security (ISS) equipment and techniques required to combat threat Signal Intelligence capabilities and to insure our data network integrity. The Army's RDT&E ISS program objective is to implement National Security Agency (NSA) developed security technology such as standard chips, modules, and algorithms in Army information systems. The thrust of project D491 is to insure total signals and data security of all Army information systems to include any operational enhancements and specialized Army configurations. The thrust of project D501 is to automate key generation and distribution while supporting joint interoperability. It provides communications and network planning with key management on a single platform. The Army ISS RDT&E program provides the Army funding required to apply the NSA technology to Army command, control, communications, and intelligence (C3I) systems in a cost effective, expeditious manner. System security engineering, integration of available information security (INFOSEC) products, development (when required), and testing are services provided to ensure the C4I systems are protected against malicious or accidental attacks by our enemies or friends. Project D501 is the result of restructure of project D491 and is not a new start.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:

(U) Project D491 Communications Security Equipment Technology: Project implements National Security Agency (NSA) developed security technology in Army information systems. Project objectives are to provide information systems security mechanisms through encryption, trusted software or standard operating procedures to protect the information and to integrate these mechanisms into specified required systems so secure operations are as transparent as possible to the users. This entails performing architectural studies and modeling, development models, system integration and testing, installation kits and certifications and accreditations of Automated Information Systems.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303140A
PE Title: Communications Security (COMSEC) Equipment **Budget Activity: #7**

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Completed software development, technical testing of the Automated Net Control Device, Key Distribution Device and Key Management workstation for the Army COMSEC Management and Engineering System (ACMES) in support of Mobile Subscriber Equipment (MSE), TRI-TAC, Single Channel Ground and Airborne Radio (SINCGARS), and Enhanced Position Location and Reporting System (EPLRS).	4Q93	3803
• (U) Studied requirements for Tier 1 level of Key Management.	4Q93	30
• (U) Awarded concept model contract for Tactical End-to-End Encryption Device (TEED).	4Q94	1020
• (U) Fielded two redesigned STU-III interface equipments.	3Q93	450
• (U) Evaluation of non-developmental INFOSEC products such as COMSEC/TRANSEC Integrated Circuit (CTIC) for computer systems and the new STU-III video telephone.	4Q93	500
• (U) Performing level II management for AIRTERM Terminal (AIRTERM) COMSEC equipment while supporting new AN/ARC-220 Avionics High Frequency (HF) radio program.	4Q93	300
Total		**6103**

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Continue Army Key Management (AKM) System engineering development concentrating on software development and software/hardware integration.	1Q96	3822
• (U) Continue TEED Concept development, refine architecture, perform initial hardware and software design.	1Q96	2200
• (U) Continue evaluation of non-developmental INFOSEC products for use in Army Common Hardware/Software (CHS) computers.	3Q95	500
• (U) Redesign STU-III conference bridge and interfaces to other types of secure communications.	2Q95	400
• (U) Fund Army portion of user authentication using program biometrics techniques in joint program consortium, chaired by NSA.	4Q95	169
Total		**7091**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303140A
PE Title: Communications Security (COMSEC) Equipment

Budget Activity: #7

(U) FY1995 Planned Program:

	Complete	Cost
• (U) Complete concept development of TEED for achieving multilevel security of the global communications networks.	1Q96	1791
• (U) Initiate prototype development of trusted software and user authentication module for incorporation into switches, computer workstations, and gateways between Local Area Networks (LANs) and Wide Area Networks (WANs). Provides accessibility to the levels of classified data through one computer.	2Q97	1125
• (U) Evaluate INFOSEC NDI equipments such as Advanced Key Management Module (AKMM), RADIANT MERCURY trusted guard, STICKPIN COMSEC chip, and CYPRESS programmable module.	1Q96	450
• (U) Initiate prototype Development of Transmission Security (TRANSEC) Low Probability of Detection (LPD) radio providing covert reconnaissance units with ability to communicate their intelligence information without detection of their physical location and subsequent loss of life.	4Q97	700
• (U) Design, fabricate and test installation kits for the AIRTERM COMSEC.	3Q96	450
• (U) Initiate test bed activity to evaluate commercial secure data base management systems, applying research performed by MITRE and previously funded by NSA.	3Q96	750
Total		**5266**

(U) Project D501 Army Key Management System:
Provides decentralized and automated key generation, distribution and management while enhancing joint interoperability. Eliminates paper encryption key and provides communications and network planning with key management on a single platform.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303140A
PE Title: Communications Security (COMSEC) Equipment

Budget Activity: #7

(U) FY 1993 Accomplishments: (Efforts funded under D491)

(U) FY 1994 Planned Program: (Efforts funded under D491)

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Concentrate on software development of key management workstation.	2Q96	2123
• (U) Proceed with operational system testing of Data Transfer Device software.	3Q95	100
• (U) Army's engineering support to Tier 1 theater level and CINC regional controller effort.	4Q97	200
Total		2423

(U) Work Performed By: Contractors performing work in this program are: Group Technology Corp., Tampa, FL; Motorola, Scottsdale, AZ; Martin Marietta, Camden, NJ; Engineering Professional Services, Tinton Falls, NJ; Booz, Allen and Hamilton, Tyson's Corner, VA; TEXCOM, Wash, DC; Alliant Techsystems, Annapolis, MD; Science Applications International Corporation (SAIC), San Diego, CA; and TELOS, Tinton Falls NJ. The primary in-house developing organizations are the US Army Communications-Electronics Command, Fort Monmouth, NJ; PEO Communications and PM Joint Tactical and Communication Systems (JTACS), Fort Monmouth, NJ; US Army Test and Evaluation Command, Aberdeen Proving Ground, MD; US Army Signal Center and Fort Gordon, Fort Gordon, GA; and the National Security Agency, Fort Meade, MD.

(U) Related Activities:
PE #0203726A (Advanced Field Artillery Tactical Data System)
PE #0[illegible]905A (Command, Control, Communications Systems - Engineering Development)
PE #0603713A (Army Data Distribution Systems (ADDS))
PE #0604741A (Air Defense Command, Control, and Intelligence - Engineering Development)
PE #0604818A (Army Tactical Command and Control System - Engineering)
PE #0603746A (Single Channel Ground & Airborne Radio System)
PE #0208010A (Joint Tactical Communications Program (TRI-TAC))

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303140A
PE Title: Communications Security (COMSEC) Equipment

Budget Activity: #7

All the above related activities use key management, embedded COMSEC hardware, software, and computer security tools. In the area of key management, several joint service/NSA working groups exist to avoid duplication and to assure interoperability between all services' systems to include standards and testing. The Defense Information Systems Agency (DISA) multilevel security (MLS) working group coordinates the service's different technology efforts. The National Security Agency (NSA) review each service's RDT&E programs to avoid duplication between the services and with their own. There is no unnecessary duplication of effort within the Army or DoD through the activities of the above organizations and working groups.

(U) Other Appropriation Funds:

($ in Thousands)

Appropriation OPA	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
BA9106	68	0	0	0	0	0	0
MA9106	0	0	3961	1144	1753	1202	789
BA1201	7180	0	0	0	0	0	0
TA0600	0	59530	13083	22358	30079	26282	26772
BQ0200	951	0	0	0	0	0	0
TA0500	4805	0	0	0	0	0	0
T54000	1207	0	0	0	0	0	0
T90600	16668	0	0	0	0	0	0
BZ8950	3974	0	0	0	0	0	0
BL5264	4622	0	0	0	0	0	0
TA0200	0	0	531	0	0	0	0

(U) International Cooperative Agreements: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0303142A**
PE Title: **Satellite Communications Ground Environment** Budget Activity: **#7**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D253 Defense Satellite Communications System-Defense Communications System (DSCS-DCS)(PHASE II)	31839	31864	32266	19102	21357	26873	23945	Cont	Cont
D383 Ground Command Post (Part of D455 thru FY93)	0	532	0	0	0	0	0	0	Cont
D384 SMART-T (Part of D455 thru FY93)	0	55779	40364	5570	5398	0	0	0	Cont
D386 SCAMP (Part of D455 thru FY93)*	0	35175	13857	25376	1126	0	0	Cont	Cont
D455 MILSTAR EDM Term (Includes all four Army Milstar Terminal Programs thru FY93)	71246	4784	762	790	855	0	0	0	300163
D456 Tactical Satellite Communications (TACSATCOM) System	9009	7943	7942	4509	4487	4472	4394	Cont	Cont
PE TOTAL	112094	136077	95191	55347	33223	31345	28339	Cont	Cont

* Reflects funding for BLK I only.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303142A
PE Title: Satellite Communications Ground Environment

Budget Activity: #7

B. (U) BRIEF DESCRIPTION OF ELEMENT: Military Satellite Communications (MILSATCOM) systems are Joint program/project efforts with each Service, Joint Chiefs of Staff (JCS), National Command Authority (NCA), Commanders-In-Chief (CINCs), National Security Agency (NSA), and Office of the Secretary of Defense (OSD) assigned specific responsibilities as specified in JCS Memorandum of Policy (MOP) 37. There are three worldwide MILSATCOM systems. These are the ultra high frequency (UHF) Fleet Satellite/Air Force Satellite (FLTSAT/AFSAT) system; the super high frequency (SHF) Defense Satellite Communications System (DSCS); and the Extreme High Frequency (EHF) Milstar UHF Follow-On Satellite system. MOP 37 designates Army as the Executive Agent for MILSATCOM Ground Subsystems. As Executive Agent for MILSATCOM Ground Subsystems, Army is responsible for developing, procuring, and life cycle logistics support for satellite terminals; satellite control subsystems; communications subsystems; and all related equipment required to achieve end-to-end connectivity to satisfy JCS command, control, communications, and intelligence (C3I) supporting the President; JCS; Commanders in Chief (CINCS); Military Departments (MILDEPS); Department of State; and other Departments and Agencies of the government.

C. (U) *JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:*

(U) Project D383 Ground Command Post (GNDCP): The Ground Command Post (GNDCP) terminals are being developed and procured by the Air Force. They will provide a survivable, enduring worldwide communications capability, replacing the present AN/GSC-40 equipment. These terminals will be fielded in both a fixed and transportable configuration. First terminal delivery to the Army is scheduled for first quarter, FY94. The Army material development efforts for this project are to assess the support required, acquire the spares, provide the required Government-furnished Equipment (GFE), and integrate/field eight terminals into the Army Force Structure. Program was restructured from Project D455.

(U) FY 1993 Accomplishments: Efforts funded under project D455 in FY93

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Mobilization of Ft McPherson terminal at Tobyhanna Army Depot	2Q94	$50
• (U) Fielding of Ft McPherson Terminal	3Q94	$110
• (U) Establish logistics support for Ft McPherson terminal and future terminals	4Q94	$119
• (U) Supporting Air Force in site surveys, design and construction of facilities at Army GNDCP sites	4Q94	$70
• (U) Continue in-house support efforts for the mobilization and fielding of remaining GNDCP terminals	4Q94	$183
Total		**$532**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303142A
PE Title: Satellite Communications Ground Environment

Budget Activity: #7

(U) FY 1995 Planned Program:
- (U) No RDT&E funded effort

(U) Work Performed By: (GNDCP) - Terminals developed and provided by USAF utilizing two (2) contractors, Raytheon Company, Marlborough, MA, ar Rockwell International, Richardson, TX. PM Milstar (Army) is integrating these terminals into the Army Force Structure.

(U) Related Activities:(GNDCP) - Joint Milstar Program. Tri-Service effort. There is no unnecessary duplication of effort within the Army or DOD.

(U) International Cooperative Agreements: None

(U) Project D455 Milstar EDM Terminal: These EHF Milstar Engineering Development Model (EDM) terminals will be utilized as test assets to support satellite payload tests and Milstar interoperability demonstrations. They will also reduce risk in the Secure Mobile Anti-Jam Reliable Tactical Terminal (SMART-T) and Single Channel Anti-jam Manportable (SCAMP) development process. The terminals are capable of providing mobile, survivable, anti-jam, low probability-of-intercept communications from an S-250 shelter mounted on a CUCV truck towing a trailer with generator.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Completed contractor Milsat EDM Terminal (MET) Milstar IV software development efforts to reduce SCAMP/SMART-T risk	2Q94	$2107
• (U) Conducted various MET contractor test to insure full joint operability	4Q93	$179
• (U) Continued government efforts to use MET to reduce SCAMP/SMART-T program risk	2Q96	$1114
• (U) Continued in-house, matrix and support contract efforts with respect to the fielding, planning, and site preparation of GNDCP terminals	4Q94	$448
• (U) Began major contract efforts for SCAMP Engineering Manufacturing Development	2Q96	$23060
• (U) Awarded major contract efforts for SMART-T Engineering Manufacturing Development	2Q96	$44338
Total		**$71246**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303142A
PE Title: **Satellite Communications Ground Environment**

Budget Activity: #7

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Continue contractor efforts to support MET testing with SCAMP and SMART-T to reduce risk	4Q97	$2457
• (U) Conduct Lincoln Lab/Raytheon Interoperability Testing and Medium Power Transmitter Efforts	4Q94	$268
• (U) Continue Government Support Effort of MET Testing with SCAMP and SMART-T to reduce risk	4Q97	$2059
Total		**$4784**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Continue Contractor efforts to support MET testing with SCAMP and SMART-T to reduce risk	4Q97	$356
• (U) Initialization of Satellite/On-Orbit Testing	4Q97	$112
• (U) Continue Government testing with SCAMP and SMART-T to reduce risk	4Q97	$294
Total		**$762**

(U) **Work Performed By: (Milstar EDM Terminal)** - In-house: PM Milstar (Army), Fort Monmouth, NJ under the management of Program Executive Officer Communications Systems (PEO COMM) with support provided by US Army Communications Electronics Command (CECOM) Fort Monmouth, NJ. Major contractors: Magnavox, Fort Wayne, IN, Lincoln Laboratories, Bedford, MA.

(U) **Related Activities:** (Milstar EDM Terminal) Joint Milstar Program Multi-service effort. Air Force airborne, Navy shipboard, Army ground environment. Numerous successful joint interoperability tests have been performed. There is no unnecessary duplication of effort within the Army or DOD.

(U) ***International Cooperative Agreements:*** None

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303142A
PE Title: Satellite Communications Ground Environment

Budget Activity: #7

(U) Project D456 Tactical Satellite Communications (TACSATCOM): The Ground Mobile Forces Satellite Communications (GMFSC) or TACSATCOM system provides funds for the development of tactical satellite communications terminals and control systems for the Department of Defense. Developments under this program provide rapid, reliable, effective communications to support tactical command, control, communications and intelligence (C3I) requirement for tactical commanders and Commanders-in-Chief (CINC).

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) UHF Control Bid Sample Test Evaluator for sample hardware completed	1Q93	$4920
• (U) Evaluated bid samples for Non-Developmental Item (NDI) PSC-5 Enhanced Manpack UHF Terminal (EMUT)	3Q93	$1620
• (U) Started Anti-Jam Control Modem (AJCM) T1 data rate study	3Q95	$2469
Total		**$9009**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Start First Article Test Evaluator for UHF program	4Q94	$3120
• (U) Complete AJCM T1 data rate study	2Q94	$1000
• (U) Start Pre-Planned Product Improvement (P3I) on PSC-5 EMUT for over-the-air-rekeying (OTAR), and Auto Demand Assigned Multiple Access (DAMA)	3Q94	$1350
• (U) Start Pre-planned Product Improvement (P3I) on PSC-5 EMUT for paging and voice recognition	3Q96	$1403
• (U) Initiate Market Survey for SHF TRI-BAND Advanced Range Extension Terminal (STAR-T)	3Q95	$1070
Total		**$7943**

(U) FY 1995 Planned Program:	Complete	Costs
• (U) Continue P3I on PSC-5 EMUT for OTAR and Auto DAMA,	3Q96	$2312
• (U) Continue P3I on PSC-5 EMUT for paging and voice recognition	3Q96	$2402
• (U) Complete market survey for STAR-T	3Q95	$3228
Total		**$7942**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303142A
PE Title: Satellite Communications Ground Environment

Budget Activity: #7

(U) **Work Performed By:** (TACSATCOM) - In house efforts will be accomplished by the PM Satellite Communications under the management of Program Executive Office for Communications Systems (PEO COMM), and US Army Communications Electronics Command (CECOM) Space and Terrestrial Communications Division, Ft. Monmouth, NJ. Major contractors are Harris Corp., Melborne, FL; Martin Marietta Corp., Orlando, FL; Applied Phvsics Laboratory, Laurel, MD; Tobyhanna Army Depot, Tobyhanna, PA; MITRE, Boston, MA; MESC Electronic Systems, Inc.,Fort Wayne, In.

(U) **Related Activities:** None. There is no unnecessary duplication of effort within the Army or DoD.

(U) **OTHER APPROPRIATION FUNDS:**

Appropriation	($ in Thousands) FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
OPA 2							
BB8417 (TACSAT)	9110	9873	5375	5194	5700	7454	7527
K49500 (TACSAT)	2438	0	0	0	0	0	0
K77200 (TACSAT)	10424	7940	15059	7656	3622	0	0
K23700 (MET)	13616	0	0	0	0	0	0
BC4001 (GNDCP)	0	0	5948	1056	1007	897	271
BC4003 (SCAMP)	0	0	0	51465	4388	10217	5560
BC4002(SMART-T)	0	0	0	67090	65638	78725	99372

(U) **International Cooperative Agreements:** None

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303142A
PE Title: Satellite Communications Ground Environment

Project Number: D253
Budget Activity: #7

A. (U) RESOURCES: ($ in Thousands)
Project Title: Defense Satellite Communications Systems-Defense Communications Systems (DSCS-DCS)

Popular Name	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DSCS/DCS	31839	31864	32266	19102	21357	26873	23945	Cont	Cont

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILI : This program element provides funds required to develop strategic and tactical Ground Subsystem equipment to support JCS validated unique and vital Command, Control, Communications and Intelligence (C3I) for the worldwide Super High Frequency (SHF) Defense Satellite Communications System (DSCS) program. Continuing upgrades for the DSCS are vital to support the emerging power projection and rapid deployment role of the Armed Forces. DSCS provides warfighters multiple channels of tactical connectivity as well as interface with strategic networks and national level decision makers.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Continued Engineering and Manufacturing Development (EMD) on the Universal Modem (UM)	4Q95	$14500
• (U) Awarded contract for DSCS Training Devices	4Q95	$9039
• (U) Awarded AN/USC-28 Conferencing Modification	4Q93	$4700
• (U) Continued support and upgrades of the Integrated Research Facility (IRF) and System Engineering Technical Assistance (SETA) efforts	4Q93	$3600
Total		$31839

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Continue development, design review and testing for DSCS Training Devices	4Q95	$3692
• (U) Continue EMD for the UM	4Q95	$14400
• (U) Replace AN/USC-28, Forward Error Correction Encoder/Decoder	4Q94	$1900

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303142A
PE Title: Satellite Communications Ground Environment

Project Number: D253
Budget Activity: #7

• (U) Solicitation for the Replacement Satellite Configuration Control Element (RSCCE)	4Q94	$200
• (U) Develop Testbed for the RSCCE	4Q95	$4800
• (U) Develop DSCS Integrated Management System (DIMS) Interface software	1Q98	$1600
• (U) Continue support and upgrades of the IRF and SETA efforts	4Q94	$5272
Total		**$31864**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Continued development, design, review and testing for DSCS training devices	4Q95	$6300
• (U) Conduct UM technical test	4Q95	$3000
• (U) Develop Communications Unit 2 (CU2) for UM	4Q96	$5700
• (U) Replace AN/USC-28 Embedded Computer	4Q95	$4000
• (U) Continue development of RSCCE testbed	4Q95	$400
• (U) Contract Award for the RSCCE	1Q97	$5600
• (U) Continue development of DIMS interface software	1Q98	$2266
• (U) Continue support and upgrades of the IRF and SETA efforts	4Q95	$5000
Total		**$32266**

D. (U) WORK PERFORMED BY: In-house efforts will be accomplished by the PM Satellite Communications under the management of Program Executive Office Communications Systems (PEO COMM) and supported by the US Army Communications Electronics Command (CECOM) Space and Terrestrial Communications Division, Fort Monmouth, NJ. Major contractors are Magnavox, Torrance, CA; Stanford Telecommunications, Inc., Santa Clara CA and Colorado Springs, CO; Harris Corporation, Melbourne, FL; Applied Physics Laboratory , Laurel, MD; and PM Training Devices, Orlando, FL.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. TECHNICAL CHANGES: The restructured DSCS training device program includes only one Generic Principles Trainer (GPT) as a result of funding changes in FY94.

2. SCHEDULE CHANGES: The DSCS training device schedule only includes one GPT.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303142A
PE Title: Satellite Communications Ground Environment

Project Number: D253
Budget Activity:#7

3. COST CHANGES: FY94 reduction of $17.5M resulted in a restructure for the DSCS training device program.

F. (U) PROGRAM DOCUMENTATION: Defense Information Systems Agency (DISA) DSCS Program Plan approved annually by the Military Departments, validated by JCS and approved by OSD.

G. (U) RELATED ACTIVITIES: There is no unnecessary duplication of effort within the Army or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation	FY 1993	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	Estimate
Other Procurement, Army								
BA9728		15801	16447					
BA8300		5893	4352	10893	7333	30387	40606	45077
BB8416		49969	27371	46004	40770	31989	26278	17153
BB8501		20616	26196	28322	20900	19244	13502	10443
BB8504		2052	4369	4579	2990	3333	3358	3394
BB8509		16823	16319	14738	6759	15580	10122	17830
MA9728		0	0	9655	11171	9806	14336	14319

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Memorandum of Understanding (MOU) between US & UK Dec 1989 for the Universal Modem. MOU between the US, UK and France to be negotiated. Other selected allies have expressed interest in the UM program.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303142A
PE Title: Satellite Communications Ground Environment

Project Number: D253
Budget Activity: #7

J. (U) MILESTONE SCHEDULE:

Milestones	Dates
DSCS TRAINING DEVICES	
Contract Award for EMD	FY93
Development/Design Review and Testing	FY94/95
UNIVERSAL MODEM	
Contract Award for EMD	FY91
Technical Test	FY95
Develop CU2	FY95/96
REPLACEMENT SATELLITE CONFIGURATION CONTROL ELEMENT (RSCCE)	
Develop Testbed	FY94/95
Solicitation and Evaluation	FY94
Contract Award	FY95
AN/USC-28	
Award Conferencing Modification	FY93
Award Forward Error Correction Encoder/Decoder Modification	FY94
Award Embedded Computer Modification	FY95
DSCS INTEGRATED MANAGEMENT SYSTEM (DIMS)	
Develop DIMS Interface Software	FY94/98

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303142A
PE Title: Satellite Communications Ground Environment
Project Title: SMART-T

Project Number: D384
Budget Activity: #7



POPULAR NAME: SMART-T

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0303142A**
PE Title: **Satellite Communications Ground Environment**
Project Title: **SMART-T**

Project Number: **D384**
Budget Activity: **#7**

A. (U) SCHEDULE/BUDGET INFORMATION: ($ In Thousands)

SCHEDULE	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	To Complete
Program Milestones	Completed Successful MILSTAR Info DAB Review 1 Q			Obtain LRIP Decision 2 Q			Obtain MS III Decision Approval - 1 Q	
Engineering Milestones	Conducted PDR; 3 Q	Conducted CDR 2 Q		Receive Delivery of EDMS 2 Q				
T&E Milestones		Begin Technical Test 4 Q	Continue Technical Test 1 - 4 Q	Complete Technical Test 2 Q		Perform FAT 1 Q; Conduct IOT&E 3 Q - 4 Q	Begin FOT&E 4 Q	Complete FOT&E 2 Q FY00
Contract Milestones	Awarded Development Contracts 1 Q		Release Solicitation for LRIP/FSP Contract - 2 Q	Award LRIP/FSP Contract - 2 Q			Award 1st FSP Option 1 Q	
BUDGET ($000)	**FY 1993**	**FY 1994**	**FY 1995**	**FY 1996**	**FY 1997**	**FY 1998**	**FY 1999**	**Program Total (To Complete)**
Major Contract		43243	28576					Cont
Support Contract		4593	3157					Cont
In-House Support		7943	8631					Cont
GFE/ Other		0	0					Cont
Total	*	55779	40364	5570	5398	0	0	Cont

* FY93 funding is in PE 0303142, Project D455 MILSTAR EDM TERMINALS (broken out into separate project numbers in FY94)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303142A
PE Title: Satellite Communications Ground Environment
Project Title: SMART-T

Project Number: D384
Budget Activity: #7

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The Secure Mobile Anti-Jam Reliable Tactical Terminal (SMART-T) will provide a range extension capability for the Army's Mobile Subscriber Equipment (MSE) to support the Force Projection Army. Specifically, it will provide a satellite interface to permit uninterrupted communications as our advancing forces move beyond the line-of-sight capability of MSE. This equipment will communicate at both low and medium data rates (LDR/MDR) over the Milstar satellite constellation. It will also be compatible with the UHF Follow-on (UFO) and the Navy Fleetsatcom EHF satellite package. It will provide the security, mobility, and anti-jam capability required to defeat the threat and satisfy the critical need as stated above. The SMART-T also will have low probability of interception and low probability of detection (LPI/LPD) to avoid being targeted for destruction, jamming or intercept. The prime mover will be a High Mobility Multi-Purpose Wheeled Vehicle (HMMWV) configured with all the electronics and the self-erectable antenna. The SMART-T is a part of the Congressional restructure of the Milstar program. Current validated service requirements include: 209 Army, 97 Air Force, 42 Marine Corps, 10 Joint Communications Support Element, 4 Navy, and 5 to other DoD Special Users.

This is not a FY94 new start. Prior to FY94, PE 0303142A for Satellite Communications Ground Environment included the funding for all four Army Milstar programs under Project #D455. Each program has since been given a separate project number within the PE effective FY94.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments: Efforts funded under Project D455

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Continue Major Contractor Engineering Manufacturing Development Efforts to build 12 SMART-T prototypes	2Q96	$43243
• (U) Continue Lab Support Efforts (Development of EHF Payload Simulator, Payload Nuller Performance Parameters and MSE Networking)	2Q96	$4593
• (U) Continue In house support efforts	2Q97	$7943
Total		**$55779**

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Continue Major Contractor Engineering Manufacturing Development Efforts to build 12 SMART-T prototypes	2Q96	$28576
• (U) Continue Lab Support Efforts (Development of EHF Payload Simulator, Payload Nuller Performance Parameters and MSE Networking)	2Q96	$3157
• (U) Continue In house support efforts	2Q97	$8631
Total		**$40364**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303142A
PE Title: Satellite Communications Ground Environment
Project Title: SMART-T

Project Number: D384
Budget Activity: #7

(U) Program Plan to Completion:

- (U) Receive delivery of 12 EDM terminals
- (U) Obtain approval to proceed into LRIP
- (U) Award LRIP contract with FSP options
- (U) Perform First Article Test (FAT)
- (U) Conduct Initial Operational Test and Evaluation with Low Rate Initial Production (LRIP) terminals utilizing an on-orbit Low Date Rate (LDR) satellite and an on-ground Medium Data Rate (MDR) simulator
- (U) Receive delivery of LRIP terminals
- (U) Obtain Milestone Decision III approval from Army Systems Acquisition Review Council
- (U) Award Full Scale Production options
- (U) Conduct Follow-On Test and Evaluation (FOT&E) on production terminals with the on-orbit MDR satellite

D. (U) WORK PERFORMED BY: In House: Project Manager, Milstar (Army), Fort Monmouth, NJ, under the management of Program Executive Officer for Communications Systems (PEO, COMM), with support provided by US Army Communications-Electronics Command (CECOM), Fort Monmouth, NJ. Major contractors: Raytheon Company, Marlborough, MA and Rockwell International, Richardson, TX

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: None

F. (U) PROGRAM DOCUMENTATION:

• Joint Integrated Logistics Support Plan (JILSP)	01/92
• Operational Requirements Document (ORD)	03/92
• Acquisition Strategy Report (ASR)	04/92
• Test and Evaluation Master Plan (TEMP)	05/92
• Acquisition Decision Memorandum (ADM)	05/92
• Joint Operational Requirements Document (JORD)	09/92

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303142A
PE Title: Satellite Communications Ground Environment
Project Title: SMART-T

Project Number: D384
Budget Activity: #7

G. (U) RELATED ACTIVITIES: Joint Milstar Program. Multi-service effort, Air Force airborne, Navy shipboard, Army ground environment. There is no unnecessary duplication of effort within the Army or Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Other Procurement, Army -2							
BC4002	0	0	0	67090	65638	78725	99372
MA9720	0	0	0	0	0	4954	8803

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable

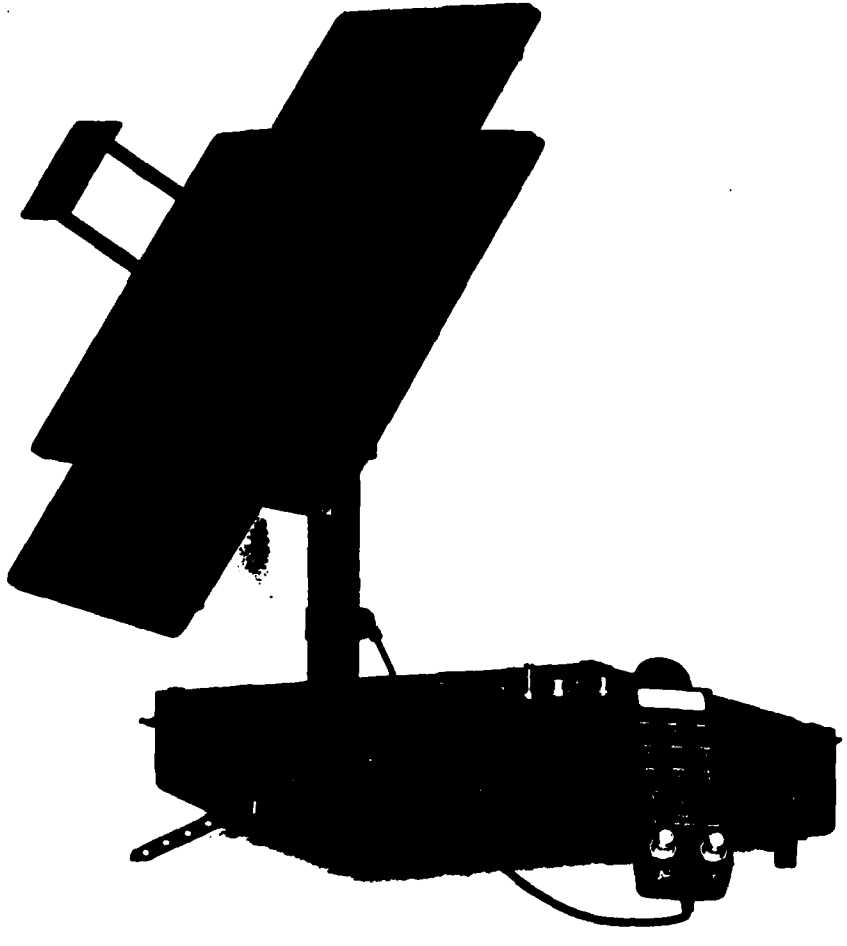
J. (U) TEST AND EVALUATION DATA:

Technical Testing	4Q94 thru 2Q96

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303142A
PE Title: Satellite Communications Ground Environment
Project Title: SCAMP

Project Number: D386
Budget Activity: #7



POPULAR NAME:SCAMP

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303142A
PE Title: Satellite Communications Ground Environment
Project Title: SCAMP

Project Number: **D386**
Budget Activity: **#7**

A.(U) SCHEDULE/BUDGET INFORMATION: ($ In Thousands)

SCHEDULE	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	To Complete
Program Milestones				Obtain ASARC MSD III	Initial Fielding 2 Q		Begin Blk II EFE	Continue Block II EFE MS II/III
Engineering Milestones								
T&E Milestones		Technical Test 4Q	Conduct RDGT 1-4Q; 3Q GT; Begin OT 4Q;	Complete OT 1Q Complete RDGT 1Q	Conduct FAT 3Q - 4Q		Begin Govt T 1-4Q	
Contract Milestones		CDR 2Q	Div GT units 2Q; Begin Div of OT units 4Q	RDGT units 3Q; Award Prod 3Q;		Begin Blk I Production Delivery 2Q	Continue Blk I Production Deliveries	Award EMD Blk II Award FSP Blk II
BUDGET ($000)	**FY 1993**	**FY 1994**	**FY 1995**	**FY 1996**	**FY 1997**	**FY 1998**	**FY 1999**	**Program Total (To Complete)**
Major Contract		26639	3211					Cont
Support Contract		5565	5747					Cont
In-House Support		2971	3112					Cont
GFE/ Other		0	1787					Cont
Total	*	35175	13857	25376	1126	0	0	Cont

* FY93 funding is in PE 0303142, Project D455, MILSTAR EDM TERMINALS (broken out into separate project numbers in FY94)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303142A | **Project Number: D386**
PE Title: Satellite Communications Ground Environment | **Budget Activity: #7**
Project Title: SCAMP

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The Single Channel Anti-Jam Manportable (SCAMP) terminal will provide a manportable, secure, anti-jam, Low Probability of Interception/Low Probability of Detection (LPI/LPD) Extremely High Frequency (EHF) satellite communications capability to Army, Air Force, Marine Corps and Joint Communications Support Element (JCSE) units which cannot be served by larger less mobile terminals. The SCAMP will be a hand carried, battery powered EHF satellite communications terminal utilized with the Milstar I and II satellites and other EHF waveform Satellites. It will communicate at data rates from 75 to 2400 bits per second (bps). The SCAMP will be compatible with the Milstar waveform, interoperable with other terminals using the Milstar network, and provide the multi-service owner operator with voice and data capability. The development contract was awarded 17 Sep 92 for SCAMP Block I with a weight goal of 30 pounds. An engineering feasibility effort to develop the Block II unit in the range of 12 - 15 pounds was approved as part of the ASARC and is now scheduled to begin FY99. The SCAMP Block II EMD is planned for FY01. The SCAMP terminal is a part of the Congressional restructure of the Milstar program and was part of the Milstar DAB Review held Oct 92.

This is not a FY94 new start. Prior to FY94, PE 0303142A for Satellite Communications Ground Environment included the funding for all four Army Milstar programs under Project #D455. Each program has since been given a separate project number within the PE effective FY94.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments: (See Project D455)

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Continue Major Contractor Block I Development Efforts	2Q96	$20879
• (U) Continue Lab support efforts Block I Risk Reduction (Miniaturized Radio Frequency generator, Lightweight Antenna, Spatial Power Combining Feed, Low Power Direct Digital Synthesizer	2Q96	$5565
• (U) Continue In house support efforts	2Q97	$2971
• (U) DOD planned carry over of FY94 funds into FY95 to support Block I Development efforts	2Q96	$5760
Total		**$35175**

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Continue Major Contractor Block I Development Efforts	2Q96	$3211
• (U) Continue Lab Support efforts Block I	2Q96	$5747
• (U) Continue In house support efforts	2Q97	$3112

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303142A
PE Title: Satellite Communications Ground Environment
Project Title: SCAMP

Project Number: D386
Budget Activity: #7

• (U) Begin testing effort (Reliability Development Growth Test (RDGT), Development Test (DT), Government Test (GT) and Operational Test (OT)	2Q96	$1787
Total		**$13857**

D. (U) WORK PERFORMED BY: In-house: PM Milstar (Army), Fort Monmouth, NJ, under the management of Program Executive Officer for Communications Systems (PEO COMM), with support provided by the US Army Communications Electronics Command (CECOM), Fort Monmouth NJ. Major contractor: Martin Marietta Corporation (formerly General Electric Aerospace), Camden, NJ.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** OSD directed that no funds be spent for Blk II before FY96.
2. **SCHEDULE CHANGES:** None
3. **COST CHANGES:** None

F. (U) PROGRAM DOCUMENTATION:

• Joint Integration Logistics Support Plan (JILSP) -	1/92
• Operational Requirements Document (ORD) -	3/92
• Acquisition Strategy Report (ASR) -	4/92
• Integrated Program Summary (IPS) -	5/92
• Acquisition Decision Memorandum (ADM) -	5/ 92
• Joint Operational Requirements Document (JORD) -	9/92
• Test and Evaluation Master Plan (TEMP) -	10/93

G.(U) RELATED ACTIVITIES: Joint Milstar Program. Multi-service effort, Air Force airborne, Navy shipboard, Army ground environment. There is no unnecessary duplication of effort within the Army or DOD.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303142A
PE Title: Satellite Communications Ground Environment
Project Title: SCAMP

Project Number: D386
Budget Activity: #7

H. (U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Other Procurement, Army							
BC4003	0	0	0	51465	4388	10217	5560
MA9718	0	0	0	0	0	8647	0

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

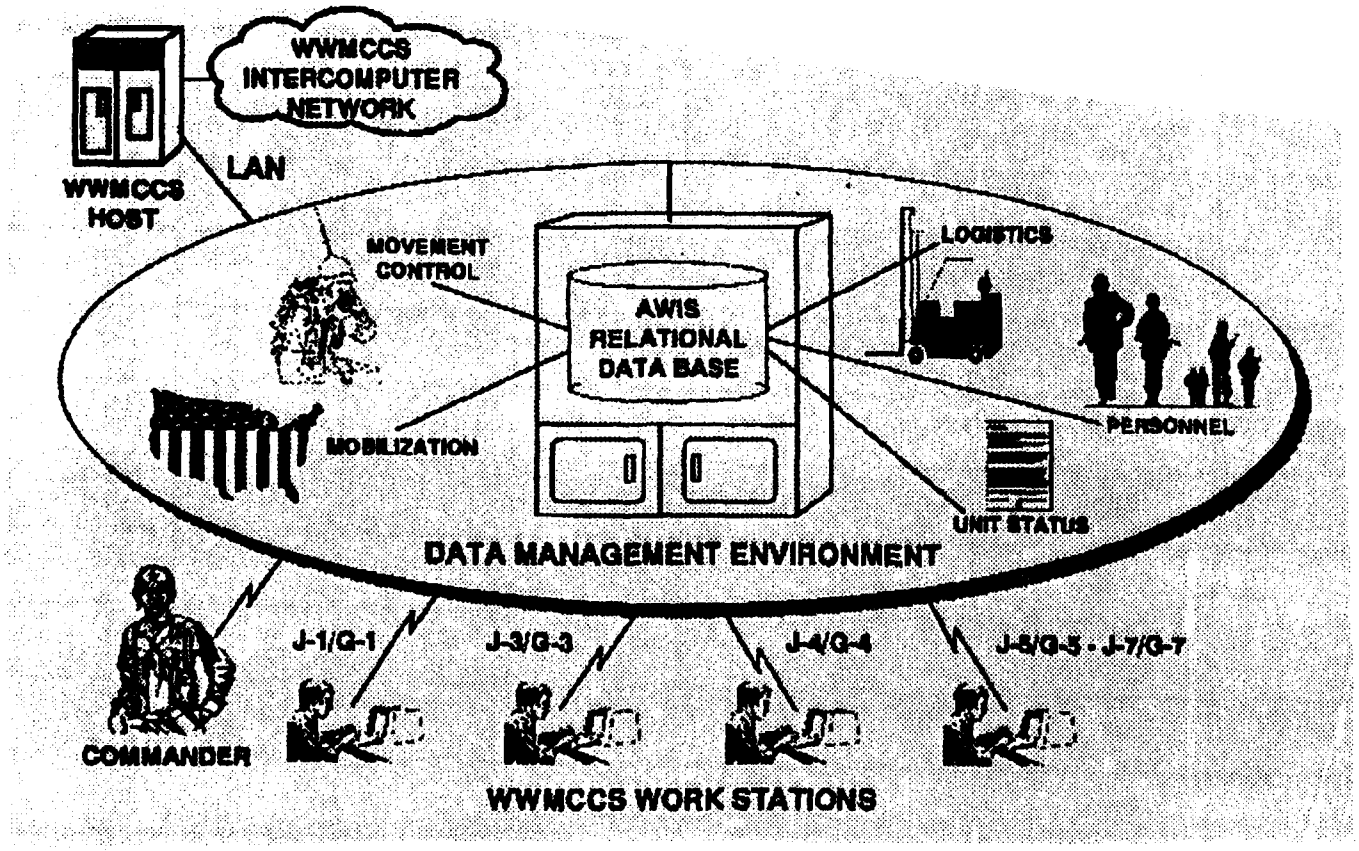
J. (U) TEST AND EVALUATION DATA:

SCAMP Block I Technical Test	4Q94 thru 4Q95

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303152A
PE Title: World-Wide Military Command & Control Systems, Information Systems (WIS)
Project Title: Army WIS Modernization Program

Project Number: DH86
Budget Activity: #4



POPULAR NAME: AWIS

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303152A | **Project Number: DH86**
PE Title: World-Wide Military Command & Control Systems, Information Systems (WIS) | **Budget Activity: #4**
Project Title: Army WIS Modernization Program

A. (C) SCHEDULE/BUDGET INFORMATION: ($ In Thousands)

SCHEDULE	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	TO COMPLETE
Program Milestone	02/93 Army/OSD							09/99
Engineering Milestones								
T&E Milestones		06/94 (OT1)						09/99
Contract Milestones		04/94 (RFP Draft)						09/99
BUDGET ($000)	**FY 1993**	**FY 1994**	**FY 1995**	**FY 1996**	**FY 1997**	**FY 1998**	**FY 1999**	**Program Total (To Complete)**
Major Contract	10125	8647	0	0	0	0	0	240609 (0)
Support Contract								
In-House Support								
GFE/ Other								
Total	10125	8647	0	0	0	0	0	240609 (0)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303152A
PE Title: World-Wide Military Command & Control Systems, Information Systems (WIS)
Project Title: Army WIS Modernization Program

Project Number: DH86
Budget Activity: #4

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Army World-Wide Military Command and Control System (WWMCCS) Information System (AWIS) is the Army component system that directly supports Army implementations of the Joint Global Command and Control System (GCCS). AWIS is accomplishing this support by creating the Army's Global Command and Control System that will be submitted as the Army's "best of breed" Command and Control (C2) functionality to be included in the Joint GCCS. AWIS also supports Army-unique command requirements in addition to Army-unique support for the implementation of the joint service program. AWIS provides both Army-unique strategic-level command and control (C2) software and the hardware infrastructure necessary for operation and support of the Joint Operations Planning and Execution System (JOPES) and other joint software which directly support the warfighting Commander in Chiefs (CINCs) and Joint Chiefs of Staff (JCS). AWIS-developed software systems dramatically improve the ability of the Army to analyze courses of action; to develop and manage Army Force components supporting JCS war plans and to ensure the Army portion of the war plan is feasible; to support status reporting; mobilization, deployment, employment and sustainment of Army forces supporting conventional joint military operations. AWIS complies with the Congressional mandate to modernize the Army system for command and control. AWIS also supports the Army CINCs in the European Command, Pacific Command, Central Command, Special Operations Command, Forces Command, and Southern Command; Headquarters Department of the Army (HQDA); Army Major Commands and the Army component of Transportation Command.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Completed detailed design and validated Block 1 software modules.	1Q93	4925
• (U) Delivered Core Block (logistics, mobilization, and personnel software to primary site.	3Q93	300
• (U) Delivered Core Block (PC ASORTS) to primary site.	3Q93	300
• (U) Completed Block 1 software data management software modules to primary and secondary sites.	4Q93	800
• (U) Continued development of Core, Block1, and Block 2 software for primary and secondary sites.	3Q93	2600
• (U) Provided common application software systems (CASS) with support for modules in the future.	3Q93	500
• (U) Provided Independent verification and validation testing.	2Q93	700
TOTAL		10125
(U) FY 1994 Planned Program:		
• (U) Continued development of Block I Software.	1Q94	1800
• (U) Continued independent verification and validation testing.	1Q94	200

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303152A
PE Title: World-Wide Military Command & Control Systems, Information Systems (WIS)
Project Title: Army WIS Modernization Program

Project Number: DH86
Budget Activity: #4

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Complete development and delivery of Block 1 software modules to primary and secondary sites.	4Q94	1000
• (U) Migrate AWIS software products to GCCS environment.	4Q94	5447
• (U) Continue Independent Verification and validation testing	4Q94	200
TOTAL		8647

(U) FY 1995 Planned Program:

- (U) AWIS program will be merged with the Standard Theater Army Command and Control System (STACCS), PE 0203740, Project DC49 and will continue as a consolidated system procurement.

D. (U) WORK PERFORMED BY: AWIS Software Development Contract: TRW, Fairfax, VA. IV&V Contract: EER Systems, McLean, VA.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None
2. (U) SCHEDULE CHANGES: Schedule delays will result in some cost increases as existing site unique programs will need to be maintained and upgraded.
3. (U) COST CHANGES: None

F. (U) PROGRAM DOCUMENTATION:

Joint Mission Element Needs Statement (JMENS)	12/81
JOPES Required Operational Capability (ROC)	07/83
Material System Requirements Specifications	05/85
WIS Decision Coordinating Paper	07/85
AWIS Program Master Plan (PMP)	12/87
Life Cycle Documents Architecture Design Contract	05/89
AWIS Mission Needs Statement (MNS) (Revalidation IPR)	02/93
AWIS Test & Evaluation Master Plan	03/93

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303152A
PE Title: World-Wide Military Command & Control Systems, Information Systems (WIS)
Project Title: Army WIS Modernization Program

Project Number: DH86
Budget Activity: #4

G. (U) RELATED ACTIVITIES:

- Defense Information Systems Agency as executive agent is responsible for joint standard hardware and software, provides interfaces to services/agencies overall hardware and software architecture.
- There is no unnecessary duplication of effort within the Army or Department of Defense

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands)

	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999
OPA2 (BE4102)	6711	0	0	0	0	0	0

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) TEST AND EVALUATION DATA:

Event	Date
MAISRC In Process Review	2Q FY93
AWIS CORE	3Q FY93
Independent Developmental Testing	2Q FY94
Major Design Review III	1Q FY95

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305150A (TIARA)
PE Title: Airborne Reconnaissance Low

Project Number: D914
Budget Activity: #7

A. (U) RESOURCES: ($ in Thousands)
Project Title: Airborne Reconnaissance Low (ARL)

Popular Name	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
Airborne Reconnaissance Low (ARL)		7760	11429	11304	10825	10968	11215	Cont	Cont

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Airborne Reconnaissance Low (ARL) Program has evolved from two complementary programs; Grisly Hunter, an electro-optic reconnaissance and surveillance system, and Airborne Radio Direction Finding (ARDF) system which provides real-time, highly accurate radio intercept and location. The ARL Program integrates the capabilities of Grisly Hunter and ARDF into a single system which satisfies all the requirements identified by the validated SOUTHCOM Statements of Need published for Grisly Hunter and ARDF.

The purpose of the ARL program is to develop the capability to detect, locate and identify targets in counternarcotics (CN) environments. The detection, location and identification of these targets will be accomplished through the use of electro-optic, radar, Communications Intelligence (COMINT) and precision location/direction finding equipment. To perform the multi-sensor mission in SOUTHCOM, the platform will possess the capability to operate in a completely autonomous mode, at a low medium altitude for an extended period (10 hours), and be capable of take-off and landing in austere forward areas. Communications links via HF and satellite will be utilized to ensure constant, real time data is provided to the SOUTHCOM commander. ARL will be used for surveillance and reconnaissance of hostile force lines of communication, shipment/infiltration routes, logistics routes, transshipment points, and small base camps and larger processing facilities. Provides CINCSOUTH with a validated host nation building capability. The ARL program is not a new start. The ARL program was transferred from the DoD Drug Interdiction Program to the Army in accordance with FY 1994 Congressional language.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments:
- (U) ARL effort reflected in PE 0305889A Project D910

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305150A (TIARA) | **Project Number: D914**
PE Title: Airborne Reconnaissance Low | **Budget Activity: #7**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Continue P^{3}I sensor test and integration	3Q94	2970
• (U) Begin workstation integration and enhancements	3Q94	2990
• (U) Continue Non-recurring engineering for ARL-M	4Q94	1800
TOTAL		**7760**

(U) FY 1995 Planned Program:		
• (U) Test and evaluate multifunction systems 4 & 5	4Q95	4500
• (U) Continue P^{3}I Sensor integration	2Q95	4000
• (U) Continue Non-recurring engineering for ARL-M	4Q95	1329
• (U) Continue workstation integration and enhancements	3Q95	1600
TOTAL		**11429**

D. (U) WORK PERFORMED BY: Program Executive Officer Intelligence and Electronic Warfare and Project Manager Signals Warfare (PM SW), Vint Hill Farms Station, Warrenton, VA. Collocated with PEOIEW and PM SW and providing significant support are two Communication-Electronics Command activities, CECOM Intelligence & Electronics Warfare Directorate (IEWD) providing engineering, technical, and contract management support and CECOM Intelligence Materiel Management Center (CIMMC) providing logistics support. Support contractor is Vitro, Silver Springs, MD. Major contracts are ESL, Incorporated, Sunnyvale, CA and California Microwave, Incorporated, Belcamp, MD.

E. (U) COMPARISON WITH FY 1994 AMENDED DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** None
2. **SCHEDULE CHANGES:**
   - (U) Slip fielding of ARL(I) and ARL(C) from 4QFY92 to 3QFY93 due to contractor difficulties and delay in securing flight certifications.
   - (U) The contracting for multi-mission system, ARL(M) was delayed from 1QFY93 until completion of the Congressionally mandated Sensor Mix Study in 3QFY93.
3. **COST CHANGES:** None

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305150A (TIARA) Project Number: D914
PE Title: Airborne Reconnaissance Low Budget Activity: #7

F. (U) PROGRAM DOCUMENTATION:

ARDF Statement of Need	09/90
Grisly Hunter Statement of Need	03/90
ARL Operational & Organizational Plan	01/91

G. (U) RELATED ACTIVITIES: The ARL COMINT and IMINT platforms have a communication suite which will interoperate with other ARL platforms, all elements of the Sea Based Aerostat and other elements such as embassies, and forward deployed ground teams.

H. (U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Procurement (SSN A11500) ARL (TIARA)		42098	39200	6600	6700	7000	6800
Operation & Maintenance Army (OMA)		20931	30100	36900	39100	41500	43800

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. (U) MILESTONE SCHEDULE:

Milestones	Dates
ARL(I) Contract Award	03/91
ARL(C) Contract Award	04/91
FAA Aircraft Certification	03/93
Limited User Test - ARL(C)	03/93
AVSCOM Interim Air Worthiness Release	04/93
SIPR - Call Forward Decision ARL(C)	04/93
Limited User Test - ARL(I)	05/93
SIPR - Call Forward Decision ARL(I)	05/93

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0305150A (TIARA)
PE Title: Airborne Reconnaissance Low

Project Number: D914
Budget Activity: #7

ARL(I) and ARL(C) Fielding	05/93
ARL (Multifunction) Contract Option Award	09/93
Multifunction System Delivery 4&5	12/95
Multifunction System Delivery 6,7&8	11/96
Multifunction System Delivery 9	11/97
Retrofit System Delivery 1,2&3	09/97

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0601101A**
PE Title: **In-House Laboratory Independent Research (ILIR)** Budget Activity: **#1**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
A91A	In-House Laboratory Independent Research - Army Materiel Command								
	5154	5560	8601	12647	16872	21611	27466	Cont'd	Cont'd
A91C	In-House Laboratory Independent Research - Medical Research and Development Command								
	5383	4378	4158	3944	4046	4238	4506	Cont'd	Cont'd
A91D	In-House Laboratory Independent Research - Corps of Engineers								
	827	862	818	777	795	832	885	Cont'd	Cont'd
A91E	In-House Laboratory Independent Research - Army Research Institute of Behavioral and Social Sciences								
	142	147	140	131	134	141	149	Cont'd	Cont'd
PE TOTAL	11506	10947	13717	17499	21847	26822	33006		

B. (U) BRIEF DESCRIPTION OF ELEMENT: Independent Laboratory In-House Research (ILIR) is part of the Army's in-house (6.1) basic research program. The purpose of ILIR is to provide a source of competitive funds at the appropriate level for specific (6.1) basic research projects of exceptional technical quality and high potential payoff to the Army's technology base but may be of high risk. Innovative proposals for the ILIR funding are submitted from the competing organizations, and the most promising are chosen for funding following a strenuous management and technical review by leading scientists and engineers from the National Academy of Sciences, Army Science Board, and Army Secretariat. Successful ILIR projects, on completion, will typically define a start-up project for (6.1)or(6.2) mission funding within the organization. In addition to providing a pathway to the development of novel and high quality research projects, by providing support for the most innovative, and often speculative ideas, this program is instrumental in enhancing the recruitment and retention of outstanding scientists and engineers. The creative atmosphere fostered in this manner is essential to the identification of emerging operational concepts and technology thrusts for the future. The Office of the Assistant Secretary of Army (Research, Development, and Acquisition) provides the required oversight to the Army's ILIR program. ILIR supports the 1987 Defense Science Board Summer Study on Technology Base Management and the recommendation to attract and retain high quality research staff.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0601101A**
PE Title: **In-House Laboratory Independent Research (ILIR)** Budget Activity: **#1**

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project A91A - In-House Laboratory Independent Research (ILIR) - Army Materiel Command: Provides the initial FY 1994 ILIR allocation for the Research, Development and Engineering Centers (RDEC) in the Army Materiel Command (AMC). Consistent with BRAC 91 and the July 1991 briefing to the Federal Advisory Commission on Consolidation and Conversion of Defense Research and Development Laboratories the increase in AMC's ILIR funds reflects a zero-sum transfer of funds from PE #0601102A, Research, Development, and Engineering Centers' mission funds to ILIR. By FY99 the RDEC's source of basic research funds will only be ILIR while the Army Research Laboratory will be mission funded from PE# 601102A.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Developed computational analysis capability for leading/trailing edges and airfoils; computed flowfield of AH-1 rotor in forward flight; modeled UH-60 during hover for significantly reduced vibrations.	*	683
• (U) Conducted experiments in energetic materials, materials processing and acoustic sensing to mature gun technologies		1134
• (U) Demonstrated first computational chemistry approach to decontamination or demilitarization of mustard; demonstrated that intrinsic fluorescence of either protein or bacteria is more sensitive than stained species	4Q93	370
• (U) Determined, via first order molecular mechanics, the most stable configurations of the critical intermediate in the synthesis of the target cartentanils	*	367
• (U) Demonstrated two different methods to modify the surface of C60 fullerenes; designed new atomizer for the generation of micron sized aerosols of JP-8 fuel; modification of an automated protein sequencer	4Q93	650
• (U) Designed and conducted proof of principle demonstration for hybrid rocket propulsion system; developing unique non destructive measurement technique for Fiber Optic Guided Missile payout bobbins;	*	550
• (U) Compared sensitivity of conventional acquisition models with a Laplacian pyramid model of target cueing and detection; developed image synthesis technique; determine fundamental insight of combustion for diesel engines	*	300
• (U) Expanded in-situ forming concept of micro-electronics circuit processing, leveraging off $2M of equipment; developed laboratory enhancements to second generation thermal imagery capability to retain our lead in night vision	*	1100
Total		**5154**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Perform experiments in gun dynamics and cooling, target recognition and warhead phenomena to enhance gun technologies	*	1048

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0601101A**
PE Title: **In-House Laboratory Independent Research (ILIR)** Budget Activity: **#1**

• (U) Analyze high temperature combustion in low heat rejection engines; analyze ground vehicle signature wavelets; measure thermal waves of ceramic cracks; develop nonlinear control theory for active suspension	4Q94	238
• (U) Complete fractal analyses for potential applications to chemical protective clothing, camouflage, and rations and conduct studies in the areas of molecular migration in biopolymers(for food materials) and parachute opening instability	4Q94	220
• (U) Investigate chemical and biological defense technologies with application to rapid stand-off biological agent detection and identification, bioremediation of compounds of military interest and mild but irreversible methods for chemical agent destruction	*	645
• (U) Demonstrate antibody antigen coupling reactions with antibodies which have been dispersed into the air; examine the effect of three classes of additives on the evaporation rate of JP-8 after it aerosolized to form a smoke cloud	4Q94	557
• (U) Demonstrate Artificial Neural networks for more cost effective flight simulation; advance turbulence modeling for turbulent flow; investigate multiple-element flaps and airfoils for smart structures	*	652
• (U) Experimentally verify revolutionary concept to reduce/eliminate laser diode thresholds and increase efficiency by using photonic bandgap structures to control spontaneous emission	*	800
• (U) Complete dry-etch processing, air and smart sensor test bed programs; develop techniques to minimize beamwidth/side lobe for ceramic phased array antennas	*	1400
Total		**5560**

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Conduct research on high quality projects leading to new and improved missile sensors, propulsion, guidance and control, and structural capabilities. Components and concepts are demonstrated and transitioned	*	1200
• (U) Evaluate unique phenomena in superconductivity, barrel plating to reduce barrel wear, lower acoustical noise and aid hypervelocity research	*	1500
• (U) Develop nonlinear models of compliant structures, heat transfer mechanisms for cold start engine phenomena, and noninvasive thermal imaging of engine combustion phenomena	4Q95	801
• (U) Identify innovative technologies in the areas of molecular migration in biopolymers and modeling of parachute instability and transition results to 6.1/6.2 core programs	4Q95	700
• (U) Investigate chemical and biological defense technologies with application to rapid stand-off biological agent detection and identification, bioremediation of compounds of military interest and mild but irreversible methods for chemical agent destruction	*	1500

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0601101A
PE Title: In-House Laboratory Independent Research (ILIR) **Budget Activity: #1**

• (U) Test and measure dynamic stall characteristics; provide software for Artificial Intelligence/Neural Networks to helicopter community for smart structures, advanced controls and reduction in operating costs	*	1300
• (U) Transition antenna programs to core tech base; develop models to enhance imaging sensors capabilities; develop more efficient algorithms for IEW data fusion; upgrade sensor simulation/performance models	*	1600
Total		**8601**

(U) Project A91C - In-House Laboratory Independent Research (ILIR) - Medical Research and Development Command: Represents allocation of funds for the 6 laboratories within the Medical Research and Development Command to conduct ILIR research.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Identified a leishmania gene which confers drug resistance; tested on-line casualty assessment monitors; tested a non-invasive technique to study muscle chemistry; developed technique to quantify antibody response to vaccines	*	5383
Total		**5383**

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Support innovative projects to test molecular strategies for subunit vaccines; on-line sensors to monitor physiological status; a "get-out-of-trouble" aircraft display; a virus replicon as a universal vaccine vector; biophysical basis of enzyme activity	*	4378
Total		**4378**

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Support innovative projects to test molecular mechanisms for immunity against disease; a high pressure, low volume surgical irrigator; gender-free, head-supported-mass criteria for aviators; a computer prediction of ionic channel-forming regions in toxins	*	4158
Total		**4158**

(U) Project A91D - In-House Laboratory Independent Research (ILIR) - Corps of Engineers: Represents allocation of funds for the 4 laboratories within the Army Corps of Engineers to conduct ILIR research.

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0601101A**
PE Title: **In-House Laboratory Independent Research (ILIR)**
Budget Activity: **#1**

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Explored fundamental issues in terrain data generation, representation and analysis using wavelet transform techniques	*	221
• (U) Developed a 2D shallow water model for accurate simulation of hydraulic jumps and surges in open channels and improved computational capabilities on groundwater modeling	4Q93	273
• (U) Demonstrated quantum control technique by producing the first Magnetic Resonance Imaging scan with automatic contrast optimization (eight times faster than industry standard MRI scanning capability)	4Q93	76
• (U) Established a new theory for failure modes of ice sheets highly relevant to submarine and offshore platform design	4Q93	257
Total		**827**

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Study terrain knowledge representation processes by continuing work on wavelets and techniques for In-Exact matching; using neural network concepts for feature extraction; and studying the effects of plant stress of leaf fluorescence	*	230
• (U) Model development for explosive source shock wave propagation through soil and replicate response of brittle materials to isotropic and deviatoric loads	*	332
• (U) Design world's smallest electrical gyroscope for use in structural instrumentation	*	79
• (U) Analytical code for full radar return signal prediction for buried objects such as mines in complex media	*	221
Total		**862**

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Concentrate efforts in terrain knowledge representation processes and terrain data generation by sponsoring related topics in these areas and continuity to exploit wavelet techniques and neural network concepts	*	230
• (U) Development of chemical oxidation techniques for explosive contamination on oversized solids; enhanced technology for identification and quantification of lighter petroleum fraction compounds	*	251
• (U) Simulation of micro-mechanical motors fabricated by x-ray lithography (nano-technology)	*	337
Total		**818**

(U) Project A91E - In-House Laboratory Independent Research (ILIR) - Army Research Institute of Behavioral and Social Sciences: Represents allocation of funds for the Army Research Institute for Behavioral and Social Sciences to conduct ILIR research.

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0601101A**
PE Title: **In-House Laboratory Independent Research (ILIR)**

Budget Activity: **#1**

	Complete	Cost
(U) FY 1993 Accomplishments:		
• (U) Conducted research on mental models and training strategies in troubleshooting skill acquisition	*	142
Total		142
(U) FY 1994 Planned Program:		
• (U) Conduct research to determine the effects of team members' goals and terrain complexity on collective performance	4Q94	147
Total		147
(U) FY 1995 Planned Program:		
• (U) Conduct research on the application of technology-based training approaches for skill acquisition	4Q95	140
Total		140

(U) Work Performed By: The work will be primarily performed in-house by six U. S. Army Medical Research and Development Command Laboratories, four U. S. Army Corps of Engineers Laboratories, the U. S. Army Research Institute, and the eight U. S. Army Materiel Command Research, Development and Engineering Centers

(U) Related Activities: The Navy (PE #0601152N) and Air Force (PE #0601101F) have similar programs. Coordination is accomplished and duplication avoided through Project Reliance, scientific symposia, literature reviews, exchange of research and technology resumes, Department of Defense topical reviews and reports transmitted by the Defense Technical Information Center. There is no duplication of these programs within the Army or the Department of Defense.

(U) Other Appropriation Funds: ($ in Thousands) Not applicable.

(U) International Cooperative Agreements: Not applicable.

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0601102A
PE Title: Defense Research Sciences

Budget Activity: #1

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
A305	Automatic Target Recognition Research								
	0	1797	1640	2024	1956	1877	1808	Cont'd	Cont'd
A31B	Night Vision and Electro-Optics Research								
	4755	2695	2512	3039	2935	2814	2709	Cont'd	Cont'd
B52C	Mapping and Remote Sensing								
	2655	2526	2633	2727	2808	2888	2972	Cont'd	Cont'd
B53A	Atmospheric Sciences								
	6250	5555	5515	6217	6848	6414	6126	Cont'd	Cont'd
A71A	Research in Chemical Warfare/Biological Warfare Defense								
	6391	4156	3055	2093	1428	742	0	Cont'd	Cont'd
B74A	Human Engineering								
	2489	2644	2543	3061	3099	2907	2775	Cont'd	Cont'd
B74F	Personnel Performance and Training								
	3455	3076	2951	2792	2856	2982	3198	Cont'd	Cont'd
A751	Department of Defense Dependent Schools								
	16962	0	0	0	0	0	0	0	16962
AF20	Research in Vehicle Propulsion								
	0	2479	2353	2811	2691	2579	2494	Cont'd	Cont'd
AF22	Research in Vehicular Mobility								
	926	1304	3330	3422	3460	3497	3532	Cont'd	Cont'd

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0601102A
PE Title: Defense Research Sciences

Budget Activity: #1

BH27	Research in Munitions Science								
	3995	2161	1651	1099	753	389	0	Cont'd	Cont'd
AH40	Signals Warfare Laboratory								
	842	707	574	380	258	134	0	Cont'd	Cont'd
AH42	Materials and Mechanics								
	2801	3945	6637	7441	7415	7416	7349	Cont'd	Cont'd
AH43	Research in Ballistics								
	6573	5428	5244	6332	6190	6037	5768	Cont'd	Cont'd
AH44	Sensor Systems Research								
	2664	2767	2664	3208	3123	3044	2908	Cont'd	Cont'd
AH45	Air Mobility								
	7040	2930	2225	1374	938	487	0	Cont'd	Cont'd
AH47	Electronic Device Research								
	4705	6619	8504	9683	9567	9497	8451	Cont'd	Cont'd
AH48	Communications Research								
	2175	1905	1483	983	671	348	0	Cont'd	Cont'd
AH49	Research in Missiles and High-Energy Lasers								
	5003	4568	3509	2332	1593	826	0	Cont'd	Cont'd
AH51	Combat Support								
	1376	983	141	101	67	34	0	Cont'd	Cont'd
AH52	Equipment for the Soldier								
	4517	2583	1960	1301	887	460	0	Cont'd	Cont'd
BH57	Scientific Problems with Military Applications								
	56826	62579	65370	67700	69745	71746	73785	Cont'd	Cont'd
AH60	Research in Armaments								
	2098	1853	1413	939	643	333	0	Cont'd	Cont'd
AH61	Research in Close Combat Weaponry								
	1545	1372	1046	697	476	248	0	Cont'd	Cont'd

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AH66	Aviation Structures Research								
	0	1454	1380	1665	1595	1525	1471	Cont'd	Cont'd
BH67	Environmental Research - Army Materiel Command								
	0	4464	7691	7793	7854	7906	7957	Cont'd	Cont'd
AH68	Processes in Pollution Abatement Technology								
	4369	463	438	402	422	440	473	Cont'd	Cont'd
BS04	Military Pollutants and Health Hazards								
	840	788	747	688	721	753	808	Cont'd	Cont'd
BS11	Science Base/Medical Chemical Defense								
	6923	8106	8087	7259	7445	7798	8290	Cont'd	Cont'd
BS12	Science Base/Medical Biological Defense								
	15080	17334	15149	15147	15535	16271	17297	Cont'd	Cont'd
BS13	Science Base/Medical Research Infectious Disease								
	8280	8672	9892	10246	10551	10854	11164	Cont'd	Cont'd
BS14	Science Base/Combat Casualty Care Research								
	3828	3335	4495	5149	5789	6433	7086	Cont'd	Cont'd
BS15	Science Base/System Health Hazards Research								
	7791	9158	6853	6435	6606	6948	7430	Cont'd	Cont'd
BS16	Science Base/Combat Dentistry Research								
	773	1199	552	498	564	591	629	Cont'd	Cont'd
BS17	Molecular Biology/Military HIV Research								
	943	1042	988	938	964	1008	1072	Cont'd	Cont'd
AT22	Soil and Rock Mechanics								
	2075	1990	2074	2148	2212	2276	2342	Cont'd	Cont'd
AT23	Basic Research/Military Construction								
	940	1853	1826	1794	1847	1911	1996	Cont'd	Cont'd

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AT24	Snow, Ice and Frozen Soil								
	2051	1260	1323	1360	1401	1441	1481	Cont'd	Cont'd
BT25	Environmental Research - Corps of Engineers								
	0	2850	4898	4963	5002	5034	5067	Cont'd	Cont'd
PE TOTAL	199936	190600	195346	198241	198915	198888	198438		

B. (U) BRIEF DESCRIPTION OF ELEMENT: Research expands our knowledge in militarily relevant fields and leads to technological breakthroughs. This is the US Army core research program focused on critical research areas that have a high potential to considerably improve the operational performance of present and future Army components and systems. The program supports theoretical and experimental research in the following basic research areas: mathematics; computer sciences; physics; chemistry; materials science; electronics; mechanics; atmospheric and space sciences; terrestrial sciences; ocean sciences; biological and medical sciences; and cognitive and neural sciences. Army basic research is executed mostly by academia and industry. Extramural research is developed and managed by the Army Research Office. University Centers of Excellence continue to be an integral part of the Army's extramural research investment strategy. The Army broadened its research base by expanding basic research investment in Historically Black Colleges and Universities and Minority Institutions (HBCU/MIs) to 5% of its individual investigator program. This core research program is complemented by the inter-disciplinary research performed under the University Research Initiative (URI) program. In-house research is a coherent, well-integrated program performed by the flagship Army Research Laboratory; nine full-spectrum warfare Research, Development and Engineering Centers (RDECs); four Corps of Engineer laboratories; six Medical Research and Development Command laboratories; and the Army Research Institute. The in-house program capitalizes on the scientific talent and specialized facilities to expeditiously transition the resulting knowledge and technology into the appropriate developmental activities. The basic research program is coordinated with the other Services via the Joint Directors Of Laboratories panels, Project Reliance, and other interservice working groups. The work in this program element is consistent with rigorous peer review, the Army Science and Technology Master Plan (ASTMP), Science and Technology Objectives (STOs) milestones for the Army's key emerging technologies, and the Army Modernization Plan.

C. (U) JUSTIFICATION FOR PROJECTS:

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(U) Project A305 - Automatic Target Recognition (ATR) Research: This project represents a zero sum transfer of funds from A31B to reflect the consolidation of this work at ARL, consistent with BRAC 91 Legislation. This project focuses on the landwarfare environment with its very challenging ground clutter problem, areas not being addressed by the other Services such as: Automatic model-based generation of Automatic Target Recognition (ATR) search trees; ATR on the focal plane; Model-based automatic recognition of one dimensional infrared signals (chemical detection); Information-based theories applied to target signature analysis; and Low depression angle, short range scene modelling for target acquisition and endgame.

(U) FY 1993 Accomplishments:	**Completed**	**Cost**
• (U) Elements of this project were previously under Project A31B.		0

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Verify/validate a 3-dimensional Multi-Spectral Scene Generation Model with field collected data (infrared)	4Q94	930
• (U) Develop foveal system simulator, and develop algorithms to enable development of Smart focal plane arrays	4Q94	867
Total		**1797**

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Perform Synthetic Aperture Radar (SAR) image model evaluation	4Q95	337
• (U) Increase the efficiency of high quality scene modeling towards real time scene simulation	4Q95	747
• (U) Develop an algorithm capable of generating a multisensor ATR algorithm with near optimal performance from mathematical imagery model input	4Q95	556
Total		**1640**

(U) Project A31B - Night Vision and Electro-Optics Research: This project sustains the Army's theoretical and experimental research in night vision and electro-optic technology. It generates the new technologies so we can continue to "Own the Night," notwithstanding increased foreign competition. The research is focused upon new dual-use materials, devices and techniques relative to infrared focal plane arrays (IRFPAs), directed

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energy sources and protection against directed energy sources. Emphasis is placed on the development of technology for high performance smart IRFPAs and on uncooled low-cost medium performance IRFPAs based on thin film ferroelectric materials. Applications for uncooled IRFPAs include improved night navigation and surveillance for both military and civilian usage. In the directed energy arena, efforts are focused on wide bandgap laser diode arrays that emit in the blue, blue-green wavelength regions, new tunable laser sources in the visible and development of frequency diversity techniques to obtain directed energy in the 3-5 micron region. Main Army applications are for countermeasures and remote chemical detection. There are many important civilian applications, such as: optical recording/storage, optical image processing, optical computing, display devices, and medical non-invasive imaging. For laser protection nonlinear optical effects are being explored which will allow broad band protection; but these nonlinear effects can also be used for optical image processing or holographic storage.

	Complete	Cost
(U) FY 1993 Accomplishments:		
• (U) Demonstrated new techniques for hetero-epitaxial growth of CdTe on GaAs	*	1100
• (U) Demonstrated optical parametric oscillator in visible wavelength region	*	1045
• (U) Demonstrated a new solid-state laser ion, manganese five-plus	*	900
• (U) Developed multispectral scene generation model, CREATION.	*	890
• (U) Optimized 10 class single sensor Forward Looking Infra Red (FLIR) algorithms	*	820
Total		**4755**
(U) FY 1994 Planned Program:		
• (U) Grow full monolithic detector substrate structure for smart IRFPA: Si/GaAs/CdZnTe	*	600
• (U) Develop improved ferroelectric thin films for uncooled IRFPAs	*	611
• (U) Demonstrate visible laser material for pumping by UV/Visible diodes	*	1484
Total		**2695**
(U) FY 1995 Planned Program:		
• (U) Optimize Si/GaAs/CdZnTe structures for HgCdTe detector growth	*	800
• (U) Demonstrate efficient, directed energy conversion through optical parametric amplifier in the 3-5 micron region	*	562

* This is continuing work which is reviewed periodically, ensuring quality, relevance and priority.

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• (U) Process laser diode array on Si/GaAs substrate for chip to chip communication	*	550
• (U) Demonstrate uncooled IRPFA based on thin film ferroelectrics	*	600
Total		**2512**

(U) Project B52C - Mapping and Remote Sensing: This project supports research in fundamental topographic sciences to improve the tactical commander's knowledge of the battlefield, to extract natural and man-made features from reconnaissance imagery in near-real time, to exploit terrain reasoning/artificial intelligence techniques for combat planning and operations, to support unmanned/autonomous vehicle navigation using sensor enhanced dynamic data bases, and to explore the potential of space technology to provide real-time terrain intelligence, command and control, and targeting support. The research provides the theoretical underpinnings for Program Element #0602784A, Project A855.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Resolved fundamental issues in terrain knowledge representation and scene generation to support real-time vision modules and demonstrated unique wavelet transform techniques for extraction of edge information from imagery.	*	1221
• (U) Developed route planner for military maneuvers and an algorithm for deploying military objects for battlefield planning, and demonstrated the use of neural nets to separate hyperspectral imagery into four terrain categories.	*	738
• (U) Demonstrated potential of spectral data for wetlands monitoring and Superfund sites and the application of spectral reflectance data in support of the narcotics program.	*	696
Total		**2655**

(U) FY 1994 Accomplishments:	Complete	Cost
• (U) Obtain high-resolution terrain data on military applications using interferometric synthetic aperture radar with other sensor data for hasty mapping; investigate generation/exploitation of high-resolution digital elevation data for small-unit simulation/modeling.	*	1092
• (U) Develop neural nets to employ spatial and spectral information for increasing the number of distinguishable terrain categories and the accuracy of classification.	*	738
• (U) Investigate multiresolution decomposition of imagery and lossy compression of imagery using biorthogonal		

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wavelet transforms.	*	696
Total		2526

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Investigate the application of multisensor imagery and data for support of simulation and modeling.	*	987
• (U) Develop neural net and/or computer algorithms for enhancing image classification accuracy and feature extraction capability from interferometric synthetic aperture radar imagery.	*	719
• (U) Instrument desert test site for collecting data on change detection using hyperspectral imagery.	*	927
Total		2633

(U) **Project B53A - Atmospheric Sciences:** Provides in-depth understanding of the complex atmospheric behavior associated with electro-magnetic propagation, transport and diffusion, and remote sensing, which affect Army operations and systems such as electro-optics, smoke deployment and target designators. Supports Project Reliance Sub-areas of Lower Atmospheric Sciences and Terrestrial Sciences with a lead role in Boundary Layer Processes and Interactions over terrain.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Completed field evaluation of techniques for mitigation of optical turbulence effects	4Q93	576
• (U) Developed interim MICROMET model with variable land use.	*	879
• (U) Developed variable-scale transport and diffusion methods applicable to pollution control as well as battlefield aerosols and obscurants	*	2232
• (U) Determined that high power microwave sources of interest to the Army propagated through natural atmospheric aerosols, fog, or rain.	*	1326
• (U) Completed field evaluation of techniques for mitigation of optical turbulence effects.	*	1237
Total		6250

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Develop spectral and polarimetric propagation models for realistic computer simulation of the atmosphere; compare model output with ground truth data	*	1316

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• (U) Determine impact of atmospheric turbulence-induced "shimmer" on imaging system performance and simulate at video rates using hybrid optical/digital processing techniques	*	1541
• (U) Develop methods to determine the internal structure of layered and inhomogeneous particles for bio-chemical agent applications	*	1616
• (U) Develop radiative effects model for battlefield obscurants; and develop color contrast transmission model applicable to realistic battlefield visualization.	*	1082
Total		**5555**

(U) **FY 1995 Planned Program:**	**Complete**	**Cost**
• (U) Develop high-fidelity atmospheric transport and diffusion model for calculating wind flow and NBC agent concentration evolution through urban areas	*	1469
• (U) Combine boundary layer meteorology, radiative, and diffusion models, and determine fluorescence efficiency of natural biological aerosols and anthrax spore simulant.	*	2437
• (U) Develop high-resolution signature prediction capability by inclusion of polarization effects in the Battlefield Emission And Multiple Scattering (BEAMS) model	*	907
• (U) Increase capacity of mobile profiler to fuse wind/temperature data; and develop 3-dimensional stratified-atmosphere, acoustic propagation theory to account for earth curvature at extended ranges.	*	702
Total		**5515**

(U) **Project A71A - Research in Chemical Warfare/Biological Warfare Defense:** The purpose of this project is to obtain, through basic research in chemistry, physics and life sciences, fundamental information in support of: new and improved defensive systems for biological agents and toxins; new and improved defensive systems for chemical threat agents; and innovative basic research program in aerosol and obscuration sciences to support the Army smoke program; new concepts in decontamination methods; and basic research on environmental fate and impact of militarily unique processes. Beginning in FY94 funding decrease reflects a conversion of this projects funds to PE 0601101, consistent with the formation of ARL and BRAC 91 Legislation.

(U) **FY 1993 Accomplishments:**	**Complete**	**Cost**
• (U) Cloned and expressed the gene for an enzyme that rapidly detoxifies the G-type nerve agents to		

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reduce the production cost of these enzymes for use in environmentally-safe CW decontamination.	*	1020
• (U) Developed new artificial intelligence designs for transition to mass spectrometry biological agent detectors.	*	1147
• (U) Developed method for detection of low numbers of microorganisms (10) in mixed samples using target capture and DNA amplification.	*	900
• (U) Successfully improved the laser beam entrance channel in the Wyatt nephelometer to allow forward light scattering detection at an angle of 10 degrees.	*	1078
• (U) Developed methodology to measure the rate of thickened agent dissolution in various amounts of cationic surfactant in a water/pyrrolidinone mixture which can be used as potential decontamination medium	*	2246
Total		**6391**

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Explore preparation of regular and isotopically labeled agents and simulants for decontamination reaction studies with NMR spectroscopy.	*	848
• (U) Take lead in the NATO Working Group of Experts initiative on enzymatic decontaminant development and investigate new synthetic routes to derivatives of Epibatidine.	*	725
• (U) Measure absorption equilibria of CW agent simulants on developmental adsorbent materials for protective mask, and improve correlation between theoretical & measured polarization spectra of large molecules.	*	868
• (U) Demonstrate optical detection of several different bacteria using anti-bodies and fluorescence, and expand discrimination between pathogenic and non-pathogenic species of Yersinia (Plague) using RNA.	*	1715
Total		**4156**

(U) FY 1995 Planned Program:	**Completed**	**Cost**
• (U) Demonstrate optical recognition of microencapsulated aerosol particles as the basis for new bio agent detector, and examine methods of determining strength of binding using antibodies to small peptides.	*	1595
• (U) Validate biological molecule analysis using laser desorption mass spectrometry techniques, and model the performance of new air filtration technique using combined separation systems.	*	858
• (U) Determine toxicity of Epibatidine derivatives and examine methods of controlling surface		

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chemistry of starburst polymers to develop more sensitive C/B agent detectors.	*	602
Total		**3055**

(U) Project B74A - Human Engineering: This project supports research on soldier performance, including the areas of visual, auditory, cognitive, and stress-related performance. The objective is to identify, describe and manage underlying human-system interface factors critical to the design of Army weapon systems. The work in this program is consistent with the Army Science and Technology Master Plan (ASTMP) and the Science and Technology Objectives (STOs) and the Army Modernization Plan. All work under this PE is part of the "Human-Systems Interfaces" Tri-Service Reliance Panel.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Extended target search and acquisition research by quantifying visual attention as a function of scene, target and observer characteristics; examined soldier stress indicators	*	1179
• (U) Developed visual, auditory and tracking subsystems and initiated integration with high fidelity simulator to recreate noise-cluttered battlefield environment	*	982
• (U) Developed combat identification (CID) system soldier-machine interface design guidelines.	*	328
Total		**2489**

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Conduct laboratory investigation of behavioral performance related to information processing for military planning, and command and control at tactical and operation levels	*	589
• (U) Conduct human factors study on perceived 3-D target position in the field using 2-D display	*	503
• (U) Complete studies comparing CID range performance with and without proposed CID devices, provide diagnostic report on device utility	*	394
• (U) Expand remote driving model to incorporate fuzzy logic simulating human decision making	*	661
• (U) Test and validate ear model for low peak and high peak wave forms.	*	497
Total		**2644**

(U) FY 1995 Planned Program:	**Complete**	**Cost**

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• (U) Study to isolate human errors due to deficiencies of visual cues due to limited depth perception with night vision devices	*	787
• (U) Expand remote driving model to incorporate neural network modeling	*	567
• (U) Complete study on CID sensor disagreement and gunner cognitive set	*	784
• (U) Develop analysis stress procedures and test ear model for situational sensitivity	*	405
Total		2543

(U) **Project B74F - Personnel Performance and Training:** This project conducts behavioral science research in the following areas of human performance: (1) variables and processes determining effective group functioning, leader-group interaction, and decision-making; and (2) principles of technology-based instructional methods that promote the learning of cognitive, perceptual-motor, and unit performance tasks by individuals and groups.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Published critical organizational chan[illegible]research and launched initiatives in peace operations and comparative personnel policies	*	580
• (U) Published landmark naturalistic decision making research and launched program of research on the effects of individual differences on individual and group performance	*	500
• (U) Completed landmark leader-experience work and extended efforts on the effects of motivation on leadership and individual performance	*	750
• (U) Continued research on learning foundations for distributive interactive training technologies	*	1220
• (U) Initiated new methodological research in chronopsychology and behavioral design	*	405
Total		3455

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Conduct research on motivational, stress, and individual difference determinants of leadership and individual and group performance	*	571
• (U) Extend military sociology research initiatives in peace operations, soldier functioning, and personnel policies	*	817

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• (U) Continue research on learning foundations for advanced distributive interactive training technologies	*	1105
• (U) Extend research on methodologies in behavioral research design, virtual reality, and performance analysis	*	583
Total		3076

(U) FY 1995 Planned Program:

• (U) Continue military sociology research in peace operations and comparative personnel policy research	*	405
• (U) Participate in collaborative effort to establish Center for Military Sociology	*	996
• (U) Continue research on learning foundations for advanced distributed interactive training technologies	*	1100
• (U) Continue methodological research on new approaches to research design and performance analysis	*	450
Total		2951

(U) **Project AF20 - Research in Vehicle Propulsion:** This project represents a zero sum transfer of funds from H45 and F22 to reflect the consolidation of this work at ARL, consistent with BRAC 91 Legislation. This project is unique in the Army and DoD, as it is the only basic research project focussed on turboshaft engine specific technology and mechanical power transmission technology. The Army is the lead service in these technology areas under Project Reliance. The purpose of this project is to perform basic research in propulsion as applicable to tracked and wheeled vehicles and to rotorcraft. Analysis, code development, tests and evaluations are conducted to improve engine and drive train components and investigate advanced materials. Component level investigations include compressors, combustors, turbines, injectors, pistons, cylinder liners, piston rings, gears, seals and controls. The goal of the activity is increased performance of small airbreathing engines and power trains, to support improvements in system mobility, reliability and survivability.

(U) **FY 1993 Accomplishments:** Work conducted in Projects AF22 and AH45.

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Complete analysis of advanced alternate engine cycles for ground vehicle application, and develop novel method for determination of fracture toughness of engine ceramics.	*	404
• (U) Validate 2D axial-centrifugal compressor model for use in analysis of rotating stall.	*	505
• (U) Complete joint Army/NASA/Navy lube tests	*	202
• (U) Validate wave rotor Computational Fluid Dynamics codes via splitter cycle experiments	*	505

* This is continuing work which is reviewed periodically, ensuring quality, relevance and priority.

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• (U) Determine influence of matrix creep on fiber load and fatigue behavior of silicon carbide/reaction bonded silicon nitride (SiC/RBSN) composite	*	304
• (U) Design powder lubricated high temperature bearing, and develop first generation reacting flow combustion code	*	559
Total		2479

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Identify wear resistant, high temperature ring-liner-lubricant systems for diesel applications	4Q95	410
• (U) Analyze benefit of inserting wave rotor into advanced engine cycles; design 4-port warm cycle wave rotor experiment; and validate new transmission diagnostic algorithm; and formulate turbine film cooling code	4Q95	1126
• (U) Incorporate detailed compressor simulation modules into full numerical turboshaft engine simulation, develop surface and intercace coatings for SiC/RBSN composites, and design high temp magnetic radial bearing	4Q95	817
Total		2353

(U) **Project AF22 - Research in Vehicular Mobility:** This effort provides the scientific foundation for computer and laboratory-based modeling and dynamics of tracked and wheeled vehicle performance to support modern warfare development, deployment, evaluation and training. The principal thrust is real-time man and hardware-in-the-loop modeling and dynamics capability. The goal is to develop and demonstrate the theory and methodologies necessary to augment or eliminate expensive field and laboratory testing in many aspects of system design, acquisition, evaluation and improvement. The Department of Defense increased Project AF22 in FY 1994 to complement the National Automotive Center (NAC) concept of the U.S. Army Tank-Automotive Research Development and Engineering Center (TARDEC). The increased funding will establish a Michigan university consortium to be linked with NAC to improve collaboration between TARDEC and universities nationally recognized for excellence in automotive research.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Advanced the theoretical development of Symbolically Optimized Vehicle Analysis System (SOVAS) for generating real-time vehicle dynamics models	4Q93	57
• (U) Demonstrated high resolution, real-time tracked and wheeled vehicle dynamics simulations on Iris graphics workstations	*	40
• (U) Demonstrated critical soldier-in-the-loop, real-time vehicle control capability	4Q93	109

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• (U) Developed capability to interface gun-turret drive, platform stabilization and fire control algorithms into real-time vehicle dynamics models	4Q93	240
• (U) Initiated experimental capability for in-cylinder lubrication technology for advanced diesel engines	4Q93	240
• (U) Developed experimental capability to assess advanced ceramic materials for low heat rejection diesel engines	4Q93	240
Total		**926**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Research symbolic and numerical methods to improve real-time vehicle modeling and simulation.	*	200
• (U) Interface real-time soldier and man-in-the-loop vehicle dynamic models with stationary crew stations.	4Q94	60
• (U) Develop theory and procedures necessary to interface real-time vehicle dynamic models with dynamic Crew Station/Turret Motion Base Simulator (CS/TMBS) and Image Generation Systems (IGS).	4Q94	61
• (U) Explore neural network, fuzzy system and genetic algorithm theories to develop on-board intelligent soldier assistant and vehicle accident avoidance/recovery systems.	4Q94	50
• (U) Select University to manage the National Automotive Center University Research Initiative Program.	*	933
Total		**1304**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Research symbolic and numerical methods to improve real-time vehicle modeling and simulation.	*	130
• (U) Interface real-time soldier and man-in-the-loop vehicle dynamic models with CS/TMBS and IGS in passive control environments.	4Q95	108
• (U) Develop theory and procedures necessary to interface real-time vehicle dynamic models with CS/TMBS and IGS in active control environment.	4Q95	50
• (U) Demonstrate simulated autonomous neural network, fuzzy system and genetic algorithm vehicle control in support of intelligent soldier assistant and accident avoidance/recovery.	4Q95	50
• (U) Conduct university research of automotive technologies as directed by the National Automotive Center University Research Initiative Program (Automotive Technologies) manager.	*	2992
Total		**3330**

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(U) Project BH27 - Research in Munitions Science: Conduct basic research in the areas of explosives, propellants and warhead/penetrator materials in support of future munitions. This research will result in improved performance of chemical/kinetic energy warheads, bio-synthesis/biodegradation of energetics, increased manufacturing safety and improved battlefield survivability. Beginning in FY94 funding decrease reflects a conversion of this projects funds to PE 0601101, consistent with the formation of ARL and BRAC 91 Legislation.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Synthesized intermediates of new, high energy explosives to enhance combat survivability	*	1099
• (U) Established molecular dynamics model of N204 propellent and reduced synthesis steps of tetranitrocubane for new Ultra High Energy Density Explosives.	*	869
• (U) Confirmed advanced tungsten technology for warheads, and designed 40mm step chamber to characterize liquid propellants for the regenerative liquid propellant gun.	*	848
• (U) Conducted enzymatic synthesis of nitramines and nitrate esters	*	1179
Total		**3995**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Establish computer models of new high energy insensitive explosives	*	517
• (U) Conduct cooperative R&D agreement for anti-viral, anti-cancer new cubane Ultra High Energy Density explosives, and establish molecular dynamics model of HZNZ02 propellant.	*	760
• (U) Characterize advanced tungsten powders and matrix materials to advance tungsten technology for warheads, and conduct baseline tests in 40mm step chamber for the regenerative liquid propellant gun	*	637
• (U) Determine the feasibility of using plant/animal sources to synthesize/degrade energetic materials	*	247
Total		**2161**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Optimize computer models of new, high energy insensitive explosives to enhance combat survivability	*	497
• (U) Conduct synthesis studies of polynitrocubanes for new Ultra High Energy Density Explosives	*	470
• (U) Characterize advanced tungsten composite materials to enhance warhead performance.	*	331
• (U) Fabricate a 40mm step chamber test fixture for the regenerative liquid propellant gun.	*	353

* This is continuing work which is reviewed periodically, ensuring quality, relevance and priority.

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PE Title: Defense Research Sciences

Budget Activity: #1

Total	**1651**

(U) Project AH40 - Signals Warfare Laboratory: The intent to develop the theory fundamental to managing the enormous quantity and variety of tactical intelligence data collected and passed from the Intelligence Electronic Warfare (IEW) battlefield sensors to the battlefield intelligence center. The nature of the problem has necessitated an approach that features an Artificial Intelligence (AI) based research for sorting and fusing data from sensors, and, signal processing techniques that promote automated sorting and interference reduction at the sensor itself. Beginning in FY94 funding decrease reflects a conversion of this projects funds to PE 0601101, consistent with the formation of ARL and BRAC 91 Legislation.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Initiated development of system which will reason with terrain and feature data to generate and manage graphical overlays for the Army Intelligence Analyst	*	170
• (U) Devised a theory for the development of data fusion databases; and devised optimal detector for a slow frequency hopper	*	240
• (U) Found direction finding performance of a time varying antenna array for the single emitter case; and produced a new decision theoretical signal classifier work for computationally efficient detection.	*	332
Total		**842**

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Complete theory of data fusion and data fusion concepts; complete algorithms to support a terrain and feature data overlay reasoning system	*	240
• (U) Develop techniques to support 3-D battlefield visualization problems and field-of-view problems; and extend direction finding through ground-based DF system subject to significant multipath effects.	*	150
• (U) Extend study of optimal detection of wideband signals; and generalize decision theoretic signal classifier work to continuous phase modulated signals.	*	317
Total		**707**

(U) FY 1995 Planned Program:	**Complete**	**Cost**

* This is continuing work which is reviewed periodically, ensuring quality, relevance and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

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Budget Activity: #1

• (U) Develop algorithms which will check for algorithm completeness and correctness	*	224
• (U) Develop robust and efficient data base structures which support dynamic procedural language requirements	*	200
• (U) Continue the study of optimal detection of wideband signals to extend to direct sequence spread spectrum	*	150
Total		**574**

(U) Project AH42 - Materials and Mechanics: This project advances the fundamental understanding of materials and solid mechanics related to future Army requirements. Results will ultimately be applied to aircraft, ground combat vehicles, armament systems and personnel support. Major thrust areas include: corrosion prevention and control, armor/anti-armor, advanced structural composites, high temperature materials and chemical protection. A materials Center of Excellence will be competitively established with local universities to conduct world-class materials collaborative research relevant to Army needs.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Determined degradation and spall/tensile strength of titanium diboride (TiB2) armor ceramics after single and repeated shock loading	*	831
• (U) Determined from Epoxy/alumina cure studies that the thin layer directly in contact with the aluminum substrate in an adhesive bond is significantly different than the bulk adhesive	*	475
• (U) Proved concept of enriching carbides in manganese (Mn) to produce stabilized austenite toughening in triple phase steels	*	455
• (U) Developed material constants for a large strain viscoelastic constitutive law which were used to characterize the response of a highly-filled carbon black rubber	*	782
• (U) Published reports on round robin decontamination test program and reliability weight attributes of simple redundant structures, and developed energy density function method for rubber like materials.	*	258
Total		**2801**

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Determine shock response of glass reinforced plastic (GRP) armor, and characterize tungsten alloys	*	775
• (U) Complete studies on use of molecular dynamics simulations to predict interactions at adhesive		

* This is continuing work which is reviewed periodically, ensuring quality, relevance and priority.

Program Element: #0601102A
PE Title: Defense Research Sciences — Budget Activity: #1

adherent interface	*	457
• (U) Develop research and development (R&D) linkages with universities in the Aberdeen, MD area	*	1000
• (U) Joining of similar/dissimilar ceramic materials for ambient and high temperature use, and demonstrate ion beam technique to improve wear and corrosion resistance of rotary winged aircraft components.	*	669
• (U) Develop mathematical model describing effect of chemical agents on protective material, and optimize radar parameters of most promising neural-network architectures for a mine detection radar system	*	1044
Total		**3945**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Measure shock induced damage in armor materials under combined compression/shear shock loading	*	585
• (U) Develop joined ceramic component for testing at high temperatures, and evaluate feasibility of adhesive bonding procedures for Li/Al alloys	*	1017
• (U) Optimize dry ion beam treatments as environmentally acceptable alternatives to Cadmium/Chromium electroplating, and optimize surface treatments to reduce hydrogen embrittlement of high strength steel	*	432
• (U) Demonstrate computer simulation of chemical agent molecular permeation through organic barrier, and develop an automated technique for extracting strain information on elastomers	*	1603
• (U) Establish materials Center of Excellence with local universities.	*	3000
Total		**6637**

(U) **Project AH43 - Research in Ballistics:** This project contains research on combustion chemistry, physics and fluid dynamics, physics of explosive materials, interior ballistic reaction kinetics, computational algorithms, computer networking, and remote sensing.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Completed first measurements of thermal conductivity/diffusivity and specific heat for Army gun propellants from -20C to +50C	*	1144
• (U) Developed an analytical semi-infinite penetration model for tungsten and DU long-rod penetrators valid up to 25km/s	*	980
• (U) Compared field measurements near existing laboratory EM launchers with computational results	*	1299

* This is continuing work which is reviewed periodically, ensuring quality, relevance and priority.

Program Element: **#0601102A**
PE Title: **Defense Research Sciences** Budget Activity: **#1**

• (U) Modeled the fire control process for the inertial reticle system to be used to evaluate alternative hardware components and measurement approaches	*	1298
• (U) Assessed viscoplasticity models to replace simple plasticity models currently used to model materials	*	1852
Total		**6573**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Exploit the shaped-charge jet necking phenomena toward creation of segmented shaped-charge penetrator	*	666
• (U) Computationally simulate the interior ballistics of a liquid propellant gun	*	1171
• (U) Generate Variable Resolution Terrain data to model existing digital topographic data	*	1290
• (U) Validate in a hydrocode a brittle/ductile damage model for high-pressure, small-elastic-distortion ballistic environments	*	1027
• (U) Demonstrate passive infrared tracker, and develop families of error control codes for error free transmission across shared channels.	*	1274
Total		**5428**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Explore novel techniques to extend penetrators in flight and provide a shaped charge precursor for a KE rod	*	963
• (U) Integrate multiple IR tracker systems to perform real-time tracking and interception of threat munitions for an active protection system	*	729
• (U) Identify/explore potential countermeasures to electromagnetic armor, and integrate natural and man-made surface features into complete scene w/ Variable Resolution Terrain Model.	*	1808
• (U) Improve the code designs obtained in FY94 to boost code transmission rates to channel capacity and develop three dimensional simulation of solid propellant electrothermal chemical w/next generation ballistics code.	*	1744
Total		**5244**

(U) **Project AH44 - Sensor Systems Research:** This project exploits new opportunities in the basic sciences underpinning the technological areas

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Program Element: **#0601102A**
PE Title: **Defense Research Sciences**

Budget Activity: **#1**

of: signal and image processing by both digital and optical techniques; radar; and smart sensors. Research involves fundamental science and engineering principles that support survivable sensor systems for target recognition. Monolithic and hybrid optoelectronic structures in gallium arsenide and lithium niobate are investigated as integrated processors for novel signal and radar processing. Diffractive optics is investigated to enhance the performance of bulk and integrated optical processors. Processing algorithms and architectures are investigated for performance of bulk and integrated optical processors. Processing algorithms and architectures are investigated for electromagnetic sensing and imaging of ultra-wideband, inverse, and conventional synthetic aperture radar (SAR) returns.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Successfully applied wavelet transforms to recognize canonical targets in ultra-wideband radar returns	4Q93	205
• (U) Successfully developed higher-order statistics algorithms for reconstruction of signals otherwise difficult to detect, and novel Fourier design techniques for diffractive array generators	4Q93	475
• (U) Invented procedures for the design of hybrid diffractive-refractive athermal, achromatic lenses and fabricateda binary-phase diffractive conical lens for a Doppler radar optical processor	4Q93	475
• (U) Demonstrated waveguide optical neuron based on Stark-Ladder Optical Electronic Integrated Circuit Integration, and developed a physical model describing fast depolarization effect in radiation hardened memory.	4Q93	1509
Total		**2664**

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Apply wavelet transform techniques to target recognition of militarily significant target vehicles in ultra-wideband radar return signatures	4Q94	158
• (U) Design, fabricate, and test the thermal and optical properties of single material hybrid diffractive-refractive athermal lenses, and of two material hybrid athermal, achromatic lenses	4Q94	375
• (U) Characterize the performance of devices for integrated photonic processors: SAW transducers; embedded waveguide lenses in gallium arsenide; and outcoupling gratings in gallium arsenide and titanium-doped lithium niobate	4Q94	375
• (U) Improve SAR automatic target recognition algorithms, and research optically integrated signal processing devices	4Q94	850

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0601102A**
PE Title: **Defense Research Sciences**
Budget Activity: **#1**

• (U) Develop low threshold vertical cavity surface emitting laser devices, and determine electrical breakdown characteristics, of a variety of silicon carbide semiconductors.	4Q94	1009
Total		**2767**

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Construct compact optical systems that combine refractive, diffractive, and integrated optical elements for performing target and pattern recognition	4Q95	600
• (U) Research integrated photonic devices for control of phased-array antennas	4Q95	1077
• (U) Design a photonic-based system for implementing algorithms using higher-order statistics	4Q95	245
• (U) Demonstrate prototype two-dimensional spatial light modulators for optical signal processing applications	4Q95	300
• (U) Measure and analyze radiation and electromagnetic effects on ferroelectrics and on silicon carbide	4Q95	442
Total		**2664**

(U) Project AH45 - Air Mobility: Basic and applied research in aerodynamics, and avionics as applied to rotary wing aircraft. Analysis, code development, test and evaluation are conducted on rotor unique aerodynamics, dynamics, performance, and aircraft performance and acoustics. Efforts in avionics are focused in antenna modeling and advanced display concepts. Beginning in FY94 funding decrease reflects a conversion of this projects funds to PE 0601101, consistent with the formation of ARL and BRAC 91 Legislation.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Validated Computational Fluid Dynamics Code rotor hover performance methods	4Q93	880
• (U) Developed vortex loading and rotor wake analysis methodologies; and developed active/dynamic stall control technology.	4Q93	1759
• (U) Developed Helicopter Antenna Radiation Prediction (HARP) code for metallic helicopters; and validated compressor characteristics and transient operation models.	4Q93	1268
• (U) Conducted large low speed centrifugal compressor boundary flow research; and validated gear system dynamic analysis code and interface dynamics/acoustics codes.	4Q93	1523
• (U) Evaluated use of active helicopter transmission mount for structure borne noise reduction; conducted fuel bladder drop test under CRDA w/McDonnel Douglas Helicopter Co.; and modified		

Program Element: #0601102A
PE Title: Defense Research Sciences — Budget Activity: #1

aeroelastic prediction method for tilt rotor.	4Q93	1610
Total		**7040**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Design smart material model rotor and dynamic stall-free airfoils; fabricate advanced dynamic model hub and blades; and conduct advanced rotor aeroacoustic tests	4Q94	700
• (U) Incorporate improved turbulence models into Navier-Stokes codes; validate interactional aerodynamic analysis	4Q94	500
• (U) Fabricate advanced dynamic model hub and blades, and conduct advanced rotor aeroacoustic tests.	4Q94	1149
• (U) Modify HARP code for non-metallic or composite helicopters; transition code to Silicon Graphics workstation	4Q94	581
Total		**2930**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Fabricate smart airfoil models and dynamic stall-free experimental model rotors.	4Q95	600
• (U) Investigate new blade concepts for low noise and vibration characteristics; and validate computational aeroacoustic codes for blade vortex interaction	4Q95	1182
• (U) Evaluate antennas embedded in composite tail rotor by both electromagnetic modeling and measurements	4Q95	443
Total		**2225**

(U) Project AH47 - Electronic Device Research: The purpose of this program is to perform research on critical dual-use electronic components and technologies vital to supporting Army requirements in the areas of electronic warfare (EW); reconnaissance, surveillance, and target acquisition (RSTA); and fire-and-forget munitions. Exploit emerging technologies and develop needed device concepts for: smart tactical electronics for real-time signal/data processing in tactical scenarios; millimeter-wave technologies for mini-radars (motor vehicle collision warning devices), missile seekers (thermal heat leakage from home/factories), and secure communications (business/banking); and tactical power sources for a wide variety of man-portable electronic equipment (ultra-long-life batteries for civilian use). A microelectronics Center of Excellence will be established at local universities to support dual-use research in opto-electronic components, ultra-low power electronics, uncooled, and low-cost/compact night vision components.

(U) FY 1993 Accomplishments:	Complete	Cost

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0601102A**
PE Title: **Defense Research Sciences** Budget Activity: **#1**

• (U) Demonstrated voltage-tunable multicolor infrared detector single-element devices	*	500
• (U) Demonstrated high-contrast-ratio single-element spatial light modulator structure	*	450
• (U) Developed technology for fabrication of three-dimensional microscale fluidic devices	*	787
• (U) Developed novel magnetic-circuits for improved traveling wave tube designs	*	500
• (U) Fabricated and delivered micromachined structures for radiometric scene generators for missile IR-detector calibration and alignment	*	650
• (U) Investigated synthesis of high-energy resin for pulse power capacitors and high conductivity polymer	*	565
• (U) Researched electronic and optoelectronic devices for high frequency microelectronics and radar.	*	1253
Total		**4705**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Demonstrate twelve micrometer infrared detector prototype in GaAs	*	950
• (U) Develop process for thick, low-stress silicon nitride for micromachined devices structures	*	570
• (U) Develop spin-on sol gel process for fabrication of thin-film ferroelectric PZT	*	700
• (U) Develop process technology and demonstrate microscale microphone with ferroelectric transducer	*	982
• (U) Demonstrate growth of lattice-matched InGaAs/InAlAs on InP	*	673
• (U) Develop prototype single-pixel 12-micron detector chip for NASA atmospheric temperature measurement and satellite detection	*	700
• (U) Establish University Center of Excellence in Electronics, and develop polymer electrolytes for improved Lithium batteries	*	2044
Total		**6619**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Design, fabricate, and test 128x128 FPA multicolor IR detector in GaAs	*	1500
• (U) Develop a process for depositing and etching single crystal germanium waveguides on GaAs wafers with application to optical computing and phase array radar	*	1297
• (U) Fabricate and test a microscale fluidic laminar proportional amplifier for low-cost high performance acoustic sensors	*	850

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FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0601102A**
PE Title: **Defense Research Sciences**

Budget Activity: **#1**

- (U) Develop materials and processes for the fabrication of SiC and diamond high power photconductive semiconductor switches for ultra wideband radar
- (U) Pursue University Center of Excellence in Electronics, and develop polymer electrolytes for improved Lithium batteries

	*	843
Total	*	4014
		8504

(U) Project AH48 - Communications Research: Two Directorates of the U.S. Army Communications-Electronics Command (CECOM), perform basic research under project AH48: The Space and Terrestrial Communications (S&T Comm) Directorate and the Command, Control, and Systems Integration (C2SI) Directorate. The research mission of these directorates is to provide the basic technology needed for the development of advanced C3 equipment and systems for the digitized battlefield. Specifically, S&T Comm addresses research issues in the areas of network management & control, antennas and propagation, and fiber optics and photonics. C2SI conducts research in the fields of artificial intelligence and modeling of C2 systems. Beginning in FY94 funding decrease reflects a conversion of this projects funds to PE 0601101, consistent with the formation of ARL and BRAC 91 Legislation.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Designed and developed specification of partial order quality-of-service protocol to support multi-media communication	*	679
• (U) Performed architectural study on integrated photonic subsystems for use in optical control of phased array antennas	*	295
• (U) Made progress in development of unified numerical analysis theory of printed antennas and arrays	*	323
• (U) Conducted series of tests on ionospheric response to wideband signals at HF under various geophysical conditions	*	403
• (U) Developed effective mathematical models for analysis/evaluation of C2 systems in battlefield environment	*	475
Total		**2175**

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Develop advanced design and fabrication techniques for integrated photonic subsystems	*	312
• (U) Investigate formal, fully automated techniques of multi-media protocol composition/decomposition for network management and control	*	208
• (U) Continue participation in EUROCAP program on characterization of ionospheric HF propagation conditions over a wide geographical area	*	318

* This is continuing work which is reviewed periodically, ensuring quality, relevance and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0601102A
PE Title: Defense Research Sciences — Budget Activity: #1

• (U) Develop computationally efficient synthesis procedures for printed phased arrays, including equivalent circuit models for transitions in (printed) feed system	*	335
• (U) Design integrated decision-aids demonstration program	*	532
• (U) Develop common language for C2 that enables the development of object-oriented C2 system models	*	200
Total		**1905**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Continue development of photonic technology for optically fed/controlled phased arrays	*	343
• (U) Continue research on formal techniques of protocol engineering	*	225
• (U) Investigate propagation prediction techniques for tactical radio communication at frequencies in the wireless personal-communication band	*	325
• (U) Continue development of advanced numerical analysis methods for printed antennas/arrays. End goal is highly efficient user-friendly computer code	*	340
• (U) Continue study (a) on representation of battlefield situation that supports automated plan management and (b) on object oriented C2 system modeling	*	250
Total		**1483**

(U) **Project AH49 - Research in Missiles and High-Energy Lasers:** This is the only Defense Research Sciences project providing basic research dedicated to the development and evaluation of evolving science knowledge critical for future superiority in Army missiles and high energy lasers. Current research emphasis is in selected key areas: integrated and guided-wave optics, optical pattern recognition, quantum optics, neural network applications, signal processing/analysis, and electro-optical materials. Work in this project supports PE #0602303A and PE #0602307A at MICOM and is fully coordinated with related activity at ARL. Beginning in FY94 funding decrease reflects a conversion of this project's funds to PE 0601101, consistent with the formation of ARL and BRAC 91 Legislation.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Advanced the state-of-the-art in optical correlator technology. Transitioned target recognition and missile guidance technology to industry and Army. Co-op activity w/ NASA-JSC to develop eye tracker for surgery.	*	1368

* This is continuing work which is reviewed periodically, ensuring quality, relevance and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0601102A
PE Title: Defense Research Sciences **Budget Activity: #1**

• (U) Achieved the first ever operating optical circuit involving monolithic integration of a source, modulator, and detector using GaAs/AlGaAs quantum well material. Transferred techniques to industry/academia.	*	1985
• (U) Developed novel neural network which produces target unique signature that is invariant to translation, rotation, scale and illumination. Transitioned ultrafast NN teaching algorithm to academia & TV industry.	*	700
• (U) Achieved new integrated optical device structure (gyro chip) and transferred technology to industry, academia and other government labs.	*	950
Total		5003

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Develop optical correlator technology for smart weapons applications in target cueing, and exploit neural network computing techniques in aided target cueing.	*	1811
• (U) Conduct integrated and guided wave optics research for sensors & signal processing circuits.	*	1088
• (U) Investigate quality assessment techniques for optical and electronic materials which are nondestructive and suitable for in-situ applications.	*	840
• (U) Conduct research in quantum and nonlinear optics for future opto-electronic components and optical computing systems.	*	829
Total		4568

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Conduct a broad based theoretical effort in quantum and nonlinear optics pertinent to developing advanced sensors and optical computing applications	*	378
• (U) Exploit advantages of neural network computing techniques for aided target cueing, and conduct integrated and guided wave optics research enabling improved fabrication/packaging for sensors.	*	1461
• (U) Demonstrate optical correlator technology for smart weapons applications in target recognition and cueing and missile terminal guidance	*	1357
• (U) Evaluate techniques for optical and electronic materials quality assessment which are nondestructive and suitable for in-situ applications	*	313
Total		3509

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FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0601102A**
PE Title: **Defense Research Sciences**

Budget Activity: **#1**

(U) Project AH51 - Combat Support: This project was transitioned in FY 1993 from the Belvoir RD&E Center (BRDEC) to the Army Research Laboratory's (ARL) Materials Directorate. In the past, this research focused on: countermine, counter-surveillance, fuels, and lubricants. The basic research in fuels and lubricants involving lubrication tribology investigations is being performed by Army scientists collocated at Wright Laboratory (USAF) under Project Reliance. Under the agreement between BRDEC and ARL the current near term research in countermine and counter-surveillance will be brought to a successful conclusion. Under this project the Materials Directorate is carrying out a program of basic research in elastomers, low volatile organic compounds (VOC) CARC coatings with low observability in the extended infra-red region. Beginning in FY94 funding decrease reflects a conversion of this projects funds to PE 0601101, consistent with the formation of ARL and BRAC 91 Legislation.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Mixed over 75 rubber compounds; samples were prepared for testing and evaluation, including compounds for bushings, roadwheels and pads	*	308
• (U) Procured 5 polyurethane materials; materials properties characterization is underway to develop techniques to assess deterioration and develop methodology to predict shelf and service life	*	373
• (U) Tested detection algorithms with experimental impulse radar	*	369
• (U) Investigated novel thermite compositions for defeating land mines, and conducted basic research in solid lubrication technologies for ground vehicle equipment applications	*	326
Total		**1376**

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Study the effect of composition, stress and weathering on the abrasion resistance of polymeric materials, using various abrasion measuring instruments	*	182
• (U) Evaluation of higher frequency and wider bandwidth detection radars for near-surface mines, and investigate effect of electron donating additives on stability of explosives	*	378
• (U) Evaluation of various neural-network architectures and models to improve accuracy of mine detection, and investigate surface chemistry/coatings process variables	*	423
Total		**983**

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FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0601102A**
PE Title: **Defense Research Sciences**

Budget Activity: **#1**

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) The portion of AH51 line transitioned from BRDEC to ARL in FY1993 was rolled into AH42 "Materials and Mechanics" in FY 1995 and outyears. Only a small portion for BRDEC's effort on fuels and lubricants remains in AH51 for FY1995 and the outyears.		
• (U) Define load-carrying capability of solid lubricant-metal combinations	*	141
Total		**141**

(U) Project AH52 - Equipment for the Soldier: Basic research focused on six core technology areas critical to the Soldier System - Bioprocess technology, Polymer Science/Textile Technology, Food Technology, Airdrop Technology, Survivability Technology, and Behavior/Performance Science. Research is targeted toward enhancing the mission performance, survivability, and sustainability of the soldier by advancing the state of the art in defense against battlefield threats and hazards such as chemical agents, lasers, ballistics, environmental extremes, shortage of potable water supplies, and shortfalls in the availability of nutritious, satisfying rations essential to the health and well-being of soldiers. Beginning in FY94 funding decrease reflects a conversion of this projects funds to PE 0601101, consistent with the formation of ARL and BRAC 91 Legislation.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Developed numerical techniques for treatment of large deformations of the parachute membrane to assist in solving the coupled aeroelastic problem	4Q93	155
• (U) Demonstrated correlation between yield of two different intrinsic chemical markers and microbial lethality as a means of validating new thermal processing methods for improved rations	4Q93	115
• (U) Optimized biodegradable polymer structures to meet storage stability and field degradation needs, as well as to meet environmental standards for international treaties and ground exercises	4Q93	1800
• (U) Transferred silk gene to CRDA partner for start up of silk production and fiber spinning	4Q93	795
• (U) Transitioned prototype non-linear optical polymer to 6.2 Laser Devices Work unit and was successfully used to fabricate lenslet arrays	4Q93	690
• (U) Evaluated sensitivity of selected performance measures to caloric restriction under laboratory conditions as well as to physical exertion under field conditions	4Q93	206
• (U) Determined effects of moisture and natural plasticizers (sugars) to improve texture and increase storage stability of carbohydrate food matrices in military rations	4Q93	122

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FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0601102A**
PE Title: **Defense Research Sciences**

Budget Activity: **#1**

• (U) Established CRDA with industry to develop and test novel targeted nutrient delivery vesicles to maximize the bioavailability of nutrients in military rations	4Q93	80
• (U) Synthesized small quantity of high-molecular-weight polyvinylalcohol (PVA) polymer for dynamic/mechanical characterization for ballistic protective applications	4Q93	554
Total		**4517**

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Synthesize thermally processable polymers/kevlar-like copolymers for ballistic protection of vests; determine impact failure mechanisms for composites for lighter weight ballistic protective vests and helmets.	*	903
• (U) Determine capability of modified liposomes to carry oral nutrients to lymphatic system; demonstrate assembly of protein-based nanostructures leading to new materials designs for ballistic/chemical defense.	*	730
• (U) Enhance structural model for aeroelastic parachute opening problem prediction; identify conditions for liquid crystal phase formation to spin protein fibers from silk	*	950
Total		**2583**

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Determine energy absorption of newly synthesized ballistic protective materials	*	614
• (U) Investigate modified liposomes and stabilized micelles as carriers for bioactive food amino acids; generate complexity in self-assembling protein-based materials; and construct database of human performance measures	*	770
• (U) Predict behavior of round parachutes; produce first generation silk-based protein fibers for lightweight protection.	*	576
Total		**1960**

(U) Project BH57 - Scientific Problems with Military Applications: This extramural research project seeks to capture and exploit new scientific opportunities, primarily at Universities, to improve Army operational capabilities of the future. Research efforts are categorized into nine research areas such as electronics, physics, materials science, etc, and special programs. It covers over 600 grants and contracts and supports 680 leading academic researchers, and over 900 graduate students yearly, and supports research at over 210 universities in 47 states. The extramural program also supports 12 Army Centers of Excellence. Additionally, 5% of Army funding of universities is committed to 31 Historically Black Colleges and Universities/Minority Institutions (HBCU/MI). Assessment of foreign capabilities is the responsibility of overseas liaison offices in Europe and the

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FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0601102A**
PE Title: **Defense Research Sciences**

Budget Activity: **#1**

Far East. The funding growth strengthens extramural participation bringing university funded research to 0% real growth from the FY92 baseline consistent with Defense guidance. Specific investments include establishment of an interdisciplinary HBCU/MI Center of Excellence and power support research for the 21st Century Land Warrior.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Advanced state-of-art in materials research including water-borne conversion coatings for aluminum which have protected treated aluminum surfaces from salt induced corrosion for exposures greater than 2000 hours.	*	10946
• (U) Advanced state-of-art in chemical defense including a new carrier which is three times better than the commercial agent used in industry.	*	11380
• (U) Advanced state-of-art in electronics research including a patent on the fabrication of ultrafast electronic circuits using x-ray lithography techniques, and the process has been transferred to industry.	*	12000
• (U) Advanced state-of-the art in biochemical research including catalytic antibodies to enhance the speed of carbon-carbon bond formation central to construction of novel polymeric materials from relatively simple commodity chemicals	*	1500
• (U) Advanced state-of-the art in mathematics including development of a pattern theoretic methodology of ingerence algorithms for automatic target recognition which accounts for shape and scale variation, textures, and variable number of shapes	*	11000
Total		**56826**

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Advance state-of-the art in atmospheric science research including a turbulence Eddy Profiler, a UHF radar system, for the boundary layer with high temporal resolution.	*	8350
• (U) Advance biosciences research including a new Molecular genetics method to provide the capability to modify biomembranes w/ the potential for self-assembly into higher order structures for biomaterial applications.	*	8000
• (U) Electronics research including the Kolga Gold Medal award for the integration of a complete millimeter wave monopulse receiver on a chip capable of tracking targets without external components.	*	8385
• (U) Invent the fractal sol-gel coatings for aluminum which improve the protection of treated surfaces		

* This is continuing work which is reviewed periodically, ensuring quality, relevance and priority.

Program Element: **#0601102A**
PE Title: **Defense Research Sciences** Budget Activity: **#1**

from salt corrosion by a factor of 100.	*	7515
• (U) Advance computer science research and develop a new 3-D visualization software tool at the Army High Performance Computing Research Center which allows a large data-set image to be rotated, panned and zoomed in real-time w/ applications in medicine.	*	9825
• (U) Advance mechanics research at the three Rotorcraft Technology Centers of Excellence will combine adaptive structures with output feedback and state observers controllers to produce robust algorithms for rotor blades.	*	9654
• (U) Advance physics research and apply newly invented photonic crystals that exclude all electromagnetic radiation over a band of frequencies to MMIC-base planar antenna performance.	*	5850
• (U) Environmental research to carry out the hydrolysis and oxidation of cellulosic waste in supercritical water. Create new nitrogen containing carrier which is three times better than the commercial agent used to extract copper form its ores.	*	5000
Total		62579

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Advance electronics research and synthesize a low cost formation of very densely packed nanowire composites for optoelectronic and nonlinear optical applications.	*	5610
• (U) Advance chemistry research and apply superlattice technology to thermoelectric materials for major innovations in cryocooler design and new commercial technologies.	*	5050
• (U) Advance materials research and bond complex adhesive polymers through electron holography.	*	7500
• (U) Advance materials research experiments probing waveguide evanescent fields with a photon scanning tunneling microscope could lead to a more powerful non-destructive testing technique.	*	6624
• (U) Advance environmental research and genetically engineer naturally occurring soil bacteria resulting in fast rates of biodegradation.	*	8950
• (U) Advance mechanics research and integrate the design of controller parameters with the structural material parameters resulting in important smart structures applications.	*	5815
• (U) Advance propulsion research and develop a combination of models for turbulence calculation to expand the range of accurate prediction of missile and projectile base drag.	*	5215
• (U) Advance electronics research and develop ion beam methods for iron and copper on silicon wafers methods will provide the highest sensitivity for impurities during wafer processing.	*	4495

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FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0601102A**
PE Title: **Defense Research Sciences**

Budget Activity: **#1**

• (U) Conduct research on advanced batteries and fuel cell technology at the interdisciplinary HBCU/MI.	*	16111
Total		**65370**

(U) Project AH60 - Research in Armaments: This project contains basic research in the areas of smart projectiles, smart mines, autonomous launchers, fire control systems and laser protection devices for users of direct-view optics. Efforts focus on resolving basic technology problems required for insertion into Exploratory Development (6.2) and Advanced Development (6.3a). This project supports Science & Technology Thrusts for Advanced Land Combat. Beginning in FY94 funding decrease reflects a conversion of this projects funds to PE 0601101, consistent with the formation of ARL and BRAC 91 Legislation.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Fabricated gallium arsenide films for investigating guided wave use in optical signal processing and investigated use of smart-focal-plane-automatic-target recognition algorithms	*	575
• (U) Validated six degree of freedom robotic controller for weapon aiming and verified Bacterio-Rhodopsin-based, high speed triggering for protecting optics from threat lasers.	*	407
• (U) Expanded software architecture for multivariable control test fixture and investigated the measuring of projectile position variables.	*	280
• (U) Created a standard intelligent control architecture for smart mine control and determined and verified detection at 10 GHZ using a frequency-scanned meanderline, phased array antenna	*	836
Total		**2098**

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Investigate alternate growth techniques for superior quality gallium arsenide films and fabricate integrated optical waveguide coupling gratings for 10.6 micron tests of wave loss.	*	623
• (U) Determine predictive modeling of clutter, investigate real-time robotic controller, fabricate meanderline phased array antenna, and verify noise reduction using neural networks.	*	597
• (U) Investigate recognition-tracker coupling for intelligent gunner/tracker fire control, integrate piexo ceramics for weapon vibration control, and define a guidance module for positioning antennas.	*	292

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Program Element: #0601102A
PE Title: Defense Research Sciences — Budget Activity: #1

• (U) Construct an artificial intelligence-based, fuzzy incomplete data logic controller for robot navigation.	*	341
Total		**1853**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Create optical digital logic circuit using infrared guided-wave components for smart munitions, and investigate integrated optical correlation for precision munitions target tracking.	*	635
• (U) Create an adaptive clutter suppression filter for smart munitions, verify a full-function, multi-agent controller for smart mines, and expand language module voice activated weapon control.	*	558
• (U) Devise methods for a next generation robotic platform to automatically adjust its ultrasonic sensor parameters for autonomous performance.	*	220
Total		**1413**

(U) **Project AH61 - Research in Close Combat Weaponry:** This effort addresses basic physical phenomena associated with gun armament development and applies the knowledge gained to new design approaches to extend service life and improve the accuracy and life cycle cost of weapon systems. Additional efforts involve the prediction of the dynamic effects in weapon and ammunition components, deposition and high strength refractory metals and alloys and characterization of weapon system failure mechanics. Efforts focus on resolving basic technology problems required for insertion into Exploratory Development (6.2) and Advanced Development (6.3a). This project supports Science & Technology Thrusts for Advanced Land Combat. Beginning in FY94 funding decrease reflects a conversion of this projects funds to PE 0601101, consistent with the formation of ARL and BRAC 91 Legislation.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Determined origin of breech ring low fatigue life and provided non-destructive fatigue detection method to the field.	*	486
• (U) Designed a unique materials coating(electro-deposit of chronium) process for refractory metals and ceramics for advanced gun propulsion systems.	*	545
• (U) Characterized large caliber muzzle brake phenomena supporting projectile obturator work to reduce		

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dynamic tube strains.	*	514
Total		**1545**

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Evaluate fractal/multifractal analysis for characterizing material microstructures to resolve gun material problems.	*	364
• (U) Devise cylindrical magnetron sputtering system for refractory metals and ceramics coatings.	*	380
• (U) Test new design obturator for attenuating gun tube dynamic strains.	*	340
• (U) Devise firing simulations and measure fatigue life for M256 muzzle reference sensor.	*	288
Total		**1372**

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Establish combined neural net multifractal method characterizing material microstructures to resolve gun material problems.	*	266
• (U) Evaluate gun materials prepared with planar magnetron and cylindrical magnetron sputtering systems for future coatings applications.	*	269
• (U) Enhance muzzle brake computer code by chemistry integrate model for propellant gases to optimize projectile obturator designs.	*	262
• (U) Establish new test geometry for the American Society for Testing and Materials fracture toughness standards for use in gun failure predictions.	*	249
Total		**1046**

(U) Project AH66 - Aviation Structures Research: This project represents a zero sum transfer of funds from H45 to reflect the consolidation of this work at ARL, consistent with BRAC 91 Legislation. As agreed to under Project Reliance, this is the only activity for rotorcraft and ground structures basic research within the DoD. The purpose of this project is to perform basic and applied research in structures, as applied to rotorcraft and ground vehicles. No related effort is being conducted within DoD.

(U) FY 1993 Accomplishments: Work conducted in Project AH45

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Program Element: #0601102A
PE Title: Defense Research Sciences

Budget Activity: #1

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Evaluate structure borne noise reduction levels using an active helicopter transmission mount.	4Q94	242
• (U) Incorporate specimen-geometry related failure mechanisms to predict strength of crashworthy structures, and develop analytical capability in area of tilt-rotor aircraft using CAMRDII, 2GCHAS, etc.	4Q94	322
• (U) Under a US/German MOU jointly model Learfan 2100 section drop tests in composite crashworthiness, and evaluate neural network systems for processing thermal corrosion data for automated inspection methods.	4Q94	446
• (U) Extend delamination analysis for tapered laminates to specific rotorcraft hub configurations under CRDAs w/ Bell Helicopter and MDHC; and develop low velocity impact test methodology for damage effects.	*	444
Total		1454

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Test piezoelectric elements bonded to a liner inside a composite fuselage mock-up for active control of interior noise	*	226
• (U) Jointly model the full-scale crash test of the Learfan 2100 under a US/German MOU; investigate scaling effects under complex statically applied loads.	*	389
• (U) Conduct tests to validate delamination criteria for rotorcraft composite hub designs under CRDAS w/ Bell and MDHC; advance high speed rotorcraft aeroelastic experimental research for refurbishing a tilt rotor model	*	402
• (U) Develop low velocity test methodology and standard impact test; and develop hybrid technique for processing thermal NDE data.	*	363
Total		1380

(U) Project BH67 - Environmental Research - Army Materiel Command: This project focuses basic research on technologies for pollution prevention related to AMC materiel development programs. The objectives are to: establish a technology base for pollution prevention and life cycle management of hazardous materials and wastes and to develop innovative key technologies to reduce the cost and risk of the Army's environmental challenge. Program thrusts include environmental acceptable advanced non-radioactive, non-toxic and lightweight alternative structural materials to enhance weapon system performance; substitutes for ozone-depleting chemicals as solvents, refrigerants, and firefighting agents for military unique applications; ordnance process improvements to eliminate the use of hazardous materials and to minimize the generation of wastes from manufacturing operations; and surface protection alternatives to hazardous paints, cadmium, chromium, and chromate conversion

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coatings for metal and composite surfaces. This program is linked to the Tri-Service Environmental Quality R&D Strategic Plan and addresses environmental technology requirements addressed in that plan. In FY 93 this program was funded in AMC projects B53A, A71A, BH27, AH43, and AH68. Beginning in FY 1994, funding is consolidated under Project BH67.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) In FY93 program was funded in AMC projects B53A, A71A, BH27, AH43, and AH68.		

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Characterize surfactants and devise feeding protocols for selected systems to create an aqueous-based system for cleaning & degreasing military material	*	182
• (U) Establish operational parameters of microphysiometer for toxicity testing w/ a human cell line to assess environmental toxicity on humans; identify the pathway for iodiglycol metabolism and isolate nerve gas product.	*	973
• (U) Determine theoretical feasibility of utilizing enzymatic reaction products to synthesize energetic materials	*	1087
• (U) Solicit, via Broad Agency Announcement, projects from academia/industry to establish technology base for pollution prevention;	*	2222
Total		**4464**

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Via BAA conduct research with academia/industry to establish a technology base in pollution prevention.	*	5378
• (U) Validate microphysiometer methodology for use in human health risk assessment.	*	281
• (U) Identify the pathway for iodiglycol metabolism; measure gaseous combustion products from open combustion of propellants	*	1093
• (U) Determine feasibility of utilizing enzymatic reaction products to degrade energetic materials.	*	969
Total		**7691**

(U) Project AH68 - Processes in Pollution Abatement Technology: This project provides fundamental understanding of the physical, chemical and biological properties and mechanisms that control the degradation and treatment of hazardous wastes on military installations. This research is used to obtain basic technical information necessary for the design of treatment systems for both cleanup of existing hazardous waste sites and control

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Program Element: #0601102A
PE Title: Defense Research Sciences

Budget Activity: #1

of future hazardous waste generation. Wastes of concern include explosives, propellants, chemical agents and smokes. This project element was enhanced in FY93 to address a broad range of environmental topics. It was then reorganized into AT25 and AH68 starting in FY94 at OSD's request. AH68 returned to its more narrow focus. This project supports exploratory development efforts in Program Element #0602720A, Projects AF25 and DO48.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Defined mechanism of wet air oxidation treatment on redwater and its intermediates	*	788
• (U) Enhanced understanding of optimal operating characteristics for nutrients and substrates affecting biodegradation of dinitrotoluene	*	653
• (U) Investigated mechanism of photocatalytic destruction of dinitrobenzene sulfonate	*	792
• (U) Performed validation of screening protocol and isolation procedure for explosives degrading bacteria	*	675
• (U) Evaluated environmental factors controlling degradation rates and products	*	713
• (U) Determined alternative methods for biological destruction of TNT	*	748
Total		**4369**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Specifications and operating protocols for bench scale photocatalytic treatment processes for reduction of aromatic compounds	*	232
• (U) Identify environmental factors controlling TNT degradation rates and products	*	100
• (U) Develop mechanism for environmental control of microbial degradation of explosives	*	131
Total		**463**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Examine pathways and controlling factors in biodegradation of energetic waste	*	158
• (U) Conduct comparison of microbial effectiveness in different biotreatment applications	*	165
• (U) Implementation guidance for using microorganisms in bioremediation of soil	*	115
Total		**438**

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PE Title: **Defense Research Sciences**

Budget Activity: **#1**

(U) Project BS04 - Military Pollutants and Health Hazards: This element provides for the development of innovative, less costly, and less time consuming toxicity assessment methods for determining potential human health and environmental effects of military unique hazardous wastes and chemicals, including explosives, propellants, and smokes. These new toxicity testing techniques will help to prioritize hazardous wastes, waste treatment technologies, and screen new Army chemicals for potential toxic effects.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Completed identification of candidate test methods for screening water samples for acute toxicity	*	100
• (U) Completed protocols for non-mammalian carcinogenicity screening tests	*	300
• (U) Completed test protocols for non-mammalian developmental toxicity screening tests	*	440
Total		**840**

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Identify candidate immunotoxicity test systems	*	100
• (U) Determine candidate microbial fate methods for inclusion in hazard estimation model	*	308
• (U) Develop Non-mammalian carcinogenicity bioassays	*	380
Total		**788**

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Neurotoxicity and reproductive toxicity models	*	300
• (U) Chemical and multi-media environmental fate models	*	333
• (U) Environmental risk prediction model	*	114
Total		**747**

(U) Project BS11 - Science Base/Medical Chemical Defense: This project emphasizes understanding of the basic mechanisms of action of the nerve, blister, blood, and respiratory agents. Basic studies are performed to delineate mechanisms and site of action of identified and emerging chemical threats to generate required information for initial design and synthesis of medical countermeasures. In addition, theses studies are further designed to maintain and extend a science base to prevent technologic surprises. The Army has been designated as the Department of Defense (DoD) Executive Agent for chemical defense research and development, and the U.S. Army Medical Research and Development Command

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Program Element: **#0601102A**
PE Title: **Defense Research Sciences** Budget Activity: **#1**

(USAMRDC) executes the medical defense portion of this executive agent role.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Described time course of sulfur mustard injury; developed tests for cellular and biochemical changes following sulfur mustard exposure; identified bacteria able to metabolize sulfur mustard.	*	3120
• (U) Characterized neurochemical and biochemical mechanisms of cyanide-induced brain dysfunction and incapacitation.	*	83
• (U) Employed biotechnological approaches to characterize the cholinesterase site inhibited by nerve agents.	*	956
• (U) Demonstrated value of exogenous cholinesterases to nerve agent pretreatment; expressed genetically engineered cholinesterases.	*	1865
• (U) Identified potential pretreatment to reduce phosgene-induced lung injury.	*	899
Total		**6923**

(U) FY 1994 Program:	Complete	Cost
• (U) Characterize cellular mechanisms of sulfur mustard damage; characterize markers of sulfur mustard injury; develop new models of sulfur mustard injury.	*	3731
• (U) Characterize mechanisms of cyanide toxicity; characterize markers of cyanide toxicity.	4Q94	973
• (U) Characterize cellular and brain mechanisms controlling nerve agent-induced seizures and pathology following anticonvulsant and other therapy.	*	825
• (U) Explore potential biological scavengers for chemical agents; apply biotechnological approaches to development of scavengers.	*	1995
• (U) Generate hypotheses and models to define mechanisms of action of CW threat agents.	*	582
Total		**8106**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Characterize mechanisms of sulfur mustard damage to cells; characterize markers of sulfur mustard injury; develop new models of sulfur mustard injury.	*	3266
• (U) Characterize cellular and brain mechanisms controlling nerve agent-induced seizures and pathology		

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following anticonvulsant and other therapy.	*	2020
• (U) Explore potential biological scavengers for chemical agents; apply biotechnological approaches to development of scavengers.	*	2200
• (U) Generate hypotheses and models to define mechanisms of action of CW threat agents.	*	601
Total		**8087**

(U) Project BS12 - Science Base/Medical Biological Defense: This project funds USAMRDC as the DoD executive Agent for exploratory research on the development of vaccines and drugs to provide an effective medical defense against validated biological threat agents including bacteria, toxins, viruses and other agents of biological origin. By employing biotechnology, medical systems will be designed to rapidly identify, diagnose, prevent and treat disease due to exposure to biological threat agents.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Developed procedures for growth, identification and diagnosis of the essential virulence factors of Yersinia pestis, the causative agent of plague.	*	503
• (U) Introduced genes from Brucella into the Salmonella vector vaccine system.	*	321
• (U) Completed characterization and mapping of ten monoclonal antibodies to the edema factor component of anthrax toxin.	*	2583
• (U) Identified a 32-kDa plasma membrane protein as a cellular receptor for Venezuelan equine encephalitis (VEE) virus (potential vaccine target).	*	632
• (U) Investigated distribution of ricin in isolated perfused rat lungs to determine potential treatment measures.	*	1965
• (U) Identified by immunochemistry the cells involved in pathological tissue changes following aerosol Staphylococcal enterotoxin B (SEB) challenge in non-human primates.	*	1882
• (U) Cloned the C fragment of botulinum neurotoxin A into an E. coli expression vector for a genetically engineered vaccine candidate.	*	900
• (U) Established that neurotransmitter release after botulinum neurotoxin A does not decrease during repetitive stimulation.	*	953
• (U) Investigated the mechanism of action of new and emerging threats.	*	3696

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Program Element: **#0601102A**
PE Title: **Defense Research Sciences** Budget Activity: **#1**

• (U) Identified and characterized three hydrophobic residues of the sodium channel peptide which can serve as targets for medical countermeasures	*	1645
Total		**15080**

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Investigate the genetics and physiology of Yersinia pestis (Plague) to understand how these microorganisms cause disease.	*	1507
• (U) Conduct research on the mechanisms by which disease producing factors are regulated by Bacillus anthracis.	*	1456
• (U) Identify the infectious site on the genes of Eastern and Western equine encephalitis viruses.	*	1009
• (U) Develop an animal model for the Marburg and Ebola viruses to understand the disease process.	*	817
• (U) Conduct basic research on the physiological sites of action for sodium channel neurotoxins.	*	1165
• (U) Delineate the mechanism of action by which drugs inhibit ricin cytotoxicity.	*	1580
• (U) Evaluate the role of immune system in mediating Staphylococcal enterotoxin B (SEB) intoxication.	*	1797
• (U) Examine intracellular effects of botulinum intoxication to develop medical countermeasures.	*	1664
• (U) Maintain the capability to develop medical countermeasures against new and emerging threats.	*	5122
• (U) Conduct basic research on the genetic composition of Brucella to produce a bio-engineered vaccine.	*	1217
Total		**17334**

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Investigate the genetics and physiology of Yersinia pestis (Plague) to understand how these microorganisms cause disease.	*	1623
• (U) Conduct basic research on the genetic composition of Brucella to produce a bio-engineered vaccine.	*	1208
• (U) Conduct research on the mechanisms by which disease producing factors are regulated by Bacillus anthracis.	*	1530
• (U) Identify the infectious site on the genes of Eastern and Western equine encephalitis viruses.	*	971
• (U) Develop an animal model for the Marburg and Ebola viruses to elucidate the disease process.	*	854
• (U) Conduct basic research on the physiological sites of action for sodium channel neurotoxins.	*	966
• (U) Delineate the mechanism of action by which drugs inhibit ricin cytotoxicity.	*	1056
• (U) Evaluate the role of immune system in mediating Staphylococcal enterotoxin B (SEB) intoxication.	*	1767

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FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0601102A**
PE Title: **Defense Research Sciences**

Budget Activity: **#1**

• (U) Examine intracellular effects of botulinum intoxication to develop medical countermeasures.	*	2258
• (U) Maintain the capability to develop medical countermeasures against new and emerging threats.	*	2916
Total		**15149**

(U) Project BS13 - Science Base/Medical Research Infectious Disease: This project funds USAMRDC as the DoD Lead Agency for basic research directed toward increasing knowledge and understanding of Infectious Diseases of Military Importance. These are naturally occurring diseases which have the potential to influence military mobilization, training, operations and deployment. Research is directed towards developing new medical knowledge and technology to design countermeasures by employing biotechnology. Medical systems will be designed to rapidly identify, diagnose, prevent and treat infectious disease threat to military forces.

(U) FY 1993 Accomplishments:

	Complete	*Cost*
• (U) Optimized the methods used for dengue antigen staining and polymerase chain reaction detection of the dengue genome for diagnostic test.	*	650
• (U) Identified the portion of the Shigella plasmid antigen responsible for the dominant immune response.	*	1550
• (U) Synthesized a series of artelinic acid analogs and tested them for antimalarial activity.	*	1050
• (U) Identified enterotoxigenic *E. coli* strains from Thailand, Peru and Egypt, to compare the pathological features that cause traveler's diarrhea.	*	889
• (U) Developed a method for purification of very young red blood cells, used for growing *Plasmodium vivax*, the second most common cause of malaria.	*	1326
• (U) Successfully predicted diarrheal disease, malaria and dengue to be the most significant disease threats to the U.S. Forces in Operation Restore Hope.	*	350
• (U) Characterized virulence factors and surface antigens associated with protective immunity against Campylobacter diarrheal disease.	*	570
• (U) Defined host-defense mechanisms for protection against bacterial wound infection and septic shock.		200
• (U) Using genetically-engineered antigens, successfully demonstrated protective antibodies against lethal malaria challenge in mice.	*	1070
• (U) Developed specific diagnostic assays for Congo Crimean Hemorrhagic Fever and hepatitis E virus.	*	625
Total		**8280**

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Budget Activity: **#1**

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Identify means of preparing sporozoite and blood stage malaria antigens as candidate vaccines.	*	1200
• (U) Acquire probes of known DNA sequence to use in the rapid diagnosis of bacterial diarrhea, typhus, leishmaniasis, and malaria.	*	891
• (U) Determine global distribution of hemorrhagic fevers, hepatitis C and E in military personnel.	*	1372
• (U) Identify new insect repellents against insect vectors of disease.	*	920
• (U) Identify virulence factors for bacteria strains causing disabling diarrheal disease in military personnel.	*	1000
• (U) Re-emphasize drug discovery in the antimalarial core drug program through application of molecular modeling and computer assisted drug design.	*	693
• (U) Determine humoral and cellular immune responses necessary for establishing protective immunity following vaccination against traveler's diarrhea.	*	375
• (U) Characterize blood and liver stage antigens,anti-idiotype monoclonal antibodies causing for protective immunity as potential malaria vaccines.	*	696
• (U) Identify novel compounds effective against drug resistant malaria and leishmaniasis.	*	100
• (U) Develop models to study genetically engineered vaccines against wound infections, hemorrhagic fever, meningitis and dengue virus.	*	1425
Total		**8672**

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Clone and sequence receptor in the liver responsible for attachment and invasion by parasites as a possible target for malaria vaccines.	*	207
• (U) Determine basic mechanisms of host parasite relationship of enterotoxigenic E. coli in cultured human colon cells.	*	575
• (U) Determine etiology of emerging infectious diseases affecting deployed forces. Improve diagnostic tests for leishmaniasis.	*	1164
• (U) Construct a genetically engineered shigella strain in which virulence factors have been deleted as an oral vaccine against bacterial diarrhea.	*	650
• (U) Compare animal immune responses to dengue and hemorrhagic fever immunity to human immune		

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Budget Activity: **#1**

response. Test improved repellents against mosquitoes.

• (U) Apply modern drug design techniques to design antimalarial drugs capable of overcoming drug resistance.	*	2095
• (U) Validate laboratory models for screening candidate vaccines against meningitis, gonorrhea and wound infections.	*	793
• (U) Design and evaluate a genetically-engineered European vaccine for a strain hemorrhagic fever with renal syndrome.	*	175
• (U) Select DNA sequences for use in improved diagnostic tests for typhus and campylobacter diarrhea.	*	795
• (U) Grow hepatitis E in cell culture.	*	1100
Total	*	475
		9892

(U) Project BS14 - Science Base/Combat Casualty Care Research: Biomedical research programs are funded in Combat Casualty Care to understand basic mechanisms of combat related trauma. This research is critical to the support of combat trauma research efforts. This research identifies trauma related topic areas, develops exploratory techniques, and initiates the experimental models necessary to support in-depth trauma research studies. This research is the basis for the development of trauma treatment and surgical procedures to "extend the golden hour" following trauma injury, "minimize lost duty time from minor battle and non-battle injuries and combat stress", and "provide military medical capabilities for far-forward medical/surgical care of battle and non-battle injuries".

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Minimizing Blood Loss and Optimizing Fluid Resuscitation: Established animal model for study of uncontrolled extremity arterial hemorrhage; tested feasibility of fibrin glue to prevent massive hemorrhage. Validated computer model of circulation.	*	1440
• (U) Treatments to Prevent Secondary Damage After Hemorrhage or Major Injuries: Showed that histamine release causes capillary breakdown in shock; reversal with antihistamine drugs. Hemoglobin toxicity blocked by various drugs.	*	2000
• (U) Treatments of Battle and Non-Battle Injuries and Soft Tissue Injuries: Showed that direct current improves wound blood flow in burn wounds, thus decreasing capillary permeability and swelling. Showed that TGF-b stimulates new bone growth.	*	388
Total		**3828**

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Minimizing Blood Loss and Optimizing Fluid Resuscitation: Identify importance of body fluid content,		

* This is continuing work which is reviewed periodically, ensuring quality, relevance and priority.

concentration and composition in determining physiological responses to hemorrhage and shock. Study feasibility of innovative resuscitative therapies. * 1450

- (U) Treatments to Prevent Secondary Damage After Hemorrhage or Major Injuries: Evaluate various *in vivo* models for ability to serve as screening test-beds for the evaluation of efficacy of proposed therapeutic trauma treatments or drugs. * 1657
- (U) Treatments of Battle and Non-Battle Injuries and Soft Tissue Injuries: Assess the vascular responses to injury and resuscitation, and determine how massive tissue damage following trauma can be minimized. * 228

Total **3335**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Minimizing Blood Loss and Optimizing Fluid Resuscitation: Refine mathematical modeling of the cardiovascular system to include both active and passive control elements. Identify potential molecular mechanisms of neuronal injury following hypoxia.	*	1916
• (U) Treatments to Prevent Secondary Damage After Hemorrhage or Major Injuries: Determine the feasibility of antibody therapy to relieve reperfusion injury and Acute Respiratory Distress Syndrome following trauma. Measure spinal cord blood flow after injury.	*	2413
• (U) Treatments of Battle and Non-Battle Injuries and Soft Tissue Injuries: Exploit new technologies (i.e., chemical fiber optic monitors, laser doppler flow probes and tissue oximetry.) to identify early ischemic changes following injury.	*	166
Total		**4495**

(U) Project BS15 - Science Base/System Health Hazards Research: The scientific and technical objectives for this project focus on physiological and psychological factors limiting soldiers' effectiveness, and on the characterization of health hazards generated by military systems and resulting from military operations. Research is conducted on military relevant aspects of environmental physiology and the neurobehavioral aspects of stress. The hazards of exposure to several classes of non-ionizing radiation directed energy, blast, jolt, vibration, noise, and military relevant toxic chemicals are also investigated under this project. Specific tasks include delineating injury and effect thresholds, mechanisms, and sites of action; developing predictive models; and identifying rapid analytical methods, including non-mammalian toxicological assessment methodologies. Overall emphasis is on protection, sustainment, and enhancement of the physiological and psychological capabilities of military personnel under combat operations in all environments.

* This is continuing work which is reviewed periodically, ensuring quality, relevance and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0601102A
PE Title: Defense Research Sciences

Budget Activity: #1

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Identified potential means for treating laser induced retinal scarring.	*	969
• (U) Characterized cochlear damage as a function of impulse noise frequency content.	*	222
• (U) Investigated cellular mediators of acute lung injury caused by exposures to propellant combustion byproducts.	*	640
• (U) Explored feasibility of rapid monitoring technologies for field potable water.	*	511
• (U) Defined electro-optical display factors affecting focusing response of eyes.	*	238
• (U) Characterized the metabolic brain processes that predict performance degradation during prolonged sleep deprivation.	*	915
• (U) Conduct studies to elucidate the neurochemical basis of stress and its behavioral and physiological correlates	*	1213
• (U) Characterized the influences of hydration and fitness on uncompensable heat stress.	*	1699
• (U) Characterized the changes in posture and body motion in soldiers marching with backpacks of various weights	*	160
• (U) Characterized the relationship between energy balance and immune function in soldiers during high intensity military training.	*	1224
Total		**7791**

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Evaluate the feasibility of using exogenously applied growth factors to stimulate retinal recovery after laser injury.	*	1101
• (U) Define auditory exposure bioeffects for freefield impulse blast from large caliber weapons.	*	748
• (U) Identify the types and concentration of toxic gases resulting from defeated armor.	*	548
• (U) Identify and assess techniques to rapidly monitor for the presence of biological contaminants in field water.	*	660
• (U) Identify flat-panel operating characteristics affecting visual performance.	*	425
• (U) Characterize the metabolic changes in brain during different phases of restorative sleep after sleep deprivation.	*	890
• (U) Identify non-invasive biological markers of stress for determining effects of exposure to chronic stress.	*	969
• (U) Characterize the cellular mediators of tolerance to environmental extremes.	*	1893
• (U) Characterize the factors predisposing female soldiers to lower extremity stress fractures.	*	213
• (U) Define the neurochemical mechanisms underlying performance-enhancing effects of tyrosine as a dietary supplement.	*	1711
Total		**9158**

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FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0601102A
PE Title: Defense Research Sciences **Budget Activity: #1**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Characterize mechanism of injury from high-peak, short-pulse microwave radiation.	*	984
• (U) Investigate cochlear "toughening" as a potential means to reduce noise-induced hearing loss.	*	667
• (U) Characterize injury threshold of freefield impulse blast on female reproductive system.	*	545
• (U) Assess the efficacy of methods identified to rapidly monitor biological contaminants in field water.	*	589
• (U) Determine factors limiting visual performance with flat panel technology incorporated into head-mounted displays.	*	406
• (U) Validate laboratory model to screen for safety and efficacy of sleep and vigilance enhancing compounds in a military setting.	*	448
• (U) Validate utility of biological markers of stress for determining a soldier's level of stress as an aid to determine fitness for duty during military operations.	*	451
• (U) Identify potential mediators of and strategies to reduce environmental injury.	*	1623
• (U) Characterize gender-related differences in metabolic responses to exercise.	*	234
• (U) Investigate potential amino-acid ration supplements to sustain immune function in stressful combat environment.	*	906
Total		**6853**

(U) Project BS16 - Science Base/Combat Dentistry Research: Biomedical research directed toward understanding basic biological mechanisms underlying repair of militarily relevant maxillofacial injuries. This research is of fundamental importance for the development of treatments which enhance survival and sustain warfighting capability following battle and non-battle injuries. This research effort is critical to the Army medical research program, as the Army has been designated by Congress as the lead agency for Combat Dentistry research.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Minimizing Blood Loss and Optimizing Fluid Resuscitation; Dental Diseases or Emergencies: Performed initial characterization of bio-polymers to prevent massive bleeding from bone. Carrier, plus bone inductive protein, evaluated in many experimental models.	*	203
• (U) Far Forward Treatment for Soft Tissue Injuries: Characterized potential for by-products from microencapsulated antibiotics to enhance infection; anticipating and de-fusing role of possible side effects. Effects of growth factors were determined in bone cell cultures.	*	180

* This is continuing work which is reviewed periodically, ensuring quality, relevance and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0601102A
PE Title: Defense Research Sciences

Budget Activity: #1

- (U) Treatments of Battle and Non-Battle Injuries and Maxillofacial Injuries: Dose-response studies completed for recombinant human bone morphogenetic protein-2 (BMP-2) in many animal models and cultured cells. Optimal dose for bone repair was determined. * 390

Total 773

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Minimizing Blood Loss and Optimizing Fluid Resuscitation; Dental Diseases or Emergencies: Report findings of higher species response to bovine osteogenin (bone growth compound) implanted in a tissue site.	*	100
• (U) Far Forward Treatment for Soft Tissue Injuries: Explore new polymers for ability to biodegrade and release growth factors.	*	240
• (U) Treatments of Battle and Non-Battle Injuries and Maxillofacial Injuries: Determine effects of cytokines (osteogenin and growth factors) on cultured bone cells (osteoblasts). Use CAD/CAM and robotic technology to design 3D/4D map capability for body surface.	*	859
Total		1199

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Minimizing Blood Loss and Optimizing Fluid Resuscitation; Continue evaluation of new polymers for their ability to biodegrade and release growth factors. Identify drug target tissue sites to treat immune failure in trauma patients.	*	175
• (U) Far Forward Treatment for Soft Tissue Injuries: Reaffirm efficacy of biodegradable polymers containing growth factors in higher animal species. Fabricate and test biodegradable bone screw. Evaluate effects of microencapsulated ampicillin on immunity.	*	82
• (U) Treatments of Battle and Non-Battle Injuries and Maxillofacial Injuries: Use bone repair material (BRM) to successfully stimulate growth of healthy, enduring bone in a critical sized osseous defect. Add video camera and laser optics to CAD/CAM project.	*	295
Total		552

(U) Project BS17 - Science Base/Medical HIV Research: This project funds Congressionally-mandated, militarily relevant HIV exploratory research in the areas of: pre-vaccine development, diagnosis, natural history, epidemiology, and chemotherapy. Efforts are directed to answer

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militarily unique needs affecting manning, mobilization and deployment.

(U) FY 1993 Accomplishments:		
• (U) Demonstrated that specific viral envelope factors determine infectivity for host cells.	*	314
• (U) Demonstrated that certain glycoproteins of the viral envelope are not essential for viral infectivity. Evaluated an improved sensitive polymerase chain reaction method to identify different functions of HIV regulatory genes.	*	629
Total		943

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Define the immune response to unique HIV antigens after immunization with subunit vaccines.	*	340
• (U) Define the effect of virus variability on the selection of vaccine strains. Describe the effects early infection on white blood cells in an animal model.	*	702
Total		1042

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Study the immune response, both humoral and cellular, after immunization with HIV antigens. Evaluate variability in HIV genotypes and phenotypes.	*	340
• (U) Determine HIV infection prevalence and incidence. Identify effects of early infection on white cells in animal model.	*	648
Total		988

(U) **Project AT22 - Soil and Rock Mechanics:** Basic research in this project develops the fundamental knowledge base required by the Army in the field of civil engineering. Current emphasis is on: determining and quantifying the non-linear, hysteretic response of deformable soils to transient loadings resulting from high-speed curvilinear vehicle maneuver; defining the constitutive behavior and penetration mechanics (including plastic deformation and microfracture mechanics) associated with projectile impact on complex geologic and structural materials; development of mathematical models needed for first principle analyses of explosive-induced ground shock and high-velocity projectile impact; development of analytic models and advanced construction materials for the design and construction of permanent or expedient operating surfaces both within CONUS and within a theater of operations; investigation of soil electromagnetic properties that affect in-situ obstacle discrimination and development of adaptive or responsive construction materials suitable for camouflage, concealment, and deception measures for fixed or semi-fixed assets. These

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FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0601102A
PE Title: Defense Research Sciences

Budget Activity: #1

technologies provide the basis for advanced research to provide: analytical capabilities for mobility assessments; hardened battlefield positions, fixed facilities, and semi-fixed assets; multispectral camouflage, concealment, and deception for fixed facilities; and advanced vertical and horizontal construction materials in PE #0602784A, Project AT4O.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Demonstrated effectiveness of superhard burster slabs against penetration by armor piercing projectiles; PC code for analyzing projectile penetration into complex layered targets; analyzed propagation of nonplanar/nonnormal shock waves in buildings.	*	925
• (U) Developed algorithms for computing dynamic soil deformation under tires; developed weather effect on terrain algorithms merging cold region algorithms for soil moisture-strength prediction.	*	300
• (U) Conductec lab measurements of: complex electrical properties of soils as function of soil type, moisture content, temperature, and frequency; properties that affect transmission of thermal-infrared energy through soils (2-100 microns).	*	220
• (U) Characterized select thermally reflective and radar attenuating passive camouflage, concealment, and deception materials. Developed experimental design for electrochromic devices for use in active camouflage technologies.	*	290
• (U) Demonstrated constitutive models for predicting dynamic response of pavement structures	*	340
Total		**2075**

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Develop laboratory analysis of advanced high-strength structural materials for use in anti-penetration shield; define mechanical property variations/uncertainties for structure backfill and soil/rock materials.	*	880
• (U) Develop algorithms to describe the response of soil subject to large discontinuous dynamic deformation using large-scale particle theory; conduct study using large-scale soil-particle model	*	350
• (U) Develop database and model of electromagnetic energy propagation through soils	*	120
• (U) Perform signature characterization of material components of responsive (active) camouflage devices. Synthesize experimental electroactive polymer films in the laboratory	*	265
• (U) Develop dynamic pavement material model for airfield pavement design/evaluation application	*	375
Total		**1990**

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FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0601102A
PE Title: Defense Research Sciences **Budget Activity: #1**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Improved finite element code for dynamic structural analysis of deformable projectiles during penetration into geologic/concrete materials; conduct constitutive property analysis of high strength concretes for structural hardening	*	875
• (U) Develop aggregate soil theory for evaluating soil subject to large-discontinuous soil deformations (dry and saturated soil conditions); compare aggregate soil theory with large-scale particle theory.	*	329
• (U) Electromagnetic propagation model verification via controlled field experiments	*	322
• (U) Perform laboratory analysis of advanced responsive/passive composite materials for potential use in fixed-facility camouflage	*	195
• (U) Develop pavement fracture and durability mechanics models for application in predicting pavement performance	*	353
Total		**2074**

(U) Project AT23 - Basic Research/Military Construction: This project supports development of fundamental knowledge essential to develop the leap ahead technologies required to solve Army and Defense (via RELIANCE) unique problems in the planning, programming, design, construction, and sustainment of force projection platforms and energy and utility infrastructure to achieve the ambitious infrastructure cost reduction goals of the current national military strategy. This project supports exploratory development efforts in Program Element #0602784A, Project AT41 and AT45. Supports related Defense Modeling and Simulation Office funded applications, and has significant dual use application potential.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Identified discourse model for collaborative design to mediate distributed multi-agent discourse and automatically identify conflicting views	*	626
• (U) Developed protocol for next generation object oriented collaborative decision support model and simulation development environment	*	314
Total		**940**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Develop method for object oriented, rule based system pattern matching essential for next generation concurrent engineering applications	*	1353
• (U) Determine environment for testing visual programming software development concepts	*	500

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FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0601102A
PE Title: Defense Research Sciences

Budget Activity: #1

Total		**1853**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Develop machine learning methods for a task modeling environment and for merging and versioning next generation concurrent engineering models	*	1292
• (U) Develop models and concepts for integrating molecular "tags" into composite materials to enable creation of "smart building materials" that can be remotely queried to perform condition analyses	*	534
Total		**1826**

(U) Project AT24 - Snow, Ice and Frozen Soil: This project is the only focused DoD basic research program investigating the physical, chemical and electrical properties of snow, ice and frozen soil and characterization of dominant cold region processes impacting military material, operations and facilities. It provides the knowledge base for exploratory development leading to reduced life cycle costs and increased readiness and operability in extreme cold, high-altitude and seasonal winter conditions around the world. Basic research in support of environmental quality was enhanced in several projects starting in FY93. This enhanced program was reorganized into BT25 starting in FY94 at OSD's request. Products are directly input to PE #0602784A, Project AT42, as well as specific Navy and Air Force science and technology efforts and forms the basis for much civilian applied research in these areas.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Developed models of propagation and interaction of seismic/acoustic, radar, and mm waves in snow, ice, and frozen ground	*	516
• (U) Developed model of soil frozen fringe and its effects on soil freezing behavior	*	195
• (U) Developed model of effects of varying thermal properties on strength of ice and icing model to predict transmission line loads	*	370
• (U) Discovered friction induced electrical charging in snow and solute redistribution during snowpack evolution	*	170
• (U) Determined influence of low temperatures on biotransformations of chemical compounds	*	800
Total		**2051**

(U) FY 1994 Planned Program:	Complete	Cost

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FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0601102A
PE Title: Defense Research Sciences Budget Activity: #1

• (U) Develop model for millimeter wave interaction with an evolving snow cover and experimentally verify relationship of turbulent fluxes with propagation statistics	*	520
• (U) Determine soil chemical processes integration into physical models of freezing-thawing	*	200
• (U) Relate physical and electromagnetic properties of ice for remote sensing and forecasting mechanical behavior	*	360
• (U) Validate an acoustic method to determine snow permeability and the impact of snow properties on acoustic energy propagation	*	180
Total		**1260**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Develop millimeter wave (MMW) scattering model for multiphase media	*	490
• (U) Develop model for unsteady freezing of soils under loads for foundation design	*	335
• (U) Determine relationship of icing accumulation processes to winter storm characteristics	*	310
• (U) Quantify vapor transport and solute release mechanisms in snow	*	188
Total		**1323**

(U) Project AT25 - Environmental Research - Corps of Engineers: This project provides the basic research needed to develop the technologies to address Army issues in the cleanup, compliance, conservation and pollution prevention areas. In cleanup the focus is providing the basic knowledge needed to develop physical, chemical and biological technologies to clean up the Army's contaminated sites. In compliance and pollution prevention, efforts will address knowledge gaps vital to maintaining compliance at non-industrial installations and fundamentals of training and testing noise as they might be applied to reducing adverse effects on mission activities. In conservation the focus is on landform and ecological modeling and the feasibility of development and propagation of resilient plant species for rehabilitation of damaged lands. This project will also examine the underlying requirements for comprehensive environmental modeling and simulation products to address environmental issues. The FY93 program is in Projects AH68 and AT24. The project supports exploratory development efforts in PE #062720A, Projects AF25, D048, and A896. Starting in FY94, 75% of the funds will be used to support extramural research via a Broad Area Announcement requesting proposed work supporting in-house laboratory efforts.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) The FY 1993 program is represented in Projects AH68 and AT24.		

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FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0601102A
PE Title: Defense Research Sciences

Budget Activity: #1

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Define hydroxyl radical formation mechanisms for chemical oxidation of explosives contaminated media	*	400
• (U) Complete database on spectral signatures of waste compounds	*	400
• (U) Model the spatial relationships of ecological systems and landforms	*	625
• (U) Verify mass balance and characterize glassy materials from laboratory tests of vitrification	*	625
• (U) Develop fractal description of blast/wind noise signals	*	400
• (U) Determine freeze-thaw effects on engine stability	*	400
Total		2850

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Define strategies to enhance microbial rates at low temperatures	*	800
• (U) Complete environmental effects studies on degradation of TNT by Cyanobacteria Mats	*	407
• (U) Determination of single constituent oxidation pathways for chemical oxidation of explosives contaminated media	*	400
• (U) Design benchmark set of dynamic spatial applications for modeling complex environmental phenomena	*	800
• (U) Field test propagation of cryptogams	*	891
• (U) Develop noise array design procedure	*	800
• (U) Criteria & application control options for vitrification	*	800
Total		4898

(U) Work Performed By: The research supported under this program is primarily performed by 31 in-house Army laboratories and activities and by academic institutions, not-for-profit organizations, and industrial laboratories through contracts and grants. The major laboratories/activities responsible for conducting the project of this program are as follows:

A305 - U.S. Army Research Laboratory, Adelphi, MD
A31B - Night Vision and Electronics & Sensors (CECOM), Fort Belvoir, VA
B52C - Topographic Engineering Center , Fort Belvoir, VA

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Program Element: #0601102A
PE Title: Defense Research Sciences

Budget Activity: #1

B53A - U.S. Army Research Laboratory, White Sands Missile Range, NM
A71A - Chem. Research, Development and Engineering Ctr, Aberdeen Proving Ground, MD
B74A - U.S. Army Research Laboratory, Aberdeen Proving Ground, MD
B74F - US Army Research Institute for Behavioral and Social Sciences, Alexandria, VA
A751 - Department of Defense Education Activity, Alexandria, VA
AF20 - U.S. Army Research Laboratory, Cleveland, OH
AF22 - Tank-Automotive Command, Warren, MI
BH27 - Armament Engineering Directorate, Dover, NJ
AH40 - Center for Signals Warfare, CECOM, Warrenton, VA
AH42 - U.S. Army Research Laboratory , Watertown, MA
AH43 - U.S. Army Research Laboratory, Aberdeen Proving Ground, MD
AH44 - U.S. Army Research Laboratory, Adelphi, MD
AH45 - Aviation and Troop Command, St. Louis, MO
AH47 - U.S. Army Research Laboratory, Fort Monmouth, NJ
AH48 - Communications and Electronics Command, Fort Monmouth, NJ and Army Research Laboratory
AH49 - Missile Command, Redstone Arsenal, AL
AH51 - Belvoir Research, Development and Engineering Center, Fort Belvoir, VA and U.S. Army Research Laboratory , Watertown, MA
AH52 - Natick Research, Development and Engineering Center, Natick, MA
BH57 - Army Research Office, Research Triangle Park, NC is responsible for managing the following Centers of Excellence:
Electronics: Columbia University, Georgia Institute of Technology, Massachusetts Institute of Technology, Stanford University
Rotorcraft: Rensselaer Polytechnic Institute, University of Maryland, Georgia Institute of Technology
Mathematics: Cornell University, SUNY at Stoneybrook, University of Puerto Rico, City College of CUNY
High Performance Computing Research: University of Minnesota, Purdue University, Howard University, Jackson State University
Artificial Intelligence: University of Pennsylvania
Training Research: Morris Brown College
Information Sciences: Clark Atlanta University
AH60 - Fire Support Armaments Center, Dover, NJ
AH61 - Close Combat Armaments Center, Dover, NJ

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0601102A
PE Title: Defense Research Sciences

Budget Activity: #1

AH66 - Army Research Laboratory, Langley, VA
BH67 - Army Materiel Command Laboratories and Centers
AH68 - U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi.
BS04 - US Army Biomedical Research Laboratory, Ft. Detrick, MD
BS11 - US Army Medical Research Institute of Chemical Defense, Aberdeen Proving Ground, MD; Walter Reed Army Institute of Research, Washington, D.C.
BS12 - US Army Medical Research Institute of Infectious Diseases, Ft. Detrick, MD; Walter
BS13 - Walter Reed Army Institute of Research, Washington, DC; US Army Medical Research Institute of Infectious Diseases, Fort Detrick, MD; US Army Biomedical Research Laboratory, Fort Detrick, MD; US Navy CONUS/OCONUS units.
BS14 - Letterman Army Institute of Research, Presidio of San Francisco, CA; US Army Institute of Surgical Research, Fort Sam Houston, TX; Walter Reed Army Institute of Research, Washington, D.C.
BS15 - US Army Aeromedical Research Laboratory, Ft. Rucker, AL; US Army Research Biomedical Research and Development Laboratory, Ft. Detrick, MD; Letterman Army Institute of Research, San Francisco, CA; Walter Reed Army Institute of Research, Washington, D.C.
BS16 - US Army Institute of Dental Research, Washington, DC
BS17 - Walter Reed Army Institute of Research, Washington, D.C.
AT22 - US Army Engineer Waterways Experiment Station, Vicksburg, MS
AT23 - U.S. Army Civil Engineering Research Laboratory, CERL, Champagne, IL
AT24 - U.S. Army Cold Regions Research and Engineering Laboratory, Hanover, NH
BT25 - U.S. Army Civil Engineering Research Laboratory, and U.S. Army Engineer Waterways Experiment Station.

(U) **Related Activities:** Work in this program element is related to and fully coordinated with efforts in PE #0601104A (Federally-Funded Research & Development Center Electromechanics & Hypervelocity Physics), PE #0602120A (Electronic Survivability & Fuzing Technology), PE #0602623A (Joint Service Small Arms Program), PE #0602624A (Weapons and Munitions Technology), PE #0602720A (Environmental Quality Technology), PE #0602784A (Military Engineering Technology), PE #0602786A (Logistics Technology), PE #0602787A (Medical Technology) and #0601103D, University Research Initiatives; the Navy, Air Force, and other Department of Defense agencies; National Aeronautics and Space Administration; National Science Foundation; Department of the Interior; Department of Energy; National Bureau of Standards; other Government agencies; and government agencies of Allied nations sponsor related research in areas of this program. Coordination is accomplished and duplication avoided

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0601102A
PE Title: Defense Research Sciences **Budget Activity: #1**

through Project Reliance; Tri-Service topical reviews; exchange of progress reports and technical reports; inter-Service/agency liaison; and formal national and international meetings and symposia. Informal coordination occurs through: visits to governmental, industrial, and academic laboratories and installations; review of the scientific literature; and publications of current research. The Army's Defense Research Sciences Program is included in the Tri-Service Technology Coordinating Papers. There is no duplication of effort in the Army or the Department of Defense.

(U) Other Appropriation Funds: ($ in Thousands) Not applicable.

(U) International Cooperative Agreements: The Army Research Office, which is the Army's primary interface to the university community, maintains cognizance of free-world research that is potentially relevant to the Army in addition to maintaining liaison offices in Japan and Europe.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0601104A**
PE Title: **Electromechanics and Hypervelocity Physics Reasearch**

Budget Activity: **#1**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
BH62 Electromechanics and Hypervelocity Physics	3686	5707	5050	8174	9779	11398	12510	Cont	Cont

B. (U) BRIEF DESCRIPTION OF ELEMENT: The objectives of this element are to: (1) Conduct long-term basic and applied research to improve the state of the art of pulsed power technology for electrically powered hypervelocity guns, and other applications such as high power microwave, lasers, and electric vehicles; (2) conduct an extensive experimental program in hypervelocity physics to model aeroballistic and aerothermal phenomena for design, development and test of projectiles and materials to defeat hardened targets; and (3) develop and conduct educational programs to transfer new technologies to personnel involved in the development or employment of advanced systems. Work in this program element is consistent with the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan, and DoD Project Reliance. Tactical demands on the future battlefield will require more mobile and lethal weapons systems having greater range and lethality, and reduced logistical demands to speed deployability and support. Electric guns with hypervelocity projectiles are one approach to achieving these needed improvements. Through FY 1993, this project funded the Army's Federally-Funded Research and Development Center (FFRDC), the Institute for Advanced Technology (IAT), for Electromechanics and Hypervelocity Physics which supported critical Army research relating to electromechanical systems for application to electromagnetic (EM) and electrothermal-chemical (ET-C) guns. Additionally, this project provided for research, testing and computer modeling of advanced hypervelocity (HV) projectiles. These focused efforts serve as catalysts for technological innovation and provide vital support to the Army technology base crucial to advanced weapons systems development with potential applications for anti-armor, artillery and air defense. After FY 1993, the Army transitioned the IAT to a non-FFRDC organization.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project BH62 - Electromechanics and Hypervelocity Physics:

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Researched/assessed hypervelocity physics technology to gain fundamental understanding of launch. flight, impact and		

lethality of hypervelocity projectiles for application to design optimization of future weapon systems	*	1800
• (U) Performed research and critical technical reviews of electrodynamics technology and provided technical expertise on the development of electric gun advanced demonstrators	*	1486
• (U) Conducted a comprehensive education and training program for Army military and civilian personnel in the high technology science and engineering disciplines	*	400
Total		3686

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Perform electrodynamics research in advanced modeling, armature/rail optimization, energy storage, and technology integration to optimize power supply/armature rail interface	*	2500
• (U) Conduct hypervelocity physics research in penetration mechanics and aerophysics of HV projectiles to quantify HV projectile effectiveness	*	2000
• (U) Provide training and technical expertise as the Army's independent evaluator of E-Gun development tasks	*	1207
Total		5707

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Conduct hypervelocity physics research and assessments to determine the lethality and flight performance of optimized hypervelocity projectiles to benefit Army mission areas	*	2350
• (U) Conduct experimentation, analysis, modeling and simulation activities in electrodynamic/electromechanic technologies, i.e., battery/capacitor based pulse-forming networks, railguns & coilguns to support multiple applications	*	1700
• (U) Provide education and technical expertise as the Army's independent evaluator of electric gun development tasks	*	1000
Total		5050

(U) **Work Performed By:** Contractors include the University of Texas/Institute for Advanced Technology (UT/IAT). The primary manager of the IAT's technical activities is the U.S. Army Armament, Research Development and Engineering Center (ARDEC).

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

(U) Related Activities: This program adheres to Tri-Service Reliance Agreements on Conventional air/surface weaponry with oversight provided by

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0601104A
PE Title: Electromechanics and Hypervelocity Physics Reasearch

Budget Activity: #1

the Joint Directors of Laboratories. Work in this Program Element is related to and fully coordinated with efforts in PE #0601102A (Defense Research Sciences), PE #0602618A (Ballistics Technology), PE #0602624A (Weapons & Munitions Technology), PE # 0603004A (Weapons & Munitions Advanced Technology), PE #0602303A (Missile Technology), and PE #0603313A (Missile & Rocket Advanced Technology) in accordance with the on-going Reliance joint planning process and contains no unwarranted duplication of effort among the Military Departments.

(U) Other Appropriation Funds: ($ in Thousands) Not applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602105A
PE Title: Materials Technology

Budget Activity: #2

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
AH69 Cast Ductile Iron	0	2000	0	0	0	0	0	0	2000
AH84 Materials	17696	15274	11083	10163	10684	11239	11844	Cont	Cont
PE TOTAL	17696	17274	11083	10163	10684	11239	11844		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element advances materials technology necessary to assure future land warfare supremacy. Efforts are focused in development, assessment and systems support in advanced materials (i.e., metals, ceramics, polymers, composites/hybrids, mechanics, and structures) for individual soldier applications, guns, missiles, armor, ground vehicles, and helicopters. This Program Element has been restructured to include components scale-up. PE/Project 0603102A/D071 was restructured in FY 1994 into this PE. The work in this program element is consistent with the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan, and Project Reliance.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project AH69 - Cast Ductile Iron: This project was started in FY 1994 in response to Conference report 103-339, page 117, dated November 9, 1993. Appropriations and Authorization conferees supported this initiative to evaluate cast ductile iron, especially for tracked vehicle components, such as track shoes. In previous years, investigations of cast ductile iron have been carried out under Manufacturing Technology (MANTECH) programs. Funds for fabrication of vehicle components have been allocated to the U.S. Army Tank Automotive Command.

(U) FY 1993 Accomplishments: Not applicable

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Fabricate combat vehicle component hardware for test and evaluation	4Q94	1000

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602105A
PE Title: Materials Technology

Budget Activity: #2

• (U) Explore non-munition applications and process improvements for cast ductile iron and austempered ductile iron	4Q94	1000
Total		**2000**

(U) FY 1995 Planned Program: Not applicable

(U) Project AH84 - Materials: This program is the technical foundation for providing necessary materials technology in metals, ceramics, polymers, and composites for all future Army systems. It is also the basis for solving materials related problems in existing fielded systems. The efforts address technologies required to meet increased performance, reliability and survivability demands of current and future systems in aircraft, armaments, missiles, ground vehicles, combat support and personnel support equipment. Cost reduction is addressed through materials manufacturing/processing developments.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Tested hybrid ceramic armor systems designed to defeat medium caliber (30mm and VIPER High Explosive Anti-Tank (HEAT)) current and advanced threats	*	3000
• (U) Completed adiabatic shear model for two-phase composite penetrator materials	*	340
• (U) Completed a series of subscale and full scale filament wound High Capacity Artillery Projectile (HICAP) aft bodies	*	1631
• (U) Designed, built and demonstrated Sensors Mounted As Roving Threads (SMART) weave sensor system; patent awarded for SMART weave system	*	2160
• (U) Filed patent on ceramic-composite formulation for phase shifter materials	*	1555
• (U) Produced prototype fins for U.S. Army Missile Command evaluation in advanced kinetic energy (KE) missile application	*	1800
• (U) Completed initial formulation of Volatile Organic Compound (VOC) compliant coatings compatible with corrosion inhibiting pigments	*	2317
• (U) Developed control loop for cam suspension system to cancel system's friction and rotational effects; and conducted tests of baseline aluminum/hybrid armor panels	4Q93	496
• (U) Developed robotic ultrasonic sensor system and non-destructive tests to evaluate critical defects in composite panels and full-scale tests to measure penetrator erosion rates	4Q93	397
• (U) Investigated hardened lightweight advanced materials for missile applications	*	4000
Total		**17696**

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

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Program Element: #0602105A
PE Title: **Materials Technology**

Budget Activity: #2

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Conduct technical evaluation of composite armored vehicle demonstration contractor proposals, and develop and integrate materials and structures technology into Army Research Laboratory (ARL) programs	*	750
• (U) Optimize processing and bonding of advanced materials, specifically, demonstrate SMART weave techniques for monitoring resin flow and state of cure in processing of thick composite plates	*	3978
• (U) Provide tandem array ceramic armor for defeat of combined medium caliber KE and hand-held high explosive anti-tank threats	*	1784
• (U) Determine optimum alloying materials for tungsten with respect to Adiabatic shear model	*	350
• (U) Demonstrate: improved wear/corrosion resistance in aircraft materials using ion beam processes; and corrosion resistant schemes for advanced magnesium aircraft components	*	1570
• (U) Development of ceramic/metallics for high temperature applications, specifically, demonstrate high quality tailored ceramics for light weight, wear resistant components for heat engine/propulsion systems	4Q94	892
• (U) Demonstrate flexible chemical resistant barrier coatings for clothing/shelters; Chemical Agent Resistant Coatings (CARC) with signature reduction attributes; and laser protective schemes for eye wear and sensors	*	1260
• (U) Develop composites for extreme environments/performance; full-scale tests of two piece vectorable, multi-pilot point solid rocket motor nozzles	*	4000
• (U) Develop advanced structural analyses and Non-Destructive Evaluation (NDE) program for complex geometry thick structures and analyze strength tests of thick curved sections	*	690
Total		**15274**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Make available a tungsten-based material that performs as well as depleted uranium in model scale ballistic testing	*	440
• (U) Provide a new military specification on low cost titanium alloys for armor applications	*	2400
• (U) Fabricate thin film alumina barium strontium titanate composites for phase shifter applications; development of laser barrier and signature reflective coatings	*	1440
• (U) Provide technical support CAV demonstration; development and evaluation of novel composite materials for ground vehicles	*	1810
• (U) Demonstrate feasibility of adhesively bonding Lithium/Aluminum alloys	*	620

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602105A**
PE Title: **Materials Technology**

Budget Activity: **#2**

• (U) Optimize dry ion beam treatments as environmentally acceptable alternatives to specific cadmium/ chronium electroplating applications; development of multi-functional protective coatings	*	2229
• (U) Demonstrate potential of SMART weave sensor grid for real time monitoring of composite parts during service	4Q95	1439
• (U) Apply NDE methods using to develop proven technology for thick composite structures, and evaluate advanced structural analyses for complex geometry thick composite structures	*	705
Total		**11083**

(U) Work Performed By: Work primarily performed in-house by: U.S. Army Research Laboratory (ARL), Materials Directorate, Watertown, MA; ARL, Vehicle Structures Directorate, Hampton, VA; Army Research Office, Research Triangle Park, NC. Limited support via other government agencies. Contractors include: University of Massachusetts, Amherst, MA; Colorado School of Mines, Golden CO; National Science Foundation, Washington, D.C.; and Bell Helicopter Textron, Fort Worth, TX.

(U) Other Appropriation Funds: ($ in Thousands) Not applicable.

(U) Related Activities: Activities are coordinated with other Government services and agencies including OSD Tri-service program reviews in materials and structures, and the Joint Directors of Laboratories Reliance Technical Panel on Advanced Materials. There is no unnecessary duplication of effort within the Army or Department of Defense.

(U) International Cooperative Agreements: The Technical Cooperation Program (TTCP) and Data Exchange Agreements (DEA) with the Republic of Korea and France.

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602120A**
PE Title: **Electronic Survivability and Fuzing Technology** Budget Activity: **#2**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
AH15 Ground Combat Identification (ID) Technology	9431	4673	4302	3725	3799	3843	3942	Cont'd	Cont'd
AH16 Sensors, Signatures, Signal and Information Processing (S3I) Technology	4829	18500	10917	11217	11733	12107	13406	Cont'd	Cont'd
AH25 Nuclear Effects Survivability Technology	6063	5382	4947	4790	5369	6204	7179	Cont'd	Cont'd
A140 High Power Microwave (HPM) Technology	6980	6153	5870	2644	2715	2855	3064	Cont'd	Cont'd
PE TOTAL	27303	34708	26036	22376	23616	25009	27591		

B. (U) BRIEF DESCRIPTION OF ELEMENT: The objectives of this program are: first, to provide sensor, signal and information processing technology for advanced Reconnaissance, Intelligence, Surveillance, and Target Acquisition (RISTA), ground Combat Identification (ID), and fire control systems as well as the fuzing and guidance integrated fuzing functions in future munitions and second, to determine and reduce the susceptibility and vulnerability of Army equipment and systems to Nuclear and Radio Frequency (RF)/High Power Microwave (HPM) environments. Four critical technologies are addressed to increase the combat effectiveness of tactical Army Forces: (1) High Power Microwave (HPM) Technology, (2) Combat Identification Technology, (3) Sensors, Signatures, Signal and Information Processing (S3I) Technology, and (4) Nuclear Effects Survivability Technology. Work in this program element is consistent with the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan and Project Reliance. Beginning in FY94 PE/Project #0602782A/AH93 (Combat Surveillance and Target Acquisition) was merged into AH16 Fuzing to create a realigned Project AH16 titled Sensors, Signature, Signal and Information Processing Technology.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project AH15 - Ground Combat Identification (ID) Technology: The objective of the project is to conduct research and evaluation on advanced technology for Combat ID. The science and technology will focus on advanced components and software algorithms for identification of ground vehicles and dismounted soldiers. Advanced components and techniques will be investigated which provide increased effectiveness,

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602120A
PE Title: **Electronic Survivability and Fuzing Technology**

Budget Activity: #2

reliability, survivability and affordability. The technology and concepts investigated in this project will transition to the advanced technology Combat ID project in PE 0603772A.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Completed Combat ID Architecture Study to select candidate technologies	4Q93	4301
• (U) Supported Situational Awareness (SA) definition process (Front End Analysis)	4Q93	1600
• (U) Conducted initial feasibility studies for embedded ID and advanced Target Identification (TI)	4Q93	3530
Total		**9431**

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Perform force-on-force effectiveness modeling/simulation of candidate advanced target ID techniques. Complete initial experiments on improved target ID using thermal imagery	4Q94	970
• (U) Complete initial development of embedded signature technology	4Q94	1768
• (U) Complete assessment of the ability of aided/automatic target identification processing, multi-sensor correlation and data fusion to enhance combat IDcapability	4Q94	1000
• (U) Define requirements for low cost, precision northfinding module to support engagement situational awareness needs	4Q94	100
• (U) Complete field demonstration of one alternative combat identification approach for dismounted soldier using laser/millimeter wave interrogation and RF reporting of ID and position information	3Q94	835
Total		**4673**

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Complete development of improved model of FLIR target ID and development of improved training materials for the FLIR operator	4Q95	607
• (U) Complete initial field testing of low probability of detection/intercept embedded signature technology	4Q95	2000
• (U) Evaluate against Combat ID requirements and complete initial testing of prototype low cost, precision northfinding module to support engagement situational awareness needs	4Q95	250
• (U) Complete field demonstration of miniaturized millimeter wave interrogator/transponder combat identification system for the dismounted soldier	4Q95	445
• (U) Complete demonstration of preliminary multi-sensor correlation and data fusion algorithms	4Q95	1000
Total		**4302**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602120A**
PE Title: **Electronic Survivability and Fuzing Technology**

Budget Activity: **#2**

(U) Project AH16 - Sensors, Signatures, Signal and Information Processing (S3I) Technology: Beginning in FY94, this project has been restructured by incorporating the efforts previously performed under PE #0602782A/AH93 (Combat Surveillance and Target Acquisition) to provide for the synergistic development of sensor, signal and information processor technology for RISTA, Fire Control, Smart Munitions and fuzing systems. In the RISTA and Fire Control area, the project will develop and demonstrate: (1) advanced Ultra Wide Band (UWB) radar technology in the all-weather, wide-area detection, location and recognition of tactical ground targets concealed in foliage, and buried mines; (2) innovative algorithms for the detection, discrimination, and classification of stationary targets from a low flying helicopter; (3) affordable, lightweight target acquisition radar technology for man-portable and ground vehicle applications; (4) advanced optical processing techniques to automatically process, at the sensor, the received signals into target information of sufficiently narrow bandwidth to be compatible with Army communication systems. Project goals in the smart munitions and fuzing sensor area include development of advanced microwave, millimeter wave (MMW), acoustic, electrostatic, and ladar technologies to reliably sense low-cross section targets in high countermeasures and clutter environments. In FY93 there are Fuze Technology accomplishments only. In FY94, the merger of PE/Project #0602782A/AH93 (Combat Surveillance and Target Acquisition) into AH16 accounts for the significant increase in funding and activity for this year. Also added in FY94 are the funds that came from PE/Project #0602709A/DH95 with the Night Vision elements that transferred into the Army Research L[illegible]ory (ARL). That work includes developing an algorithm that synergistically uses outputs of Forward Looking Infrared (FLIR) and Laser Radar (LADAR) sensors to identify combat vehicles, and performing signature predictions in many bands (infrared, visible, MMW and LADAR) from target and backgrounds at specified times, weather conditions and locations.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Developed simulation of end-game aim-point selection by millimeter-wave (MMW) anti-armor seekers	4Q93	865
• (U) Demonstrated and validated artillery projectile tracking using Global Positioning System (GPS)	4Q93	495
• (U) Developed techniques and discriminants to allow proximity fuze sensors to detect helicopter targets in foliage clutter for optical, radio frequency and electrostatic sensors	4Q93	678
• (U) Integrated a portion of the Low Cost Advanced Target Sensor (LCATS) fuze signal processor circuits into electronic integrated circuit chips that are suitable for insertion into low-cost fuzing systems	4Q93	500
• (U) Developed 3D sensitivity analysis of Guidance Integrated Fuzing (GIF) algorithms	4Q93	674
• (U) Designed Smart Mines testbed and developed advanced acoustic algorithms	4Q93	1617
Total		**4829**

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Develop low depression angle real aperture radar clutter data base, and develop procedures for embedding targets in the clutter. Using this data develop innovative target/clutter discriminants	4Q94	2384

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602120A**
PE Title: **Electronic Survivability and Fuzing Technology** Budget Activity: **#2**

• (U) Develop the first iteration of a specific detection logic and insert an advanced Analog/Digital (A/D) converter to improve the Ultra Wide Band (UWB) foliage penetration (FOPEN) Synthetic Aperture Radar (SAR) testbed	4Q94	3862
• (U) Demonstrate two-dimensional optical processing for Synthetic Aperture Radar (SAR) and wideband radar, integrating a range-doppler processor into the Missle Command (MICOM) Multi-Role Survivable Radar (MRSR) and design the optical pulse compressor for the Communications, Electronics Command (CECOM) Electronic Support Measures (ESM) testbed	*	2630
• (U) Development of target engagement sensor technologies including GPS, and Electro Static Sensor	*	1492
• (U) Demonstrate Smart Mine testbed with advanced acoustic algorithms and design multi-sensor capability into the testbed	4Q94	974
• (U) Develop sensor/target simulation and an Automatic Target Recognition (ATR) algorithm for LADAR and FLIR 10-12 class target and evaluate system	4Q94	698
• (U) Evaluate improved models and sensor designs for Air and Ground target engagements	*	1470
• (U) Construct an advanced transceiver which can support multiple modes such as wide area surveillance, track while scan, and enhanced vehicle classification for use in man portable and vehicle-mounted radars for battlefield applications	4Q94	990
• (U) Develop technologies for passive millimeter wave (MMW) camera and line scanner	*	4000
Total		**18500**

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Expand UWB SAR technology to demonstrate improved vehicle detection in foliage, and to implement a transportable testbed for sub surface target detection studies	*	1480
• (U) Demonstrate digital pulse compression, investigate digital Inphase/Quadrature phase (I/Q) demodulation and demonstrate digital phase control of Direct Digital Synthesizer (DDS) to compensate for transceiver phase errors for the detection of moving and stationary targets	4Q95	915
• (U) Develop neural net based stationary target/clutter discriminator and test on existing radar data base. Identify alternate target clutter algorithm architectures	*	1858
• (U) Develop algorithms and implementation architectures for interfacing wide band optical correlation processors to radar signal processing for the CECOM Electronic Support Measures (ESM) and the MICOM Multi-Role Survivable Radar (MRSR) testbeds	*	2266
• (U) Demonstrate improved multi-sensor automatic target recognition (ATR) algorithms to expand the ATR operation envelope, and increase performances by further emphasizing target signature differences	*	842
• (U) Develop enhanced target engagement sensor technologies including, Microwave, Electrostatic, & GPS for future Army systems	*	1397

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602120A
PE Title: Electronic Survivability and Fuzing Technology Budget Activity: **#2**

• (U) Develop MMW and electro-optic breadboards and modeling technologies needed for the development of improved target acquisition, tracking, and endgame engagement techniques	*	1428
• (U) Incorporate multi-sensor capabilities and evaluate them in the Smart Mines Testbed	4Q95	731
Total		**10917**

(U) Project AH25 - Nuclear Effects Survivability Technology: This project develops and provides nuclear weapon effects survivability technology for designing, producing, and fielding tactical systems and equipment for the Army and other military services in accordance with the Tri-Service Reliance Agreements on Nuclear Weapons Effects. The goals are to understand new weapons phenomena and the response of new emerging technologies to nuclear weapons effects, to develop new techniques for mitigating the response and protecting systems against the effects, and to develop new methods for analyzing and simulating the effects in order to reduce the costs for achieving nuclear survivability. This project will provide cost effective solutions for the rapidly growing threat of nuclear weapons technology proliferation in the Third World.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Developed Electromagnetic Pulse (EMP) design practices for electronic equipment shelters	4Q93	600
• (U) Developed fluidic helicopter flight control transducers to protect against nuclear EMP and other electromagnetic effects	3Q93	500
• (U) Developed an optimized memory test methodology for verifying the nuclear radiation survivability of Complementary Metal Oxide Semiconductor (CMOS) random access memories	4Q93	500
• (U) Developed EMP terminal protection device data base for use in designing future systems	4Q93	430
• (U) Evaluated airblast turbulence codes using data from laboratory simulators	4Q93	400
(U) Calculated nuclear radiation protection for the crew of the M1A2 Abrams tanks	3Q93	402
• (U) Developed computational methods for predicting the effects of terrain on the low altitude EMP environment	4Q93	600
• (U) Determined the probability of producing non-ideal airblast for various weapons yields, heights of burst, and terrains	*	770
• (U) Developed a layered metal foil technique for electromagnetic shielding of composite materials and demonstrated radiation hardened silicon carbide semiconductors for high temperature applications	4Q93	890
• (U) Enhanced the NUSSE4 model to include meteorological effects on cloud travel and the breakup, dispersion and fall of aerosols	4Q93	971
Total		**6063**

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FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602120A**
PE Title: **Electronic Survivability and Fuzing Technology**

Budget Activity: **#2**

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Model the physics of silicon carbide semiconductor operation	*	400
• (U) Develop test methodology for nuclear radiation upset of application-specific integrated circuits.	4Q94	450
• (U) Develop an improved EMP terminal protection device performance model for use in designing future systems	3Q94	560
• (U) Complete characterization testing of laboratory scale blast/thermal simulator for evaluating new materials and design concepts	3Q94	450
• (U) Complete calculation of radiation protection for the crew of the Advanced Field Artillery System and develop a low altitude source region EMP prediction code	4Q94	1043
• (U) Define the non-ideal nuclear airblast threat to tactical Army systems deployed on desert terrain.	*	500
• (U) Develop analytical methods and experimental facilities to characterize the electromagnetic shielding properties of composite structures	*	720
• (U) Develop a candidate radiation hardened ferroelectric non-volatile memory integrated circuit for use in future systems	4Q94	500
• (U) Improve investigative techniques for Nuclear Biological Chemical/Smoke and Obscurants threat effects on equipment and personnel	*	759
Total		5382

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Conduct electromagnetic shielding tests of candidate materials for use in future Army systems	*	350
• (U) Develop guidelines for designing radiation hardened integrated circuits	3Q95	430
• (U) Evaluate the electromagnetic shielding characteristics of a prototype composite electronic equipment shelter	4Q95	400
• (U) Demonstrate no-cost-impact process changes to improve the radiation hardness of commercial electronic components	*	400
• (U) Calculate nuclear radiation protection for the crew of the composite armored vehicle and demonstrate improved speed of EMP analysis using massively paralled processors	4Q95	972
• (U) Demonstrate the ability to simulate the non-ideal nuclear airblast and test the effects on Army vehicles	*	500
• (U) Identify state-of-the-art commercial electronic components that can be used in Army systems with nuclear survivability requirements	4Q95	500

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FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602120A**
PE Title: **Electronic Survivability and Fuzing Technology** Budget Activity: **#2**

• (U) Demonstrate methods of enhancing the electromagnetic shielding properties of composite materials	*	560
• (U) Improve algorithms to insert chemical, biological, and nuclear impact into conventional weapon effects models	*	835
Total		**4947**

(U) Project A140 - High Power Microwave (HPM) Technology: The objective of this project is to develop the tools, techniques and methodology to assess the susceptibility and vulnerability of Army equipment and systems to various types of Radio Frequency (RF)/High Power Microwave (HPM) environments, and to identify and evaluate the technology required to protect and harden U.S. equipment.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Performed HPM susceptibility assessments (analytical and experimental) on U.S. and foreign fuzes, threat helicopter radio and altimeter, threat mines and Anti-Tank Guided Munitions (ATGMs), and two threat radio technologies	4Q93	2207
• (U) Conducted High Power Radio Frequency/Directed Energy Weapons (HPRF/DEW) hardening technology assessments and demonstrations of a foreign mine and the electronics of a mobile ground based system	4Q93	1253
• (U) Demonstrated a compact, 40pica seconds (ps) pulsewidth laser source and completed L-Band split cavity oscillator for HPM assessments	4Q93	2964
• (U) Developed improved methodology for determining susceptibility of US Army and foreign missile fuzes to RF threat environment	4Q93	556
Total		**6980**

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Perform HPM susceptibility assessments and establish database of attack helicopter avionics technology, communications technology and ground based equipment technologies	*	1940
• (U) Determine hardening protective measures for the Global Positioning System (GPS) and continue composite material electromagneticeffects measurements for Environmental Electromagnetic Effects (E3) hardening	4Q94	1104
• (U) Characterize two wideband pulsers and continue HPM component development involving backward wave oscillator, amplifier, and the multiwave Cerenkov Generator	*	2614
• (U) Upgrade tools to implement characterization of ultrawide band HPM environment	*	495
Total		**6153**

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602120A
PE Title: Electronic Survivability and Fuzing Technology

Budget Activity: #2

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Conduct HPM susceptibility assessments and analysis of foreign and domestic assets including mines, missiles, and fuzes	*	1850
• (U) Conduct HPRF/DEW hardening technology investigations of the 21st Century Land Warrior Identify Friend or Foe system and the helmet mounted display for hardening protective measures	4Q95	1052
• (U) Develop HPM tools (sources/components) for indoor/outdoor experimentation including antennas and pulse power amplifiers for HPM environment simulation	*	2492
• (U) Improve special electromagnetic interference, High Power Microwave, and ultrawide band RF analysis methodologies using impulse electromagnetic fields	*	476
Total		**5870**

(U) **Work Performed By:** In-house work to be primarily performed by the U.S. Army Research Laboratory (ARL), Adelphi, MD. Additional work performed by the U. S Army Communications-Electronics Command (CECOM) Night Vision Electronic Sensors Directorate, FT Belvoir, VA. For project AH15 program oversight is through PM Combat ID, Ft Monmouth, NJ and PEO Intelligence and Electronic Warfare, Vint Hill Farms, Warrenton, VA. Contractors include: Martin Marietta Corp., Orlando, FL; Mission Research Corp., San Diego, CA; Sol Telecommunications Services, Tucson, AZ; SRI International, Menlo Park, CA; Electronics Development Corp., Columbia, MD; Hughes Aircraft Company, Torrance, CA; KDI, Cincinnati, OH; Magnavox, Ft. Wayne, IN; Millitech, Deerfield, MA; Motorola, Scottsdale, AZ; Reticon Corp., Sunnyvale, CA; Sandia National Laboratories, Albuquerque, NM; University of Florida, Gainesville, FL; VLSI Inc., Milpitas, CA; Science Applications International Corp., McLean, VA; Booz Allen Hamilton, Bethesda, MD; Mission Research Corp., Santa Barbara, CA; New Mexico State University, NM; Optimetrics, Inc., Ann Arbor, MI; Massachusetts Institute of Technology, Cambridge, MA; Mission Research Corporation, Newington, VA; Berkeley Research Associates, Springfield, VA; Varian Beverly Division, Beverly, MA; Sol Telecommunications, Inc., Annandale, VA; Directed Technologies, Inc., Arlington, VA; University of Maryland, College Park, MD; and Mitre Corporation, McLean, VA.; Thermo-Trex Corp, MIT/Lincoln Labs, University of Florida, Boeing, Power-Spectra and Ohio State University.

(U) **Related Activities:** This program adheres to Tri-Service Reliance Agreements on Technology Panel for Sensors; Technology Panel for Conventional Air/Surface Weaponry; Vulnerability Assessment and Directed Energy Weaponry and Nuclear Weapons Effects and Nuclear Weapons Effects with oversight and coordination provided by the Joint Directors of Laboratories (JDL). Work in this program element is related to and fully coordinated with efforts in PE #0605604A (Survivability & Lethality Analysis), PE #0601102A (Defense Research Sciences), PE #0602303A (Missile Technology), PE #0602624A (Weapons & Munitions Technology), PE #0602709A (Night Vision Technology), PE #0603005A (Combat Vehicle & Automotive Advanced Technology), PE #0603742A (Advanced Electronic Devices Development), PE #0603745A (Tactical Electronic

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FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602120A
PE Title: Electronic Survivability and Fuzing Technology **Budget Activity: #2**

Support Systems - Advanced Development), PE #0603772A (Advanced Tactical Computer Science & Sensor Technology) and PE #0604270A (Electronic Warfare Development). There is no unnecessary duplication of effort within the Army or DoD.

(U) Other Appropriation Funds: ($ in Thousands) Not applicable.

(U) International Cooperative Agreements: DEA/MOU with Sweden, France, and Germany.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602211A**
PE Title: **Aviation Technology**

Budget Activity: **#2**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
AH85* Aircraft Avionics Technology	9803	6725	0	0	0	0	0	Cont'd	Cont'd
Aeronautical & Aircraft Weapons Technology	35414	24251	16649	16490	17022	17580	18126	Cont'd	Cont'd
A47B** Vehicle Propulsion & Structures Technology	0	4131	3344	2733	2765	2903	3109	Cont'd	Cont'd
PE TOTAL	45217	35107	19993	19223	19787	20483	21235		

* Efforts in support of aircraft avionics technology beyond FY94 will be conducted in PE 0602782 Project A779.
** Project established to fund Vehicle Structures and Propulsion Directorates in accordance with implementation of BRAC 91.

B. (U) BRIEF DESCRIPTION OF ELEMENT: The objective of this program element (PE) is to develop aeronautical technology for new and/or upgrades to DoD/Army Vertical Take-off and Landing (VTOL) airmobile systems. Helicopter rotors provide low disc loading as compared to the tilt rotor's intermediate disc loading and vertical lift jet engine's high disc loading. Low disc loading Vertical Take-off and Landing (VTOL) aircraft offer a practical solution to many of the DoD/Army's operational needs. Such aircraft, with their ability to operate below tree top level for Nap-of-the-Earth (NOE) missions, present significantly different analysis and design challenges from traditional fixed wing aircraft which fly at higher altitudes. The Army Aviation Science and Technology program's functional organization with assistance from National Aeronautics and Space Administration (NASA) at three co-located activities are the focal points for US efforts in rotorcraft technology. Technical areas include aeromechanics, aerodynamics, structures, propulsion, reliability and maintainability, safety and survivability, mission support equipment, aircraft system synthesis, aircraft subsystems, advanced helicopter analysis, flight simulation, aircrew-aircraft integration, aircraft weapons, aircraft avionics for command and control, air-to-air/air-to-ground communications, controls and displays, digital avionics and architectures, NOE navigation, mission planning, air traffic management and investigation and selective application of Integrated Product and Process Development (IPPD) techniques. These technologies are continuously being researched for applications to improve and correct deficiencies in current DoD/Army VTOL aircraft systems, and to improve the capabilities of future rotorcraft. The work in this PE is consistent with the Army Science and Technology Master Plan

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602211A
PE Title: **Aviation Technology**

Budget Activity: #2

(ASTMP) and Army Aviation Modernization Plan, and DoD Project Reliance agreements.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project AH85 - Aircraft Avionics Technology: The objective of this project is the exploration of new concepts and techniques in aviation electronics to achieve new and enhanced military functional capabilities. Emphasis is on aided pilotage, mission planning, precision navigation, nap of the earth communications, and integration with the evolving digital command and control battlefield. New enabling technologies which support the current thrusts are also explored, such as aircraft controls and displays, voice interactive technology, fault tolerant processing, real time artificial intelligence processing, covert communication technologies, data communication, and advanced open system architectures and integration concepts.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Completed low level aided pilotage flight test and demonstrated injection of flight path guidance symbols into night vision goggles	4Q93	4328
• (U) Completed Army Fault Tolerant Architecture (AFTA) detailed design and demonstrated compliance with open system architecture	4Q93	436
• (U) Completed system level diagnosis and functional testing of Real Time Artificial Intelligence System (RTAIS) brassboard	4Q93	387
• (U) Completed aircraft Helmet Mounted Display (HMD) stereo capability evaluation and developed hot bench test capability for effort to define nap of the earth (NOE) flight path guidance display	4Q93	855
• (U) Completed aviation data communication in noise tests and Command and Control (C2) antenna multiplexer tests	4Q93	984
• (U) Integrated Global Positioning System (GPS) and Digital Terrain Elevation Data (DTED) for aviation mission route rehearsal	4Q93	793
• (U) Completed navigation GPS reference receiver specification and GPS satellite selection algorithm based on altitude and terrain for Army NOE and emergency medical service missions	4Q93	1685
• (U) Designed architecture for airborne video compression system	4Q93	200
• (U) Coded prototype Expert Communications Link Manager (ECLM) algorithm and tested on development system	4Q93	135
Total		**9803**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602211A**
PE Title: **Aviation Technology**

Budget Activity: **#2**

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Augment aided pilotage flight path guidance algorithm with laser radar obstacle avoidance sensor and integrate radar deception and jamming (RD&J) pod into aided pilotage aircraft	*	3617
• (U) Augment aircraft mission route rehearsal software with terrain visibility algorithms and develop software to integrate satellite imagery with perspective view generation	*	960
• (U) Complete definition of nap or the earth flight path guidance display and evaluate color helmet mounted display symbology	4Q94	574
• (U) Complete definition for high integrity database for precise terrain/obstacle registration and integrate GPS reference receiver into precision navigation configuration	4Q94	1543
• (U) Evaluate commercial video compression technology for application to airborne platforms	*	31
Total		*6725*

(U) FY 1995 Planned Program: Project transitions to PE 62782, Project A779.

(U) Project A47A - Aeronautical and Aircraft Weapons Technology: The purpose of this project is to conduct exploratory development of technologies for DoD/Army VTOL airmobile systems improvements in operational effectiveness and combat mission capability including air-to-air combat, higher tactical mobility, increased strategic mobility, improved fire power, use of special weapons and increased combat sustainability. This project is essential to maintaining world excellence in rotorcraft technology. Areas of investigation and research consist of the following: fluid mechanics, dynamics, aerodynamics, advanced flight control technology; aircraft and weapons interaction; acoustics and signature reduction, weight reduction; advanced materials applications; internal/external loads; militarization of propulsion/structures technology, engine specific component technologies in support of the DoD Integrated High Performance Turbine Engine Technology (IHPTET) initiative goal demonstrators, advanced smart materials applications; flight simulation; improved soldier machine integration and pilot-vehicle interface, improvements in reliability and maintainability, combat damage repair of new materials, survivability/vulnerability to new threats, crashworthiness, and logistics. These technologies are being developed for application to current as well as future DoD/Army rotorcraft systems.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Completed investigations and demonstrations on the application of Navy rocket system, French target acquisition radar and chemical detection supporting lethality and self protection concepts for helicopter strike capability	*	2167

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602211A**
PE Title: **Aviation Technology**

Budget Activity: **#2**

• (U) Evaluated materials for application to Advanced Rotor Blade Erosion System; demonstrated new textile process for fabricating curved composite fuselage frames and tapered beams; developed finite element model for composite panels with cutout	*	5381
• (U) Developed initial analysis/prediction methods for wake, multirotors, acoustics, and aerodynamics interference, conducted first test of model hi-lift rotor (HLR), and developed individual rotor blade control and vibration reduction techniques	*	3242
• (U) Developed critical flight control system and components for Rotorcraft Aircrew System Concepts Airborne Lab (RASCAL) (UH-60 helicopter), and developed advanced flight control systems and handling qualities criteria for fleet upgrade and VTOL aircraft	*	4195
• (U) Conducted Phase VI of Man-Machine In Design and Analysis System (MIDAS), performed AH-64D displays legibility study with MIDAS, established CRDA with Richmond, CA, Police for 911 Dispatch Console design using MIDAS	*	4852
• (U) Completed propulsion 2-stage axial compressor predicted performance verification, mixed flow ceramic turbine testing, low pressure fuel combustor testing, composite inlet housing fabrication & transmission split torque balanced beam validation	*	5102
• (U) Demonstrated improved aviation restraint systems to aid delethalization of the cockpit and assessed rotorcraft Nuclear/Biological/Chemical (NBC) contamination survivability and protection concepts	*	3817
• (U) Demonstrated improved rod-end bearing designs that resulted in improved mission effectiveness, increased aircraft utilization and reduced life cycle costs	*	1047
• (U) Demonstrated Combat Maintenance/Battle Damage Repair of Fiber Optic components to improve helicopter maintenance effectiveness, and tested and transitioned a prototype Shop Equipment Combat Maintenance set to advanced development	*	2319
• (U) Conducted evaluations and simulations of various VTOL systems and their effectiveness in combat tactical operational regimes	4Q93	3292
Total		**35414**

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602211A**
PE Title: **Aviation Technology**

Budget Activity: **#2**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Conduct integration concept studies for The Army Combined Arms Weapon System missile, hypervelocity rocket, distributed target acquisition, Low Cost Precision Kill technologies & complete evaluations of a target acquisition radar	4Q94	1073
• (U) Design & fabricate Damage Tolerant Thermoplastic Tailboom, Low Cost Isotropic Preforms, Thermoplastic OH-58D Horizontal Stabilizer including development of manufacturing/virtual prototyping models & Active Control of Cure Monitoring	*	3975
• (U) Develop reprogramable Smart Integrated Micro Sensor to permit realtime monitoring and calculation of life usage of individual rotorcraft components	*	539
• (U) Develop advanced rotor blade technologies supporting acoustic signature and vibration control techniques including fabrication of hi-lift rotor for wind tunnel testing	*	2857
• (U) Develop advanced flight control analysis tools to support research, development, acquisition and simulation including definition of concepts for integrated flight, fuel and fire control systems	*	2409
• (U) Complete engine testing of composite inlet housing, effort on Titanium Aluminum (TiAl) diffuser and conduct aerodynamic/ mechanical testing of low inertia turbine design	*	1792
• (U) Complete 911 Dispatch Console Public Safety CRDA, demonstrate MIDAS Phase VI results to industry, conduct MIDAS Phase VII to optimize user interface incorporating advanced human models	*	4202
• (U) Complete analysis of relationship among active/passive countermeasures and tactics, their relative costs and design constraints and helicopter survivability and investigate effects of NBC environments on rotorcraft maintenance	*	4363
• (U) Investigate innovative concepts for autonomously coupling external sling loads to the rotorcraft including Tri-Service packaging commonality and methodologies	*	391
• (U) Develop system concepts with "Dual Use" application & identify the area of technology requiring future development	*	2650
Total		**24251**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Evaluate integration concept studies for The Army Combined Arms Weapon System missile, distributed target acquisition and Low Cost Precision Kill technologies	*	508

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602211A**
PE Title: **Aviation Technology**

Budget Activity: **#2**

(U) Conduct manufacturing and test to verify manufacturing virtual prototyping models, and flight test thermoplastic tailboom and Low Cost Isotropic Preforms	*	2008
• (U) Develop rotor analysis/prediction/computational fluid dynamics codes, verify analysis/prediction methods via comparison to wind tunnel & flight test data, & optimize adv. blade technology for improv. performance, reduced vibration & acoustic signature	*	1182
• (U) Expand integrated flight, fuel and fire control concepts to including reconfiguration approaches, application of handling qualities criteria and development methods for dual use application	*	2671
• (U) Complete MIDAS Phase VII development, transition to validation and demonstration of MIDAS code and transfer results to industry	4Q95	3521
• (U) Conduct low inertia turbine engine testing, advanced seal development, flightweight magnetic bearing controls development, adaptive lube system analysis, innovative inlet protection system analysis, and non-intrusive ignition demonstration	*	1117
• (U) Demonstrate field evaluation of NBC contamination hardening concepts on selected rotorcraft for durability, compatibility and decontaminability	*	2826
• (U) Demonstrate advanced technology for inflight oil monitoring that will allow prognostic capability for maintenance intervention including application of virtual display technology to rotorcraft	*	664
• (U) Develop and demonstrate through simulation and analysis "Dual Use" system capabilities and value for military/civilian applications	*	2152
Total		**16649**

(U) Project A47B - Vehicle Propulsion and Structures Technology: This purpose of this project is to conduct exploratory development of generic propulsion and structures technology in support DOD/Army VTOL airmobile systems improvements. Areas of investigation and research include concepts of; small airflow gas turbines; high temperature materials; mechanical drive systems; integrated composites structural integrity; low cost manufacturing concepts; aerodynamic loads; aeroelastic interactions; and environmental control systems. The propulsion technology in this project supports the Army Aviation RDEC focus on the goals of the DOD Integrated High Performance Turbine Engine Technology (IHPTET) Program. The goal of IHPTET is to demonstrate technology which would double propulsion system capability for wide range of potential future aircraft and missile applications. Work in this project was previously conducted in Project A47A.

* This is continuning work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602211A**
PE Title: **Aviation Technology**

Budget Activity: **#2**

(U) FY 1993 Accomplishments: Work conducted in Project A47A.

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Evaluate compliant backed ceramic combustor liner concept with advanced fuel injectors for 3000 degrees F applications	4Q94	521
• (U) Map Laser Doppler Velocimetry (LDV) flow test data for 5:1 axial 2-stage compressor and perform analytical testing of cooled radial turbine	4Q94	833
• (U) Develop split torque drivetrain analytical method, validate low noise spiral bevel gear design and evaluate enhanced face gear components	4Q94	1042
• (U) Evaluate UH-1 fuel bladder crash protection concepts in cooperation with ATCOM	4Q94	100
• (U) Validate analysis of large pre-twist on extension twist coupled composite blades, methodies for modeling shape memory alloy effect in finite-element analysis of active control mechanisms	4Q94	190
• (U) Fabricate updated parametric bearingless hub and baseline blade for loads and vibration research program Advanced Research Experiment System (ARES II) control algorithms	4Q94	575
• (U) Validate model skin/stringer disbonding in composite panels in cooperation with Boeing Helicopters and publish Army/Boeing Commercial advanced computational analysis to predict damage tolerance of composite panels	*	259
• (U) Apply thermal diffusivity NDE methods to industry provided panels with manufacturing defects	4Q94	176
• (U) Fabricate composite wing box to validate bending-torsion stiffness designs and demonstrate capability of nonlinear loom to fabricate net-shape woven preforms	*	435
Total		**4131**

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Perform durability test of advanced fuel injector and compliant-backed ceramic combuster liner	4Q95	506
• (U) Design and fabrication Ceramic Matrix Composite (CMC) turbine transition duct	4Q95	537
• (U) Evaluate stability enhancement for turbine engines and develop waverotor cycle design with combustion	4Q95	1012
• (U) Design more efficient energy absorbing fuselage frames using Vlasov analysis with optimization algorithms	4Q95	110

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602211A
PE Title: Aviation Technology

Budget Activity: #2

• **(U) Develop finite element analysis for elastically coupled composite tilt rotor blades, and correlate experimental data with analytical results for panel incorporating shape memory alloy**	4Q95	110
• **(U) Fabricate flex beams for parametric bearingless hub loads validation and rotor blades with aeroelastic tailoring for low vibration with design closed-loop controller for ARES II rotor test system to simulate desired helicopter inertias**	*	425
• **(U) Publish results of cooperative effort with Boeing Helicopters on skin/stringer disbonding of composite panels**	4Q95	127
• **(U) Incorporate advanced models into COMET model for evaluating failure in laminated composites and develop optimization method to distribute airfoils for maximum performance**	4Q95	196
• **(U) Develop prototype thermal NDE hardware for composites filed inspection and manufacturing quality assurance**	*	106
• **(U) Evaluate composite wing box to validate bending-torsion stiffness design and incorporate clamping-bar take-up and advanced reed concepts to nonlinear testbed loom for fabricating net-shape woven preforms**	*	215
Total		**3344**

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

(U) Work Performed By: Contractors include: McDonnell Helicopter Company, Meza, AZ., Boeing Helicopter Company, Philadelphia, PA., Bell Helicopter Textron Incorporated, Ft. Worth, TX., Grumman, Bethage, NY., General Electric, Lynn, MA., Textron Lycoming, Stratford, CT., Sikorsky, Stratford, CT., Allied Signal Power and Engine, Phoenix, AZ., Allison Gas Turbine, Indianapolis, IN., Rolls Royce, Atlanta, GA., Kaman Aerospace Corp., Bloomfield, CT., Piasecki Aircraft Corp. Essington, PA., Technology Integration Inc., Bedford, MA., Structural Integrity Associate San Jose, CA., Simula, Phoenix, AZ., Lucas Western, City of Industry, CA., Vetronics, Bedford, MA., Georgia Tech Research Institute, Atlanta, GA Sterling Federal Systems Inc., Palato, CA., Navajo, San Jose, CA., Institute of Medical Cybernetics Inc., Potomac, MD., SRI/David Sarnoff Research Center, Princeton, NJ., BDM International, MITRE, McClean, VA., Intermetrics, Wall Township, NJ., and Charles Stark Draper Laboratory, Cambridge, MA. Primary in-house developers include: Aviation and Troop Command (ATCOM), St Louis, MO; Communications Electronics Command (CECOM), Ft Monmouth, NJ; Vehicle Structures Directorate/Army Research Laboratory (ARL), NASA Langley Research Center, Hampto Va; Aeroflightdynamics Directorate/ATCOM, NASA Ames Research Center, Moffett Field, Ca; Vehicle Propulsion Directorate/ARL NASA Lewis Research Center, Cleveland, OH; and Aviation Applied Technology Directorate, ATCOM, Ft Eustis, VA. Related activities are performed by Nationa Aeronautics and Space Administration.

(U) Related Activities: This program adheres to Tri-Service Reliance Agreements on Aeropropulsion and Air Vehicles (Rotary) with oversight and

coordination provided by the Joint Directors of Laboratories. Related technology demonstrations is conducted under PE #0603003A (Aviation Advanced Technology). Work in this Program Element contains no unwarranted duplication of effort among the Military Departments. Joint coordination of efforts where applicable are conducted with National Aeronautics and Space Administration (NASA) Low Speed Aircraft Research and Technology; PE #0602122N, Aircraft Technology; and PE #0602201F, Aerospace Flight Dynamics. Coordination to eliminate unnecessary duplication is accomplished by joint program reviews, exchange of program data sheets, research and technology resumes, technical reports; inter-service liaison; attendance at scientific meetings and conferences; joint participation in The Technical Cooperation Program (TTCP), NASA Research and Technology Committees, and the North Atlantic Treaty Organization (NATO) Advisory Group on Aerospace Research and Development (AGARD).

Efforts under this PE transition and provide risk reduction for Demonstration/Validation and Engineering Development programs supported by PE #0603801A (Aviation - Advanced Development) PE #0604801A (Aviation - Engineering Development) and PE #0604270A (Electronic Warfare Development). In addition, this PE's deliverables provide technical support to PE #0604223A (RAH-66 Comanche), PE #0604816A (Longbow), PE #0203744A (Aircraft Modifications/Product Improvement).

Active joint Service programs include the Army/NASA aided pilotage program, Air Force/Army Real Time Artificial Intelligence System (RTAIS); the Tri-Service Multi-mode Navigation/Communication Microstrip Antenna and Covert Communications program; the Tri-Service Integrated High Performance Turbine Engine Technology program.

(U) Other Appropriation Funds: ($ in Thousands) Not applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602270A
PE Title: Electronic Warfare Technology Budget Activity: #2

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
A442 Tactical Electronic Warfare Technology	10674	11710	10030	8908	8637	8695	10074	Cont'd	Cont'd
A906 Tactical Electronic Warfare Techniques	8356	9211	8226	6225	6111	6220	7074	Cont'd	Cont'd
PE Total	19030	20921	18256	15133	14748	14915	17148		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program provides for exploratory development of current and future Electronic Attack (EA) systems. It also involves development of automated intelligence fusion systems and flexible manufacturing technologies. Work in this program will lead to winning the battlefield information war through controlling the electromagnetic spectrum. Work in this program element is consistent with the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan and Project Reliance.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project A442 - Tactical Electronic Attack Technology: This project develops electronic warfare sensor and countermeasure (CM) technologies for self protection of air and ground platforms, area protection against radar directed weapons (e.g. jamming against enemy counter mortar/counter battery radars), and combat surveillance and target acquisition. The following technology areas are investigated:
Infrared (IR) Countermeasures - technologies that provide air and ground platforms with the capability to detect and jam heat-seeking surface-to-air missiles and anti-tank guided missiles with active IR sources, or to decoy them with flares or other devices.
Self-protection Radar Countermeasures/Warning - technologies that provide air and ground platforms with warning and jamming against radar directed air defense weapons, and jamming of top attack/smart munitions/ artillery delivered radio proximity fuzes.
Laser Warning and Countermeasures - technologies that provide air and ground vehicles with warning and jamming capability against laser-aided and

Program Element: #0602270A
PE Title: Electronic Warfare Technology

Budget Activity: #2

optically-directed threats including laser range finders, laser designators and laser beamrider missiles.
Electronic Support Measures (ESM) - technologies that provide the capability to intercept, direction find and locate current and emerging hostile non-communications emitters for targeting and tactical situational awareness.
Area Protection Radar Countermeasures - Technologies that provide radar stand-off and stand-in jamming and deception in support of ground forces.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Performed measurements on airborne missile warning devices for the purpose of use on land based platforms	4Q93	3374
• (U) Completed fiber optics study for 9-11 micron spectral range use to be optimized for laser warning applications	4Q93	2000
• (U) Completed demonstration of millimeter wave (MMW) technology for armor vehicle warning receiver	4Q93	3100
• (U) Completed surface acoustic wave (SAW) channelizer interferometer	4Q93	500
• (U) Conducted WARLOCK hearability tests	2Q93	500
• (U) Conducted successful technical/operational test against surrogate threats showing operational utility for WARLOCK X	3Q93	500
• (U) Fabricated ceramic antenna equipment and improved ceramic phase shifters	*	700
Total		**10674**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Integrate beam steering device with an optical tracker and perform laboratory demonstration	4Q94	2600
• (U) Complete development of a low profile fiber optic laser warning sensor for use on ground vehicles	4Q94	1800
• (U) Upgrade survivability integration laboratory (SIL) with smart munitions simulator, laser bands, IR/ultra-violet missile plume simulators and MMW and microwave (MW) bands.	*	3852
• (U) Integrate ceramic phase shifters into phased array antenna to improve direction finding (DF) accuracy in ESM/electronic intelligence (ELINT) systems	3Q94	1200
• (U) Conduct multi-service multipath test of SAW Channelized Compressive Interferometer (SCCI), Manpack and Canadian ESM systems at Fort Huachuca	3Q94	1300
• (U) Complete next generation ESM processor study for potential improvements in emitter identification, deinterleaving techniques, DF/geolocation algorithms and multipath rejection.	*	458
• (U) Reduce size, weight, and cost of simulator and transmitter subsystems of the WARLOCK for testing and demonstration of the ability to generate false targets	*	300

* This is continuing work which is reviewed periodically ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602270A
PE Title: Electronic Warfare Technology

Budget Activity: #2

• (U) Perform a lab demonstration of a moving platform capability of WARLOCK X by making software module upgrades to existing hardware	*	200
Total		11710

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Integrate high temperature superconductive spiral antenna with ESM system	4Q95	930
• (U) Demonstrate accuracy, efficiency and bandwidth improvement of ceramic antennas in ESM testbed	*	800
• (U) Field test WARLOCK X	4Q95	400
• (U) Conduct field measurements of beam steering device for application to future laser based infrared countermeasure (IRCM) program	4Q95	2700
• (U) Complete development of source technology for laser countermeasure system for armored vehicles	4Q95	1400
• (U) Develop countermeasures for advanced top attack munitions	*	3800
Total		10030

(U) Project A906 - Tactical Electronic Warfare Techniques:

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Continued technology development for devices needed to meet common module requirements.	*	800
• (U) Investigated vulnerability of mobile cellular radio systems to jamming.	4Q93	900
• (U) Develop techniques to automatically detect, sort and identify multiple communication signals in a dense signal environment	3Q93	1556

* This is continuing work which is reviewed periodically ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602270A
PE Title: Electronic Warfare Technology

Budget Activity: #2

• (U) Demonstrate proof of concept countermeasures techniques against mobile cellular radio with laboratory type equipment	*	1500
• (U) Complete battlefield visualization concepts to be used as method to represent data on displays	4Q95	1826
• (U) Develop multi-media man machine interface techniques involving displays	3Q95	1100
Total		8226

(U) **Work Performed By:** In-house work primarily performed by: U.S. Army Communications-Electronics Command (CECOM) Night Vision Electronic Sensors Directorate, Fort Belvoir VA and Intelligence Electronic Warfare Directorate, Vint Hill Farm Station, Warrenton VA; and U.S. Army Research Laboratory (ARL) Electronics & Power Sources Directorate, Fort Monmouth, NJ and Sensors, Signatures, Signal and Information Processing (S3I) Directorate, Adelphi, MD. Supporting work: Air Force Avionics Laboratory, Wright Patterson AFB, OH; Rome Air Development Center, Grifiss AFB, NY; Naval Weapons Center, China Lake, CA; Naval Research Laboratory, Washington, DC; Naval Air Warfare Center, Warminster, PA; Letterman Research Institute, San Francisco, CA; Pacific Missile Test Center, Point Mugu, CA; National Security Agency, Ft Meade MD. Contractors include: GE/RCA Corporation, Camden, NJ; Delfen Corporation, San Jose, CA; Hughes Aircraft Corporation, Fullerton, CA; Lockheed Sanders, Nashua, NH; Quest Research Corporation, McLean, VA; Lockheed Electronics, Plainfield, NJ.; Georgia Tech Research Institute, Atlanta, GA; Digital Radio Corporation, Redondo Beach, CA; E-Systems, Greenville, TX; GTE Sylvania, Mountain View, CA; Northrop, Rolling Meadows, IL; Ratheon, Goleta CA; Loral IR Imaging Systems, Lexington, MA; Westinghouse, Baltimore, MD; MACOM-PHI, Torrance, CA; Microwave Semiconductor, Somerset, NJ; American Electronic Laboratories, Lansdale, PA; SCS Telecom, Port Washington, NY; Martin Marietta, Orlando, FL; ESL, Inc., Sunnyvale, CA; Applied Signal Tech, Sunnyvale, CA; University of Maryland, College Park, MD; SAIC, Vienna, VA; Electronic Warfare Associates, Vienna, VA; Eyring Corp, Canada; Rohde & Schwarz, Canada; George Mason University, Fairfax, VA; VGS, McLean, VA; NAVCOM Defense Electronic, El Monte, CA; Iowa State University, Ames, IA; TRW, San Diego, CA; Clark Atlanta University, Atlanta, GA; Green Mountain Radio Research Corp, Colchester, VA.

(U) **Related Activities:** This program adheres to Tri-Service Reliance Agreements on Electronic Warfare with oversight provided by the Joint Directors of Laboratories. Work in this Program Element is related to and fully coordinated with efforts in PE #0602782A (Command, Control & Communications Technology), PE #0603789F, PE #0603270A (Electronic Warfare Technology), PE #0604270A (Electronic Warfare Development), PE #0603745A (Tactical Electronic Support Systems - Advanced Development), PE #0602131M, and PE #03058856G in accordance with the ongoing Reliance joint planning process. Work in this Program Element contains no unwarranted duplication of effort among the Military Departments.

(U) **Other Appropriation Funds:** ($ in Thousands) Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602270A
PE Title: Electronic Warfare Technology

Budget Activity: #2

(U) International Cooperative Agreements: Current Memorandum of Understanding (MOU) on Electro-Optical Countermeasures (EOCM) with United Kingdom. The Technical Cooperation Program (TTCP) Subgroup Q (EW), Defense Exchange Agreement (DEA) with France, Israel and Canada.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602303A **Budget Activity: #2**
PE Title: Missile Technology

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DC04 Smart Munition Technology Management	2836	0	0	0	0	0	0	Cont'd	Cont'd
A214 Missile Technology	35873	23255	23301	21848	22410	24454	25987	Cont'd	Cont'd
PE TOTAL	38709	23255	23301	21848	22410	24454	25987		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This exploratory development program is designed to provide the Army with missile, rocket, and unmanned vehicle technology ready for insertion into operational systems and next generation weapon systems. Its overall objective is to provide a Continental U.S. (CONUS)-based, post-cold-war Army with weapon systems enabling immediate world-wide deployment of forces with the capability to initially contain and ultimately achieve decisive victory against hostile forces equipped with modern weapons. The program is driven by U. S. Army Training and Doctrine Command (TRADOC) battlefield dynamics (Battle Labs) and mission area analyses of deficiencies in the areas of close combat, fire support, air defense, intelligence/electronic warfare; and the Army Science and Technology Master Plan. The program is focused on technologies which enhance weapon system deployability, flexibility, lethality, survivability, and affordability. Work within the program is conducted through system simulation, virtual prototyping, concept synthesis, hardware development, and focused technology demonstrations. The work in this program element is consistent with the resource constrained Army Science and Technology Master Plan, the Army Modernization Plan and Project Reliance.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project DC04 - Smart Munition (SM) Technology Management: U.S. Army Missile Command (MICOM) is executive agent under charter from The Commander of the Army Materiel Command (AMC) to operate the AMC Smart Weapons Management Office (AMC-SWMO). The AMC-SWMO will not be resourced with S&T funds after FY93.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602303A
PE Title: Missile Technology

Budget Activity: #2

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Completed methodology for analysis of Battle Damage Assessment (BDA) process and prototype decision aid tool workstation software/database	4Q93	474
• (U) Completed standardization project to define the Realistic Dirty Battlefield Environment	4Q93	400
• (U) Completed independent technical and programmatic assessments on smart weapon concepts and systems	4Q93	1962
Total		**2836**

(U) FY 1994 Planned Program: Not applicable

(U) FY 1995 Planned Program: Not applicable

(U) Project A214 - Missile Technology: Efforts in this project are focused on missile and rocket technologies that support high fire power/logistic support weight ratio concepts for the Light Forces, address system concepts that enhance the survivability of launch systems, provide greater effectiveness under adverse battlefield conditions, increase kill probabilities against hard targets, and provide powerful new simulation and virtual prototyping analysis tools. This project encompasses seven major areas:

- (U) Missile Guidance Systems
- (U) Air Defense Target Acquisition Systems
- (U) Multi-Spectral Missile Seekers
- (U) High Fidelity System Level Simulations
- (U) Missile Aerodynamics and Structure
- (U) Smart, Stealthy, Smokeless Missile Propulsion
- (U) Focused Technology Integration/Demonstrations

This project is partially transitioning to PE #0603313A, Projects D263, D486, D493 and D496.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Completed preliminary design studies of next generation Guidance and Control (G&C) subsystem components, software, and navigation techniques; developed and demonstrated brassboard G&C inertial components applicable to all missile systems	4Q93	4849

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602303A **Budget Activity: #2**
PE Title: Missile Technology

• (U) Developed and demonstrated advanced air defense missile system target acquisition and fire control algorithms with direct application for PATRIOT	*	2062
• (U) Investigated advanced seeker technology leading to robust operation over many spectral bands; instated sensor design modifications for U.S. Forest Service Fire Detection System	4Q93	2149
• (U) Completed design and development of a Wideband Digital Quadrature Modulator, a critical component for high fidelity hardware-in-the-loop simulation	*	1865
• (U) Developed, exercised, and distributed DoD wide Computational Fluid Dynamics software; completed detailed design of extended range fiber optic guided missile (LONGFOG)	4Q93	6003
• (U) Completed smart propulsion test facility; Negotiated Ducted Rocket Engine (DRE) program with Japan; developed first metallized solid smokeless propellant theory; completed preliminary test of 4 inch turbojet; prepared first Fullerenes for stealth materials	4Q93	1923
• (U) Completed adaptive missile feasibility study; completed Mach 6 Advanced Kenetic Energy Missile (AdKEM) integration and bench test; demonstrated optical correlator target recognition capability in bench tests	*	5672
• (U) Completed design, fabrication and live fire testing of warhead and propulsion concepts for Multi-Purpose Individual Munition system	4Q93	8600
• (U) Built on current advanced software system development and hardware simulation capabilities in the areas of Radio Frequency (RF), Electro-Optical, Infrared and millimeter wave technology, neural nets, and control systems	*	2750
Total		**35873**

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Develop and demonstrate G&C brassboard subsystem components, executive software, navigation, and guidance techniques which meet operational requirements of next generation tactical missiles	4Q94	4210
• (U) Develop and integrate air defense missile target acquisition and fire control hardware, software, and techniques which exploit the full range of target features	*	2050
• (U) Evaluate candidate multi-spectral missile seeker/tracker/algorithm designs in simulations, hardware, and field tests; test prototype fire detection sensor in tower tests, and transition technology to U.S. Forest Service	4Q94	2205
• (U) Demonstrate feasibility of producing high fidelity system level simulations with advances in target/background scene generation techniques for direct, real time missile system stimulus and high performance commercial signal processors	*	1690
• (U) Develop analytic aerodynamic and structural modeling techniques to model complex structural/aerodynamic		

* This is continuing work which is reviewed periodically, ensuring quality, relevance and priority.

interactions; evaluate and exploit new materials using advanced modeling techniques		
• (U) Demonstrate first ever smart gel, turbo, and air turborocket propulsion; perform cooperative development of Ducted Rocket Engine Program with Japan; investigate stealth application of Fullerenes; demonstrate first metallized smokeless propellant	4Q94	4300
• (U) Complete simulation and begin system trade study for adaptive missile demonstration; conduct inertially guided hypervelocity AdKEM flights; integrate improved optics and electro-optic devices into brassboard optical correlator for automatic target recognition simulation	4Q94	3110
Total	*	5690
		23255

(U) **FY 1995 Planned Program:**	**Complete**	**Cost**
• (U) Analyze seeker performance in tower and captive carry flight tests using The Army Combined Arms Weapon System (TACAWS) operational criteria	4Q95	2260
• (U) Demonstrate G&C subsystem to include bench level and flight testing; transition G&C technology to upgrade existing missile systems and provide next generation G&C to new system technology demonstrations such as TACAWS and Fiber Optic Guided Missile (FOG-M)	*	4460
• (U) Test integrated air defense missile target acquisition/fire control system using operational requirements germane to TACAWS, AdKEM, and FOG-M; transition technology to PATRIOT, STINGER, JAVELIN, Line-of-Sight Antitank (LOSAT), and TACAWS	4Q95	2980
• (U) Optimize scene generation techniques for next generation tactical missile simulations; transition technology into system simulations for operational and developing systems such as PATRIOT and JAVELIN	*	1935
• (U) Validate aero/structural models and develop visualization techniques applicable to tactical missile design; bench test candidate advanced materials and transition to upgrades of fielded systems and new missile concepts such as TACAWS	4Q95	3261
• (U) Demonstrate smart adaptable propulsion; demonstrate small turbo and ducted rocket for Japan Cooperative Program; demonstrate environmentally benign propulsion and radar absorbing materials for specific civilian and military applications	4Q95	5878
• (U) Complete system trade study, conduct preliminary design, and conduct captive carry seeker tests for the adaptive missile demonstration; analyze AdKEM flight test results and transition technology to developmental systems; demonstrate robust auto target recognition with prototype optical correlator	*	2527
Total		**23301**

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602303A
PE Title: Missile Technology **Budget Activity: #2**

(U) Work Performed By: The Research, Development, and Engineering Center (RDEC), U.S. Army Missile Command, Redstone Arsenal, AL, has primary responsibility for execution of this program. Contractors include: Boeing Aerospace Company, Seattle, WA; General Dynamics Corporation, Pomona, CA; Georgia Institute of Technology, Atlanta, GA; Hercules, Incorporated, Cumberland, MD; and Simulation Technology, Huntsville, AL. The AMC-SWMO obtains Government technical expertise from MICOM RDEC, Armament Research Development and Engineering Center, the U.S. Army Research Laboratory and contractor support through a competitive smart munitions master planning support services contract, existing competitively awarded time and material contracts in Government laboratories and from the GACIAC currently operated and competitively awarded to Illinois Institute of Technology (IIT) Research Institute, Chicago, with offices in Dayton, Ohio; Lanham, MD; Las Cruces, NM; and Huntsville, AL. All contractors are analytical houses and are not in conflict of interest with project managed smart weapon systems.

(U) Related Activities: This program adheres to Tri-Service Reliance Agreements on Conventional Air/Surface Weaponry with oversight provided by the Joint Director of Laboratories. Reliance joint efforts include signal processing, inertial components and radiation guidance. Work in this Program Element is related to and fully coordinated with efforts in PE #0602702E, PE #0602602F, PE #0603601F, PE #0601104A (Federally-Funded Research & Development Center Electromechanics & Hypervelocity Physics), PE #0603313A (Missile & Rocket Advanced Technology), and PE #0602782A (Command, Control & Communications Technology) in accordance with the ongoing Reliance joint planning process and contains no unwarranted duplication of effort among the Military Departments.

(U) Other Appropriation Funds: ($ in Thousands) Not applicable.

(U) International Cooperative Agreements: Joint USA/Canada defense development sharing agreement, Memorandum of Understanding (MOU) with Japan for Ducted Rocket Engine development.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602307A
PE Title: **Advanced Weapons Technology**

Budget Activity: #2

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
A139 Directed Energy Technology	53	4509	0	0	0	0	0	0	12221

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element provides for the evolution of high energy laser technology for Army weapon system applications. Due to fiscal constraints and the lack of near term transition opportunities, the program terminates after FY94. Lower power laser technology is being developed under PE 0602709A. The program terminates after FY94. Work in this program element is consistent with the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan and Project Reliance.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project A139 - Directed Energy Technology: This project will evaluate high energy laser technologies for Army weapon system applications. Under congressional direction, solid state dye lasers and high powered diode lasers are being developed to provide the wavelength diversity necessary for medical applications. This technology will be developed for dual use application. Technology transfer areas to the commercial sector include laser dyes, laser calorimeters, laser radiometers and remote power concepts. Efforts will be completed in FY94.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Completed assessment of Point Laser Air Defense System	4Q93	30
• (U) Participated in Joint Directors of Laboratories Reliance Panel on Directed Energy Weaponry; provided the Laser Devices section of yearly report; Proof-of-Concept demonstration for laser based Identification Friend or Foe (IFF) system; technology transfer to small business	4Q93	23
Total		**53**

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Demonstrate improved performance of solid state dye lasers for medical applications by doubling current efficiency and providing wavelength diversity appropriate for plaque, thrombus, and kidney and gallstone removal	4Q94	4000

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602307A** Budget Activity: **#2**
PE Title: **Advanced Weapons Technology**

• (U) Perform role as chairman of Joint Directors of Laboratories Reliance Panel including responsibility for yearly laser report	4Q94	75
• (U) Elevate scalability of Overtone Chemical Laser for tactical applications	4Q94	100
• (U) Evaluate feasibility of dye lasers for accelerated aging for materials	4Q94	184
• (U) Monitor and assess evolving laser technologies	4Q94	150
Total		**4509**

(U) FY 1995 Planned Program: Not applicable

(U) Work Performed By: Work primarily performed by U.S. Army Missile Command, Research, Development and Engineering Center, Redstone Arsenal, AL.

(U) Related Activities: This program adheres to Tri-Service Reliance Agreements on Conventional Air/Surface Weaponry and Directed Energy Weaponry with oversight provided by the Joint Directors of Laboratories. Work in this Program Element is related to and fully coordinated with efforts in PE #0605601A (Army Test Ranges and Facilities), PE #0602601F, PE #0603221C, PE #0602301E, PE #0602707E in accordance with the ongoing Reliance joint planning process and contain no unwarranted duplication of effort within the Army and DoD.

(U) Other Appropriation Funds: (**$** in Thousands) Not applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602308A**
PE Title: **Modeling and Simulation Technology**

Budget Activity: **#2**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
AC90 Distributed Interactive Simulation (DIS) Technology	0	0	11071	11379	10854	10516	10862	Cont'd	Cont'd
AC99 Modeling and Simulation Technology (Advanced Concepts and Technology)	4715	10000	40446	29922	40063	40260	40441	Cont'd	Cont'd
PE TOTAL	4715	10000	51517	41301	50917	50776	51303		

B. (U) BRIEF DESCRIPTION OF ELEMENT: Work in this program element (PE) advances the development and use of modeling and simulation including Distributed Interactive Simulation (DIS) as related to Army-specific experiments/demonstrations and industry participation at the U.S. Army Training and Doctrine Command (TRADOC) Battle Labs and Army's Louisiana Maneuvers (LAM). It develops standards, architecture and interfaces that are essential to realizing the DoD/Army vision of creating a verified, validated and accredited synthetic "electronic battlefield" environment. The electronic battlefield is used to investigate and demonstrate new warfighting concepts and approaches including development of tactics, doctrine, training techniques, soldier support, systems and system upgrades. It directs and stimulates advances in those technologies required for real time interactive linking within and among constructive, virtual and live simulations. Work also supports planning and execution of the Advanced Concepts and Technology (ACT) II program. ACT II focuses on providing a timely, low overhead mechanism for industry and academia to participate in the Army's Louisiana Maneuvers (LAM) and TRADOC Battle Labs warfighting demonstrations and experiments. The work in this program element is consistent with the Army Science and Technology Master Plan and the Army Modernization Plan. In FY95 simulation technology development was consolidated into project AC90 from PE0603003A and PE0602727A.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project AC90 - Distributed Interactive Simulation (DIS) Technology: This program provides and demonstrates enabling technologies for advancing Distributed Interactive Simulation (DIS) networking capabilities and synthetic representation of the battlefield needed to support virtual prototyping and training in the era of reduced funding. The Battlefield Distributed Simulation-Developmental (BDS-D) project will provide virtual representation of a lethal combined arms environment with the warfighter-in-the-loop that closed-form analysis cannot provide. The environment permits new system concepts, tactics and doctrine and test requirements to be evaluated with a warfighter-in-the-loop in a combined arms battlefield throughout the acquisition life cycle at a reduced cost and time than the traditional approach. The research being conducted includes Semi-

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602308A**
PE Title: **Modeling and Simulation Technology** Budget Activity: **#2**

Automated Forces (SAFOR), dynamic terrain and data base development for networking. Arrival of this sophisticated technology, equipment and complex relations to each other, makes this effort critical to overall success of Army acquisition and training requirements.

(U) FY 1993 Accomplishments: Project established FY95. Related work previously performed in PE 0602727A Project A230 Non-Systems Training Devices and PE 0603003A Project DB39 Advanced Distributed Simulation.

(U) FY 1994 Planned Program: Project established FY95. Related work previously performed in PE 0602727A Project A230 Non-Systems Training Devices and PE 0603003A Project DB39 Advanced Distributed Simulation.

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Define requirements and conduct experiments to demonstrate linkage of constructive (analytical and training wargame models) and virtual simulations (simulators and computer generated forces) in DIS environments	*	1197
• (U) Define the virtual reality interface and architecture requirements to network the dismounted infantry into the DIS environment	*	1876
• (U) Expand the Battlefield Operating System (BOS) functionality semi-automated force including command, control and communications and countermeasure DIS environments	2Q95	2676
• (U) Enhance standard for terrain databases to assure correlation and interoperability among simulators, semi-automated forces, and constructive simulations	4Q95	1672
• (U) Expand the architecture to support Division level DIS experiments and mission rehearsals	*	2104
• (U) Demonstrate dynamic terrain capability for DIS and establish architectural changes to integrate into the DIS	1Q95	1546
Total		**11071**

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

(U) Project AC99 - Modeling and Simulation Technology: This project supports the Army's Louisiana Maneuvers and TRADOC Battle Labs Advanced Concepts and Technology (ACT) II Program. ACT II provides a timely, low-overhead mechanism for industry and academia to demonstrate mature technologies, concepts, software and/or systems for assessment via simulation and live demonstration by the TRADOC Battle Labs and the Chief of Staff of the Army's Louisiana Maneuvers Task Force. It supports modeling and simulation in real time, soldier-in-the-loop, electronic battlefield demonstrations including constructive, virtual and live simulations. Specific areas of interest include: battlespace management and battlefield synchronization; depth and simultaneous attack capabilities; early entry operations, lethality, survivability and mobility; command, control, communications and computers (to include interoperability); force sustainment; and doctrine and leader development. ACT II funds are

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602308A**
PE Title: **Modeling and Simulation Technology**

Budget Activity: **#2**

competitively awarded based on annual Broad Agency Announcement (BAA).

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Developed Aggregate Level Simulation Protocols (ALSP) for LAM	4Q93	990
• (U) Completed upgrades to mobilization and deployment model for LAM	4Q93	800
• (U) Developed After Action Report (AAR) tool for LAM	*	250
• (U) Developed TRADOC Battle Command Battle Lab Command and Control Center to enable interface with DIS experiments and demonstrations	*	1834
• (U) Supported demonstration of real time, combined arms DIS industry/government linking of man-in-the-loop simulators industry/government in support of LAM	4Q93	841
Total		**4715**

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Conduct demonstrations and experiments in support of the Battle Labs and LAM	4Q94	10000
Total		**10000**

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Conduct demonstrations and experiments in support of the Battle Labs and LAM	4Q95	40446
Total		**40446**

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

(U) Work Performed By: Efforts are conducted by the broadest range of the nation's industrial and academic communities. Contractors include: Loral Western Development Laboratories, San Jose, CA; Pathfinder, Littleton, CO; University of Central Florida, Institute for Simulation and Training, Orlando, FL; Georgia Tech Research Institute, Atlanta, GA; Veda Incorporated, Orlando, FL; University of Alabama, Tuscaloosa, AL; Perceptronics, Inc, Woodland Hills, CA; Lockheed Sanders, Nashua, NH; Martin Marietta, Daytona Beach, FL; Evans & Sutherland, Salt Lake City, UT. Simulation, Training and Instrumentation Command (STRICOM), Orlando, FL. is responsible for Project AC90 and Army Research Office, Raleigh, NC is responsible for Project AC99.

(U) Related Activities: This program is fully coordinated with the other Army exploratory development programs, ARPA, Defense Modeling and Simulation Office, TRADOC and DoD Project Reliance agreements on conventional air/surface weaponry with oversight provided by the Joint Directors of Laboratories. Work in this Program Element is related to and fully coordinated with efforts in PE #0602727A (Non-System Training

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602308A
PE Title: Modeling and Simulation Technology

Budget Activity: **#2**

Device Technology) and PE #0604715A (Non-System Training Devices - Engineering Development). There is no unnecessary duplication of effort within the Army or DoD.

(U) Other Appropriation Funds: ($ in Thousands) Not applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602601A**
PE Title: **Combat Vehicle and Automotive Technology**

Budget Activity: **#2**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
AH77 Advanced Automotive Technology	12261	12453	5562	5486	5509	5535	5561	Cont	Cont
AH78 Natural Gas Vehicle Technology	943	0	0	0	0	0	0	0	943
AH79 Air Brake Technology Test	0	500	0	0	0	0	0	0	500
AH91 Tank & Automotive Technology	35754	20511	15519	13449	12749	13382	14439	Cont	Cont
DC05 Armor Exploratory Development	8759	5980	7249	6287	6513	6801	7482	Cont	Cont
PE TOTAL	57717	39444	28330	25222	24771	25718	27482		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program advances the state of technologies leading to development of advanced ground combat systems and components that improve the Army's ability to project force and fight, survive against, and defeat future battlefield threats. Increased emphasis is placed on technologies for exceedingly mobile, lightweight, versatile and highly survivable systems essential for the post Cold War era. New technology thrusts aimed at achieving more deployable future armored vehicles reflect the Army's need to lighten the force while retaining the ability to survive in diverse, worldwide battlefield environments. This program provides critical new technologies to improve survivability against advanced anti-armor weapons. This PE also funds an initiative to exploit dual-use, military and commercial automotive technologies by fostering cooperation among the government, industry and academia. Work in this program element is consistent with the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan and Project Reliance.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project AH77 - Advanced Automotive Technology: This project is aimed at fostering automotive research, facilitating automotive and manufacturing development, conducting dual-use technology demonstrations and encouraging two-way transfer of dual-use technology. It was started in FY 1993 in response to Joint Appropriations Conference Report 102-1015, dated October 5, 1992. Recent economic and legislative changes

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602601A
PE Title: Combat Vehicle and Automotive Technology

Budget Activity: #2

encourage the Government and the automotive industry to work more closely together and share the large automotive technology base. The National Automotive Center (NAC), located at the U.S. Army Tank-Automotive Research, Development and Engineering Center (TARDEC), serves as a catalyst, linking industry, academia and government agencies and as a clearinghouse for the development and exchange of automotive technologies. Initial collaborative R&D stresses the application of ongoing commercial R&D to military requirements, and military R&D to commercial needs. A number of automotive technology Cooperative Research and Development Agreements (CRADAs) are being pursued in two-way technology transfer. Government agencies with ground vehicle development missions will be linked under a Memorandum of Agreement which will jointly advise and support the activities of the NAC and consolidate the collective expertise of Federal Government Departments such as Energy, Transportation, and Commerce and other DoD agencies. The NAC also supports the Next Generation of Vehicles Initiative announced by the President on September 29, 1993. As a complement to this effort, the NAC funding in PE #0603005A will be used to manage a program identifying and evaluating non-ozone depleting fire suppressant substances for vehicles. Additionally, the Army has provided funds in PE #0601102A (1000 appropriated but not authorized in FY 1994 and 3000 requested in FY 1995) to support an automotive center of excellence which is closely linked with the NAC.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Established linkage to capture ongoing commercial and academic automotive activities through 27 collaborative research and development (R&D) contracts	*	9500
• (U) Formulated concepts for automotive research, manufacturing technology development and a long term strategy for the NAC	*	1661
• (U) Developed gear and cold environment technologies	4Q93	1100
Total		**12261**

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Implement Phase 2 of collaborative R&D contracts (electronics, sensors, materials processes, mobility, simulation and design) begun in FY 1993; sign CRADAs with Big Three automobile manufacturers	*	7169
• (U) Acquire advanced, commercial automotive technologies by tailoring ongoing private R&D for military applications, and provide in-house support for dual-use technologies	*	4500
• (U) Analyze high payoff dual-use automotive technologies and develop a plan for demonstrating ongoing technology	4Q94	784
Total		**12453**

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Acquire and analyze products from collaborative R&D technology development contracts	*	2000

* This is continuing work which is reviewed periodically, ensuring quality, relevance and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602601A**
PE Title: **Combat Vehicle and Automotive Technology** Budget Activity: **#2**

• (U) Acquire advanced, commercial automotive technologies by tailoring or adapting ongoing private automotive research for military applications	*	3000
• (U) Integrate and evaluate technologies from FY 1993 and FY 1994 contracts	*	562
Total		5562

(U) Project AH78 - Natural Gas Vehicle Technology: This project was started in FY 1993 in response to Conference Report 102-1015, page 121, dated October 5, 1992. The Congress recommended funding for a pilot program at Ft. Hood, Texas, to convert non-military fleet vehicles to use compressed natural gas. Funds were not released by OSD to execute this program.

(U) FY 1993 Accomplishments:

• (U) Modify commercial light duty trucks, install temporary refueling stations and associated safety and metering devices, conduct test	4Q94	943

(U) FY 1994 Planned Program: Not applicable

(U) FY 1995 Planned Program: Not applicable

(U) Project AH79 - Air Brake Technology Test: This project was started in FY 1994 in response to Conference Report 103-339, page 115, dated November 9, 1993. The House recommended funding to verify that the operating advantages and maintenance cost reduction of air-applied, mechanically held, non-spring type brake systems can be realized in DoD applications. Due to the potential for dual-use applications, this program will be administered by the National Automotive Center.

(U) FY 1993 Accomplishments: Not Applicable

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Competitively procure air brakes and install on test vehicle(s)	4Q94	350
• (U) Evaluate air brake performance and safety	*	150
Total		500

(U) FY 1995 Planned Program: Not applicable

* This is continuing work which is reviewed periodically, ensuring quality, relevance and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602601A
PE Title: Combat Vehicle and Automotive Technology **Budget Activity: #2**

(U) Project AH91 - Tank and Automotive Technology: This project provides improved vehicle concepts and component technologies leading to product improvements to fielded equipment and to the development of future systems that will enable the Army to fight and survive against diverse threats. Conceptual designs, virtual prototyping, and analyses of ground vehicle systems identify promising emerging technologies and quantify benefits, burdens and trade-offs related to ground vehicle applications. Activities are closely coordinated with, and complement, Army battle laboratories. The program is comprised of six topics: (1) future vehicle concepts and technology integration; (2) mobility; (3) integrated survivability; (4) vehicle electronics (vetronics); (5) advanced vehicle structures; and (6) simulation/analysis. The survivability technologies include non-armor approaches such as signature reduction, countermeasures, and damage reduction which complement, but do not duplicate, the work performed under the armor exploratory development project (DC05). Technology initiatives are being pursued to address future mobility, survivability and lethality requirements of lighter, more deployable vehicles. Following concept exploration funded by this project in FY 1993, composite structures technology transitioned to PE #0603005A, and a Composite Armored Vehicle (CAV) demonstration contract was awarded in FY 1994.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Developed Combat Vehicle Command & Control Program and fabricated Vetronics Crewman's Associate Test Facility	*	4552
• (U) Developed initial combat vehicle concepts for the Composite Armored Vehicle (CAV) and a Future Main Battle Tank (FMBT) and conducted performance analysis of future combat vehicle effectiveness	*	3377
• (U) Performed initial vulnerability and operational effectiveness analyses to determine potential benefits of CAV technologies and demonstrated modular signature technology	*	2517
• (U) Performed electric drive analytical/design investigation and contracted for development of semi-active external suspension and band track technologies for combat vehicles	*	8685
• (U) Demonstrated combat vehicle gun/turret drive stabilization in laboratory using a Bradley vehicle turret, and established agreement with Simulation and Training Command (STRICOM) on close combat tactical trainer	*	2541
• (U) Conducted virtual prototyping development plan and technology study and published report on integrated virtual prototyping technology development strategy	*	3037
• (U) Characterized crash results from commercial database	*	250
• (U) Developed composite material approaches to the Composite Armored Vehicle program and transitioned concepts and lessons learned to advanced technology (6.3A)	4Q93	7226
• (U) Assessed prototype countermeasures, identified shortfalls in performance, performed technical evaluation of proposals, and implemented contracts	4Q93	3569
Total		**35754**

* This is continuing work which is reviewed periodically, ensuring quality, relevance and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602601A**
PE Title: **Combat Vehicle and Automotive Technology** Budget Activity: **#2**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Develop test scenarios and enhance soldier-in-the-loop simulations to support the Crewman's Associate	*	2881
• (U) Evaluate near term laser threat to laser protected vision devices for combat vehicles	*	1846
• (U) Develop and assess future vehicle concepts incorporating high payoff technologies, and complete composite structure technology study	*	3116
• (U) Develop electric drive technology (high tractive effort motors and high temperature power electronics); investigate high performance diesel technology; and develop band track designs for CAV test bed assessment	4Q94	8239
• (U) Update Turret Motion Base Simulator, procure real time computer and implement real time vehicle code to support Louisiana Maneuvers	4Q94	3452
• (U) Complete virtual prototyping plan, to include virtual manufacturing, and acquire software	4Q94	877
• (U) Publish crashworthiness test data characterization report	4Q94	100
Total		**20511**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Assess soldier-in-the-loop simulation results and incorporate into Crewman's Associate effort	*	3308
• (U) Tailor laser protected vision devices for combat vehicle demonstrations	*	1100
• (U) Integrate and demonstrate signature components on ground combat vehicles	*	1000
• (U) Refine and evaluate future vehicle concepts for systems with high interest to the User/Army Staff	*	3219
• (U) Demonstrate advanced electric drive system in the laboratory, conduct CAV semi-active external suspension laboratory unit evaluation, and deliver CAV suspension set and band tracks for test bed feasibility demonstrations	4Q95	6892
Total		**15519**

(U) Project DC05 - Armor Exploratory Development: This project lays the technical foundation to solve critical armor deficiencies and improve the survivability of conventional ground combat forces against increasingly lethal anti-armor weapons. Supporting the ultimate objective of lighter, more deployable, more survivable combat vehicles, the emphases are on armor technologies that will be compatible with light weight structural technologies of future combat systems, on armors suitable for upgrade of systems (e.g., Abrams, Bradley, Advanced Field Artillery System, Armored Gun System), and on using armor to complement innovative survivability techniques such as those described in project AH91. Within the broader field of armor development, this project focuses technology on problems unique to the Army: protection of combat and tactical vehicles against kinetic energy projectiles, explosively formed penetrators and chemical energy warheads. This project draws upon products from Army programs, as well as innovative armors from industry (e.g., PE/Project 0602618A/AH81), providing for the transition of armor products from those

* This is continuing work which is reviewed periodically, ensuring quality, relevance and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602601A
PE Title: Combat Vehicle and Automotive Technology **Budget Activity: #2**

programs to Army systems applications. In addition to development of specific armor concepts, the project includes supporting work in armor materials, bringing together the collective expertise of the Department of Defense, the Department of Energy, and industrial and academic sources. Supporting work also includes development and refinement of armor performance models and integration tools necessary to realize the benefits of this technology on the battlefield.

(U) FY 1993 Accomplishments	Complete	Cost
• (U) Determined performance of "tandem" armor against shaped charge threats	4Q93	950
• (U) Tested two electromagnetic armor configurations	4Q93	1400
• (U) Demonstrated high performance reactive armor modules for light armored vehicles such as the Armored Gun System	*	2609
• (U) Studied effects of material properties on non-energetic reactive armor	4Q93	1000
• (U) Demonstrated a "smart" reactive armor system with significantly increased protection over currently available armors	*	1500
• (U) Developed test analysis methods and tools using neural networks and modeling techniques to reduce the cost and increase the reliability of high performance ceramic armor designs	*	1300
Total		**8759**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Analyze and document the Protection Areal Density method and implement a material fracture model for cost efficient ceramic armor design and testing	4Q94	640
• (U) Demonstrate passive armor solutions to chemical energy and kinetic energy overhead and horizontal threats	*	1020
• (U) Develop integration technology for efficient application of armor systems as upgrades for existing vehicles	*	4320
Total		**5980**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Develop energetic armors utilizing self-limiting energetic materials and other techniques to improve vehicle tolerance to effects of high performance armors	*	4000
• (U) Demonstrate roof armor systems for protection against advanced threats (e.g. explosively formed penetrator)	*	1669
• (U) Demonstrate armors that upgrade existing medium vehicle systems to the level of the advanced medium cannon threat (e.g., 30mm long rod penetrators)	4Q95	1580
Total		**7249**

* This is continuing work which is reviewed periodically, ensuring quality, relevance and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602601A
PE Title: Combat Vehicle and Automotive Technology Budget Activity: #2

(U) **Work Performed By:** In-house work primarily performed by the U.S. Army Tank-Automotive Research, Development and Engineering Center (TARDEC), Warren, MI. Contractors include: General Dynamics Land Systems Division, Warren, MI; FMC, San Jose, CA; McDonnell Douglas, St. Louis, MO; Michigan Technological University, Houghton, MI; Teledyne Continental Motors, Muskegon, MI; Booz-Allen and Hamilton, Arlington, VA; BRTRC, Vienna, VA; ERIM, Ann Arbor, MI; Pentastar, Huntsville, AL; University of Detroit, Detroit, MI; University of Iowa, Iowa City, IA; University of Maryland, Baltimore, MD; University of Michigan, Ann Arbor, MI; University of Texas, Austin, TX; and Wayne State University, Detroit, MI.

(U) **Related Activities:** This program adheres to Tri-Service Reliance Agreements on advanced materials, fuels and lubricants, and ground vehicles with oversight and coordination provided by the Joint Directors of Laboratories. There is no unnecessary duplication of effort within the Army or DoD. Furthermore, the program is coordinated among the Marine Corps office within the Naval Surface Weapons Center and ground vehicle developers within the Departments of Energy, Commerce and Transportation, and the Advanced Research Projects Agency.

(U) **Other Appropriation Funds:** ($ in Thousands) Not applicable.

(U) **International Cooperative Agreements:** Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602618A
PE Title: Ballistics Technology **Budget Activity: #2**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
AH80 Ballistics Technology	33193	23815	22682	22705	23450	24187	24978	Cont	Cont
AH81 Armor/Anti-Armor MOU	27341	5695	3010	5732	7955	8735	8088	Cont	Cont
PE TOTAL	60534	29510	25692	28437	31405	32922	33066		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element (PE) provides ballistic technologies required for defensive (armor) and offensive (anti-armor) weapons systems to counter changing threats. Project AH80, is focused on anti-armor warhead mechanics; penetrator mechanics; munition-target interactions; terminal effects; propulsion dynamics; launch and flight dynamics, remote sensing, and computational physics. It also includes work in hypervelocity penetrators that could greatly increase anti-armor capabilities. Corresponding emphasis is placed on advanced armor technology; vulnerability, lethality and survivability analyses and efforts to optimize effectiveness and survivability of armored combat vehicles. Until FY 1994, Project AH81 was the source of Army funds for the joint Army/Advanced Research Projects Agency (ARPA)/U.S. Marine Corps (USMC) Armor Anti-Armor (A3) program. This project was created in 1986 in response to a Defense Science Board study. The Memorandum of Understanding (MOU) with ARPA expired on September 30, 1993. The program transitioned to the Army and will continue to tap the innovation of industry and pursue the most promising and affordable activities. FY 1994 reflects the termination of the A3 MOU. The work performed in this PE complies with the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan and Project Reliance.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project AH80 - Ballistics Technology: This project produces ballistic technologies required for offensive and defensive material in response to heavy, medium and light threats in a global context. This project contains ballistic technology advances in vehicle survivability, direct fire armament capabilities, indirect fire support, and weapon effectiveness evaluation in order to be able to design the most lethal weapon capability and optimally

Program Element: #0602618A
PE Title: Ballistics Technology

Budget Activity: #2

protect against the most dangerous threat. It manages and exploits the Army's supercomputer network, as well as extensive experimental programs to advance the state of ballistics technologies.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Demonstrated compacted ball powder propellant to counteract low-temperature problems in artillery; transferred technology to U.S. Army Armament Research, Development and Engineering Center (ARDEC)	4Q93	3899
• (U) Demonstrated the integrity of the lightweight aft section of High Capacity Artillery Projectile (HICAP) during launch at maximum artillery zone charge (Zone 8S(Hot))	*	3437
• (U) Designed and validated a concept for weight-efficient passive armor capable of withstanding kinetic energy (KE) and chemical energy (CE) threats	4Q93	4845
• (U) Successfully devised method to launch multiple rods against multiple submunitions at hypervelocity	*	3505
• (U) Investigated the technical feasibility of the application of a recoilless rifle weapon system to the robotics test bed platform	*	3257
• (U) Completed prototype spall-generating module for KE and shape charge threats against all armors and implemented it in the Multi-platform Unix Vulnerability Estimation Suite (MUVES)	*	820
• (U) Developed integrated vulnerability/lethality/survivability methodology for analysis of Army systems operating in the full spectrum of battlefield threats (ballistic/directed energy weapons; nuclear, biological, chemical)	*	5285
• (U) Finalized computational modeling techniques for resin transfer molding process and performed advanced computing/communications research	4Q93	7521
• (U) Formulated user definable geotypical terrain	4Q93	624
Total		**33193**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Expand Hybrid Integrated RAM (HIRAM) large caliber facility to achieve ram acceleration of high mass (3-5 kilograms) to hypervelocity (> 2.1 kilometers/second)	*	3440
• (U) Demonstrate lightweight fin assembly, payload dispersal mechanism, and fore body configurations for High Capacity Artillery Projectile (HICAP)	*	3200
• (U) Predict and validate enhanced lethality from precursor additions to KE/CE warheads	*	3727
• (U) Design and determine stress state in inhomogeneous and/or hybrid composite material sabot	*	2885

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602618A
PE Title: Ballistics Technology
Budget Activity: #2

• (U) Demonstrate a prototype self-contained rifle with an inertial reticle system	*	2349
• (U) Develop the Computer Man System to enable analysis of penetrating injuries to personnel	*	895
• (U) Develop tools, techniques, and methodologies to improve vulnerability/lethality analysis for terminal ballistics, external blast, and behind armor debris	*	4880
• (U) Provide a resin transfer molding model for the manufacturing of a Comanche 2 foot risk reduction box and a 10-foot keel beam and transfer to U.S. Army Aviation & Troop Command (ATCOM)	*	1773
• (U) Integrate land warrior into prototype synthetic environment with user-definable, geotypical, dynamic terrain	*	666
Total		**23815**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Finalize designs for a weaponizable reverse annular piston liquid propellant gun	*	2639
• (U) Demonstrate all-up HICAP prototype with inert payload and transition technologies to ARDEC	4Q95	2988
• (U) Evaluate ability of ceramic/composite armor concepts to defeat novel KE penetrators	*	5099
• (U) Provide design for an advanced sabot for long rod penetrator rounds using lightweight, high strength materials (goal 10% increase muzzle energy and 20% reduction in yaw)	4Q95	2762
• (U) Evaluate performance of inertial reticle system in moving weapon and moving target application	*	1586
• (U) Demonstrate north-finding technologies with 0.5 degree accuracy	*	1000
• (U) Implement the high resolution vulnerability Stochastic Quantitative Analysis of System Hierarchies (SQUASH) into the MUVES environment	*	895
• (U) Develop next generation vulnerability,lethality, and survivability methodologies for studies involving conventional ballistics, electronic/directed energy warfare, and nuclear, biological, and chemical environments	*	3648
• (U) Provide 24 foot keel beam resin transfer molding model to ATCOM and Sikorsky	*	1491
• (U) Provide distributed, integrated simulation compliant user-definable, geotypical terrain model to battle labs	*	574
Total		**22682**

(U) Project AH81 - Armor/Anti-Armor Memorandum of Understanding (MOU): The overall objective of this project is to provide significantly increased levels of protection and survivability to existing and future combat systems, and to provide significantly increased lethality and effectiveness to existing and future anti-armor munitions by seeking novel and innovative solutions from industry. This project began as a joint

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602618A
PE Title: Ballistics Technology

Budget Activity: #2

program among the U.S. Army, Advanced Research Projects Agency (ARPA), and the U.S. Marine Corps to enhance the national capability in Armor/Anti-Armor (A3) technologies. The Memorandum of Understanding (MOU), begun in 1986, expired in FY 1993. The program has transitioned to the Army. Armor programs will continue with U.S. Army Tank-Automotive Command oversight. Advanced kinetic energy (KE) and chemical energy (CE) warheads will continue with U.S. Army Armament Research, Development and Engineering Center oversight. Work on novel materials for armor and penetrators will be performed under the U.S. Army Research Laboratory's purview. A very high percentage of all work accomplished under this project is performed by contractors.

(U) **FY 1993 Accomplishments:**

	Complete	Cost
• (U) Demonstrated and transitioned improved CE warheads to Army for potential product improvements to anti-tank guided missiles (e.g., Javelin technology insertion)	4Q93	5586
• (U) Provided mine and small arms protection kits for the High Mobility Multipurpose Wheeled Vehicles and 5-ton trucks for U.S. forces in Somalia	*	1874
• (U) Designed, built and demonstrated state-of-the-art armors and compiled results	*	4153
• (U) Developed smart armor system (sensor technical difficulties encountered and resolved)	*	4909
• (U) Performed risk reduction of small low-cost interceptor device design	4Q93	4684
• (U) Developed hydrocode models for ballistic armor development	4Q93	1650
• (U) Issued final report on design and testing by Red Design Bureau	4Q93	4485
Total		**27341**

(U)**FY 1994 Planned Program:**

	Complete	Cost
• (U) Develop and evaluate novel armor protection approaches to provide lightweight protection for combat vehicles	*	1903
• (U) Investigate scaling and designs of alternative warhead concept configurations to determine the minimum size warhead that provides specified anti-armor performance	*	1424
• (U) Demonstrate the capability of a free form shaped charge precursor design constrained to Javelin dimensions	*	711
• (U) Conduct demonstrations of unitary hybrid warhead concept against appropriate range targets and bench mark performance capability against state-of-the-art warheads	*	474
• (U) Evaluate KE precursor design concepts	4Q94	711
• (U) Scale-up sintered transparent spinel armor ceramics; obtain powders and tiles of cubic boron nitride from the		

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602618A
PE Title: Ballistics Technology

Budget Activity: #2

Ukraine for study and testing	4Q94	472
Total		5695

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Demonstrate novel armors for medium and heavy classes of combat vehicles for potential system upgrades	*	890
• (U) Demonstrate roof armors for light vehicles addressing a multiple threat spectrum	*	1200
• (U) Conduct laboratory evaluation of KE precursor concepts and validate interaction models	4Q95	920
Total		3010

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

(U) Work Performed By:
AH80: In-house efforts accomplished primarily by the U.S. Army Research Laboratory (ARL) Weapons Technology Directorate, Aberdeen Proving Ground, MD. Contractors include: Lawrence Livermore National Laboratory, Livermore, CA; University of Washington, Seattle, WA; M. L. Energia, Princeton, NJ; General Fiber Optics, Cedar Grove, NJ; Stablease, Santa Fe, NM; Princeton Combustion Research Laboratory, Princeton, NJ; Johns Hopkins University, Baltimore, MD; Veritay Technology, East Amherst, NY; Elmore Associates, Portola Valley, CA; Paul Gough Associates, Portsmouth, NH; Naval Ordnance Systems, Propellant Manufacturing, Indian Head , MD; Naval Aviation Weapons Center, China Lake, CA; Pennsylvania State University, State College, PA; Custom Analytical Engioneering Systems, Flintstone, MD; and Arrowtech, Burlington, NY.
AH81: Prior to FY1994, in-house efforts accomplished primarily by the Advanced Research Projects Agency. After FY1993, in-house efforts accomplished primarily by the U.S. Army Tank-Automotive Command, Warren, MI; U.S. Army Armament Research, Development and Engineering Center, Picatinny Arsenal, NJ; and the U.S. ARL, Adelphi, MD. Contractors include: Los Alamos National Laboratory, Los Alamos , NM; Sandia National Laboratory, Albuquerque, NM; Battelle Memorial Institute, Columbus, OH; Lawrence Livermore National Laboratory, Livermore, CA; FMC Corporation., San Jose, CA; University of Texas, Austin, TX; Southwest Research Institute, San Antonio, TX; Science and Technology Associates, Colorado Springs, CO; Alliant Tech Systems, Edina, MN; General Dynamics Land Systems, Warren, MI; and Hunting Engineering, United Kingdom.

(U) Related Activities: This program adheres to Tri-Service Reliance Agreements on Advanced Materials, Conventional Air/Surface Weaponry and Directed Energy Weaponry with oversight and coordination provided by the Joint Directors of Laboratories. Work in this Program Element is related to, and fully coordinated with, efforts in PE #0601104A (Electromechanics & Hypervelocity Physics), PE #0602105A (Materials Technology), PE #0602624A (Weapons & Munitions Technology), and PE #0603004A (Weapons & Munitions Advanced Technology), #0602601A

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602618A
PE Title: Ballistics Technology **Budget Activity: #2**

(Combat Vehicle and Automotive Technology), #0603005A (Combat Vehicle and Automotive Advanced Technology) and contains no unwarranted duplication of effort among the Military Departments.

(U) Other Appropriation Funds: ($ in Thousands) Not applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602622A**
PE Title: **Chemical, Smoke and Equipment Defeating Technology** Budget Activity: **#2**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
A552 Smoke/Novel Effects Munitions	6730	3106	2077	1321	1595	3028	3498	Cont'd	Cont'd
A553 Chemical/Biological (CB) Defense & General Investigations	38243	36431	27580	24349	24150	25175	27919	Cont'd	Cont'd
PE TOTAL	44973	39537	29657	25670	25745	28203	31417		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element provides exploratory development of technologies to enhance the ability of U.S forces to deter and defend against chemical and biological (CB) warfare, increase survivability with enhanced smoke and obscurant capabilities, and solve critical light force deficiencies to defeat enemy targets (i.e. non-lethal, Antimateriel, and flame/incendiary devices) Despite the significant progress made towards bi- and multi- lateral treaties, the probability of U.S. forces encountering chemical or biological agents during conflicts around the globe remains extremely high. More than 25 countries have the capability to deliver chemical agents and the use of chemical weapons has been documented in recent third world conflicts. The curtailment of an active U.S. chemical munitions development program drives the need for a most significant improvement in CB defense materiel to serve as a deterrent and guard against technological surprise. A robust defense should reduce the probability of a CB attack and enable U.S. forces to survive, continue operations in a CB environment, and win. Exploratory development is conducted for all the services in areas that include Chemical/Biological Defense and General Investigations (Project A553) consisting of: contamination avoidance through reconnaissance, detection, identification and warning; individual and collective protection; decontamination; CB defense technologies, antiterrorism and support to the Program Executive Officer, Armored Systems Modernization (PEO,ASM). Project A552 provides exploratory development of several capabilities essential to countermeasure enemy weapons systems and to provide the overall capability of degrading or defeating the mission of the enemy. Improved multispectral smokes/obscurants will be explored to enhance survivability by providing effective and efficient screening of deployed forces from threat force surveillance sensors and effective defeat of target acquisition devices, missile guidance, and directed energy weapons, all of which can operate anywhere within the visible through the microwave region of the electromagnetic spectrum. These systems will be designed to be safe and environmentally acceptable. Also under project A552, flame and incendiary payloads will

be developed to defeat a variety of targets ranging from personnel to bunkers and light armored vehicles.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project A552 - Smoke/Novel Effects Munitions: This project addresses the urgent need to provide smoke and obscurants to reduce the vulnerability of US forces by defeating or degrading Reconnaissance/Surveillance/Target Acquisition (RSTA) capabilities directed energy weapons and smart sensors, by providing covert marking for identification friend/foe (IFF); search and rescue; and target marking. This project also provides technology essential to development of novel flame and incendiary payloads.

(U) FY 1993 Accomplishments:	Completed	Cost
• (U) Completed Light Vehicle Obscuration Screening System technology demo, participated in own night demo and transitioned to Dem/Val		
• (U) Completed XM56 Millimeter Wave (MMW) module technology development	FY93	600
• (U) Developed multicomponent (visual/infrared/MMW)/multispectral smoke material; demonstrated ability to control MMW materiel decoy and generation of multispectral from fuel feedstock in lab scale process	*	2000
• (U) Evaluated new payload materials and demonstrated hardware design concepts for an Enhanced Incendiary Grenade	*	350
• (U) Completed design efforts and payload evaluation for a 40mm Incendiary Projectile; transitioned to soldier enhancement program	FY93	450
• (U) Evaluated effectiveness methodology for thermal and blast overpressure	FY93	185
• (U) Conducted study of high energy material for shaped charge follow through for shoulder fired munition	FY93	75
• (U) Demonstrated additional mission kill payload materials for the defeat of armored vehicles. Conducted modeling efforts to determine feasibility of mission kill payloads for indirect fire system	*	500
• (U) Demonstrated unique direct fire system for temporary defeat of armored vehicles	*	480
• (U) Demonstrated effective dissemination of obscurant countermeasure of Infrared (IR) top attack sensor	*	650
Total		**6730**

* This effort is continuing work which is reviewed periodically, ensuring quality, relevance and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602622A
PE Title: Chemical, Smoke and Equipment Defeating Technology — **Budget Activity: #2**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Develop and evaluate multicomponent/multispectral materials	*	910
• (U) Fabricate and test Electro-Optic (EO) countermeasured decoy grenade for top attack protection of armored vehicle	*	250
• (U) Fabricate and test Electro-Optic (EO) marker design for day/night decoy marking of targets and terrain in support of Close Air Support	*	250
• (U) Establish capability to simulate/evaluate obscurant effect on smart sensors	*	200
• (U) Evaluate high energy materials and support conceptual warhead technology program.	*	285
• (U) Develop effectiveness evaluation methodology for thermal and blast overpressure effects for military operations in urban terrain (MOUT) and bunker targets	*	396
• (U) Complete design of enhanced incendiary grenade, conduct demonstration for user and transition as a soldier enhancement program	FY94	380
• (U) Investigate novel methods to destroy or prevent aerosolization of biological agents when production facilities and storage areas are attacked with conventional high explosive munitions, investigate use of aqueous foams	*	135
• (U) Complete Front End Analysis and Master Plan for Flame/Incendiary Weapons	FY94	300
Total		**3106**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Complete tech demo on IR/MMW Countermeasure grenade and transition to Dem/Val	FY95	600
• (U) Develop multicomponent/multispectral material and conduct evaluations	*	400
• (U) Evaluate obscurant effects on smart sensors	*	150
• (U) Evaluate candidate concepts of EO in support of day/night air operations	*	200
• (U) Evaluate high energy materials for advanced target defeating munitions	*	450
• (U) Investigate novel methods to defeat or prevent aerosolization of CB agents when production facilities and storage areas are attacked with convention HE munitions	*	277
Total		**2077**

(U) Project A553 - Chemical/Biological (CB) Defense and General Investigations: This project addresses the urgent need to provide all services with defensive materiel to protect individuals and groups from threat chemical-biological agents in the areas of detection, identification and warning;

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

contamination avoidance through reconnaissance; individual and collective protection and decontamination. It also provides for special investigations into CB defense technology to include CB threat agents, operational sciences, modeling, CB simulants, and nuclear, biological, chemical (NBC) survivability. This project also addresses support to Program Executive Offices aiming towards horizontal integration of cb defensive technologies across the armored force.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Demonstrated toxin and pathogen detection on biorefractometer; assembled eye safe long range laser bio standoff system and tested at limited ranges	*	8438
• (U) Transitioned Chemical-Biological Mass Spectrometer to dem/val	FY93	3667
• (U) Evaluated stand-off chemical detection concepts using laser and Infrared imaging, and thermoluminescence for ground contamination	*	2223
• (U) Established antibody development plan	*	600
• (U) Optimized initial facepiece designs and associated components for advanced respiratory protection mask	*	1200
• (U) Developed test methodologies for respiratory and exercise performance, visual/communication improvements and investigated advanced concepts for facepiece fabrication for future mask concepts	*	2000
• (U) Developed and evaluated concept for regenerable temperature swing adsorption (TSA) for collective protection. Conducted preliminary testing	*	600
• (U) Evaluated improved filtration sorbents for chemical filters and signed an MOU with Canada for joint evaluation of an improved mask canister	*	1219
• (U) Evaluated regenerable pressure swing adsorption and catalytic air filtration systems, obscuration systems and chemical detector concepts for use in future armored systems	*	8279
• (U) Evaluated self-stripping decontamination (decon) coatings for vehicles, catalysts/catalytic impregnants for soldier decon and reformulated/tested a decon agent multipurpose (DAM) decontaminant	*	3225
• (U) Conducted extensive Chemical-Biological battlefield and agent modeling studies, developed and applied new chemical analysis methodology to critical sample analysis tasks and evaluated chemical anti-terrorism concepts	*	6792
Total		**38243**

* This effort is continuing work which is reviewed periodically, ensuring quality, relevance and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602622A
PE Title: Chemical, Smoke and Equipment Defeating Technology — Budget Activity: #2

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Transition bio-detection kit program to production and improved sorbent decon to dem/val	FY94	1400
• (U) Demonstrate low power tunable ultraviolet laser for improved biological discrimination; improve biological identification data base	*	9812
• (U) Conduct studies on recombinant antibodies and develop Deoxynucleic Acid (DNA) library for genes of specific antibodies and express in bacterial system	*	1565
• (U) Fabricate and test Infrared and Laser standoff chemical detector breadboard systems and determine operational parameters and limitations; conduct system modeling	*	2675
• (U) Finalize component design and evaluate facepiece and components for the advanced respiratory protection mask	FY94	700
• (U) Investigate new materials and manufacturing technologies for future/novel respirator designs and conduct physiological performance evaluations of new mask concepts	*	800
• (U) Fabricate and test lab scale temperature swing adsorption filtration and develop data base of performance characteristics for collective protection	FY94	1350
• (U) Evaluate new sorbents and sorbent mixtures for improved filtration performance; test a new Canadian designed filter canister and transition to production	*	1015
• (U) Establish design parameters for pressure swing adsorption/catalytic air filtration and transition to Program Manager, Advanced Field Artillery System; investigate filtration, detection, obscuration system concepts for combat systems	*	7300
• (U) Evaluate reduced-ph hydrolysis catalysts and investigate methodology for examining agent-decontaminant interaction in solid matrices	*	1120
• (U) Integrate chemical models into conventional Army war game scenarios, investigate new CB threat agents and test methodology for evaluating performance of equipment in a CB environment	*	8694
Total		**36431**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Demonstrate flow cytometry as an immunoassay platform for bio detection; evaluate polarization techniques for long range standoff biological detector	*	10702
• (U) Optimize expression of recombinant antibody and scale-up fermentation; conduct antibody modification and design studies	*	1640

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602622A
PE Title: **Chemical, Smoke and Equipment Defeating Technology** Budget Activity: #2

• (U) Conduct studies to optimize integration of future/novel respirator designs to soldier system concepts and standardize mask performance evaluation rating methodology	*	2050
• (U) Evaluate new multi-layer filter designs and fabricate/test engineered adsorbents for improved agent filtration performance	*	1100
• (U) Evaluate limits of performance for regenerable filtration concepts and rapid obscuration concepts for combat vehicles	*	4606
• (U) Develop a quantitative mechanism to determine decon reactions in solids; characterize catalyst and polymers with agent reactive sites for increased reactivity	*	1584
• (U) Expand CB battlefield modeling efforts supporting the development of a Distributed Interactive Simulation (DIS) capability for CB warfare war gaming	*	2050
• (U) Develop standardized test methodologies for CB evaluation of Army materiel and expand CB laboratory analysis capability for special projects	*	3848
Total		**27580**

* This effort is continuing work which is reviewed periodically, ensuring quality, relevance and priority.

(U) Work Performed By: Smoke and Obscurant Munitions and Chemical Munitions: In-house work is primarily performed by the US Army Edgewood Research, Development and Engineering Center (ERDEC), Aberdeen Proving Ground, MD. Some other government agencies performing work for ERDEC are: US Army Research Laboratory, Aberdeen Proving Ground, MD; Army Research Office, Research Triangle Park, NC; Lawrence Livermore National Laboratory, Livermore, CA; Test and Evaluation Command, Aberdeen MD. Contractors include: Allied Signal, NJ; Engineering Technology Inc, FL; MACH I, PA; Rutstein and Assoc, OH; Petersen and Assoc, MA. Chemical/Biological Defense and General Investigations In-house work is primarily performed by the U. S. Army Edgewood Research, Development and Engineering Center, Aberdeen Proving Ground, MD. Some other Government agencies performing work for the Center are: Dugway Proving Ground, Dugway, Utah; U.S. Army Research Laboratory, Aberdeen Proving Ground, MD; Army Research Office, Research Triangle Park, NC; Lawrence Livermore National Laboratory, Livermore, CA; and Belvoir Research, Development and Engineering Center, Ft Belvoir, VA; Los Alamos National Laboratory, NM; Naval Surface Warfare Center, VA; Natick Rsch, Dev and Eng Center, MA; Argonne Nat'l Lab, IL; U.S. Army Topographic Engineering Center, VA. Contractors include: Hughes Aircraft, El Segundo, CA; Battelle Columbus Laboratories, Columbus, OH; Geocenter, MA; Teledyne, CA; Science and Technology Corp, VA; Environmental Technologies Group,MD; TSI, Minn; Wirtz Manufacturing Co, Mich; Environmental Diagnostics, Inc, NC; New Horizons Diagnostics, MD; Hawaii Biotech Group, HI., Guild Assoc, OH.

(U) Related Activities: This program adheres to Tri-Service Reliance Agreements on CB Defense with oversight and coordination provided by the Joint Directors of Laboratories. Work in this Program Element contains no unwarranted duplication of effort among the military departments.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602622A
PE Title: Chemical, Smoke and Equipment Defeating Technology **Budget Activity: #2**

There is an active exchange scientist program with Germany focusing on decontamination; there is a memorandum of understanding (MOU) between the U.S. Army Edgewood Research, Development and Engineering Center (ERDEC) and the U.S. Army Natick Research, Development and Engineering Center and an MOU between ERDEC and USAF Armstrong Laboratory. Work in this program element is consistent with the resource constrained Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan and Project Reliance.

(U) Other Appropriation Funds: ($ in Thousands) Not applicable

(U) International Cooperative Agreements:

- MOU with France - Joint research and development of a Laser Standoff Chemical Detector.
- International MOU with United Kingdom/Canada/U.S. on research, development, production and procurement of CB defensive materiel.
- Numerous Data Exchange Agreements with foreign countries.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602623A
PE Title: **Joint Service Small Arms Program**

Budget Activity: #2

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
AH21 Joint Service Small Arms Program (JSSAP)	4643	3393	5326	3166	3423	3722	4234	Cont	Cont

B. (U) BRIEF DESCRIPTION OF ELEMENT: The objective of this Program Element (PE) and its sole project is to demonstrate key technologies that will enhance the fighting ability and survivability of dismounted battlefield personnel across all the Services. This PE funds several efforts including the following: (1) Component technology for a weapon to replace selected M249 Squad Automatic Weapons, the M60 machine gun, the M2 machine gun, and the MK19 grenade machine gun; (2) Bursting munitions technology to provide a 200% to 300% increase in hit probability and maximize the range of the Objective Individual Combat Weapon to 1000 meters; (3) Non-conventional target effects technology to provide a variable level (lethal/nonlethal) effects against point and area targets; (4) Personal defense weapon technology leading to a more effective Objective Personal Defense Weapon (hit probability of .9 at 50 meters); (5) Objective sniper weapon technology to increase accuracy and effective range to 2000 meters for the next sniper weapon; and (6) Individual fighting system technology to explore and integrate armament and fire control technologies to meet the needs of future dismounted battlefield personnel. The bursting munition technology development supports the 21st Century Land Warrior (21 CLW) program. All JSSAP efforts are based upon approved Joint Service Science and Technology Objectives (JSSTO) and the emerging Joint Service Small Arms Master Plan (JSSAMP) which are drawn from the following Service documents: The Army Battlefield Development Plan and Small Arms Master Plan, the U.S. Marine Corps' (USMC) emerging Advanced Small Arms Plan, the Special Operations Command Destructive Capabilities Master Plan, the Air Force Air Base Ground Defense, Navy requirements, and the Coast Guard Small Arms Master Plan. The work in this PE is consistent with the Army Science & Technology Master Plan (ASTMP), the Army Modernization Plan, and Project Reliance.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project AH21 - Joint Service Small Arms Program:

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Conducted technology build/support analysis for Bursting Munitions (Fire Control/Ammunition/Weapon/Baseline Upgrade) for 21CLW	*	1917

* This is continuing work which is reviewed periodically, ensuring quality, relevance and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602623A
PE Title: Joint Service Small Arms Program **Budget Activity: #2**

• (U) Updated Crew-Served Weapon technology assessment (Lethality/Effectiveness/Baseline Performance/Error Budget) supporting 21CLW	*	1565
• (U) Established and demonstrated initial High Power Acoustic Beam prototype for non-conventional target effects	*	1161
Total		**4643**

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Transition Bursting Munitions technology to the 6.3a Objective Individual Combat Weapon project for 21CLW	*	0
• (U) Award multiple contracts for the Objective Crew-Served Weapon System	*	2341
• (U) Evaluate High Power Acoustic Beam options, construct phased array (infrasonic & audio), and conduct Bio-Simulant effects tests	*	1052
Total		**3393**

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Evaluate Crew-Served Weapon concept definitions and analyze and downselect to the two most promising approaches for component demonstrations	*	4369
• (U) Fabricate High Power Acoustic Beam test bed, perform Bio-Effects tests, and perform initial propagation testing for non-conventional effects	*	957
• (U) Conduct Blue Team Effects review of overall non-conventional target effects efforts	*	0
Total		**5326**

(U) Work Performed By: In-house efforts accomplished primarily by the U.S. Army Armament Research, Development and Engineering Center, Picatinny Arsenal, NJ, with other efforts at the U.S. Naval Surface Warfare Center, Crane, IN, and the U.S. Air Force Wright Laboratory/Armament Directorate, Eglin Air Force Base, FL. It is managed by the Joint Service Small Arms Program Management Committee, with additional oversight provided by the Joint Service Small Arms Program Management Committee. Contractors include: Battelle Columbus Laboratories, Columbus, OH; Mission Research Corporation, Santa Barbara, CA; Scientific Applications & Research Associates, Inc., Huntington Beach, CA; Hilton Systems, Jackson, MS; Desert's Edge Research Laboratories, Las Cruces, NM; the Analytical Sciences Corporation, San Antonio, TX; and the Bio-Dynamics Corporation, San Antonio, TX.

* This is continuing work which is reviewed periodically, ensuring quality, relevance and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602624A
PE Title: Weapons and Munitions Technology

Budget Activity: #2

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
AH18 Artillery & Combat Support Technology	17155	17462	14420	15210	14657	13972	14910	Cont	Cont
AH19 Close Combat Weaponry	8593	8077	5288	5218	5478	5928	7627	Cont	Cont
AH22 High Explosive Materials	0	1000	0	0	0	0	0	0	2000
AH28 Munitions Technology	10638	9126	8455	7819	8329	8728	9591	Cont	Cont
PE TOTAL	36386	35665	28163	28247	28464	28628	32128		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Program Element (PE) develops key technologies that will increase the lethality and survivability of future artillery weapons, munitions and armaments for ground combat vehicles and aircraft. Many of these technologies support the Rapid Force Projection Initiative (RFPI) to make our early entry air deployable forces more capable. This PE funds several efforts, including: advanced gun propulsion technologies, including electric launch; the use of lightweight composite materials in weapons; the application of novel gun recoil concepts and techniques; extended range cargo-carrying projectile technology; as well as projectile concepts featuring an integral, near real time, battle damage assessment capability. This PE also includes tasks that exploit high energy explosive technologies for projectiles and warheads to increase their lethality, and improved gun propellants for increased projectile range and velocity. Advanced armament fire control systems, advanced overwatch sensors for smart mines, and supporting technology advances in mine warfare and demolitions will also be demonstrated. This PE also includes work on thermal management of high performance, high rate of fire, large caliber guns, and advanced air-to-air guns for rotary wing aircraft (e.g., Apache and Comanche). Finally, this PE supports the insensitive munitions technology development for increased survivability of combat vehicles and safety in explosive manufacturing and storage facilities. The work in this PE is consistent with the Army Science & Technology Master Plan (ASTMP), the Army Modernization Plan, and Project Reliance.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602624A
PE Title: Weapons and Munitions Technology

Budget Activity: #2

C. (U) JUSTIFICATION FOR PROJECTS:

(U) **Project AH18 - Artillery and Combat Support Technology:** This project involves the exploratory development of technology for cannon artillery weapon systems and combat support systems. Technology will be developed to increase the battlefield survivability of self-propelled howitzers, such as the Advanced Field Artillery System (AFAS) program. Automated artillery ammunition handling systems, which have the potential to decrease howitzer crew requirements by fifty percent, are also being developed. Technologies for significantly improving the anti-armor performance of precision guided munitions, refinements in baseburn and rocket assist technology for extending the range of improved conventional munitions, and battle damage assessment via a video imaging/reconnaissance projectile are funded under this project. Component technologies, such as the use of composites and novel recoil management concepts, are being developed to lighten towed howitzers and other systems, thereby resulting in improved strategic and tactical mobility for contingency and light forces. This project also includes broad base technology in the areas of advanced electrical propulsion for hypervelocity launch to improve future hit and kill probability against threats at extended ranges.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Performed prove out of Battlefield Imaging Projectile System (BIPS) concept	*	3427
• (U) Completed development of a reconnaissance, surveillance and occupation of position module for decision aid system, and initiated target acquisition improvement for next generation self-propelled artillery, AFAS	*	3509
• (U) Performed initial development of an advanced sensor array for insertion into intelligent minefield (IMF) program	*	1979
• (U) Performed static tests of XM982 extended range artillery projectile components and major subassemblies (e.g., baseburn grain, rocket grain, and expulsion system)	*	2417
• (U) Concluded Phase I contract study of electro-rheological (ER) fluids for use in a lightweight howitzer recoil management system concept	4Q93	576
• (U) Conducted sub-scale static cargo expulsion testing of front payload module & center core burster to obtain payload dispersion characteristics; performed initial projectile fuze study with modified electric time (ET) fuze	*	420
• (U) Completed Armicide concept definition studies, including air defense host radar accuracy investigation	4Q93	1262
• (U) Achieved 2 kilometer/second projectile velocity, without transition, to increase electromagnetic (EM) gun efficiency and extend barrel life; conducted over 75 tests to improve power effects in EM gun systems	*	2730
• (U) Commissioned Kirk Cudbright facility in Scotland to test flight dynamics of EM projectiles	4Q93	229
• (U) Tested and evaluated a sub-scale, lightweight, selectable EFP warhead effective against future advanced complex reactive armor targets and transitioned to 6.3A	4Q93	606
Total		**17155**

* This is continuing work which is reviewed periodically, ensuring quality, relevance and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602624A**
PE Title: **Weapons and Munitions Technology** Budget Activity: **#2**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Perform captive flight test experiments of laser radar (LADAR) technology emphasizing performance in smoke and adverse weather	*	4165
• (U) Define characteristics and initiate development of a self defense module for a decision aid system for next generation self-propelled artillery, AFAS	*	1650
• (U) Conduct tests of advanced sensor array with capability of real time, 2-dimensional tracking at ranges in excess of 1 kilometer for Intelligent Minefield (IMF) program	*	2382
• (U) Perform ballistic testing of XM982 ERA projectile components (i.e., baseburn grain, rocket grain, expulsion system); conduct in-flight high capacity artillery projectile cargo tests	*	1773
• (U) Establish distributive interactive simulation (DIS) node for participation in wargaming scenarios for battle laboratories	*	1774
• (U) Investigate recoil attenuation techniques, composite studies and automation parameters for a 155mm lightweight automated howitzer	*	546
• (U) Conduct competent munition parametric studies on stockpiled munitions incorporating Global Positioning System for improved accuracy and performance at minimum cost	*	955
• (U) Perform 120mm mortar ballistic and aerodynamic analyses to determine parameter profiles for extended ranges	*	314
• (U) Increase non-transitioning projectile velocity closer to 3 km/s goal to further increase EM gun efficiency; conduct characterization tests of EM barrel to advance knowledge of physics in EM launchers	*	2602
• (U) Conduct armature compliance tests to decrease projectile parasitic mass, increasing EM gun efficiency and extending barrel life	*	1301
Total		**17462**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Determine improvements in laser radar technology for enhanced performance in adverse weather and enhanced target signature effects	4Q95	3172
• (U) Demonstrate a decision support system offering a 50% time reduction in planning a new position for a next generation self-propelled artillery (AFAS) fire mission; provide a tool for assessment of expert systems	4Q95	1538
• (U) Develop detailed designs for advanced sensor array demonstrator; insert technology into Intelligent Minefield	4Q95	1970
• (U) Support demonstration of a 155mm ERA projectile (XM982) capable of delivering cargo out to 50KM; conduct full-scale launch of 2-piece composite High Capacity Artillery Projectile (HICAP) for future ERA application	*	1395

* This is continuing work which is reviewed periodically, ensuring quality, relevance and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602624A**
PE Title: **Weapons and Munitions Technology** Budget Activity: **#2**

• (U) Demonstrate a HMMWV-mounted, 120mm mortar system as part of the RFPI early version demo	*	1130
• (U) Complete light weight, automated howitzer trade-off studies to determine optimum approach and prepare for demonstration phase	4Q95	398
• (U) Define optimum, low-cost, competent munition approach based on FY 1994 parametric studies for stockpiled munitions and develop demonstration plan	*	503
• (U) Conduct 120mm mortar rocket motor design for extended range propulsion system; fabricate motors	4Q95	314
• (U) Conduct characterization tests of EM barrel to increase transitioning velocity of EM projectiles and increase EM gun efficiency/barrel life; advance knowledge of physics in EM launchers	*	2600
• (U) Test advanced armature configurations to improve EM gun efficiencies/lethality while decreasing projectile parasitic mass	*	1400
Total		**14420**

(U) Project AH19 - Close Combat Weaponry: The objective of this project is to exploit and advance new technologies which will demonstrate significant improvements in direct fire cannon performance for ground and airborne combat vehicles. This includes developing the basic technology in the areas of weapon stabilization and control, projectile design and fabrication, thermal management of high rate launching mechanisms, and the design of munition automatic loaders/feed systems. This project provides opportunities for longer range, more accurate and more lethal cannon systems for armored vehicle upgrades (e.g., Abrams, Bradley Fighting Vehicle System) and for new systems. The approach will be to develop both the hardware and analytical tools necessary to assess system performance, identify problem areas and to develop solutions.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Studied bio-effects and finalized concepts for "Demon" (Classified program)	*	1524
• (U) Designed composite sabot and demonstrated new Kinetic Energy (KE) projectile concept to defeat explosive reactive armor	*	763
• (U) Tested Light Armament Module components to demonstrate a modular, fully automated direct fire system	*	916
• (U) Accomplished concept definition of demonstration program for Armicide Air Defense adjunct to Patriot Missile Defense System	*	1109
• (U) Demonstrated 72% peak recoil force reduction, demonstrated ability to track 20mm and 30mm projectiles with laser radar	*	3470
• (U) Developed concept for automatic loader control system	*	392
• (U) Developed heat buildup computer codes for gun tubes	*	419
Total		**8593**

* This is continuing work which is reviewed periodically, ensuring quality, relevance and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602624A**
PE Title: **Weapons and Munitions Technology**

Budget Activity: **#2**

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Evaluate six to ten non-lethal weaponization concepts	*	2912
• (U) Conduct static and dynamic tests of gun tubes; conduct live fire demonstration of composite sabot for goal for defeat of explosive reactive armor	*	2975
• (U) Demonstrate a modular, fully automated, direct fire system which is light, lethal and adaptable to light vehicles	*	1531
• (U) Evaluate baseline and improved gun system models and integrate into Helicopter Simulator for man-in-the-loop evaluation	*	659
Total		**8077**

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Prove out two non-lethal weapon concepts in an operational environment to develop low collateral damage munitions	*	1811
• (U) Integrate and demonstrate composite sabot with explosive reactive armor defeat penetrator into a projectile to defeat explosive reactive armor	*	2348
• (U) Demonstrate Light Armament Module	*	1129
Total		**5288**

(U) Project AH22 - High Explosive Materials: This project was started in FY 1994 in response to Conference Report 103-339, page 115, dated November 9, 1993, which made reference to Longhorn Army Ammunition Plant (AAP). The House Armed Services Committee recommended funding to conduct feasibility tests and process prove-outs of energetic materials and binders from low sample test quantities to small scale production at the high explosive materials facility at Longhorn AAP.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Not Applicable		

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Develop processes to correct safety, environmental and sole source dependency problems in pyrotechnics manufacturing	4Q94	500
• (U) Develop pilot plant processes for prove out of production of more powerful explosives	4Q94	500
Total		**1000**

* This is continuing work which is reviewed periodically, ensuring quality, relevance and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602624A**
PE Title: **Weapons and Munitions Technology** Budget Activity: **#2**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Not Applicable		

(U) Project AH28 - Munitions Technology: This project supports weapon system developments and advances technologies in the areas of propellants, explosives, warhead, ammunition packaging, pyrotechnics and penetration materials. Advances in warhead technology will provide improved explosively formed penetrators (EFP), shaped charges and heavy metal alloy penetrators and liners to defeat the current and future threat systems. High energy/density explosives developed will increase light material anti-armor and multi-target lethality. Improved pyrotechnic expendables will be developed in this project to protect low flying and relatively slow Army aircraft from heat-seeking missiles. The Insensitive Munition (IM) efforts conducted in this project will increase the survivability of tanks, artillery, helicopters and infantry fighting vehicles, as well as safety in manufacturing plants and storage depots.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Identified new plasticizers for the insensitive PAX formulation for application to Javelin/TACAWS warheads	*	645
• (U) Prepared 80 lbs of trinitroazetidine (TNAZ), a more powerful/less sensitive/castable explosive, for a TNAZ-loaded Explosively Formed Penetrator (EFP) warhead	*	1489
• (U) Demonstrated feasibility of multi-mode non/axisymmetric EFP warhead to defeat a variety of future heavy and light armored targets	4Q93	1876
• (U) Fabricated improved tungsten alloy penetrator for ballistic evaluation	*	415
• (U) Submitted candidate high energy tank propellant for large scale vulnerability/ballistic tests	*	2937
• (U) Conducted concept study for imaging seeker pyrotechnic decoy expendable flare to protect Army aircraft	*	400
• (U) Tested and evaluated a sub-scale, lightweight, selectable EFP warhead effective against future advanced complex reactive armor targets and transitioned to 6.3A	4Q93	2322
• (U) Demonstrated feasibility, as directed by Congress, of decontaminable wood packaging/pallets	4Q93	554
Total		**10638**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Scale up PAX synthesis to 100 lb/batch level; potential upgrade for Javelin/TACAWS warheads	*	650
• (U) Conduct laboratory tests on TNAZ explosives and scale up TNAZ synthesis to 250 lbs for EFP demo	*	2361
• (U) Demonstrate improved performance of advanced shaped charge warhead loaded with TNAZ; potential upgrade for Longbow and Javelin	*	2357

* This is continuing work which is reviewed periodically, ensuring quality, relevance and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602624A
PE Title: Weapons and Munitions Technology — **Budget Activity: #2**

• (U) Demonstrate armor defeat capability of improved, environmentally safe tungsten penetrators	*	485
• (U) Develop a scale-up pilot plant process concept for high performance gun propellant; potential M829 upgrade	*	2823
• (U) Conduct design study for imaging seeker pyrotechnic decoy expendable flare	*	450
Total		**9126**

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Establish feasible laboratory scale synthesis routes for new insensitive explosives such as trinitroimidizol	*	830
• (U) Investigate concepts for industrial pilot plant scale-up processes of TNAZ towards improved process for Army ammunition plants	4Q95	2838
• (U) Develop high efficiency reinforced concrete defeat mechanisms	4Q95	2418
• (U) Develop process, characterize/evaluate mechanical properties of fully dense, tungsten composite	*	569
• (U) Demonstrate pilot plant level-type scale-up for manufacture of high performance gun propellant	*	1500
• (U) Fabricate test hardware of imaging seeker pyrotechnic decoy expendable flare	*	300
Total		**8455**

* This is continuing work which is reviewed periodically, ensuring quality, relevance and priority.

(U) Work Performed By: In-house efforts primarily accomplished by U.S. Army Armaments Research Development and Engineering Center, Picatinny Arsenal, NJ. Contractors include: Alliant Tech Systems, Minneapolis, MN; Geo-Centers, Wharton, NJ; Drexel University, Philadelphia, PA; SAIC, PA; Ferrulmatic, Totowa, NJ; Chamberlain-SAAP, Scranton, PA; Talley Defense Systems, AZ; Textron, Lowell, MA; Parker Kinetic Design, Austin, TX; Pinnacle Corp, Los Gatos, CA; University of Texas, Austin, TX; Kaman Sciences Corp., Colorado Springs, CO; KDI Precision Products, Inc., Cincinnati, OH; LB&M Associates Inc., Lawton, OK; LTV Aerospace, Dallas, TX; and Technical Solutions Inc., Mesilla Park, NM; University of Texas, El Paso, TX; Thiokol, Elkton, MO; Olin Corp, E. Alton, FL; Thiokol LHAAP, Marshal, TX.

(U) Related Activities: This program adheres to Tri-Service Reliance Agreements on Conventional Air/Surface Weaponry with oversight provided by the Joint Directors of Laboratories. Additionally, the Decision Aids technology development is being supported through ARPA's Domain Specific Software Architecture Program. Work in this PE is related to, and fully coordinated with, efforts in PE #0601102A (Defense Research Sciences), PE #0601104A (Electromechanics & Hypervelocity Physics), PE #0602618A (Ballistics Technology), PE #0602623A (Joint Service Small Arms Program), PE #0603004A (Weapons & Munitions Advanced Technology), PE #0603606A (Landmine Warfare & Barrier Advanced Technology), PE #0603607A (Joint Service Small Arms Program), and PE #0603005A (Combat Vehicle & Automotive Advanced Technology). In accordance with the on-going Reliance joint planning process, this PE contains no unwarranted duplication of effort among the Military Departments.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602624A**
PE Title: **Weapons and Munitions Technology**

Budget Activity: **#2**

(U) Other Appropriation Funds: ($ in Thousands) Not applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602705A
PE Title: **Electronics and Electronic Devices**

Budget Activity: #2

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
AH72 Fuels Cells	0	2500	0	0	0	0	0	0	2500
AH94 Electronic and Electronic Devices	21499	22386	21222	17773	17423	18738	19870	Cont'd	Cont'd
PE TOTAL	21499	24886	21222	17773	17423	18738	19870		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program supports advanced electronic device and power source device technology, for present and projected Army systems, enabling considerably lower Operations and Support costs (O&S), superior lethality, survivability, performance, and reliability, and greatly reduced acquisition cost. Advanced electronic device and power-source device technology is essential to all land combat systems that contain electronics, including the 21st Century Land Warrior, autonomous missile systems, advanced land combat vehicles, brilliant anti-tank munitions, electric weapons, secure jam-resistant communications, Automatic Target Recognition (ATR), foliage-penetrating radar, and combat identification systems. The work under this program element provides enabling capability to provide small, low-cost, lightweight, high-energy sources of power for communications, target acquisition, miniaturized displays and microclimate cooling for the 21st Century Land Warrior. Under Defense Reliance Agreements this program supports the in-house exploratory development effort at a single Army site which serves as both the center for display technology development and the center for frequency control and devices for the Army, Navy, Air Force, BMDO, and DNA. Principal advanced electronic device technology programs within these centers include the development of high-resolution, full-color military displays ranging in size from head-mounted personal viewers to large area one-square-meter battlefield displays, and ultra-stable, super-high-accuracy frequency sources and devices for anti-jam communications and precision location systems, such as the Global Positioning System. Dual-use applications being pursued include: microwave/millimeter wave (MW/MMW) and photonic devices for personal communication/navigation systems, automotive radar, flat panel displays for portable computers, and high energy rechargeable batteries for commercial electronic devices. Work in this program element is consistent with the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan and Project Reliance. It supports DOD requirements for areas that employ electronic and portable power source technology. All Army electronic device work is combined in this PE.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602705A
PE Title: Electronics and Electronic Devices

Budget Activity: #2

C. (U) JUSTIFICATION FOR PROJECTS:

(U) **Project AH72 - Fuel Cells.** This project develops preliminary fuel cell systems that are needed to provide signature-free power for micro-climate cooling in the protective clothing for the individual infantryman on missions lasting longer than a few hours. The key problem is minimization of system weight (less than 5kg). This work will increase the survivability and letahlity of the dismounted soldier. The present best approach involves the use of polymer-electrolyte-membrane (PEM) fuel cell technology, with pressurized or chemically-generated hydrogen as the fuel. A more attractive, but longer-term solution that is being researched is the use of liquid fuels.

(U) **FY 1994 Planned Program:**

	Complete	Cost
• (U) Develop fuel cells to provide signature-free power for micro-climate cooling in the protective clothing for the individual infantryman on missions lasting longer than a few hours	4Q94	2500
Total		2500

(U) **Project AH94 - Electronic and Electronic Devices.** Efforts in this project are restructured from PE #0603742A, Project DF32.

(U) **FY 1993 Accomplishments:**

	Complete	Cost
• (U) Demonstrated and delivered prototype interface for interoperability of SINCGARS radio and French (NATO) PR4G radio, allowing first-ever direct communication among secure NATO radios	4Q93	500
• (U) Completed and distributed computer-aided-design (CAD) tools for integrated circuit design (based on VHDL (VHSIC Hardware Description Language) behavioral descriptions and signal processor synthesis	4Q93	700
• (U) Demonstrated ten-fold increase in blue phosphor luminance, resulting in first-ever color-balanced full-color thin-film electroluminescent display	4Q93	800
• (U) Developed prototype 6-volt rechargeable lithium batteries that have five times the energy density of nickel-cadmium batteries, for use in thermal weapon sight	4Q93	650
• (U) Demonstrated second generation primary Lithium-Sulfonyl Chloride battery delivering 300 Watt-Hours per kilogram, for use in Soldier Integrated Protected Ensemble (SIPE)	4Q93	1050
• (U) Completed development of a prototype of a dual-mode (infrared and microwave) sensor	4Q93	500

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602705A**
PE Title: **Electronics and Electronic Devices**

Budget Activity: **#2**

• *(U) Congressional special interest program to increase manufacturability of improved magnesium batteries, develop recycling process for Cadmium/Mercury batteries, and develop advanced non-metallic batteries*	4Q93	3000
• (U) Research and develop advanced electronic devices and power sources enabling superior lethality, survivability, performance, reliability, and reduced acquisition cost for Army land combat systems	*	14299
Total		21499

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Develop materials, processes, and fabrication technology for passive/active matrix, full color, high-resolution flat panel displays and interactive devices crucial to digitized battlefield and 21 Century Land Warrior	*	1000
• (U) Investigate failure of high frequency microcircuits, determine reliability limitations of advanced packaging technology, and establish procurement guidance for use of commercial plastic parts to reduce costs	*	1347
• (U) Develop CAD/simulation tools for design of digital/analog components from behavioral descriptions for rapid prototyping, acquisition, and improved affordability. Demonstrate advanced packaging and high-power microwave protection	*	3269
• (U) Exploit novel electronic materials and processing technologies to demonstrate high-power photoconductive switches for UWB radar and advanced, microscale sensors and actuators for target recognition, and engine failure prognosis	*	3650
• (U) Improve primary/rechargeable lithium batteries to increase energy density for man-portable Command, Control, Communications, &Intelligence (C3I). Investigate preliminary fuel cell system design and liquid fuels to enhance survivability and lethality of the dismounted soldier	*	3547
• (U) Design MW/MMW and acoustic devices for high data rate communications and extended EW (Electronic Warfare)/radar capabilities. Exploit MW/optical and quasi-optical phenomena to enable advanced imaging systems	*	4450
• (U) Demonstrate 1000 line/inch head-mounted personal viewer. Transition to Army Communication Command low-power ruggedized, display technology for portable and command post C3I systems and the Lightweight Computer Unit (LCU)	4Q94	723
• (U) Develop solid state switch modules for power conditioning circuits for Electric Gun and advanced land combat vehicles. Develop narrow band high-power MW sources for MW weapons, radar, and electric gun technology	4Q94	400
• (U) Demonstrate and transition to Army Communications-Electronics Command MW transponder for dismounted soldier combat identification; demonstrate one watt, 35/44 GHz heterojunction bipolar transistor (HBT) power amplifier for smart munitions	4Q94	1000

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602705A**
PE Title: **Electronics and Electronic Devices**

Budget Activity: **#2**

• (U) Congressional special interest program for low-cost, reusable alkaline manganese batteries for portable manpack radios, no-lead added alkaline cells, and advanced non-metallic rechargeable battery systems	4Q94	3000
Total		22386

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Develop and characterize advanced high performance, full-color display technology and associated technology for interactive displays	*	1607
• (U) Develop and apply techniques and tools to assure cost effective, testable and reliable electronic components. Develop documentation to enable effective insertion of best commercial practice parts	*	1405
• (U) Develop ultra-low power, ultra-high speed microcircuits, e.g. single chip direct digital synthesizer technology. Establish interoperability criteria to achieve rapid insertion and exploit hardware among Army, Navy, and Air Force	*	2380
• (U) Fabricate improved fluidic amplifier, demonstrate micromachined IR scene generator, and improve processing technology for advanced miniature sensors and actuators for mine detection, optoelectronic biosensors, missile seekers	*	2508
• (U) MW/Acoustics-Develop advanced heterojunction devices and integrated circuits, quasi-optical grid oscillators and power combiners, MMW Passive Imaging Arrays, and producible conformal electronic scan antenna seekers	*	4930
• (U) Develop hydrogen fuel cell for futue soldier applications, improved primary lithium battery with 600W-Hr/Kg and re-chargeable/polymer cells with 250W-Hr/Kg for soldier, C3I and robotics applications, and pulse power battery with 300Kj/Kg	*	4142
• (U) Demonstrate concurrent computer-aided engineering system with modeling/assessment capabilities for improved affordability, testability, and performance of microcircuits to capitalize on industry foundry processes	4Q95	2950
• (U) Demonstrate rechargeable/polymer cells for soldier, C3I, and robotic vehicles with 140W-Hr/Kg	4Q95	1300
Total		21222

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

(U) Work Performed By: Work is performed by Electronic and Power Source Directorate (E&PSD) of the Army Research Laboratory (ARL), Ft. Monmouth, NJ, and Communications and Electronics Command (CECOM), Ft. Monmouth, NJ. Principal contractors include: IT&T Corp., Easton, PA; Hughes Aircraft, Los Angeles, CA; GE, Syracuse, NY; TRW, Inc., Redondo Beach, CA; RAYOVAC Corp, Madison, WI; Ball Aerospace, Broomfield, CO; Quartztronics, Salt Lake City, UT; Honeywell Power Source, PA; Westinghouse, PA; Westinghouse, MD; Varian Associates, CA; Planar Systems, OR; Whittaker-Yardney, MA; United Tech Corp., CT; David Sarnoff, NJ; Honeywell, MN; Alliant, PA; Howard Univ, Wash DC; Hampton University, Hampton, VA; Morgan State University, Baltimore, MD; Northeastern Univ, MA.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602705A**
PE Title: **Electronics and Electronic Devices**

Budget Activity: **#2**

(U) Related Activities: This program adheres to Tri-Service Reliance Agreements on Electronic Devices with oversight and coordination provided by the Joint Directors of Laboratories. There is no unnecessary duplication of effort within the Army or DoD.

(U) Other Appropriation Funds: ($ in Thousands) Not applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602709A**
PE Title: **Night Vision Technology** Budget Activity: **#2**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DH95 Night Vision and Electro-Optic Technology	33444	18917	19406	16882	16970	17660	19631	Cont'd	Cont'd

B. (U) BRIEF DESCRIPTION OF ELEMENT: The key objective of this program is to provide electro-optical technology and devices that can acquire and track enemy targets at the maximum weapon system ranges under conditions of smoke, countermeasures, and darkness. Development is concentrated on infrared focal plane arrays, image intensification devices, low energy lasers, aided target recognition and performance modeling, simulation and analysis for system development programs. In thermal imaging, the development of advanced infrared focal plane array technology to significantly increase the range and sensitivity of Forward Looking Infrared (FLIR) systems will meet stringent target acquisition and fire control requirements for upgrades to Army systems. Advanced generation infrared imaging technology is under development. In signal processing, exploitation of automatic target acquisition capabilities afforded by integrating second generation FLIR technology with advanced image processing algorithms, and the processing of features from additional sensors are emphasized for upgrades to Army systems. In lasers, the emphasis is placed upon the development of laser technology for Army tactical laser countermeasures, particularly for individual soldier applications. For modeling, simulation and analysis, the development of performance models and simulations for sensor/processor systems and subsequent evaluation/analysis of these systems is critical as a baseline performance indicator to weapon system managers producing high-performance electro-optic target acquisition systems. The program addresses affordability of technology, particularly in the areas of Focal Plane Arrays (FPA) and signal processors; flexible manufacturing technologies are also being investigated. Work in this program element is consistent with the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan, and Project Reliance. The FY 1994 funding profile reflects the transfer to Army Research Laboratory of missions in multisensor target signatures and tunable laser research; maturation of target acquisition technologies, with transition to advanced technology development efforts (PE #0603710A); as well as the end of the Automatic Target Cueing and Recognition Engine (ATCURE) phase I program with demonstration of hardware modules and software architecture modules; completion of demonstration hardware for the passive microwave camera (with follow-on technology investigation in PE #0602120); and across-the-board DoD adjustments to fund dual use technologies.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602709A
PE Title: Night Vision Technology
Budget Activity: #2

C. (U) JUSTIFICATION FOR PROJECTS:

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Transitioned improved resolution image intensifier tubes to advanced technology development of wide field of view night vision goggles for pilotage and ground maneuver applications	*	3400
• (U) Completed development and evaluated high performance miniaturized image processing modules using programmable silicon circuit board interconnect technology	4Q93	4400
• (U) Completed and released to government/industry the forward looking infrared (FLIR) 92 target acquisition model as baseline for performance modeling of advanced sensors	4Q93	5200
• (U) Implemented a joint Army/Air Force program to develop a family of modular high performance, standard electronics module-version- E (SEM-E) autonomous target recognition (ATR) processing components	*	5300
• (U) Implemented an all service/industry/academia consortium to develop producible high performance smart focal plane arrays using metal organic molecular beam epitaxial (MOMBE) growth process	*	7100
• (U) Developed and integrated feature level fusion algorithms into multi-sensor processor	4Q93	3044
• (U) Evaluated/improved radar signature model/developed Beta version FLIR ATR algorithm/evaluation system	4Q93	1200
• (U) Developed & integrated subsystems of concept demo model of pssive millimeter Wave camera and began evaluation	4Q93	2000
• (U) Developed processing technology for next generation infrared detector structures and designed readout integrated circuits to enhance cooled and uncooled IR detector arrays	*	1800
Total		**33444**

(U) FY 1994 Planned Program	Complete	Cost
• (U) Develop the key protocols and interface mechanisms to implement night capability onto the Army simulation node for interactive simulation activities with the Battle Labs	*	3700
• (U) Develop an interactive staring testbed to evaluate and assess staring focal plane arrays and improvement methodology	*	3917
• (U) Develop the electronic interfaces and readout circuitry aspects of smart focal plane arrays for automated targeting	*	3500
• (U) Develop new optical structures to increase performance envelopes while reducing cost of advanced electro-optical sensor systems	*	1000

*This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602709A**
PE Title: **Night Vision Technology** Budget Activity: **#2**

• (U) Transition advanced laser protection technology to the program manager and provide technology support for the Army's horizontal integration of second generation FLIRs	4Q94	700
• (U) Map ATR algorithms into high performance image processors and conduct experiments to validate automated targeting concepts	*	4600
• (U) Improve the capability of the target acquisition model to predict performance against low-signature targets	4Q94	1500
Total		**18917**

(U) FY 1995 Planned Program	Complete	Cost
• (U) Demonstrate through the MOMBE consortium the capability to grow integrated smart FPAs	*	2800
• (U) Evaluate emerging staring focal plane arrays and establish critical improvement mechods	*	3006
• (U) Investigate the use of micro-binary optical structures for advanced electron-optical sensors	*	4800
• (U) Transition high performance image processing modules to the Army's scout sensor and target acquisition sensor technologies to support the integration of aided target recognition	4Q95	4800
• (U) Implement advanced modeling techniques to support performance characterization of Army electro-optical targeting sensor/systems.	*	4000
Total		**19406**

*This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

(U) Work Performed By: Work primarily performed by the U.S. Army Communications-Electronics Command (CECOM) Night Vision and Electronic Sensors Directorate, at Fort Belvoir, VA, and Ft. Monmouth, NJ. Contractors include: EOIR, Spotsylvania, VA; ERIM, Ann Arbor, MI; Omar McCall, Beltsville, MD; Texas Instruments, Plano and Dallas, TX; AT&T, Greensboro, NC; Signal, Falls Church, VA; and Plasmaquest, Inc, Richardson, TX.

(U) Related Activities: This program adheres to Tri-Service Reliance Agreements on Electro-optics with oversight and coordination provided by the Joint Directors of Laboratories. Work in this Program Element is related to and fully coordinated with PE #0603710A (Night Vision Advanced Technology). There is no unnecessary duplication of effort within the Army or DoD.

(U) Other Appropriation Funds: ($ in Thousands) Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602709A
PE Title: Night Vision Technology

Budget Activity: #2

(U) International Cooperative Agreements: International interchange of information is accomplished primarily through active participation on various NATO working groups, The Technical Cooperation Program (US, United Kingdom, Canada, Australia), and the International Standardization Program.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602716A**
PE Title: **Human Factors Engineering Technology**

Budget Activity: **#2**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
AH70 Human Factors Engineering Systems Development	10594	15144	14393	13928	14896	15834	15715	Cont'd	Cont'd

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program focuses on maximizing the effectiveness of the soldier in concert with his materiel, in order to survive and prevail on the battlefield. 21st Century Land Warrior (21CLW) program is directly supported by this soldier-system performance and supportability enhancement program. Specialized laboratory studies and field evaluations are conducted to collect performance data on the capabilities and limitations of soldiers, with particular attention on soldier and equipment interaction. The resulting data are the basis for weapon systems and equipment design standards, guidelines, handbooks, and soldier training and manpower requirements to improve equipment operation and maintenance. Application of advancements yield reduced workload, fewer errors, enhanced soldier protection, user acceptance, and allows the soldier to extract the maximum performance from his equipment. In FY1994, the Manpower, Personnel, Training, Health Hazards and Safety (MANPRINT) functions from PE #602785A.BB2 and PE #603007A.792 are restructured into this Program Element (PE). In addition, the Human Factors Engineering in System Design portion of PE #603007A.796 is transferred to this PE in FY94. The work in this program is consistent with the Army Science and Technology Master Plan (ASTMP) and the Army Modernization Plan. All work under this PE is part of the "Human-Systems Interfaces" Tri-Service Reliance Panel.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project AH70 - Human Factors Engineering Systems Development:

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Developed an operational prototype knowledge-based decision support system for Corps level baseline and contingency supply distribution	*	600
• (U) Conducted field experiments for automation equipped enhanced rough terrain forklifts	*	389
• (U) Extended Hardware versus Manpower (HARDMAN) computer model to estimate platoon through division maintenance personnel requirements and assessed new computers for future modeling efforts	*	935

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602716A**
PE Title: **Human Factors Engineering Technology** Budget Activity: **#2**

• (U) Enhanced JACK anthropometric model capabilities with feature refinements, user interface improvements, two-way Computer Aided Design translators	*	2249
• (U) Developed battlefield-hazardous environment simulators specifications and designs	*	106
• (U) Developed modeling techniques for assessing Intelligence Electronic Warfare soldier resource issues affected by materiel, doctrinal and force structure changes and assess individual weapons heads-up display requirements	*	1577
• (U) Enhanced speech intelligibility and soldier performance model to incorporate temperature and wind gradients effects on sound propagation and published research on 3-D auditory warnings and displays	*	488
• (U) Produced draft Army symbology standard for materiel developer and user comment	*	100
• (U) Provided MANPRINT support to Training & Doctrine Command (TRADOC) and Army Materiel Command (AMC) individual activities including Battle Labs, RDECs, Laboratories, and test and evaluation installations	*	3177
• (U) Demonstrated Video Imaging Projectile (VIP) and Global Positioning System Fuze concept for real-time target acquisition location and battle damage assessment including investigation of automated fire support crew technologies	4Q93	973
Total		**10594**

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Demonstrate a knowledge-based decision support system that enables interactive planning and scheduling for all classes of supply, typical of the size and complexity of Desert Storm	*	1351
• (U) Enhance auditory detection model by developing and incorporating a method for measuring ground impedance and its effects and demonstrate 3-D auditory sound localization	*	710
• (U) Develop brigade staff Intelligence Decision Support System (IDSS) requirements including development of prototype for demonstration	*	1755
• (U) Enhance virtual reality (VR) capabilities for individual soldier simulation including integration of enhanced JACK anthropometric model with addition of body strength and motion-smoothing equations	*	2348
• (U) Enhance soldier modernization models and methods to identify high-cost-driver soldier-system design features (current and new technologies) and allow consideration of soldier survivability concerns	*	1845
• (U) Conduct beta testing and validation of battlefield-hazardous environment simulation facility and evaluate of heads-up display for rifle sight	*	1914
• (U) Enhance MANPRINT field Test and Evaluation (T&E) methods with soldier-in-the-loop operational test exercises to reduce T&E costs and timelines burden to Test & Evaluation Experiments Command (TEXCOM)	*	1562

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602716A**
PE Title: **Human Factors Engineering Technology** Budget Activity: **#2**

• (U) Obtain data to parameterize MANPRINT models while providing MANPRINT evaluation and design support to TRADOC, AMC, Battle Labs, RDECs, and laboratories	*	2992
• (U) Provide soldier-machine interface (e.g., crew station, symbology) design standards and guidance to materiel and combat developers	*	667
Total		**15144**

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Expand knowledge-based support systems to include combat and disaster relief planning	*	717
• (U) Expand use of auditory detection model to include predictions for impulse noise and demonstrate operator guidance with 3-D auditory display, including development of speech intelligibility measure	*	729
• (U) Collect and parameterize data for IDSS	*	2346
• (U) Enhance virtual reality (VR) capabilities for individual soldier simulation including integration of enhanced JACK anthropometric model with addition of body strength and motion-smoothing equations	*	1709
• (U) Develop MANPRINT soldier-modernization trade-off tools to assess effects of manpower (e.g., crew size and personnel skills) characteristics on weapon system redesign options	*	2151
• (U) Exercise battlefield-hazardous environment simulator with fielded and prototype systems	*	1398
• (U) Enhance MANPRINT field T&E methods with soldier-in-the-loop operational test exercise data to upgrade TEXCOM capabilities to assess new-technology systems	*	1376
• (U) Derive field, laboratory and simulation exercise data to parameterize MANPRINT evaluation and design support to TRADOC, AMC, BattleLabs, RDECs, and laboratories	*	3132
• (U) Provide soldier-machine interface (e.g., crew station, symbology) design standards and guidance to materiel and combat developers	*	835
Total		**14393**

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

(U) Work Performed By: In-house work is primarily performed by the Army Research Laboratory, Human Research and Engineering Directorate (HRED), Aberdeen Proving Ground, MD, and at ARL-HRED sites at supported installations: Fort Bliss, TX; Fort Hood, TX; Picatinny Arsenal, NJ; Fort Knox, NJ; St. Louis, MO; Fort Rucker, AL; Fort Belvoir, VA; Fort Monmouth, NJ; Edgewood, MD; Redstone Arsenal, AL; Alexandria, VA; Fort Gordon, GA; Orlando, FL; Warren, MI; Fort Sill, OK; Fort Benning, GA; Fort Bragg, NC; Warrenton, VA; and Fort Huchuca, AZ. Contractors include: CSC Analytics, Inc., Eatontown NJ; CAE--Link Corp., Binghampton, NY; Dynamics Research Corp., Wilmington MA; Micro Analysis & Design Inc., Boulder, CO; BDM International, Inc., Albuquerque, NM. Universities with which ARL-HRED is carrying out joint

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602716A**
PE Title: **Human Factors Engineering Technology** Budget Activity: **#2**

and sponsored work include University of Pennsylvania; University of Pennsylvania State College; University of Utah; Carnegie-Mellon University, Pittsburgh, PA; Morgan State University, Baltimore, MD.

(U) Related Activities: This program adheres to Tri-Service Reliance Agreements on Conventional Air/Surface Weaponry, Ground Vehicles, and Manpower & Personnel with oversight and coordination provided by the Joint Directors of Laboratories. Work in this Program Element contains no unwarranted duplication of effort among the Military Departments

(U) Other Appropriation Funds: ($ in Thousands) Not applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602720A
PE Title: Environmental Quality Technology

Budget Activity: #2

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D048 Industrial Operations Pollution Control Technology	8927	3442	3556	2210	2244	2259	2503	Cont'd	Cont'd
A821 Bioremediation Education, Science and Technology (BEST) Centers	0	2000	0	0	0	0	0	0	2000
A822 Facility Environmental Management and Monitoring System (FEMMS)	0	4500	0	0	0	0	0	0	4500
A823 Hawaii Small Business Development Center	0	5400	0	0	0	0	0	0	5400
A824 National Renewable Energy Laboratory (NREL)	0	1000	0	0	0	0	0	0	1000
A826 Unexploded Ordnance Remediation	9431	10000	0	0	0	0	0	0	19431
A827 NEWTTEC Technology	9431	0	0	0	0	0	0	0	9431
A829 NDCEE Technology	4715	9745	8891	13262	13023	13044	13323	Cont'd	Cont'd
A830 Biodegradable Packaging Technology	14524	5000	0	0	0	0	0	0	25171
A835 Military Medical Environmental Criteria	4525	4338	4487	3233	3522	3550	3967	Cont'd	Cont'd
A896 Base Facility Environmental Quality	6308	4746	4864	3426	3599	3626	3994	Cont'd	Cont'd
AF25 Military Environmental Restoration Technology	4870	3952	4089	2654	2719	2733	3063	Cont'd	Cont'd
PE TOTAL	62731	54123	25887	24785	25107	25212	26850		

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602720A
PE Title: Environmental Quality Technology **Budget Activity: #2**

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Program Element (PE) provides technology that will allow the Army to comply with regulations mandated by all Federal, State and local environmental/health laws and to reduce the cost of this compliance. Examples of key laws include the Superfund Amendments and Reauthorization Act of 1986 and the Defense Environmental Restoration Act (the DOD equivalent of this law) in addition to the Resource Conservation and Recovery Act of 1984 as amended. This PE provides the Army with a capability to decontaminate or neutralize Army-unique hazardous and toxic wastes at sites containing waste ammunition, explosives, heavy metals, propellants, smokes, chemical munitions, and other organic contaminants. The current DOD estimate for the total Army cost of completing this cleanup program is 8 to 10 billion dollars. This PE also provides technology to avoid the potential for future hazardous waste problems, by reducing hazardous waste generation through process modification and control, materials recycling and substitution. The PE also provides technology to mitigate noise impacts and maneuver area damage resulting from Army training activities. The work in this program element is consistent with the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan, and Project Reliance.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project D048 - Industrial Operations Pollution Control Technology: This project provides pollution control technologies required to reduce costs of treatment of hazardous toxic effluent from operation of Army industrial installations such as ammunition plants, and to satisfy increasingly stringent wastewater discharge standards under the Clean Water Act and state regulations. Federal facilities are now subject to fines and facility shutdowns for violation of Federal, State, and Local air and wastewater discharge regulations. New technology is essential to control and reduce generation of hazardous waste in order to satisfy the required reduction of hazardous waste from a 1992 baseline and to avoid future hazardous waste disposal costs and liabilities to the Army. This project will provide compliance tools for control toxic air pollutants regulated under the Clean Air Act Amendments.

(U) FY 1993 Accomplishments:	Complete	Costs
• (U) Demonstrated expanded bed anaerobic granular activity carbon (GAC) contactors to treat of dinitro-toluene (DNT) and pilot scale nitrocellulose fines removal tests using microfiltration	*	3148
• (U) Designed and built prototype hydromil for safe size reduction of energetic production scrap	*	307
• (U) Demonstrated technology for the treatment of pink water from Army ammunition plants	*	3400
• (U) Demonstrated plasma arc technology for treatment of hazardous wastes	*	1600
• (U) Congressionally approved reprogramming	*	472
Total		**8927**

* Continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602720A**
PE Title: **Environmental Quality Technology**

Budget Activity: **#2**

(U) FY 1994 Planned Program:

	Complete	Costs
• (U) Develop operational and analytical protocol for on-site pilot scale testing of DNT destruction and identify trace level organics in pilot redwater wet air oxidation (WAO) effluents	*	2706
• (U) Conduct pilot scale test of hydromills for processing energetic material prior to destruction	*	736
Total		3442

(U) FY 1995 Planned Program:

	Complete	Costs
• (U) Develop open burning/open detonation (OB/OD) alternatives technology and transfer to field and assist with implementation	*	559
• (U) Develop computer model for simulations of Advanced Oxidation (ADVOX) processes effectiveness based on physio-chemical properties of wastewater	*	2997
Total		3556

(U) Project A821 - Bioremediation Education, Science and Technology Centers (BEST): This Congressionally mandated project is managed by the Army to develop a partnership of a major research university, a national laboratory, and a science consortium located at a historically black college or university (HBCU) to advance the field of bioremediation research to support Army environmental quality technology development for environmental restoration and waste management.

(U) FY 1993 Accomplishments:

	Complete	Costs
• (U) Not applicable		

•(U) FY 1994 Planned Program:

	Complete	Costs
• (U) Implement a university, national laboratory, and HBCU consortium partnership and plan development for bioremediation research and demonstration on environmentally hazardous wastes	4Q94	2000
Total		2000

(U) FY 1995 Planned Program:

	Complete	Costs
• (U) Not applicable		

* Continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602720A
PE Title: Environmental Quality Technology **Budget Activity: #2**

(U) Project A822 - Facility Environmental Management and Monitoring System (FEMMS): This Congressionally mandated project is managed by the Army to develop the initial phase of demonstration testbed at Tobyhanna Army Depot for the integrated and comprehensive management and control of environmental wastes and other issues.

(U) FY 1993 Accomplishments:	**Complete**	**Costs**
• (U) Not applicable		

(U) FY 1994 Planned Program:	**Complete**	**Costs**
• (U) Demonstration of management and control system testbed in coordination with the National Defense Center for Environmental Excellence (NDCEE)	4Q94	4500

(U) FY 1995 Planned Program:	**Complete**	**Costs**
• (U) Not applicable		

(U) Project A823 - Hawaii Small Business Development: A823, a new project in FY94, is a continuation of one effort begun and funded in FY93 under project A830. The DoD has recently articulated technology policy goals favoring activities that meet dual-use and employment-creating criteria. The former refers to commercializing products that are used by the armed services personnel, as well as, the civilian population. The latter is offered as a contribution to U.S. economic revitalization. The basic approach being followed involves private-public partnerships to carry out the activities leading to the commercialization of these products. Advisory personnel from Federal agencies, primarily the Departments of Defense and Agriculture, and State agencies participate at the work group level and oversight committee levels.

(U) FY 1993 Accomplishments:	**Complete**	**Costs**
• (U) Not applicable		

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Commercialize products, previously developed for military application, using the private-public partnership operating through the Hawaii Small Business Development Agency	4Q94	5130
• (U) Characterize the properties and fibers of the agricultural plant Kenaf, a renewable resource, and determine potential DoD uses	4Q94	270
Total		**5400**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602720A
PE Title: Environmental Quality Technology **Budget Activity: #2**

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Not applicable		

(U) Project A824 - National Renewable Energy Laboratory (NREL): Acceleration of Environmental Activities for Solar Detoxificationof Hazardous Wastes. This project is under investigation at the National Renewable Energy Laboratory (NREL) and managed by the Department of Energy's Office of Industrial Technologies (OIT). The mission is to develop solar-based technologies as cost-effective alternatives to conventional technologies for the treatment of hazardous wastes in water, air, and soil. The technology uses ultraviolet light from sunlight to decompose hazardous organic compounds or remove heavy metals from contaminated sites or process streams. This is a Congressional interest project in which NREL will apply current research to areas of immediate interest to the DoD. The ultimate goal of this work is to provide sufficient information to industry to enable them to construct full-scale systems for site remediation or hazardous waste treatment at applicable DoD sites. This project will leverage DOE funds designated for solar detoxification and will be closely coordinated with the DoD.

(U) FY 1993 Accomplishments:	**Complete**	**Costs**
• (U) Not applicable		

(U) FY 1994 Planned Program:	**Complete**	**Costs**
• (U) Research to improve system performance through catalyst development and process optimization and transfer the technology to the industrial sector	4Q94	350
• (U) Conduct treatability studies to predict the performance of the process at specific sites, demonstration site selection, and detoxification system design	4Q94	150
• (U) Construct, operate, and analyze the performance of a demonstration system for solar detoxification	4Q94	520
Total		**1000**

(U) FY 1995 Planned Program:	**Complete**	**Costs**
• (U) Not applicable		

(U) Project A826 - Unexploded Ordnance Removal: This project has been designated by Congressional language as being of special interest. The purpose of the project is to conduct a demonstration of commercially available technology to detect and remediate uexploded ordnance (UXO) at Jefferson Proving Grounds (JPG).

(U) FY 1993 Accomplishments:	**Complete**	**Costs**
• (U) Developed plans and contract for the creation of a controlled test site at JPG and solicitated		

companies or organizations interested in demonstrating unexploded ordnance detection and remediation technologies	4Q93	5000
• (U) Conducted demonstration and publication of unexploded ordnance detection and remediation technology at JPG; FY93 funds provided in November 1993 and work to be conducted in FY94.	*	4431
Total		**9431**

(U) FY 1994 Planned Program:	**Complete**	**Costs**
• (U) Plan and obligate all contracts to create a controlled test site at JPG and four other sites and solicit companies or organizations interested in demonstrating UXO detection and remediation technologies	4Q94	10000
Total		**10000**

(U) FY 1995 Planned Program:
- (U) Not applicable

(U) Project A827 - National Environmental Waste Technology Testing and Evaluation Center (NEWTTEC) Technology: This project has been designated by Congressional language as being of special interest. The purpose of the project is for the NEWTTEC to develop and use new technologies designed to expedite the remediation and cleanup of residual waste.

(U) FY 1993 Accomplishments:	**Complete**	**Costs**
• (U) Developed and used new technologies designed to expedite the remediation and cleanup of residual waste	4Q93	9431
Total		**9431**

(U) FY 1994 Planned Program:	**Complete**	**Costs**
• (U) Not applicable		

(U) FY 1995 Planned Program:	**Complete**	**Costs**
• (U) Not applicable		

* Continuing work which is r viewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602720A**
PE Title: **Environmental Quality Technology** Budget Activity: **#2**

(U) Project A829 - National Defense Center for Environmental Excellence (NDCEE) Technology: The mission of the NDCEE is threefold: (1) Demonstrate and export new environmentally acceptable technology to the industrial base, (2) train the industrial base on the use of the new technology, and (3) perform research and development, where necessary, to mature a new technology prior to demonstrating and exporting the new technology to the industrial base. The NDCEE has a principle goal of resolving the environmental technology requirements of the DoD community and commercial industrial base. The NDCEE is to evaluate alternative manufacturing materials, treatments and processes which comply with environmental and OSHA regulations.

(U) FY 1993 Accomplishments:	Complete	Costs
• (U) Made Environmental Technology Facility Operational (85,000 sq ft)	*	2116
• (U) Environmental Information Network developed and tested	*	137
• (U) Provided multi-Service environmental and industrial operations support	*	134
• (U) Planning completed for the four main pollution prevention thrust areas: Organic Finishing, Cleaning and Surface Preparation, Paint Stripping and Inorganic Coatings	*	1180
• (U) Conducted initial planning for four Congressionally directed efforts (Plastic Sortation, Risk Assessments, Coal Cleaning and Medical Waste Tracking)	*	1148
Total		**4715**

(U) FY 1994 Planned Program:	Complete	Costs
• (U) Expand Environmental Technology Facility	*	1151
• (U) Expand DoD and industrial outreach programs including the Environmental Information Network	*	2250
• (U) Install equipment and conduct demonstrations for DoD developed tasks (Non-CFC Metal Parts Cleaning, Electro-deposited & Powder Coat Demonstration, Ion Beam Processing, & Non-Chromate Conversion Coatings)	*	3350
• (U) Conduct four Congressionally directed efforts (Plastic Sortation, Risk Assessments, Coal Cleaning and Medical Waste Tracking)	*	1200
• (U) Plan for projects: Assessment of Strategic Coal Reserves, Disposal of Used Torpedo Boilers, Red Water Destruction Demonstration, Phosphoric Acid Fuel Cell Demo, and Biological Approaches to Remediation and Pollution Prevention	*	1800
Total		**9751**

* Continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602720A
PE Title: Environmental Quality Technology **Budget Activity: #2**

(U) FY 1995 Planned Program:	Complete	Costs
• (U) Continue demonstration projects, industry and DoD support projects and expand environmental outreach	*	8891
Total		**8891**

(U) Project A830 - Biodegradable Packaging Technology: This project is a joint DoD, Department of Agriculture (DoA) and industry program to commercialize biodegradable polymers for packaging applications. The project has been designated by Congressional language as being of special interest. The program addresses starch based technology and other to support degradable packaging needs for the four Military Services, Special Operations Command, and the Defense Logistics Agency. Thrust areas include research and development of biodegradable packaging materials as replacements for existing packaging to enhance disposability, reduce signature in the field, meet environmental requirements, meet international treaty obligations, and lighten-the-load for the individual soldier. The Hawaii Small Business Development Program, a part of A830 in FY93, was moved to Project A823 in FY94.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Developed new starch-based and non-starch-based blends of biodegradable materials to improve the properties of films and injection molded materials for packaging	4Q93	3956
• (U) Completed toxicity evaluation of candidate biodegradable materials	4Q93	225
• (U) Working with DoA, conducted technology development efforts in advanced materials from renewable resources in a wide range of product categories	*	9400
• (U) Established Small Business Development Program in Hawaii to commercialize dual-use military technology	4Q93	943
Total		**14524**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Fabricate and conduct additional testing and evaluation of prototype biodegradable packaging products	4Q94	5000

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Not applicable		

* Continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602720A
PE Title: Environmental Quality Technology **Budget Activity: #2**

(U) Project A835 - Military Medical Environmental Criteria: This project evaluates the human health and environmental effects resulting from exposure to military-unique chemical compounds produced in Army industrial and field operations or disposed through past activities. The end results of this research are determinations of environmental concentration levels that will protect the environment and human health from adverse effects. The products of this research are U.S. Environmental Protection Agency approved health advisories and criteria documents that specify which Army compounds are toxic/hazardous and at what levels they become a threat to human health and the environment. These criteria are used by the Army during negotiations with regulatory officials to set scientifically and economically rational safe cleanup and pollution abatement levels at Army installations.

(U) FY 1993 Accomplishments:	Complete	Costs
• (U) Developed air dispersion/fate model	*	483
• (U) Established methodology to predict uptake of contaminants by plants and leachability of energetic compounds in soil	*	644
• (U) Validated aquatic microcosms and methods to predict uptake of contaminants by animals	*	483
• (U) Produced health advisories and criteria for Army inventory chemicals and methods for ecological health advisories	*	1008
• (U) Assessed the composting of munitions contaminated soils	*	1194
• (U) Developed technologies for treating contaminated ground leading to assessment of treatment effectiveness	*	713
Total		**4525**

(U) FY 1994 Planned Program:	Complete	Costs
• (U) Configure an acute aquatic toxicity module and preliminary carcinogenicity model for mobile biomonitoring facility	*	1635
• (U) Validate developmental toxicity model and on-site validation of field chemical module	*	1100
• (U) Development and validation of fate models including air dispersion and microbial models	*	450
• (U) Development and validation of methods to predict uptake of contaminants by plants and biomarkers of exposure	*	380
• (U) Produce health advisories and criteria for Army inventory chemicals and methods for ecological health advisories	*	273
• (U) Hazard assessment of byproducts of munitions contaminated soils incineration and from bioremediation		

* Continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

Program Element: #0602720A
PE Title: Environmental Quality Technology — Budget Activity: #2

of contaminated groundwater	*	500
Total		**4338**

(U) FY 1995 Planned Program:	Complete	Costs
• (U) Construct mammalian models for carcinogenicity, immunotoxicity, and reproductive toxicity using non-mammalian aquatic species and non-mammalian models	*	1635
• (U) Validate combined field biomonitoring methods for acute toxicity, developmental toxicity, and carcinogenicity	*	1157
• (U) Development and validation of fate models including air dispersion and microbial models and biomarkers of exposure	*	412
• (U) Produce health advisories and criteria for Army inventory chemicals and methods for ecological health advisories	*	280
• (U) Conduct hazard assessment of byproducts of munitions contaminated soils incineration and from bio-remediation of contaminated groundwater	*	528
• (U) Develop models/methods of effects of human exposure to contaminated soils and waterborne contaminants, ecological effects, and structure/activity relationships	*	475
Total		**4487**

(U) Project A896 - Base Facility Environmental Quality: This project provides the Army the technical capability to preserve and improve the physical and biological characteristics of fixed installation training and testing areas in conjunction with sustainment of mission requirements while conserving natural resources, including threatened and endangered species and cultural resources. Efforts under this project will also enable the Army to address compliance with the myriad of Federal, state and host country environmental regulations dealing with non-hazardous water, wastewater, and air emissions including solid wastes and sediment discharges and noise. An additional effort involves the development of environmental monitoring and modeling capabilities to support both conservation and compliance programs.

(U) FY 1993 Accomplishments:	Complete	Costs
• (U) Developed methods to collect and analyze field and remote data on soils and vegetation for application to resource management decisions	*	1133
• (U) Constructed DoD noise assessment model providing a uniform basis for noise assessment and real-time, weather-based sound propagation models for blast noise propagation	*	1100

* Continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602720A
PE Title: Environmental Quality Technology **Budget Activity: #2**

• (U) Economic forecast capabilities integrated into geographic information analysis for realignment and joint community planning studies	*	710
• (U) Developed a waste conversion program for solid waste minimization at Army installations	*	677
• (U) Established design criteria for physical erosion control measures on damaged land	*	348
• (U) Developed techniques to implement measures to mitigate military land use impacts on natural and cultural resources	*	270
• (U) Basic scale requirements investigated for biological data collection	*	122
• (U) Revised Geographic Information System program distributed; prototype relational data base designed, a comprehensive environmental database set evaluated for "usefulness" by Army personnel	*	500
• (U) Congressionally approved reprogramming	*	1448
Total		**6308**

(U) FY 1994 Planned Program:	**Complete**	**Costs**
• (U) Establish building codes for noise impacted structures on and in the vicinity of Army installations	*	1074
• (U) Develop standardized data collection for training land condition assessment and erosion control technologies	*	1619
• (U) Develop implementation package for best management practices for stormwater control	*	730
• (U) Develop advanced technology for air pollutant emissions control for Army installations	*	297
• (U) Provide technical guidance for training land use decision support	*	261
• (U) Develop tools and systems allowing environmental planners and managers to project the consequences of several concurrent projects or actions including update of the Economic Impact Forcast System	*	336
• (U) Establish Analysts Workbench graphical user interface for Geographic Analysis Systems Support (GRASS)	*	429
	Total	**4746**

(U) FY 1995 Planned Program:	**Complete**	**Costs**
• (U) Prepare lead-base paint abatement environmental guidance ready for technology demonstration	*	339
• (U) Establish protocols for evaluation of the status of plants and soils and threatened/endangered species and assessment of management strategies on Army lands	*	1538
• (U) Develop prototype knowledge-based system for air pollution compliance strategies for Army operations	*	800
• (U) Construct integrated framework for spatial and aspatial data translation and analysis	*	330

* Continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602720A
PE Title: Environmental Quality Technology **Budget Activity: #2**

• (U) Investigate methods for subsurface characterization and modeling of archeological resources	*	286
• (U) Assess methods to mitigate avoidable resource damage through education	*	279
• (U) Develop evaluation methods to determine the effects of Army activities on Threatened and Endangered species	*	133
• (U) Develop methodologies for integrating installation environmental carrying capacity	*	253
• (U) Produce guidelines for helicopter landing, hovering and take-off to reduce noise impact at specific locations	*	906
Total		**4864**

(U) Project AF25 - Military Environmental Restoration Technology: This project provides cost effective technologies required to clean up DoD hazardous waste sites, including those installations on the Environmental Protection Agency National Priority List and those indicated for closure under DoD Base Realignment and Closure (BRAC). The primary thrusts of this effort are to expedite site cleanup; reduce the cost of cleanup of contaminated soil, groundwater, and structures; and to ensure that human health and the environment are protected. Research is conducted in three major areas: innovative and cost effective site identification, characterization, and monitoring technologies; groundwater modeling systems; and treatment technologies to remediate soil and groundwater contaminated with military unique contaminants such as explosives/energetics, chemical agents, heavy metals, and other organics.

(U) FY 1993 Accomplishments:	Complete	Costs
• (U) Developed procedures for physical fractionation of heavy metal contaminated soils	*	300
• (U) Established protocol for laboratory evaluation of composting for treatment of explosives contaminated soils	*	2803
• (U) Constructed prototype hot gas desorption sampler for extracting vapor samples for contaminant analysis	*	1242
• (U) Evaluated existing groundwater modeling systems and research program development	*	525
Total		**4870**

(U) FY 1994 Planned Program:	Complete	Costs
• (U) Develop enhanced sensors, sampling devises, and evaluation techniques for the Site Characterization and Analysis Penetrometer System (SCAPS)	*	650
• (U) Develop analytical methods for assessing explosives, explosive degradation products, and military unique compounds in complex environmental media such as compost, slurries, and soils	*	300

* Continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602720A
PE Title: Environmental Quality Technology **Budget Activity: #2**

• (U) Design criteria and assessment of in-situ and ex-situ biological processes for remediation of explosives/organics contaminated soils	*	2502
• (U) Develop enhanced contaminant transport algorithms for explosives and military unique compounds	*	240
• (U) Develop methods of assessing metal speciation technologies and mass transport limitations on mobility of metals in soils	*	260
Total		3952

(U) FY 1995 Planned Program:	**Complete**	**Costs**
• (U) Establish guidance on selecting, designing, and operating biotreatment systems for explosives/organics contaminated soils and groundwater	*	2731
• (U) Configure technical data package and guidance documents on physical separation technologies for metals contaminated soils	*	340
• (U) Develop state-of-the-art contaminant sensors for identification and quantification of fuels, solvents, and explosives, fuels, and solvents in groundwater	*	418
• (U) Develop a computer-based DoD Groundwater Modeling System incorporating enhanced contaminant transport algorithms for explosives and military unique compounds	*	200
• (U) Develop analytical methods for assessing explosives, explosive degradation products, and military unique compounds in complex environmental media such as compost, slurries, and soils	*	400
Total		4089

(U) Work Performed By:

D048: The primary developing agency is the U.S. Army Construction Engineering Research Laboratories, Champaign, IL.
A826: The primary developing agency is the U.S. Army Environmental Center, Aberdeen Proving Ground, MD. Contractors include the U.S. Navy Explosive Ordnance Detection Technology Center, PRC and Automation Research Systems, Limited.
A827: The National Environmental Waste Technology Testing Center, Department of Energy, Butte, Montana.
A829: Concurrent Technologies Corporation, Johnstown, PA. Subcontractors include Westinghouse, Chamberlain MRC, University of Pittsburgh, Carnegie-Mellon, Battelle, Penn State University, Sam Houston University, Center for Hazardous Materials Research, Stone & Webster, Innoteck and others. The primary development agency is the U.S. Army Materiel Command's Production Base Modernization Activity.
A830: The primary developing agency is the U. S. Army Natick Research, Development and Engineering Center, Natick, MA. Contractors

* Continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

include: Toxicon Corp., Woburn, MA; Science Applications International Corporation, Narragansett, RI; Woods Hole Oceanographic Institute, Woods Hole, MA; University of Hawaii, Honolulu, HI; MIT, Cambridge, MA; University of Rhode Island, Kingston, RI; Clemson University, Clemson, SC; University of Detroit, Detroit, MI; Lowell University, Lowell, MA; Washington University, St. Louis, MO; and University of Connecticut, Storrs, CT.

A835: Contractors include: Department of Energy Laboratories: Pacific Northwest Laboratories, Richland, WA; Oak Ridge Laboratories, Oak Ridge, TN; Argonne Laboratories, Argonne, IL., U.S. Department of Agriculture, U.S. Environmental Protection Agency, National Cancer Institute, John Hopkins University, University of Massachusetts, and the University of Maryland. The primary developing agency is the Biomedical Research and Development Laboratory, Ft. Detrick, MD.

A896: Contractors include: the University of Illinois, Champaign, IL, Colorado State University, University of Oklahoma, and Roy F. Weston, Inc. The primary developing agency is the U.S. Army Construction Engineering Research Laboratories, Champaign, IL.

AF25: The primary developing agency is the U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi. Contractors include: Cornell University (NY), Clark Atlanta University (GA), Mississippi State University, Louisiana State University, University of Nebraska, AScI Corporation (MD), A.D. Little Company (MA)

(U) Related Activities: PE #0601102A (Defense Research Sciences). This program adheres to Tri-Service Reliance Agreements on Civil Engineering and Environmental Quality with oversight provided by the Joint Engineers and Armed Services Biomedical Research, Evaluation and Management. Work in this program element is related to and fully coordinated with efforts in PE #0601102A (Defense Research Sciences), PE #0602787A (Medical Technology), and PE #0603002A (Medical Advanced Technology) in accordance with the ongoing Reliance joint planning process and contains no unwarranted duplication of effort between military departments. Duplication of effort is avoided through annual OSD/service sponsored reviews of all environmental quality RDT&E programs using established reliance program management agreements. There is no unnecessary duplication of effort within the Army or DoD.

(U) Other Appropriation Funds: ($ in Thousands) Not applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602727A**
PE Title: **Non-System Training Device Technology** Budget Activity: **#2**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
A230 Non-System Training Devices	7836	4407	0	0	0	0	0	0	66661
PE TOTAL	7836	4407	0	0	0	0	0	0	12243

B. (U) BRIEF DESCRIPTION OF ELEMENT: Beginning in FY95 this program is funded in PE 0602308 Project AC90. This program provides enabling technologies for advancing Distributed Interactive Simulation (DIS) networking capabilities and synthetic representation of the battlefield needed to support virtual prototyping and training in the era of reduced funding. The Battlefield Distributed Simulation-Developmental (BDS-D), a component of DIS, will provide virtual representation of a lethal combined arms environment with the warfighter-in-the-loop that closed-form analysis cannot provide. The environment permits new system concepts, tactics and doctrine and test requirements to be evaluated with a warfighter-in-the-loop in a combined arms battlefield throughout the acquisition life cycle at a reduced cost and time than the traditional approach. The research being conducted includes Semi-Automated Forces (SAFOR), dynamic terrain and data base development for networking. Arrival of this sophisticated technology, equipment and complex relations to each other, makes this effort critical to overall success of Army acquisition and training requirements. The work in this program element is consistent with the resource constrained Army Science and Technology Master Plan and Army Modernization Plan.

C. (U) JUSTIFICATION FOR PROJECT:

(U) Project A230 - Non-System Training Devices: Description of project is identical to program element description in paragraph B.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Completed review and approval of DIS Version 1, IEEE 1278-1993 "Standard for Information Technology, Protocols for DIS Applications, Entity Information and Interaction" and completed draft of DIS Version 2.0 Standard	3Q93	480
• (U) Designed and implemented a DIS testbed for compliance testing	*	608

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602727A
PE Title: Non-System Training Device Technology **Budget Activity: #2**

• (U) Conducted research to define the requirements for terrain database interoperability and correlation in heterogeneous simulators in a DIS environment	*	1790
• (U) Conducted research and experiments to develop dynamic terrain models for DIS applications	*	480
• (U) Investigated data compression technology for application to DIS to increase entities into the synthetic environment	*	388
• (U) Expanded reusable blade element model research to include AH-64, UH-60, and OH-58D helicopters	*	573
• (U) Define and develop DIS Protocol Data Units (PDU) to support linkage of heterogeneous simulators	*	1402
• (U) Develop a modular and open architecture for semi-automated forces that are capable of independent component development and demonstration in a DIS environment	*	2115
Total		**7836**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Complete review and approval of DIS Version 2, IEEE 1278-1993 "Standard for Information Technology, Protocols for DIS Applications, Entity Information and Interaction" and completed draft of DIS Version 3.0 Standard	4Q94	400
• (U) Investigate terrain data base development to support trafficability, maneuver and navigation requirements analysis	*	1040
• (U) Enhance representation of battlefield operating systems in modular semi-automated forces including modification of system performance to reflect atmospheric and dynamic terrain environments	*	1085
• (U) Complete reusable blade element model research to include AH-64, UH-60, and OH-58D helicopters	3Q94	103
• (U) Demonstrate preliminary DIS integration of enhanced semi-automated dismounted infantry to support Battle Lab demonstrations	2Q94	580
• (U) Correlate terrain database utilized by heterogeneous simulators including development of initial database and conduct of preliminary tests	*	1199
Total		**4407**

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority

(U) Work Performed By: Contractors include: Loral Western Development Laboratories, San Jose, CA; Pathfinder, CO; University of Central Florida, Institute for Simulation and Training, Orlando, FL; Georgia Tech Research Institute, Atlanta, GA; Veda Incorporated, Orlando, FL; University of Alabama, Tuscaloosa, AL; Perceptronics, Inc, Woodland Hills, CA; Lockheed Sanders, Nashua, NH; Martin Marietta, Daytona Beach, FL; Evans & Sutherland, Salt Lake City, UT. Simulation, Training and Instrumentation Command (STRICOM), Orlando, FL. is responsible

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602727A
PE Title: Non-System Training Device Technology Budget Activity: **#2**

for the work in the PE.

(U) Related Activities: This program adheres to Tri-Service Agreements on Training Systems with oversight and coordination provided by the Training and Personnel Systems Science & Technology Evaluation Management Committee (TAPSTEM). Work in this Program Element is related to and fully coordinated with efforts in PE #0602308A (Modeling & Simulation Technology) and contains no unwarranted duplication of effort among the Military Departments.

(U) Other Appropriation Funds: ($ in Thousands) Not applicable

(U) International Cooperative Agreements: Not applicable

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602782A**
PE Title: **Command, Control and Communications (C3) Technology** Budget Activity: **#2**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
AH92	Communications Technology								
	10454	10321	9886	8753	8755	8839	10472	Cont'd	Cont'd
AH93	Combat Surveillance and Target Acquisition (CSTA) Technology								
	7620	0	0	0	0	0	0	0	42540
A779	Command/Control (C2) and Platform Integration Technology								
	0	0	7014	7112	7322	7797	8564	Cont'd	Cont'd
PE TOTAL	18074	10321	16900	15865	16077	16636	19036		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program contains two related projects: Communications Technology and Command/Control (C2) and Platform Integration Technology. Faced with an increasing responsibility for meeting contingencies worldwide, field commanders must be capable at short notice of providing battlefield communications to and from virtually any place on earth. The Communications Technology project explores the development of those advanced communications technologies required to provide a worldwide communications capability. The objective of C2 and Platform Integration Technology is to expand scientific knowledge for demonstration of state-of-the-art technologies, including command/control and electronic systems/subsystems, performance reliability, maintainability, safety, survivability, and man-machine interface for all Army air and ground platforms including soldier systems and equipments. Development of an infrastructure that will allow timely distribution, display and use of C2 data on Army platforms will lead to greater battlefield functional capabilities, survivability and total integration into the digitized battlefield. Work in this Program Element is consistent with the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan, and Project Reliance. The technology program in Project AH93 was transferred to PE #0602120A Project AH16 in FY94 as a part of the restructuring for the Army Research Laboratory (ARL).

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project AH92 - Communications Technology: Perform the exploratory development for net radio High Frequency (HF) and Very High Frequency (VHF); common user technology Ultra High Frequency (UHF), Microwave (MW), Millimeter Wave (MMW), and multichannel services; distributed communications (photonic and fiber optic systems, Internet architecture, integrated services, packet appliques and Mobile Subscriber

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602782A
PE Title: Command, Control and Communications (C3) Technology

Budget Activity: #2

Equipment (MSE) Applications; frequency management; computer operating systems supporting Ada applications that will provide multilevel security for Army Tactical Command and Control System (ATCCS), prevent compromise of classified information, and protect against subversive software; enhanced modeling of communications system capacity and dynamic field environments required to support the global deployment of new communications technology. This project will meet the threats of Electronic Countermeasures (ECM), the need for survivability on the automated battlefield and the need to avoid unauthorized access.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Developed algorithms for various combat net radio initiatives, including electronic countermeasure evaluations, international interoperability studies, and video battlefield initiatives	*	1923
• (U) Implemented tactical multinet gateway simulation	*	1082
• (U) Fabricated and tested final exploratory development models for mini Fiber Optic Transmitter/Receiver (FOT/R) for local area network (LAN) and integrated hardware into Tactical Local Area Network (TACLAN) testbed	*	1268
• (U) Completed development of optical transceiver technology for D-shaped optical fiber for applications in signal processing and LANs.	*	373
• (U) Demonstrated breadboard of frequency agile solid state tuner	4Q93	516
• (U) Performed hardware development on phase one multiband multimode radio (Joint program with ARPA/AF lead)	*	2140
• (U) Developed algorithms for Army common user, narrowband packet, net planner and distributed processing programs	*	1210
• (U) Completed frequency hopping (FH) interleavened sharing study, obtained patent disclosure for 24-hour net management system, defined rain propagation reliability forecast process for super high frequency (SHF), transitioned climate factors technical report	*	1942
Total		**10454**

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Deliver first breadboard of the reconfigurable multiband multimode radio. Develop preliminary packet radio networking protocol. Develop proof-of-concept hardware on adaptive network radio	*	3739
• (U) Demonstrate tactical multinet gateway in laboratory demonstration.	*	1824
• (U) Start development of network planner to obtain automated LAN design tool capability	*	413
• (U) Perform experiments in LAN asynchronous transfer mode (ATM) testbed and complete photonics architectural study	*	787

*This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602782A**
PE Title: **Command, Control and Communications (C3) Technology** Budget Activity: **#2**

• (U) Design and initiate fabrication of integrated photonic components for use in optical control of phased array antennas and in fiber optic transmitters and receivers	*	1950
• (U) Develop models for extremely high frequency (EHF)/SHF propagation reliability, 24-hour multipath fading prediction, diffraction controlled link propagation, and improved systems performance models. Conduct studies on line-of-sight antenna beamwidth effects, frequency engineering techniques, and ATM model structure	*	1608
Total		**10321**

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Demonstrate tactical multinet gateway during Survivable Adaptive Systems (SAS) co[illegible]nd post exercise. Test & evaluate multimedia routing techniques	4Q95	1595
• (U) Demonstrate tactical fiber optics on SAS command post demonstration. Integrate fiber o[illegible]cs tactical local area network into wideband digital communications	4Q95	770
• (U) Test selected conformal antennas. Perform technical assessment of candidate protocols for HF Packet Network	*	2686
• (U) Implement Taguchi process for model development and verification. Expand communication systems/reliability models for wideband digital communications	*	1870
• (U) Develop preliminary capabilities for automated network utilization and reconfiguration	*	575
• (U) Complete fabrication of integrated photonic components and perform initial testing of optical control system for phased array antennas	*	1600
• (U) Demonstrate low cost phase shifter as part of Army common user	*	790
Total		**9886**

(U) Project AH93 - Combat Surveillance and Target Acquisition (CSTA) Technology: Develop and demonstrate low cost, lightweight survivable tactical radar systems capable of automatic detection and identification of stationary and moving ground vehicles and low flying helicopters in an intense clutter environment. The technology program in this project was transferred to PE #0602120A, Project AH16 in FY 1994 as a part of the restructuring for the Army Research Laboratory.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Measured tactical stationary target signatures using the ultra-wide-band estbed; initially evaluated effectiveness of an interference extraction algorithm using real data	4Q93	1063
• (U) In support of lightweight battlefield radars, designed and modeled a very wideband transceiver,		

* This is continuing work which is reviewed periodically, ensuring quality, relevance and priority.

using direct digital synthesis and developed an innovative fiber optic based target simulator for realistic radar test and evaluation	4Q93	1017
• (U) Refined clutter rejection algorithms for real aperture radars such as Longbow	4Q93	2608
• (U) Demonstrated laboratory breadboard range-doppler optical processor with signals from the MICOM "Quiet Radar"; designed a wide bandwidth optical processor for real-time SAR image formation	4Q93	2932
Total		**7620**

(U) FY 1994 Planned Program: Not applicable

(U) FY 1995 Planned Program: Not applicable

(U) Project A779 - Command/Control and Platform Electronics Technology: This project restructured from PE 0602211 Project AH85 in FY95. The objective of this project is the exploration of new concepts and techniques in command/control and platform electronics integration to achieve new and enhanced military functional capabilities. Emphasis is on aided pilotage, mission planning, precision navigation, command and control, soldier systems and integration with the evolving digital battlefield. New enabling technologies which support the current thrusts are also explored, such as controls and displays, voice interactive technology, fault tolerant processing, real time artificial intelligence processing, data transfer, distributed data bases and advanced open system architectures and integration concepts, which will permit digitization of the battlefield and provide command and control on the move.

(U) FY 1993 Accomplishments: Not applicable

(U) FY 1994 Planned Program: Not applicable

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Integrate aided pilotage capability onto testbed aircraft and conduct simulations for threat symbology and nap-of-the-earth (NOE) flight symbology.	4Q95	2770
• (U) Assess capabilities of mosaic flat panel for large screen panoramic display aviation applications.	4Q95	1078
• (U) Develop data preparation software for Aircraft Mission Rehearsal (AMPS).	4Q95	785
• (U) Demonstrate improved global positioning system (GPS) satellite selection algorithms utilizing the precision navigation system.	4Q95	2249
• (U) Evaluate expert system communication link manager system.	4Q95	132
Total		**7014**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602782A
PE Title: Command, Control and Communications (C3) Technology **Budget Activity: #2**

(U) Work Performed By: Work is performed primarily by Space and Terrestrial Communications Systems Directorate, U.S. Army Communications-Electronics Command (CECOM), Ft. Monmouth, NJ; other government agencies performing work on this effort include DoD Electromagnetic Compatibility Analysis Center, Annapolis, MD; Rome Air Development Center, Rome, NY; Department of Energy, San Francisco CA; Jet Propulsion Laboratory, Pasadena CA; Advanced Research Projects Agency (ARPA); Joint Research Programs Office, NASA Langley Research Center, Hampton Va; Topographic Engineering Center, Ft. Belvoir, VA; and the 46th Test Group/GD, Holloman, AFB, NM. Contractors include: ITT Corp., Fort Wayne, IN; Harris Corp., Rochester, NY; Canadian Marconi Corp., Montreal, Canada; Motorola Corp., Scottsdale, AZ; Xetron, Cincinnati, OH; AT&T, Greensboro, NC; Intermetrics; Charles Stark Draper Labs, MA; Vitronics, and Lockheed Electronics.

(U) Related Activities: This program adheres to Tri-Service Reliance Agreements on Command Control and Communications, Radar and Space with oversight and coordination provided by the Joint Director of Laboratories. Work in this Program Element is related to and fully coordinated with efforts in PE#0603006A (Command, Control & Communications Advanced Technology), PE #0208010A (Joint Tactical Communications Program (TRI-TAC)), PE #0602705A (Electronics & Electronic Devices), PE #0603737D, PE #0602303A (Missile Technology), PE #0603772A (Advanced Tactical Computer Science & Sensor Technology) and PE #0303142A (Satellite Communications Ground Environment) in accordance with the ongoing Reliance Joint planning process. There is no unnecessary duplication of effort within the Army or DoD.

(U) Other Appropriation Funds: ($ in Thousands) Not applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602783A**
PE Title: **Computer and Software Technology** Budget Activity: **#2**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
A094 Tactical Software Technology	3520	2398	2080	1799	1978	2402	3087	Cont'd	Cont'd
DY10 Computer and Information Science and Technology	*0	3338	2555	2266	2373	2568	2660	Cont'd	Cont'd
PE TOTAL	3520	5736	4635	4065	4351	4970	5747		

* FY93 resources (manpower and funding) for project DY10 were transferred from the Army to the Defense Information Agency (DISA). Resources were returned to the Army in FY94.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Program Element develops and applies software technology to improve the performance and reduce the cost of computer software for Army tactical, strategic, and administrative information systems, tactical embedded realtime systems, high performance computational technology, and simulation technology. Tactical software technology efforts capitalize on computationally intensive approaches that exploit the rapidly evolving capabilities of emerging computer technology. Focus is on providing general solutions that can be applied to a wide variety of specific problems. Current examples include: information distribution paradigms for constrained environments (e.g., bandwidth or security limited but not computationally limited), computational technologies for scalable, parallel computer architectures, and simulation techniques for synthetic environments for application to tactical systems. Further specific concentrations are on applications to support tactical information distribution for situational awareness and interoperability of tactical systems. In the computer and information science technology areas, the efforts exploit advances in computer and communication technologies, and develop and modernize standard information management systems to support the soldier. Program addresses technical issues in the development of the Army's information mission areas of automation, communication, visual information, records management, and publication systems. In addition, the program investigates the infrastructure in communications and computers to support the information and communications needs of weapons technology. Work in this program element is consistent with the Army Science & Technology Master Plan (ASTMP), the Army Modernization Plan and Project Reliance.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project A094 - Tactical Software Technology: This project addresses the development of software techniques to exploit the rapid advances in

Program Element: #0602783A
PE Title: Computer and Software Technology

Budget Activity: #2

computer (hardware) performance that is becoming equally available to both the scientific and tactical community. The vast gap in computational performance and capabilities that used to exist between computer systems in these two domains is rapidly diminishing. Computer power previously available only to scientists and engineers is now becoming routinely available to the warrior and new concepts for one domain will be applicable to the other. This project insures that a fresh perspective on the application of this power is maintained. It concentrates on computationally intensive paradigms for information distribution and manipulation in severely constrained environments such as those encountered in the use of existing low-bandwidth tactical radios. This includes the automation of information exchange and research into the tactical aspects of the data abstractions of military concepts. Scalable, parallel computer architectures provide promise for achieving significant improvements in computational power for design and analysis of weapons systems. This project seeks to develop the computational technology to achieve efficient utilization of advanced computer architectures to infuse this technology into the development process in a timely manner.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Adapted existing application programs to Standard X-Window environments compatible with current Army tactical communications hardware	4Q93	542
• (U) Developed & demonstrated basic adaptive networking techniques that allow information requirements to vary with dynamic available bandwidth	4Q93	479
• (U) Developed software tools in support of Army Software Technology for Adaptable Reliable Systems (STARS), Software Metrix Guidebook, and Ada 9X Transition Materials	4Q93	2499
Total		**3520**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Validate statistically a simulation of the Advanced Field Artillary Tactical Data System (AFATDS) throughput experiment conducted in FY93	4Q94	822
• (U) Demonstrate AI-controlled route planning and dissemination in bandwidth constrained environments suitable for situational awareness	4Q94	928
• (U) Design & implement automated network congestion control on low-bandwidth tactical channels via dynamic information thresholds	4Q94	648
Total		**2398**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Develop validation techniques for stochastic simulations of smart C3 systems	4Q95	702
• (U) Participate in Secure Tactical Data Networks (STDN) #6 and demonstrate FY93 & FY94 accomplishment in a realistic, heterogeneous, tactical environment	4Q95	689

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Program Element: **#0602783A**
PE Title: **Computer and Software Technology** Budget Activity: **#2**

• (U) Develop and implement robust recovery techniques in applications of totally automated information distribution software	4Q95	689
Total		**2080**

(U) Project DY10 - Computer and Information Science Technology: This project provides for the adaptation and application of research for the development and modernization of standard Army computer, command and control, and information systems. The project addresses technical issues in the development of an Information Architecture which will interconnect regional, local, and end user computing services resulting in a fully connected information management system with minimum data storage and maximum data access. The objectives of this project are to improve Information Mission Area computer and communication system efficiencies by exploiting emerging technologies to reduce system development and maintenance costs and time, and to support modernization efforts of computing and communications hardware and software presently used at Army deployments throughout the world in both tactical and non-tactical environments. In addition, this project will facilitate transition to Ada for Army systems software development and achieve significant software reuse across Department of Defense (DoD) systems. The potential payoffs of this project are: measurable improvements in productivity and quality; reductions in utilization of life cycle resources by institutionalizing software management procedures and practices with savings in development and maintenance costs; increased communication systems capacity; responsiveness, reliability, interoperability, availability, and maintainability. Synthetic environment simulation technology provides the capability to simulate manufacturing, combat element maneuvers, weapon system functionality and other aspects of combat material, combat individual, and combat leader functions. Efforts in this project will address the technology to accelerate the application of these capabilities into the Army warfighting analysis system.

(U) FY 1993 Accomplishments:
This was not an Army Program in FY93. FY93 resources (manpower and funding) for project DY10 were transferred from the Army to the Defense Information Agency (DISA). Resources were returned to the Army in FY94

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Integrate Army Data Element Finder (ADEF) and Information Resource Investment Model (IRIM) to provide integrated support for data standardization across organizational boundaries	4Q94	690
• (U) Prepare technical report on designing/selecting representations for the reverse engineering of software (Sept. 1994); continuing efforts with National Science Foundation (NSF) software engineering center	*	724
• (U) Provide guidelines on accommodating existing protocols in distributed systems in order to achieve interoperability and maintain performance (technical report Sep 1994)	4Q94	586

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

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• (U) Investigate broadband Integrated Services Digital Network (ISDN) capability for the Army and update Army ISDN profile	4Q94	475
• (U) In dual use (information infrastructure) area, conduct experiments on the use of group tools (decision models) in assessing software modernization planning for software applications. Expand models to include communication and data decisions	4Q94	487
• (U) Complete prototype to interface Computer-Aided Design (CAD) tool to database for Army installation asset management (April 1994)	4Q94	376
Total		**3338**

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Implement ADEF/IRIM as a front end for the Generic Hub (high level enterprise model created by NATO) for army Theater C2 information systems	4Q95	527
• (U) Re-engineering demonstration using the result from previous reengineering research. Will address issues in metrics, reuse, and business process redesign concepts	4Q95	591
• (U) Use guidelines developed in FY94 to develop a prototype incorporating database concepts where users can access database information with only minimal knowledge of database structure and content (dual use -heterogeneous database)	4Q95	405
• (U) Evaluate use of ISDN via satellite for use in mobile telecommunications	4Q95	357
• (U) Use decision models in distributed collaborative development demonstration	4Q95	395
• (U) Expand decision model with IDEF (information engineering) to create an information architecture for the Army's installation environment	4Q95	280
Total		**2555**

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

(U) Work Performed By: In-house work is primarily performed by: U.S. Army Research Laboratory (ARL), Advanced Computational and Information Sciences Directorate (ACISD) which now includes the Software Technology Branch (formerly the U.S. Army Institute for Research in Management Information, Communications, and Computer Sciences (AIRMICS), located at Georgia Tech, Atlanta, GA). Major contractors are Georgia Institute of Technology, Atlanta, GA; Morris Brown College, Atlanta, GA; Purdue University, West Lafayette, Indiana; Clark Atlanta University, Atlanta, GA; University of Arizona, Tucson, AZ; University of Florida, Gainsville, Florida; Analytical Software Inc., Dallas, TX; American Management Systems Inc., Roslyn, VA; Innovative Research Inc., Denver, CO; Delta Information systems, Horsham, PA; Artificial Intelligence Atlanta Inc, Atlanta, GA.

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(U) Related Activities: This program adheres to Tri-Service Reliance Agreements on Software with oversight provided by the Joint Directors of Laboratories and falls under the Joint Services Program Plan for Computer Sciences. Work in this Program Element is related to and fully coordinated with efforts in PE #0603805A, PE #0603006A, PE #0603756D, PE #0303152A, PE #0602234N, PE #0601153N, PE #0604574N, #0602[illegible]4F, #0602702F, #0603728F, and #0603756E. There is no unnecessary duplication of effort within the Army or DoD.

(U) Other Appropriation Funds: ($ in Thousands) Not applicable

(U) International Cooperative Agreements: Not applicable

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602784A
PE Title: Military Engineering Technology

Budget Activity: #2

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
A855 Topography, Image Intelligence and Space Technology	9236	9439	9180	8124	8677	9183	10258	Cont'd	Cont'd
AH71 Atmospheric Investigations	5894	4972	5876	5379	5813	6069	6375	Cont'd	Cont'd
AT40 Mobility & Weapons Effects Technology	10718	11452	12313	10442	11250	12098	13381	Cont'd	Cont'd
AT41 Military Facilities Engineering Technology	6230	5930	5342	4541	4319	5191	6112	Cont'd	Cont'd
AT42 Cold Regions Engineering Technology	5490	6584	5594	4233	4451	4717	5471	Cont'd	Cont'd
AT45 Energy Technology Applied to Military Facilities	2975	3000	2896	2171	2441	2565	2903	Cont'd	Cont'd
PE TOTAL	40543	41377	41201	34890	36951	39823	44500		

B. (U) BRIEF DESCRIPTION OF ELEMENT: The research conducted in this Program Element provides technology in direct support of the critical Army combat engineer missions of mobility, countermobility, survivability, sustainment engineering and topography needed to win on the modern battlefield. Research is also conducted that supports the special requirements for tactical decision aids, weather intelligence products and capabilities to exploit space assets. Key operational technologies developed are demonstrated to Army units under Program Element #0603734A (Military Engineering Advanced Technology). Results are tailored to support the material development, test and acquisition community in evaluating the impacts of weather, terrain and atmospheric obscurants. Research develops and exploits a wide range of innovative technologies and applies them to Defense unique infrastructure planning, acquisition, revitalization, and sustainment processes to improve the efficiency and cost effectiveness of Defense infrastructure as it relates to supporting the training/readiness/force projection missions in garrison and force sustainment missions in theaters of operation The work in this program element is consistent with the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan, and Project Reliance.

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PE Title: Military Engineering Technology

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C. (U) JUSTIFICATION FOR PROJECTS:

(U) **Project A855 - Topography, Image Intelligence and Space Technology:** This project funds the technology to enhance the tactical commander's ability to visualize the battlefield in an easily understandable, 3-D perspective and exploit his knowledge of combat relevant intelligence as a force multiplier to conduct and win AirLand Battle Operations across the operational continuum. Using tactical/strategic/space sensor data, together with terrain data bases as input, the technology program emphasizes automating the processes of detecting changes on the battlefield, identifying battle significant features, exploiting space based/remote sensing information (especially for deep operations and over denied areas), and integrating the impacts of the battlefield environment to significantly improve combat planning and operations. Development efforts will enable the commander to locate and position enemy and friendly forces in day/night all-weather conditions, provide crucial terrain data for command and control systems (C2) as well as modeling and simulation systems, and enhance the speed and accuracy of maneuver and weapon systems. The technology being developed will help those who move, shoot, and communicate on the battlefield to "fight smarter" through superior knowledge of the total battlefield terrain and environment. Weather/atmospheric effects data is provided by Atmospheric Sciences Laboratory Project AH71.

(U) **1993 Accomplishments:**

	Complete	Costs
• (U) Established a laboratory testbed for processing signature data from hyperspectral sensor and a map/image/image registration testbed software	*	2800
• (U) Developed a Prototype Terrain Information Extraction System (TIES)	*	2094
• (U) Developed a basic integrated capability for visual/infrared (IR) scene generation, and progressive refinement visualization software	*	1900
• (U) Developed a concept design model for a personal navigator integrating Global Positioning System (GPS) and other navigation sensors	*	500
• (U) Integrated Geographic Information System (GIS) capabilities into the Battlefield Environmental effects modules	*	1942
Total		**9236**

(U) **FY 1994 Planned Program:**

	Complete	Costs
• (U) Demonstrate correlation of hyperspectral data to a reference library to identify man-made materials; and maintain and operate image exploration lab and computer system in support of Joint Precision Strike initiatives and the ARPA Warbreaker program	*	2904
• (U) Transfer TIES technology to Digital Topographic Support System (DTSS) preplanned product		

* Continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

improvement (P3I)		
• (U) Develop terrain-based mission planning capability and port visualization component to TEM; capability for update/dynamic terrain and environmental effects for distributed interactive simulations; and virtual reality test bed	*	1332
• (U) Develop personal navigation and reporting system components identification and Hybrid Navigation	*	3060
• (U) Develop standard testing and documentation criteria/procedures for entering MC&G software into Army Reuse Center	*	600
• (U) Identify Battle Field Environmental Effects Configuration and demonstrate feasibility of integrating GIS, Image Processing and Fusing Techniques	*	555
Total	*	988
		9439

(U) FY 1995 Planned Program:

	Complete	Costs
• (U) Demonstrate laboratory feasibility for identifying gasses from spectral signature data	*	2923
• (U) Develop concept model of personal navigation and reporting capability	*	600
• (U) Implement limited software reuse capability	*	920
• (U) Demonstrate rapid 3-D battlefield visualization for tactical systems	*	2350
• (U) Demonstrate software capability for evaluation of Digital Terrain Evaluation Data	*	1443
• (U) Develop automated regional environmental effects summary	*	944
Total		**9180**

(U) Project AH71 - Atmospheric Investigations: Realistically model atmospheric effects on target acquisition, mobility, lethality, and survivability to provide weather limitations for design and operation of smart weapons, improved war game realism and tactics and improved Intelligence Preparation of the Battlefield. Develop weather decision aids for the commander applying advanced computer techniques; incorporate new technology in meteorological sensor design; develop data fusion techniques to horizontally integrate data from advanced weather sensors and non-weather sensors into decision aids to enhance combat power on the battlefield. Supports Project Reliance Theater Data Fusion and Prediction, Atmospheric Effects Assessment, and Battle field Environmental Effects sub-sub area joint programs.

(U) FY 1993 Accomplishments:

	Complete	Costs
• (U) Transitioned battlefield weather intelligence software to the Integrated Meteorological System Block I	*	2022
• (U) Designed and developed software/hardware that models the target area atmosphere and increases		

* Continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602784A
PE Title: Military Engineering Technology

Budget Activity: #2

artillery effectiveness

	*	999
• (U) Designed and developed a mobile atmospheric profiler to collect wind, temperature, pressure and humidity data to increase artillery accuracy/environmental monitoring	*	900
• (U) Upgraded Electro-Optical Systems Atmospheric Effects Library distributed to DoD agencies, contractors, and to NATO Research Study Group Panels	*	1318
• (U) Microphone wind noise analyzed indicating evidence of non-linear effects caused by atmospheric turbulence	*	655
Total		5894

(U) FY 1994 Planned Program:

• (U) Battlefield/target area meteorological forecast model and automated decision aids on testbed configured for operational use on the Integrated Meteorological System Block II	Complete	Costs
• (U) Conducted acceptance testing, field testing, and demonstration of the ability to model the atmosphere in the target area and increase accuracy of weapons	*	1957
• (U) Integrate multiple weather sensor, improve performance characteristics, and fully document the mobile atmospheric profiler	*	825
• (U) Incorporate effects of target and scene shadows on target acquisition into the Target Acquisition (TARGAC) model	*	825
• (U) Develop Tactical Decision Aid for the detection of acoustical sources, assuming a non-turbulent planetary boundary layer over flat terrain	*	695
Total	*	670
		4972

(U) FY 1995 Planned Program:

• (U) Integrate realistic weather effects into Louisiana Maneuvers and the Army Battle Labs	Complete	Costs
• (U) Increase lethality, reduce costs of indirect fire weapons, and collect environmental data via computer modeling of the atmosphere	*	1213
• (U) Exploit meteorological satellite and atmospheric profiling technology to collect critical environmental data	*	1504
• (U) Incorporate horizontal radiative transport into the Boundary Layer Illumination and Radiation Balance model	*	1504
• (U) Develop a tactical decision aid for displaying sound pressure levels in the two dimensional turbulent	*	881

* Continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

planetary boundary layer over flat terrain	*	774
Total		**5876**

(U) Project AT40 - Mobility and Weapons Effects Technology: This project will provide warfighters the technologies for: rapid establishment and repair of lines of communications by both light and heavy engineers in support of US deployed forces; optimal obstacle siting based on accurate predictions of enemy movement and the synergistic effects between obstacles and weapons systems; techniques for rapid barrier creation; accurate assessments of battlefield mobility for maneuver commanders (and materiel developers during virtual prototyping); methodologies to predict coastal effects on Logistics-Over-The-Shore operations; camouflage, concealment, and deception for fixed facilities to deny accurate acquisition and engagement by threat weapon systems; and designs, materials, and construction methods for battlefield, fixed, and forward base survivability against advanced conventional weapons and terrorist weapons. Civil Engineering Science and Technology (S&T) in this project directly supports the Army's DOD Project Reliance S&T responsibilities in Airfields & Pavements, Survivability & Protective Structures, and Sustainment Engineering.

(U) FY 1993 Accomplishments	**Complete**	**Costs**
• (U) Expanded and verified stochastic mobility analysis process; developed inference algorithms to derive required quantitative mobility factors for use in battlefield mobility operations	*	1380
• (U) Developed obstacle effectiveness algorithms and procedures for automatic transformation of standard hydrologic data into Obstacle Planning Software	*	775
• (U) Developed algorithms to provide automated convoy planning, highway scheduling, and allocation of engineer resources; field tested Logistics-Over-the-Shore site selection model	*	925
• (U) Developed PC-based structural analysis code for predicting in-structure shock for buried multi-story/multi-bay structures; threat and failure criteria, retrofit hardening concepts, and comparative vulnerability analysis for communication sites	*	2090
• (U) Conducted model assessment for moisture migration for improved pavement performance models	*	969
• (U) Devised new materials that will effectively control dust while reducing equipment, manpower, and logistical requirements by 30 percent	*	750
• (U) Updated criteria for battlefield protection from existing weapon threats (small arms & indirect fire) and criteria for protection from advanced weapons (enhanced blast, dual stage munitions, & explosively forged penetrators)	*	725
• (U) Constructed a technology data base for responses of reinforced concrete target targets to firings of field-packable explosively formed penetrators	*	534

* Continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

• (U) Established a camouflage, concealment, and deception (CCD) research technologies workstation, a visual evaluation module, and selected multi-spectral fast application camouflage decal material for fixed facilities	*	2150
• (U) Developed a method for predicting fragmentation of windows due to blasts from vehicle bombs; analyzed structural damage to World Trade Center complex following bombing incident	*	420
Total		10718

(U) FY 1994 Planned Program:	**Complete**	**Costs**
• (U) Transition stochastic mobility techniques for soldier evaluation; validate mobility inference algorithms in two climatic regions; describe soil dynamics of maneuvering vehicles on deformable soil	*	1700
• (U) Develop and integrate direct-fire/obstacle synergistic relationship algorithms, Tactical Dam Analysis Model, and Reservoir Outflow Model into Obstacle Planning Software	*	920
• (U) Develop a Logistics-Over-the-Shore simulation planning model for prediction of logistics throughput; develop and validate logistics convoy operation system assessment model; automate work rates for engineer equipment	*	935
• (U) Establish design criteria for Army Technical Manual (TM) 5-855-1 for anti-penetration shielding to defeat advanced design projectiles; upgrade vulnerability analysis methodology for structural response from direct hit using in-structure shock code	*	2392
• (U) Provide a reliability-based design/evaluation procedure for airfield pavements	*	1080
• (U) Conduct an evaluation and field demonstration of materials and methods for stabilization of dry soils	*	775
• (U) Evaluate advanced materials for expedient protection for mobile command centers, parked army aircraft, and their supporting assets and develop survivability algorithms for Simplified Survivability Assessment procedure for troop use	*	775
• (U) Develop high efficiency standoff assault breaching, bridge demolition and road cratering techniques	*	800
• (U) Develop basic CCD design guidance for new/hardened construction and CCD research technologies work-station radar design module and radar terrain/target database	*	1225
• (U) Develop and test techniques for upgrading windows and doors to resist blasts from terrorist vehicle bombs	*	850
Total		11452

(U) FY 1995 Planned Program:	**Complete**	**Costs**

* Continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

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Program Element: #0602784A
PE Title: Military Engineering Technology Budget Activity: **#2**

• (U) develop a stochastic mobility model with capabilities to quantify reliability of predictions and measures of risk; develop algorithms describing torque/traction/soil motion resistance of maneuvering vehicles on deformable soil	*	1890
• (U) Develop and integrate indirect-fire/obstacle synergistic relationship algorithms and RIVERINE Analysis Model into Obstacle Planning Software	*	1149
• (U) Construct a theater infrastructure assessment model integrating convoy operation system assessment and Logistics-Over-The-Shore models; develop horizontal engineering work effort model; provide real-time sea state forecast	*	900
• (U) Evaluate effectiveness of new high-strength, high-ductility materials against hard target penetrators; upgrade designs and unprotected versus protected vulnerability evaluations for generic hardened facility subjected to direct hits	*	2442
• (U) Establish design criteria for use of modifiers in asphalt concrete to improve durability, reduce maintenance costs, and increase pavement life	*	1055
• (U) Develop methods for rapid stabilization of loose dry soils in arid regions to provide operating surfaces (paved and unpaved) for contigency military operations	*	1105
• (U) Determine protective measures that will increase the survivability of Brigade and Division command centers without interfering with mobility and operational requirements	*	1055
• (U) Develop techniques or methodologies for rapid obstacle creation immediately following last use of terrain and lines of communications by friendly forces	*	1130
• (U) Establish design criteria for chapter on camouflage, concealment, and deception for Army TM 5-855-1	*	800
• (U) Develop/test methods for hardening building walls to resist terrorist vehicle bombs. Test forced entry resistance of building components	*	787
Total		**12313**

(U) Project AT41 - Military Facilities Engineering Technology: This project exploits innovative developments in a wide range of technologies to achieve critically needed cost reductions in Army facility life cycle processes (infrastructure planning, assessment, design, construction, revitalization, sustainment, and disposal). Current Army infrastructure related costs alone are about $7 billion dollars/year. National Military Strategy goal is to reduce facility infrastructure life cycle costs by 20% by FY2000. Meeting this critical goal is not possible without application of significant technology innovation. Technology innovations already developed and projected for the future have high civilian sector "dual use"

* Continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

Program Element: **#0602784A**
PE Title: **Military Engineering Technology** Budget Activity: **#2**

potential and interest and include innovations in material science, composite materials, operations research, systems analysis, robotics, concurrent engineering, collaborative decision support, knowledge-based systems, object oriented modeling and simulation. As a side benefit, significant soldier retention benefits also accrue from providing high quality, professional work environments and high quality communities for military families. Under the DoD Project RELIANCE initiative, the Army is responsible for meeting the conventional facilities research and development needs of all the military services.

(U) FY 1993 Accomplishments:	Complete	Costs
• (U) Developed a Theater Construction Management System for Combat Engineer forces to plan theater of operation sustainment missions and to manage those missions in theaters of operation	*	783
• (U) Developed an innovative prototype spatial grammar to generate better facility design alternatives; developed a national standard for the electronic data exchange of construction project schedules	*	1328
• (U) Designed a high temperature anti-scale/ corrosion resistant protective coatings for piping, heat exchangers, and mechanical equipment at Army installations	*	1060
• (U) Tested nonductile concrete frames and equipment fragility for retrofiting Army facilities and critical equipment in seismic IV zones	*	525
• (U) Constructed an analytical decision support models for Army facility planners; evaluated alternative facility disposal processes; established a center to develop/test integrated systems for master planning/facility management	*	501
• (U) Provided enhanced capabilities of Knowledge Worker System (Version 1.6) to improve productivity of Army professionals in installation management	*	886
• (U) Engineered management systems for roofing, pavements, and exterior painting for Commander's optimal allocation of public works funds	*	823
• (U) Developed low cost electromagnetic shielding design guidance for critical Army facilities	*	324
Total		**6230**

(U) FY 1994 Planned Program:	Complete	Costs
• (U) Establish a biddability, Constructability, Operability, and Environmental compatibility expert design advisor to reduce construction claim costs and improve cost effectiveness of facility acquisition process	*	1642
• (U) Develop a lead-based paint removal and hazard mitigation techniques using new and emerging technologies, including vacuum blasting and heat gun for Army lead-based paint removal program	*	905
• (U) Test energy dissipation technologies and develop criteria for improving seismic performance for		

* Continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

upgrading existing Army facilities	*	505
• (U) Develop innovative systems analysis techniques to quantify the relative utilities of existing and proposed installation facilities	*	505
• (U) Design a Knowledge Worker System enhancement that supports dynamic task allocation among defense knowledge workers to employ existing workforce more effectively	*	1121
• (U) Integrated Commander's public works maintenance management models and algorithms for optimal maintenance and repair resource allocation with special emphasis on automated inspection procedures	*	917
• (U) Develop synchronous detection for non-disruptive electromagnetic hardness assessment of fixed Army facilities	*	335
Total		**5930**

(U) FY 1995 Planned Program:	Complete	Costs
• (U) Design a real time decision support probabilistic analysis model for predicting costs/risks of proposed technology alternatives in highly uncertain environmental remediation construction situation	*	1200
• (U) Evaluate smart roofing systems and construction materials recycling for design, repair and revitalization of Army facilities	*	820
• (U) Test retrofitted complex concrete and masonry systems and develop seismic strengthening techniques for Army facilities	*	436
• (U) Develop innovative macro cost/risk analysis techniques for evaluating long range facilities planning alternatives	*	421
• (U) Provide next generation integrated decision support environment to exploit collaborative object oriented simulation analysis techniques	*	1000
• (U) Establish condition indices and prediction models for building engineered management system	*	1090
• (U) Test computer based maintenance management system for shielded construction	*	375
Total		**5342**

(U) Project AT42 - Cold Regions Engineering Technology. This project is the only DoD exploratory development program focused on the knowledge base and engineering principles needed to sustain an effective war fighting force in the cold regions of the world including combat support, combat engineering and base/facility construction, operation and maintenance. Research directly lowers high life cycle costs and extends abbreviated service life of DoD facilities subjected to winter and extreme cold conditions, as well as, providing basis for extending operability of

* Continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

Program Element: #0602784A
PE Title: Military Engineering Technology

Budget Activity: #2

forces and material to cold climates with minimized capability and cost penalties. Research supports readiness and effectiveness of DoD conventional, light, and special operations forces in the Arctic, Alaska, Scandinavia, Korea, Japan, Europe, US northern tier and other remote/high altitude environments. This program is a source of special technologies for civilian engineering and environmental applications not obtainable through the private sector. This program is essential to improving US projection of power and operational capabilities in winter and the cold regions of the world.

(U) FY 1993 Accomplishments:	Complete	Costs
• (U) Develop environmental design criteria for smart weapons performance in winter supporting Smart Weapons Operability Enhancement (SWOE) Program	*	1280
• (U) Provided product improvement for shallow snow conditions in Condensed Army Mobility Model System (CAMMS)	*	633
• (U) Examined effect of low temperature cycling on experimental infantry fighting vehicle composite material	*	603
• (U) Quantified criteria for mine neutralization system performance over snow	*	548
• (U) Updated snow-load database and national standard for snow load design and completed winter criteria for facility security system design	*	435
• (U) Developed frost shielding methods for buried utilities systems and criteria for roof de-icing systems	*	1083
• (U) Defined performance of geotextiles as a stabilizer of pavements subject to frost action and rutting resistance of asphalt concrete design mixes	*	908
Total		5490

(U) FY 1994 Planned Program:	Complete	Costs
• (U) Investigate temporal and spatial variability of snowpack at radar wavelengths impacting smart weapon performance supporting SWOE	*	994
• (U) Incorporate algorithms for predicting mobility for freezing and thawing soil on CAMMS in support of Vehicle Terrain Interaction (VTI)	*	824
• (U) Remote icing accumulation detection method and standard method for ice bonding strength	*	818
• (U) Evaluate ripper tooth for Combat Engineer Vehicle excavation in frozen soil to be a companion digger for the Armored Combat Earthmover in hard or frozen ground	*	539
• (U) Porduce guide specifications and design guidance for air tightness in metal buildings and design criteria for insulated foundations	*	522

* Continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

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Program Element: #0602784A
PE Title: Military Engineering Technology **Budget Activity: #2**

• (U) Develop user guide for protected membrane roofs and guidance for winter repair of building wall systems	*	944
• (U) Develop and procure a state of the art load bridge to validate mechanistic pavement design models built to full scale in the Frost Effect Research Facility	*	1943
Total		6584

(U) FY 1995 Planned Program:	Complete	Costs
• (U) Develop radar backscatter model for synthesis of winter background scenes	*	1121
• (U) Develop model of wheel/track traction in deep snow and incorporate models for shallow snow and freezing/thawing soil into NATO Reference Mobility	*	831
• (U) Devise analytical techniques for optimizing seismic/acoustic system performance in winter for smart weapons and mines	*	877
• (U) Develop advanced cutter design concepts for light excavation equipment in frozen ground supporting Lines of Communication (LOC)	*	745
• (U) Develop low temperature admixtures for concrete placement at -10 degrees Centigrade	*	536
• (U) Develop lower life cycle cost heat distribution systems for military installations	*	821
• (U) Develop cold regions mechanistic pavement design model	*	663
Total		5594

(U) **Project AT45 - Energy Technology Applied to Military Facilities:** Energy for Army facilities is essential for the modern Army to meet its mission. The research conducted in this project provides the technology for providing energy efficient facilities, adapting new energy source technologies to military facilities, adapting renewable technology to Army scale facilities, and improving the efficiency of Army unique on-site central energy plants. Research focuses on leveraging industry technology investments and integrating a broad range of advanced technologies into a comprehensive system to meet the specialized needs of the Army occasioned by size, age and mission dependent operational standards. Activities include modelling and simulation of thermal loops and electrical systems, constructing new analytic techniques, and developing new system designs and new hardware in conjunction with industry. Research products/systems are integrated in a "Low Energy" Model Installation Program. Research products are transferred to the field and used in new construction and in upgrades of existing facilities. The Energy Policy Act of 1992 requires the Army to reduce energy consumption 20% by 2000 from the 1985 base line. This project includes the Natural Gas Cooling Dessicant Technology program which has been designated by Congressional language as being of special interest. This objective is to identify sites for demonstrating desicant cooling technology with subsequent activities including system design, equipment installation, and performance monitoring.

* Continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

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Program Element: #0602784A
PE Title: Military Engineering Technology **Budget Activity: #2**

(U) FY 1993 Accomplishments:	Complete	Costs
• (U) Established boiler control modernization procedures for Army central heat plants and load forecasting/load allocation expert system for Army central energy plants	*	668
• (U) Analyzed chloro-florocarbon (CFC) alternatives/substitutes for Army chillers and developed maintenance management techniques for Army Heating Ventilation Air Condition (HVAC) systems	*	1360
• (U) Determined Army-specific load profiles for adjustable speed drives, analysis of circuit breakers under harmonic loads, and lighting guidance for new construction	*	947
Total		**2975**

(U) FY 1994 Planned Program:	Complete	Costs
• (U) Develop energy design agents for military facilities using Army Design Software Program	*	714
• (U) Develop retrofit burner technique for boilers in central energy plants	*	646
• (U) Modify HVAC system designs for special purpose application for Army facilities	*	650
• (U) Porvide technologies to reduce energy system harmonics on Army installations, lighting retrofit 'guidance, and refrigeration management system	*	790
• (U) Select site and develop performance monitoring for natural gas cooling technology	*	200
Total		**3000**

(U) FY 1995 Planned Program:	Complete	Costs
• (U) Develop Collaborative Agent Facilitator for Army energy/utility systems in Concurrent Engineering for military facilities	*	984
• (U) Devise methods for adopting fuel cell technology to Army facilities	*	640
• (U) Design new digital control hardware for Army utility control systems	*	638
• (U) Establish methods for electric/motor drive analysis and selection for retrofits to Army facilities	*	634
Total		**2896**

(U) Work Performed By:
A855: Topography, Image Intelligence and Space Technology: Approximately 65 percent of the work is performed by the Topographic Engineering Center, Fort Belvoir, VA. Contractors include: General Dynamics, San Diego, CA; Loral Corp., Akron, OH; BBN Corp., Boston, MA; 3M Corp., St. Paul, Minnesota.

* Continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602784A
PE Title: Military Engineering Technology

Budget Activity: #2

AH71: Atmospheric Investigation: Approximately 77 percent of the work is performed in-house primarily by the Atmospheric Sciences Laboratory, White Sands, NM. Contractors include: New Mexico State University, Las Cruces, NM; Sand T Corp., Hampton, VA; University of Texas, El Paso, TX.
AT40: Principal performing organization is the U.S. Army Engineer Waterways Experiment Station. Contractors for R&D related goods and services include: Louisiana State University, Colorado State University, University of Colorado, Northeast Louisiana Univerity, University of Nevada, University of Arkansas, Mississippi State University, University of Illinois, University of Texas, Georgia Tech, Nichols Research (CA/MD/MS/NM/VA), Applied Research Associates (MS/CA), California Research and Technology (CA/MS), Jay Corp, Venue (CA), PDA Engineering (CA), Phoenix Scientific, Inc. (CA),Bevilacqua Research Corp (AL), EMOS Inc (AL), GEMS Research Corp (NV), I-Math Corp (FL), Wright Labs (FL), Applied Research Associates (NM/MS/DC/MD), Sunburst Excavation Inc (CO), Sandia National Laboratories (NM/CA), Titan Research and Technology (CA/NM), Seco-Dyn (CA), Guided Boring Systems Inc (TX), Dustpro (AZ), Energy Systems Associates (VA), Executive Resource Associates Inc (VA), Soil Stabilization Products Co (CA), Ergon Asphalts & Emulsions Inc (MS), Naval Surface Warfare Center (MD).
AT41: Military Facilities Engineering Technology: Approximately 65 percent is performed primarily by the U.S. Army Construction Engineering Research Laboratory, Champaign, IL. Contractors include: University of Illinois, Urbana, IL; Bechtel National Inc., San Francisco, CA; Carnegie Mellon University, Pittsburgh, PA; Georgia Tech University, Atlanta, GA; Stanford University, Palo Alto, CA; and MIT, Cambridge, MA.
AT42: Cold Regions Engineering Technology: Approximately 75 percent is performed primarily by the Cold Regions Research and Engineering Laboratory, Hanover, NH. Contractors include: Dartmouth College, Hanover, NH., MIT, Cambridge, MA, U. of Alaska, Fairbanks, AK, Michigan Technology U., Houghton, MI, Boston U., Boston, MA.
AT45: Energy Technology Applied to Military Facilities: Approximately 65 percent is performed primarily by the U.S. Army Construction Engineering Research Laboratory, Champaign, IL. Contractors include: University of Illinois, Urbana, IL; Arthur D. Little, Inc., Boston, MA; Institute of Gas Technology, Chicago, IL; Science Applications International Corp., McLean, VA; Stanley Consultants, Muscatine, IA.

(U) Related Activities: This program adheres to Tri-Service Reliance Agreements on Civil Engineering and Environmental Sciences with oversight provided by the Joint Directors of Laboratories and Joint Engineers. In accordance with the ongoing Reliance joint planning process, work in this Program Element is related to and fully coordinated with efforts in the following PEs:
PE #0601102A (Defense Research Sciences) Projects AT22, AT23, AT24, B53A and B52C.
PE #0603734A (Military Engineering Advanced Technology).
PE #0603730A (Tactical Surveillance System - AD) (TIARA).
PE #0604716A (Terrain Information-Engineering Development) (TIARA).
PE #0604740A (Tactical Surveillance System - ED) (TIARA).

* Continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602784A
PE Title: Military Engineering Technology

Budget Activity: #2

Cooperative programs have been established by Memorandum of Understanding with the Belvoir Research, Development and Engineering Center involving the following:
PE #0602786A (Logistics Technology) Project AH20.
PE #0603606A (Landmine Warfare and Barrier Advanced Technology) Project D608.
PE #0603619A (Landmine Warfare and Barrier-Advanced Development).

Work in this Program Element contains no unwarranted duplication of effort within the Army or DoD. This research is coordinated with the following agencies annually, or more frequently as required:
Department of Defense, Office of The Director of Defense Research and Engineering
Advanced Research Projects Agency
Defense Intelligence Agency
Defense Nuclear Agency
Department of the Air Force
Defense Mapping Agency
U.S. Marine Corps
Department of the Navy
Joint Services Civil Engineering Research and Development Coordination Group (JSCERDCG)
NATO Panel IV, Research Study Groups (RSGs) 8, 14 and 15
NATO Panel III, RSG 2 and 11
NATO, Special Group of Experts on Concealment, Camouflage and Deception
NATO Armaments Group, Panel XII (Meteorology)
Department of the Interior
Department of Transportation
Department of Energy
Central Intelligence Agency
National Institute of Standards and Technology
National Academy of Sciences

(U) **Other Appropriation Funds:** ($ in Thousands) Not applicable.

(U) **International Cooperative Agreements:** Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602785A
PE Title: Manpower, Personnel and Training Technology

Budget Activity: #2

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
ABB2 Life Science Technology	1666	0	0	0	0	0	0	0	1666
A790 Personnel Systems and Performance Technology	4670	4172	3366	2842	3131	3298	3775	Cont'd	Cont'd
A791 Education and Training Technology	8974	9147	7118	6319	6895	7223	8012	Cont'd	Cont'd
PE TOTAL	15310	13319	10484	9161	10026	10521	11787		

B. (U) BRIEF DESCRIPTION OF ELEMENT: The objective of this program is to provide a scientifically-sound basis for maximizing soldier and unit performance through empirical research, the results of which lead to: 1) cost-effective training strategies for synthetic training environments, 2) optimum simulator designs to achieve maximum learning at minimum cost, 3) enhanced battle command performance, and 4) improved selection and classification of soldiers to maintain the Army's warfighting edge. Work in this program element is consistent with the Army Science and Technology Master Plan, the Army Modernization Plan, and Project Reliance. This program element was restructured in FY93 following the transfer of the Manpower and Personnel Integration (MANPRINT) System Acquisition function from the U.S. Army Research Institute for the Behavioral Sciences (ARI) to the Army Research Laboratory (ARL). Funding from Project ABB2 and partial funding from Projects A790 and A791 was moved in FY94 from this PE to PE #0602716A, Project AH70. Projects A790 and A791 were restructured in FY94 to better reflect the PE's two main areas of exploratory development, in conformance with Tri-Service Reliance agreements .

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project ABB2 - Life Sciences Technology: The objective of this program was to develop models and tools for the identification and integration of user requirements as part of the MANPRINT process. These technologies combine human engineering, manpower, personnel, training, system safety, and health hazard concerns and data to understand, predict or improve actual or conceptual system performance. This research supports the Army's Modernization Plan. This funding line existed for FY93 only and was transferred in FY94 to PE #0602716A under the Army Research Laboratory.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602785A
PE Title: Manpower, Personnel and Training Technology **Budget Activity: #2**

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Completed prototype of commander's display of realtime intelligence imagery and non-imagery updates, e.g., infrared and electro-optics	4Q93	787
• (U) Developed a MANPRINT-based model to examine the effects of task-induced stress on battle staff competence and effectiveness with a focus on communication and decision-making	4Q93	438
• (U) Conducted analyses to identify the cognitive tests required to predict target detection performance by soldiers in sustained operations	4Q93	441
Total		1666

(U) FY 1994 Planned Program: Work transferred to PE #0602716A under the Army Research Laboratory

(U) FY 1995 Planned Program: Not applicable.

(U) Project A790 - Personnel Systems and Performance Technology: The objectives of this project are to provide the scientific basis for: (1) technology-based methods for leader assessment and development, (2) enhanced selection and classification procedures to ensure the right person is placed in the right job, (3) improved organizational design to enhance warfighting decision making, and (4) methods for determining effective utilization of soldiers with minimal entry qualifications. This project will also develop methods for the effective organizational design, leadership, and training of units required to perform peacekeeping operations and other operations other than war. Research under this project supports the Manpower and Personnel Defense Technology Area. Funding figures for FY93, FY94 and FY95 are based on the new project structure.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Developed initial versions of tests and feedback systems for assessing strategic leadership skills	*	1217
• (U) Developed prototype model of command and control (C2) processes for commanders and their staffs	*	460
• (U) Demonstrated the incremental validity of biographical data measures for predicting West Point cadet performance	*	863
• (U) Identified performance predictors for low aptitude personnel	*	729
• (U) Developed model for the application of life course theory to military experience	*	425
• (U) Identified critical issues related to Army survey confidentiality	*	976
Total		4670

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602785A
PE Title: Manpower, Personnel and Training Technology **Budget Activity: #2**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Develop cognitive analysis techniques to identify the decision-making requirements of C2 tasks	*	1382
• (U) Conduct test of new paradigm of distributed battle command planning and decision-making	*	343
• (U) Develop and evaluate experimental soldier classification procedures which include temperament measures	*	707
• (U) Develop methods for identifying optimal job assignments for lower aptitude personnel	*	372
• (U) Conduct retrospective survey of leaders who participated in Sinai Peacekeeping mission	*	287
• (U) Conduct experimental investigation of issues related to ensuring survey data quality	*	1081
Total		4172

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Determine relationships between leaders' problem-solving capabilities, leadership style, and rated effectiveness	*	1476
• (U) Develop computer modeling tools to assist in the design of staff groups	*	221
• (U) Develop new measures of performance-related aptitude, leadership, and stress tolerance	*	504
• (U) Develop new selection techniques for enlistees with low aptitude scores	*	325
• (U) Conduct analyses on the long-term effects of Sinai peacekeeping on leader career commitment	*	444
• (U) Develop architecture for a master data base of Army personnel surveys	*	396
Total		3366

(U) Project A791 - Education and Training Technology: The objectives of this project are to provide the behavioral technology required for the development of effective individual and collective (unit) training strategies using simulation-based synthetic environments. Research conducted in this project builds on recent advances in the cognitive sciences and will provide an empirical basis for: (1) improved collective (unit) training strategies and techniques for brigade and below, with an emphasis on commander's visualization of the battlefield, (2) training strategies for time-stressed, high skill crew/team training and training during night operations, (3) individual soldier training strategies exploiting "virtual reality" technology for warfighting training and "intelligent tutor" technology for language training, and (4) determination of task-based fidelity requirements for cost-effective simulator training. Research under this project directly supports the Training Systems Defense Technology Area. Funding figures for FY93, FY94 and FY95 are based on the new project structure.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Developed virtual reality (VR) environment and task battery for assessing performance	*	1037

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602785A
PE Title: Manpower, Personnel and Training Technology

Budget Activity: #2

• (U) Defined critical variables related to skill acquisition and retention in teams and units	*	812
• (U) Developed innovative front-end analysis method for identifying critical soldier performance problems during night operations	*	2223
• (U) Developed methodology to identify critical tasks for brigade training	*	1293
• (U) Developed instructional display screens for prototype Arabic and Spanish tutors	*	1389
• (U) Established state-of-the-art training simulator research testbed (aviation focus)	*	2220
Total		8974

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Assess the capability of performing land navigation and target detection in a virtual reality environment	*	756
• (U) Test prototype unit skill acquisition and retention model using Armor platoon tasks in a simulated training environment	*	539
• (U) Develop and evaluate field-expedient methods for maximizing soldier visual acuity at night	*	1632
• (U) Design methods for coupling new battlefield visualization technologies with the cognitive/perceptual models of expert tacticians	*	1023
• (U) Complete research on the effectiveness of tutoring rules and their interaction with individual learning styles	*	1190
• (U) Identify team coordination problems and training requirements for medical emergency teams	*	4007
Total		9147

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Identify the necessary fidelity requirements for cost-effective team training in virtual reality environments	*	1538
• (U) Design methods for training collective skills in a distributed interactive simulation (DIS) environment	*	627
• (U) Develop prototype training methods to facilitate the acquisition of collective skills in a DIS environment	*	1028
• (U) Develop training methods using emerging computer graphic display technologies to enhance commanders' visualization of the battlefield	*	936
• (U) Demonstrate a portable, computer-based language tutor prototype	4Q95	565
• (U) Empirically determine the content requirements of flight simulator scenes	*	2424
Total		7118

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602785A
PE Title: Manpower, Personnel and Training Technology

Budget Activity: #2

(U) **Work Performed By:** The primary in-house developing organization for Projects A790 and A791 is the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI), Alexandria, VA. Contractors include: Evidence Based Research, Vienna, VA; Micro Analysis & Design, Inc., Boulder, CO; CAE Electronics, LTD, Quebec, Canada; University of Central Florida, Orlando, FL; Yale University School of Law, New Haven, CT; American Institutes for Research, Washington, DC; Human Resources Research Organization, Alexandria, VA; Anacapa Sciences, Santa Barbara, CA; Dynamics Research Corporation, Wilmington, MA; and MAFAT, Tel Aviv, Israel.

(U) **Related Activities:** This program adheres to Tri-Service Reliance Agreements on Manpower and Personnel and Training systems with oversight and coordination provided by the Armed Services Training and Personnel Systems Science and Technology Evaluation and Management (TAPSTEM) Committee. Work in this Program Element contains no unwarranted duplication of effort among the Military Departments.

(U) **Other Appropriation Funds:** ($ in Thousands) Not applicable.

(U) **International Cooperative Agreements:** Project Agreement between the United States Department of the Army and the Canadian Department of Regional and Industrial Expansion for Army Aviation Combat Training Simulator, United States-Canada Cost-Shared Development Project, 29 April 1987.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602786A
PE Title: Logistics Technology

Budget Activity: #2

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
AH20 Mobility Equipment Technology	12572	7466	9351	7956	8802	9481	10892	Cont'd	Cont'd
AH98 Clothing & Equipment Technology	9456	10088	12031	9901	9881	10568	11600	Cont'd	Cont'd
AH99 Joint Services Food/System Technology	4157	4978	5284	3913	4136	4771	5347	Cont'd	Cont'd
DJ10 Combat Rations Quality Enhancement	3750	4104	930	1269	0	0	0	0	11538
D283 Airdrop Advanced Technology	2071	2053	1950	1594	1688	1942	2197	Cont'd	Cont'd
A427 Tactical Shelters-Exploratory Development	4531	2728	2279	0	0	0	0	0	13738
PE TOTAL	36537	31417	31825	24633	24507	26762	30036		

B. (U) BRIEF DESCRIPTION OF ELEMENT: Next generation and future hardware will place unusual demands on future Army logistics systems. In order to achieve the logistics efficiency and responsiveness that will be required, there must be associated technology developments evolving in logistics equipment, supplies, and systems to make them smaller, lighter, more reliable and durable, more survivable, less manpower intensive, and more mobile. Technology efforts on clothing and equipment and on field shelters provide enhanced individual soldier protection from both combat threats and from the natural field environment. The Joint Services Food/System Technology program supports all the military Services,

the Special Operations Command, and the Defense Logistics Agency with research and development of advanced military food products, packaging, and combat food service equipment. The Combat Ration Quality Enhancement project will establish quality quantification parameters and criteria to minimize physical, chemical, and nutritional degradation of combat rations thus maintaining/enhancing acceptance and consumption by the military community. Similarly, work on advanced airdrop technology supports all Services' requirements for dropping larger combat and logistics loads while improving delivery accuracy, minimizing vulnerability of aircraft and reducing life cycle costs. Moving men and equipment in support of the ground Army is the focus of investigation into mobility equipment technology. This includes renewed emphasis on landmine detection and neutralization, countersurveillance, improved warehousing and supply distribution, and low-signature, high efficiency mobile electric power sources. The work in this program element is consistent with the Army Science and Technology Master Plan (ASTMP) and Science and Technology Objectives (STOs).

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project AH20 - Mobility Equipment Technology: This exploratory development program addresses the need for advanced Combat Support and Combat Service Support equipment and material. The project is directed toward providing the technology to solve deficiencies in the Army mission areas of Engineer-Mine Warfare and Combat Service Support. It includes efforts in countersurveillance, deception, survivability, countermine, logistic supply and support, materials, fuels, lubricants, mobile electric power, environmental control, and corrosion.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Proved the capabilities of a breadboard high speed engine generator-compressor assembly for Soldier Individual Power.	2Q95	2122
• (U) Demonstrated 3 unique polymer based techniques for improving operating efficiency and life of membranes for desalting water.	4Q93	800
• (U) Transitioned fuel design limits for advanced combat vehicle engine systems and completed laboratory development phase of the new single hydraulic fluid for combat and tactical material.	4Q93	777
• (U) Demonstrated coatings and system designs for thermal suppression, mobile camouflage, and deception to counter threat sensors.	4Q93	2086
• (U) Successfully demonstrated the design of three candidate composite mechanical connectors for composite tubes and plates and the use of bonding and inflation technology to provide mobile bridging.	1Q94	644
• (U) Completed field evaluation of ground sonar technology which shows great promise for detecting mines.	4Q95	1400
• (U) Demonstrated countermeasure technology to defeat acoustic and seismic sensors for top attack, anti-tank mines.	4Q95	1500

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602786A
PE Title: Logistics Technology
Budget Activity: #2

• (U) Designed, tested, and fabricated experimental kits to protect crews in 5 Ton trucks and HMMVs from mine blasts and provided to U.S. Forces Somalia.	4Q93	3243
Total		**12572**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Design, fabricate and test commercial engines and generators for individual soldier power.	2Q95	1200
• (U) Assess performance data regarding configurations with new polymeric materials.	4Q94	82
• (U) Complete field demonstration of new single hydraulic fluid and transition to field.	4Q94	651
• (U) Design low observable systems to reduce detection ranges by 50% for mobile assets in woodland/desert/arctic/urban battlefield environments.	4Q94	958
• (U) Evaluate different algorithms with various detector arrays to optimize sensor performance for false alarm rate reduction.	4Q95	1200
• (U) Design and build smart mine end-to-end simulator for use in the joint Army/USMC Off-Route Smart Mine Clearance program.	4Q95	1200
• (U) Study the effects of a directed energy charged particle beam against mines.	4Q97	1684
• (U) Design, fabricate, and test a portable water chiller for use with tank trailers.	1Q95	491
Total		**7466**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Develop and complete fuel injector work for 8 lb engine-generator system for soldier micro-climate cooling module.	4Q95	943
• (U) Evaluate bench scale models for suitability for military water purification operations and application to commercial use.	4Q96	258
• (U) Complete engine/transmission dynamometer evaluations on environmentally compliant combat/tactical powertrain lubricant.	4Q96	552
• (U) Test/evaluate ability of low observable designs for rapid force projection vehicles to deny enemy surveillance of friendly activities.	4Q95	2223
• (U) Build and test detector arrays for the Vehicle Mounted Mine Detector test bed and transition to ADV DEV (6.3a) at completion of test.	4Q95	1805
• (U) Test and evaluate performance of smart mine emulator and counter-measure techniques. Transition emulator to support Off-Route Smart Mine Clearance 6.3a development.	4Q95	1615

Program Element: #0602786A
PE Title: Logistics Technology

Budget Activity: #2

• (U) Evaluate combining a forward looking detector (microwave or infrared) with a directed energy or explosive projectile to create a mine-hunter killer.	4Q97	1955
Total		**9351**

(U) Project AH98 - Clothing and Equipment Technology: This exploratory development improves soldier performance and survivability through significantly improved materials and new design applications for combat clothing and personal equipment. Areas of emphasis include material development to improve ballistic, chemical/biological, flame, nuclear thermal, and directed energy protection; enhanced countersurveillance/camouflage, microclimate conditioning, materials/concepts for protection in arctic/desert environments, and improvements to lighten the soldier's load. Human factors research and simulation and modeling tools applicable to the soldier system are used to quantify soldier performance and determine optimal R&D alternatives.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Demonstrated lighter weight (25% reduction) ballistic protective helmet using new high strength fibers and composite materials processing techniques.	4Q93	1325
• (U) Incorporated a thin, stretchable meltblown-web incorporating active carbon in a close-fitting chemical protective undergarment improving protection without adding burden.	4Q93	1055
• (U) Demonstrated composite material systems providing both fragment and flechette protection at 40% lower cost than current material.	4Q93	1170
• (U) Constructed laboratory prototype for eye protection against tunable lasers using improved nonlinear optical materials and hybrid lenslets.	4Q93	1040
• (U) Successfully characterized bioengineered polymers for feasibility in ballistic protective and electro-optic applications.	4Q93	1240
• (U) Improved the scratch resistance of transparent eye armor material through the application of dielectric coatings that also provided laser protection.	4Q93	810
• (U) Quantified and verified clothed anthropometric and joint range-of-motion data to assist in computer-aided design of optimally fitted clothing systems.	4Q93	760
• (U) Demonstrated and transferred to development,technology for printing combat uniform fabric with reversible woodland and desert camouflage patterns.	4Q93	630
• (U) Conducted survey to define factors that influence quality of life in the field and to examine the relationship of these factors to morale and evaluations of Natick items.	4Q93	475

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602786A
PE Title: Logistics Technology

Budget Activity: #2

• (U) Developed and distributed for user testing a first generation integrated soldier system model which simulates the interaction between soldier equipment, battlefield environment, and the soldier to determine effects changes in equipment have on soldier performance and survivability.	4Q93	950
Total		**9455**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Construct and evaluate flame resistant combat uniform shell fabrics and high efficiency flame resistant insulation materials for cold weather clothing.	*	2333
• (U) Evaluate, modify, and adapt biomechanical methods used by the sports shoe industry to characterize military footwear.	4Q97	200
• (U) Identify potential coatings and application technologies with controlled emissivity for thermal signature-reducing (i.e. extended camouflage) textile systems.	*	666
• (U) Characterize silk fibers by x-ray diffraction to determine potential application in individual ballistic protective systems.	*	821
• (U) Transfer reflective technology to development of multi-line laser eye protection for the land warrior. Assess flammability and thermal transport of military uniform systems when challenged by lasers and thermal-nuclear pulses.	*	1915
• (U) Assess the mechanisms of damage propagation and penetration failure under ballistic impact of high potential fiber-based materials.	*	1200
• (U) Characterize lightweight composite technologies and initiate area of body coverage study for personnel combat protection against small-arms projectiles.	4Q98	350
• (U) Optimize permeable and impermeable material technologies for individual chemical protection to increase durability and flame resistance while minimizing weight and bulk.	*	868
• (U) Evaluate novel, selectively-permeable membrane technology which allows passage of moisture vapor but not chemical warfare agent (vapor/liquid/aerosol) for use in lightweight chemical protective overgarments.	4Q96	400
• (U) Extend Unit Simulation System to platoon level force-on-force simulation, quantifying with high resolution the vulnerability, lethality, and mobility effects of explicit changes to soldier's clothing and equipment.	*	1335
Total		**10088**

* This is continuing work which is reviewed periodically ensuring quality, relevance and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602786A**
PE Title: **Logistics Technology** Budget Activity: **#2**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Enhance the crew station and combat uniform design capabilities of the Human Figure Performance Model by integrating clothed anthropometric and range of motion data and completing anthropometric spreadsheet software.	*	1830
• (U) Select materials and designs for field footwear to enhance soldier biomechanical efficiency and reduce soldier foot injuries.	4Q97	250
• (U) Refine controlled emissivity materials for personnel camouflage to minimize adverse effects on combat uniform fabrics.	*	1394
• (U) Scale-up production, isolation and purification of lighter weight silk proteins in collaboration with Industry for application in individual ballistic protective systems.	*	820
• (U) Develop Tristimulus filters for interim eye protection against tunable lasers.	*	1739
• (U) Conduct optimization of small arms protective technologies, focusing on decreased weight and minimized bulk for individual combat protective systems.	*	2800
• (U) Incorporate novel, semi-permeable membranes into lightweight chemical protective garments to evaluate durability and reduced physiological burden.	*	935
• (U) Develop first generation soldier-on-the-battlefield simulation software for virtual prototyping to reduce soldier system design costs and reduce risks to the individual soldier.	*	2263
Total		**12031**

* This is continuing work which is reviewed periodically ensuring quality, relevance and priority.

(U) Project AH99- Joint Service Food/System Technology: This DoD program addresses the food and food system technologies to support all the military Services, Special Operations Command, and the Defense Logistics Agency. Thrust areas include the exploratory development of combat rations, packaging, field food service equipment and combat food service systems all of which enhance the survivability, sustainability, and supportability of the Armed Forces ensuring optimal nutritional intake to maximize cognitive and physical performance on the battlefield.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) *Developed/transitioned to Services alternative combat food service concepts for Air Force missile sites,* Battlefield Distribution Systems, Naval shipboard food service.	4Q93	708
• (U) Improved stability of ration components in high heat environments to better maintain quality; conducted successful initial shipboard test of environmentally friendly eating utensils; and conducted successful field evaluations (including Somalia) of new ration components to enhance acceptability.	4Q93	2550

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602786A**
PE Title: **Logistics Technology**

Budget Activity: **#2**

• (U) Designed safe, lightweight, integrated, electrochemical heater prototype to effectively heat a multi-serving ration; developed a working prototype for a self contained compact self-heating, heat and serve ration for small groups of soldiers at remote sites.		
• (U) Completed a feasibility study of a novel field kitchen concept based on the use of thermal fluid/single burner system for cooking equipment, versus individual burners or large generators that will improve fuel/burner efficiency and operate safely. Transition appropriate technologies to 6.3a.	4Q93	395
Total	4Q93	505
		4158

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Develop preliminary decision criteria/tools for economical shipboard equipment repair/replacement and for field ration design trade-off analysis to model Prepositioned War Reserve Stocks/industrial base mobilization capacities/requirements.	*	372
• (U) Investigate active ration packaging to maintain quality and extend shelf life; apply intrinsic chemical markers to validate efficacy of state-of-the-art food preservation technologies to improve nutrient retention/ sensory quality, complete development of rapid assay kit for listeria monocytogenes to ensure ration safety.	*	2604
• (U) Refine reduced hydrogen chemical heater technology for individual and group rations to enhance safety/logistics and enable scale-up/commercialization; conduct cost benefit analysis of new self heating individual/group rations to ensure affordability; investigate application of ohmic heating/processing to improve quality of self heating rations.	4Q99	459
• (U) Establish and modify glass transition temperature to reduce ambient heat sensitivity of combat rations; quantify relationships between protein consumption and water demands to formulate water sparing foods for desert/tropic use; assess nutritional bioavailability of carbohydrates in high heat environments.	4Q97	418
• (U) Determine feasibility of catalytically lowering the vaporization temperature of diesel fuel for application in vaporizing burner units to enable the use of clean burning, natural gas equipment for field kitchens.	4Q98	370
• (U) Formulate components with complex carbohydrates of differing glycemic indices, which can be exploited to modulate energy; test complex carbohydrate component and cognitive performance link; assess tyrosine availability and utilization and its depletion effects under conditions of stress.		
Total	4Q98	755
		4978

* This is continuing effort which is reviewed twice annually by the DoD Food and Nutrition Research and Engineering Board (FNREB) among others, to ensure quality, relevance and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602786A**
PE Title: **Logistics Technology** Budget Activity: **#2**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Refine/apply simulation/modeling of combat food service systems to all future combat food service concepts for all services.	*	397
• (U) Determine initial producibility of liquid crystal polymer food container to minimize weight/maximize shelf life; establish logistical parameters and develop strategies to incorporate commercially viable irradiated foods into field rations.	*	2839
• (U) Evaluate the utility of time/temperature indicators to estimate remaining shelf life of rations with a predictive model, develop math model to correlate accelerated and long term stability testing to ration quality/produce safety.	4Q97	374
• (U) Incorporate results of cost benefit analysis to minimize cost of self heating rations/maximize convenience & acceptability; validate advancements in food processing/preservation packaging for technology insertions in self-heating individual and group rations.	4Q99	581
• (U) Investigate feasibility of closed cycle regenerative refrigeration and other refrigeration systems for more efficient operation and to reduce electrical power requirements in the field; investigate methods of catalytically converting diesel fuel into clean burning, natural gas for field kitchens.	4Q98	348
• (U) Demonstrate extending endurance with caffeine/carbohydrate bar. Demonstrate modulating glucose input and moderating muscle glycogen depletion with low glycemic index solid carbohydrate foods. Establish tyrosine levels needed to avoid stress-induced impairments. Assess glutamine for maintaining immune-functions. Demonstrate enhancing cognitive performance using food management strategies	4Q98	745
Total		**5284**

(U) **Project DJ10 - Combat Rations Quality Enhancement:** This project involves development of technologies for quantifying food quality in combat rations and other emergency feeding situations to enhance consumer acceptance. Parameters affecting food quality, including interrelationships among raw materials, processing, packaging, and storage, will be determined and analytical techniques for quantification will be developed. Innovative processing methods (ohmic heating and combination preservation processes) will be investigated. Optimal raw material processing techniques and packaging systems will be selected to minimize deteriorative changes in foods and maximize the deliverable quality of subsistence to the user community. It also involves the use of novel electric and magnetic field technologies to pasteurize chilled items.

* This is continuing effort which is reviewed twice annually by the DoD Food and Nutrition Research and Engineering Board (FNREB) among others, to ensure quality, relevance and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602786A
PE Title: Logistics Technology

Budget Activity: #2

Pasteurization is achieved by subjecting fluid foods to microsecond duration pulses of high electric fields and by subjecting fluid or solid foods to millisecond-duration pulses of an oscillating magnetic field. The efficacy and practicality of cold pasteurization will be explored.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Successfully determined the effect of raw material and process interaction on ration quality; developed baseline quality data for new food preservation technologies to benchmark quality enhancements.	4Q93	2000
• (U) Demonstrated microbial inhibition by pulsed electric field and hyperbaric preservation technologies for the cold pasteurization/preservation of fresh-like foods for military rations.	4Q93	1750
Total		**3750**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Produce fresh-like prototype ration components by non-thermal high pressure or pulsed electric fields; define optimal processing parameters to ensure microbiological safety; enhance quality and nutrient retention.	4Q94	2000
• (U) Develop/correlate analytical and sensory techniques for food quality quantification; transition promising new processing techniques to combat ration manufacturing.	*	2104
Total		**4104**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Identify and characterize microbial enzymes leading to ration quality losses; investigate free radical formation during processing and identify effects on ration quality; correlate military consumer perception of quality with chemical and physical measurements.	*	930
Total		**930**

* This is continuing effort which is reviewed twice annually by the DoD Food and Nutrition research and Engineering Board (FNREB) among others, to ensure quality, relevance and priority.

(U) **Project D283 - Airdrop Advanced Technology:** This project involves exploratory development to enhance personnel and cargo airdrop capabilities. Areas of emphasis include parachute technology for improved performance and high speed/low altitude extraction, soft landing system development, advanced rigging/derigging technology, airdrop simulation, and high speed airdrop systems technologies. Efforts will result in

increased personnel safety and reduced personnel, aircraft, and cargo vulnerability.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Successfully determined the effects of unsteady flow, added mass, and fabric porosity on parachute opening force, opening time and flow interaction with canopies that reduces reliance on costly and time-consuming testing.	4Q93	332
• (U) Developed computations to solve the equations of fluid dynamics in the presence of rapidly deforming decelerator (i.e., parachute) shapes.	4Q93	280
• (U) Developed the model to predict motion and trajectory of payload-canopy systems and validated experimental results.	4Q93	375
• (U) Successfully determined interactions of clustered parachutes in the flow field to identify and measure factors that influence parachute opening.	4Q93	450
• (U) Conducted systems analysis of airdrop requirements for low intensity conflict and developed a data base of human factors issues in airdrop.	4Q93	270
• (U) Completed the prioritized vehicle load list module of the expert system for airdrop mission planning which will significantly improve the efficiency of airdrop operations.	4Q93	364
Total		**2071**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Define opening dynamics of deployable gliding wings to determine stresses in wings and forces on payloads for the design of systems capable of heavier payload delivery.	*	247
• (U) Experimentally determine the details of parachute opening including the histories of shape, velocity, pressure, and flow fields about the parachutes for delivery of heavier payloads.	*	274
• (U) Develop method for measuring electrostatic charges on parachute fabric; relate charge distributions to parachute dynamics/reliability to reduce the risk of airdrop system failure.	*	75
• (U) Redefine the deformable fabric membrane model of the parachute to improve its ability to predict stresses during opening and reduce reliance on costly and time consuming tests during development.	*	277
• (U) Utilize theoretical and experimental methods to describe airdrop system trajectories and the personnel-parachute interaction during opening and descent, thus reducing risk of personnel injury during high speed airdrop operations.	*	278
• (U) Conduct human performance and biomechanical studies to identify factors affecting parachutist's safety.	*	125
• (U) Conduct systems analysis of high-altitude, offset air delivery of supplies and heavy combat equipment.	*	408

* This is continuing work which is reviewed periodically ensuring quality, relevance and priority.

• (U) Conduct vulnerability assessment (threat and hazard analysis phases) of high altitude cargo air delivery concepts.	*	369
Total		**2053**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Develop experimental methods for measuring parachute performance to verify computation of dynamic opening performance, thus improving reliability of designs for high speed low altitude airdrop systems.	*	230
• (U) Conduct experimental and theoretical analysis of the behavior and performance of large deployable gliding wing decelerators for use at greater altitudes and lateral offset to reduce aircraft vulnerability.	*	250
• (U) Complete systems analysis to improve effectiveness and reliability of high-altitude, offset air delivery of supplies and heavy combat equipment.	*	330
• (U) Apply computational fluid dynamics, trajectory analysis, advanced concepts and improved experimental techniques to enhance low-altitude, high speed parachute performance.	*	610
• (U) Complete experimental and theoretical study of influence of electrostatic charge on parachute opening to reduce the risk of airdrop system failure.	*	50
• (U) Complete vulnerability assessment of high altitude cargo air delivery.	*	190
• (U) Develop analytical models for evaluating advanced airdrop concepts.	*	190
• (U) Develop a model of human performance/biomechanics to improve parachutist's safety.	*	100
Total		**1950**

(U) Project A427 - Tactical Shelters-Exploratory Development: This project addresses requirements for transportable maintenance tentage and Soldier Quality of Life tentage technologies, both identified in Operation Desert Storm (ODS) as required improvements. Thrusts focus on tentage structures and lightweight materials for advanced pressure-stabilized rib tentage, and improved shelter habitability through ventilation modelling/advanced designs. Exploited technologies will significantly increase mobility through reduction of tentage weight and shelter erect/strike times, increase service life, enhance sustainability, and reduce operating and support (O&S) costs. Work in this project is complete in FY95.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Constructed and evaluated experimental pressurized airbeam specimen using advanced fabrication techniques.	4Q93	2741
• (U) Investigated stress concentrations in pressurized air beams with fabric discontinuities.	4Q93	1375
• (U) Developed a model to predict distribution of chemical agent inside a tent form exterior/interior conditions.	4Q93	415
Total		4531

* This is continuing work which is reviewed periodically ensuring quality, relevance and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602786A
PE Title: Logistics Technology **Budget Activity: #2**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Design quick-erect, lightweight night maintenance shelter brassboard using advanced high-pressure airbeam supports.	4Q95	1500
• (U) Integrate the selected airbeam support system with the skin fabric, the thermal system and the redesigned anchoring system.	4Q95	1228
Total		**2728**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Complete fabrication of prototype large area night maintenance shelter.	4Q95	1200
• (U) Evaluate the prototype shelter to determine the feasibility of rapidly erectable, durable, large systems for extreme environments.	4Q95	1079
Total		**2279**

(U) Work Performed By: Natick Research, Development and Engineering (RD&E) Center, Natick, MA; Belvoir RD&E Center, Ft Belvoir, VA; and Night Vision and Electro-Optics Directorate, Ft Belvoir, VA. Contractors include: Grumman Corp., Bethpage, NY; Allied Signal, Inc., Morristown, NJ; Albany International, Mansfield, MA; Teledyne Energy Corporation, Timonium, MD; Georgia Institute of Technology, Atlanta, GA; Stanford Research Institute, Menlo Park, CA; and Southwest Research Institute, San Antonio, TX; Kansas State University, Manhattan, KS; University of Massachusetts, Amherst, MA; Rutgers University, New Brunswick, NJ; W.L. Gore, Elkton, MD; duPont, Inc., Wilmington, DE; Kodak, Rochester, NY; 3M, St Paul, MN; Fabric Development, Inc., Boston, MA; North Carolina State, Raleigh, NC; Auburn Univ., AL; Worcester Polytechnical Institute, Worcester, MA; Boston University, Boston, MA; University of Massachusetts, Lowell, MA; Washington State University, Pullman, WA; Illinois Institute of Technology, Chicago, IL; Tulane University, New Orleans, LA; Battelle, Columbus, OH; Simulation Technologies, Inc., Dayton, OH; Mission Research Corp, Costa Mesa, CA; Test Systems, Inc, Hudson, NH; Northeastern University, Boston, MA; Foster-Miller, Waltham, MA; Modine Manufacturing, Racine, WI; University of Pennsylvania, Philadelphia, PA; University of Delaware, Newark, DE; Yuma Proving Ground, Yuma, ZA; Army Research Office, Research Triangle Park, NC; Forest Service, Missoula, MT; North Carolina A&T State University, Greensboro, NC; Iowa State University, Ames, IA; TDA Research, Wheatridge, CO; Mainstream Engineering Rockledge, FL; Rochester Institute of Technology, Rochester, NY; Dynatron, Inc., Cincinnati, OH; Zestotherm, Inc., Cincinnati, OH; University of Michigan, Ann Arbor, MI; Virginia State University, Petersburg, VA; Milliken Corp, Spartanburg, SC; Radian, Inc., Alexandria, VA; BRTRC, Inc., Fairfax, VA; Surface Optics Corp, La Jolla, CA; Westinghouse Corp, Baltimore, MD; Amherst, Inc., Buffalo, NY; Damascos, Inc., Concordville, PA; University of Tennessee, Knoxville, TN; Separation Systems Technology, Inc., San Diego, CA; Soane Technologies, Inc., Hayward, CA; Zenon Environmental Inc., Burlington, Ontario; Band, Lavis, and Associates, Annapolis, MD; Advanced Marine Enterprises, Crystal City, VA; P.C. Krause & Associates, Lafayette, IN; GS Engineering, Incline Village, NV; Ricardo Engineering, Detroit, MI; Tecogen, Boston, MA; Vitro, Silver Spring, MD; Geiger Electronics, Ft. Washington, NY; Alturdyne, and San Diego, CA.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602786A**
PE Title: **Logistics Technology** Budget Activity: **#2**

(U) Related Activities: This program adheres to Tri-Service Reliance agreements on Clothing, Textiles, and Food and Fuels and Lubricants with oversight and coordination provided by the Joint Directors of Laboratories. Work in this Program Element contains no unwarranted duplication of effort among the Military Departments.

(U) Other Appropriation Funds: ($ in Thousands) Not applicable

(U) International Cooperative Agreements: Not applicable

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602787A
PE Title: Medical Technology

Budget Activity: #2

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
A825	Combat Maxillofacial Injury								
	2249	1669	1018	1083	1054	1098	1164	Cont'd	Cont'd
A870	DoD Medical Defense Against Infectious Diseases								
	21547	24287	23752	18929	19145	19486	19723	Cont'd	Cont'd
A871	Medical Biological Defense - Exploratory Development								
	17285	14847	14795	11526	11798	12481	13275	Cont'd	Cont'd
A873	HIV Exploratory Research								
	3220	2956	3222	2969	3034	3174	3374	Cont'd	Cont'd
A874	Combat Casualty Care Technology								
	12449	10075	12351	8862	9139	9582	10194	Cont'd	Cont'd
A875	Medical Chemical Defense - Exploratory Development								
	16968	15627	15122	13242	13573	14327	15240	Cont'd	Cont'd
A878	Health Hazards of Military Materiel								
	10035	9602	8123	7356	7511	7982	8523	Cont'd	Cont'd
A879	Medical Factors Enhancing Soldier Effectiveness								
	8968	9398	9146	8469	8694	9182	9690	Cont'd	Cont'd
A881	Laser Burn Research								
	0	2000	0	0	0	0	0	0	2000
A882	Environmental Medical Unit								
	0	300	0	0	0	0	0	0	300
A883	Post-Polio Syndrome								
	0	1000	0	0	0	0	0	0	1000
A884	Hypoglycemia								
	0	1000	0	0	0	0	0	0	1000

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602787A
PE Title: Medical Technology

Budget Activity: #2

A885	Madigan ENT Project	0	2000	0	0	0	0	0	0	2000
PE TOTAL	92721		94761	87529	72436	73948	77312	81183		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element funds exploratory development (ED) in Department of Defense (DoD) medical defense against chemical agents, medical defense against biological threats, medical protection against naturally occurring diseases of military importance, and combat dentistry, as well as ED for Department of Army care of combat casualties, health hazard assessment of military materiel, and medical factors enhancing soldier effectiveness. The primary goal of medical research and development is to sustain medical technological superiority to improve the protection and survivability of U.S. forces on the conventional and integrated battlefields as well as in potential areas of low intensity conflict and military operations short of war. Under this PE is the core DoD technology base to develop methods and materials for: medical chemical defense in the areas of antidotes, drug treatments, medical protection against chemical agents, personnel and casualty decontamination, medical management of chemical casualties, and combat effectiveness and sustainability; medical biological defense and infectious disease prevention and treatment including vaccines, prophylactic and therapeutic drugs, insect repellents, and methods of diagnosis and identification of biological warfare threats or naturally occurring infectious diseases; prevention and treatment of combat maxillofacial (face and neck) injuries, and essential dental treatment on the battlefield; combat casualty care of trauma and burns due to weapons, organ system survival, shock resulting from blood loss and infection, blood preservation and potential blood substitutes for battlefield care; assessment of the health hazards of military materiel, and the sustainment or enhancement of soldier performance. The work in this program element is consistent with the resource constrained Army Science and Technology Master Plan, Army force modernization plans, and Project Reliance.

C. JUSTIFICATION FOR PROJECTS:

(U) Project A825 - Combat Maxillofacial Injury: This project is the core Department of Defense exploratory development technology base for Combat Dentistry. Its major thrusts are exploratory development of new/improved methods and materials for rapid simplified treatment of face and neck wounds and provision of field dental treatment. The Army has been designated Congressional lead agency for Combat Dentistry research.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Evaluated and refined fiberoptic dental probes, correcting previous flaws. Completed U.S. Space Shuttle experiment testing microencapsulated ampicillin.	3Q93	764
• (U) Evaluated a biodegradable bone wax to control hemorrhage in bone wounds in an animal model. Significant advances made in 3-D imaging capability, using innovative laser technology.	4Q93	672

Program Element: #0602787A
PE Title: Medical Technology — Budget Activity: #2

• (U) Tested optimal non-steroidal, anti-inflammatory indirect pulp-capping agents in an animal model. Toradol, in combination with calcium hydroxide, was most desirable in a therapeutic range.	3Q93	463
• (U) Completed dose response studies of a potassium channel blocker as a dental anesthetic. A non-human primate pulpal inflammation model was developed for use in evaluating experimental pulp capping agents.	4Q93	350
Total		**2249**

(U) FY 1994 Program:	**Complete**	**Cost**
• (U) Begin studies to enhance the stability of critical dental materials by improving composition and packaging.	*	700
• (U) Measure and extend the shelf life of perishable dental biomaterials.	*	600
• (U) Identify and test novel local anesthetics for treatment of pain far forward.	4Q94	369
Total		**1669**

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Develop a hemostatic agent to control osseous bleeding from far-forward maxillofacial injury.	*	610
• (U) Apply 3-D data to the custom design and fabrication of splints and prostheses needed for management of combat craniofacial injuries.	4Q95	408
Total		**1018**

(U) Project A870 - DoD Medical Defense Against Infectious Diseases: This project funds exploratory development of medical countermeasures to naturally occurring infectious diseases of mission aborting potential. Work performed in laboratories and among troop populations is directed to prevention, diagnosis and treatment of viral, bacterial and parasitic diseases, to prevent casualties, sustain operational performance and minimize deaths and disability of armed forces during military operations.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Introduced the use of a cornea challenge model for evaluation of oral shigella diarrhea vaccine candidates.	3Q93	1454
• (U) Created recombinant malaria vaccines in two live vectors, vaccinia and bacillus Calmette-Guerin(BCG).	4Q93	2429
• (U) Assessed campylobacter stress proteins as a potential component for diarrhea vaccine.	3Q93	2039

*This is continuing work which is reviewed periodically to assure quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602787A
PE Title: Medical Technology **Budget Activity: #2**

• (U) Established that sexual reproduction occurs in the parasite which causes leishmanisis. Established azithromycin as a potential malaria preventative.	3Q93	4797
• (U) Showed that white cell cytokine response to dengue infection strains is strain specific. Immunogenicity of subunit meningitis demonstrated.	4Q93	2224
• (U) Isolated dengue-2 virus from troops deployed to Somalia. Identified African tick fever as a cause of illness in troops deployed to Botswana.	2Q93	1572
• (U) Developed dip-stick diagnostic tests for tickborne fevers and scrub typhus. Demonstrated successful detection assay for hemorrhagic fever.	3Q93	1285
• (U) Showed that the cellular immune response to an antigen (SSP2) is 100% protective against a lethal challenge of Plasmodium yoelli malaria.	3Q93	2059
• (U) Developed a diagnostic assay using a novel protein (ORF2) for diagnosing hepatitis E infection.	4Q93	2044
• (U) Demonstrated that Aedes albopictus, a domestic mosquito, is an efficient transmitter of eastern equine encephalitis.	2Q93	1644
Total		**21547**

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Evaluate immune responses to diarrheal infection required for producing protective immunity.	*	1775
• (U) Determine molecular properties of anti-idiotype monoclonal antibodies suitable for use as candidate malaria vaccines.	*	2945
• (U) Evaluate feasibility and stability of *E. coli-Shigella sonnei* hybrid as a candidate vaccine against bacterial diarrheal disease.	4Q94	1830
• (U) Evaluate natural products as potential antimalarials. Evaluate potential of drug-resistance reversing agents for malaria and leishmaniasis.	*	4525
• (U) Assess meningococcal group B vaccine candidates for stability and efficacy. Select gonococcal vaccine candidate for microencapsulation.	4Q94	1450
• (U) Evaluate the ability of purified recombinant dengue virus components to protect against dengue infection.	*	2390
• (U) Characterize global variation of surface antigens of campylobacter to select vaccine components.	4Q94	735

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Program Element: #0602787A
PE Title: Medical Technology

Budget Activity: #2

• (U) Identify hemorrhagic fever virus components as vaccines against Korean hemorrhagic fever and hemorrhagic fever with renal syndrome.	4Q94	2440
• (U) Develop serum antibody capture assay for the identification of rickettsial diseases. Develop tests to identify infected arthropod disease vectors.	*	2660
• (U) Evaluate new technologies for forward diagnosis of endemic infections and early recognition of emerging diseases.	*	3537
Total		**24287**

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Evaluate, in animals, vaccine induced mucosal immunity to shigella, ETEC, and campylobacter diarrheal disease.	*	3915
• (U) Evaluate safety and efficacy of malaria vaccine PfSSP2 against falciparum malaria in non-human primates.	*	4535
• (U) Isolate and determine chemical structure of active antimalarial and antileishmanial principals of *Picralima nitida*, a Nigerian herbal remedy.	4Q95	3050
• (U) Determine the ability of purified dengue virus proteins expressed in vector systems to protect animals against challenge.	4Q95	2290
• (U) Evaluate threat posed to deployed forces by hepatitis C and E as well as emerging drug resistant malaria and typhus infections.	*	2117
• (U) Evaluate safety and efficacy in animal models of multivalent vaccine against hepatitis A and B.	*	2190
• (U) Evaluate active principals of antiparasitic traditional remedies as potential reversing agents against multi-drug resistant malaria.	4Q95	1375
• (U) Synthesize and evaluate in animal model formulations of gonorrhea vaccines based on pilus proteins incorporation in biodegradable microspheres.	*	1925
• (U) Develop new vaccine candidates using genetically-engineered tick-borne encephalitis and hemorrhagic fever virus components.	*	1005
• (U) Evaluate immune responses important to protection against group B meningitis.	*	1350
Total		**23752**

*This is continuing work which is reviewed periodically to assure quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602787A**
PE Title: **Medical Technology**

Budget Activity: **#2**

(U) Project A871 - Medical Biological Defense - Exploratory Development: This project funds USAMRDC as the DoD Executive Agent for exploratory research on the development of vaccines and drugs to provide an effective medical defense against validated biological threat agents including bacteria, toxins, viruses and other agents of biological origin. By employing biotechnology, medical systems will be designed to rapidly identify, diagnose, prevent and treat disease due to exposure to biological threat agents.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Studies of animal models for vaccine evaluation to protect against inhalation of plague.	*	834
• (U) Demonstrated that a new non-living vaccine candidate, PA monophosphoryl lipid A (MPL), was efficacious in animal models against anthrax.	2Q93	1907
• (U) Demonstrated proof of principle for a multiple agent (e.g., anthrax, ricin, SEB and VEE) dipstick for immunoassay rapid diagnostic kit.	3Q93	867
• (U) Established polymerase chain reaction (PCR) and biosensor diagnostic assay for diagnosis of exposure to Yersinia pestis, the causative agent of plague.	3Q93	2497
• (U) Produced and characterized a chemically modified ricin as a potential second generation vaccine candidate.	*	1254
• (U) Evaluated *in vitro* toxicity of potential second-generation Staphylococcal enterotoxin B (SEB) vaccine candidates.	*	2709
• (U) Tested feasibility of using synthetic genes of botulinum serotype A and B for potential genetically engineered vaccine.	4Q93	3999
• (U) Demonstrated that microencapsulation significantly enhances efficacy of inactivated VEE vaccine.	2Q93	813
• (U) Identified and evaluated the therapeutic effectiveness of aminopyridine drugs against saxitoxin-induced cardio-respiratory failure.	*	2081
• (U) Characterized antibody response of acute and convalescent sera from individuals infected with Brucella.	2Q93	324
Total		**17285**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Elucidate the immunological response of bio-engineered vaccines against plague in animal models.	*	696
• (U) Conduct exploratory research on the development of synthetic and bio-engineered vaccines against Brucella.	*	274

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FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602787A
PE Title: Medical Technology — Budget Activity: #2

• (U) Evaluate preparation techniques for the optimum expression and purification of Protective Antigen, the primary component of the second generation Anthrax vaccine.	4Q94	801
• (U) Evaluate preparation techniques for the optimum expression and production of bio-engineered candidate vaccines for Venezuelan equine encephalitis virus.	3Q94	462
• (U) Test the prototype of field diagnostic systems.	3Q94	1329
• (U) Evaluate laboratory preparations of candidate biological reagents for use in confirmation diagnostic kits.	*	1705
• (U) Elucidate the mechanism of action of candidate drugs for the treatment of sodium channel neurotoxins.	4Q94	859
• (U) Evaluate pharmacologic agents for prophylaxis and therapy of ricin intoxication.	*	1711
• (U) Establish preliminary safety and efficacy data for second generation candidate solution to Staphylococcal enterotoxin B intoxication.	*	3273
• (U) Evaluate laboratory preparations of bio-engineered botulinum vaccines for immunogenicity.	2Q94	3737
Total		**14847**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Elucidate the immunological response of bio-engineered vaccines against plague in animal models.	*	1214
• (U) Conduct exploratory research on the development of synthetic and bio-engineered vaccines against Brucella.	2Q95	536
• (U) Determine the optimum vaccine formulation for the second generation Anthrax vaccine for maximum protection.	3Q95	1129
• (U) Conduct studies to enhance the efficacy and reduce the risk of candidate vaccines for Venezuelan equine encephalitis virus.	*	553
• (U) Evaluate laboratory preparations of candidate biological reagents for use in confirmation diagnostic kits.	*	812
• (U) Establish preliminary safety and efficacy data for candidate drugs for the treatment of sodium channel neurotoxins.	3Q95	336
• (U) Evaluate pharmacologic agents for prophylaxis and therapy of ricin intoxication.	*	1943
• (U) Establish preliminary safety and efficacy data for second generation candidate solution to Staphylococcal enterotoxin B.	*	4269
• (U) Establish preliminary safety and efficacy data for candidate bio-engineered botulinum vaccines.	*	4003
Total		**14795**

*This is continuing work which is reviewed periodically to assure quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602787A**
PE Title: **Medical Technology** Budget Activity: **#2**

(U) Project A873 - Human Immunodeficiency Virus (HIV) Exploratory Research: This project funds Congressionally-mandated, militarily relevant HIV exploratory research in the areas of: pre-vaccine development, diagnosis, natural history, epidemiology, and chemotherapy. Efforts are directed to answer militarily unique needs affecting manning, mobilization and deployment.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Discovered unusual bidirectional reading of HIV genome.	2Q93	550
• (U) Identified new technology to measure HIV replication. First to document that HIV continues to replicate during periods of inapparent infection.	2Q93	981
• (U) Showed that new adenosine compounds are potent anti-HIV drugs and are effective against AZT resistant HIV strains.	3Q93	774
• (U) Identified diagnostic technique for measurement of protective and nonprotective responses to infection and immunization which will assist in formulation of an effective HIV vaccine.	4Q93	915
Total		**3220**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Define the immune response to unique HIV antigens after immunization with subunit vaccines.	*	952
• (U) Characterize effects of chemotherapeutic agents on the replication of HIV virus in an in vitro system.	*	710
• (U) Define geographical areas of military importance with high incidence of disease.	4Q94	640
• (U) Study effects of early infection on white cells in an animal model.	4Q94	333
• (U) Evaluate candidate vaccines which prevent infection or enhance immune responses against HIV infection.	*	321
Total		**2956**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Define the immune response, both humoral and cellular, after immunization of animals with HIV antigens.	*	952
• (U) Evaluate worldwide variability in HIV genotypes and phenotypes.	*	671
• (U) Evaluate HIV variability in serial blood samples.	*	340
• (U) Characterize effects of chemotherapeutic agents in-vitro on the replication of HIV virus.	*	705
• (U) Develop quantitative measures of viral growth to assist evaluation of candidate vaccines and treatments.	*	554
Total		**3222**

*This is continuing work which is reviewed periodically to assure quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602787A**
PE Title: **Medical Technology**

Budget Activity: **#2**

(U) Project A874 - Combat Casualty Care Technology: This project funds the core technology base to develop concepts, techniques and material for the treatment and return-to-duty of soldiers wounded in combat and to support Low Intensity Combat as well as military operations short of war. This project addresses investigation of the treatments of weapons-induced trauma and burns, and shock due to blood loss. It also funds technologies for blood substitutes and blood preservation.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Developed low volume I.V. solution with no side effects effective in dehydrated subjects. Conducted efficacy studies for fibrin glue. Identified optimal timing for resuscitation solutions.	2Q93	3051
• (U) Tested feasibility of cytokine antibody and inhibitor therapy. Showed that recombinant human insulin-like growth factor I decreased oxidative and degradative tissue damage in burn patients.	3Q93	2724
• (U) Tested prototype components for far-forward physiologic sensors and monitors. Determined role of infection in skin graft failure. Showed failure of bone growth in microgravity.	4Q93	616
• (U) Assessed role of growth factors, skin substitutes on wound healing in burn patients. Continued data collection on non-battle injuries in West Point cadets. Tested silver nylon dressings for efficacy in burn patients.	*	6058
Total		**12449**

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Determine the effect of head trauma (alone, and in combination with other physiological insults such as hemorrhage) on cardiodynamic responses to traumatic injury. Evaluate intraosseous infusion device.	*	1285
• (U) Evaluate efficacy of cytokine antibody and inhibitor therapy. Assess the effects of growth factors and skin substitutes on wound healing in thermally injured patients.	*	4971
• (U) Study innovative therapies such as lazeroids.	*	356
• (U) Perform peripheral nerve and bone regeneration studies utilizing electrical current. Improve techniques of burn wound management to include topical agents, hormones, and skin substitutes.	3Q94	3438
• (U) Develop new technologies for cold sterilization to support field medical needs. Determine feasibility of use of photovoltaic cells to power medical equipment in the field.	4Q94	25
Total		**10075**

*This is continuing work which is reviewed periodically to assure quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602787A
PE Title: Medical Technology

Budget Activity: #2

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Determine vital organ (brain, heart, lung) functional responses to traumatic brain injury combined with hemorrhage. Produce purified hemoglobin and chemically modified hemoglobins for evaluation as blood substitutes.	*	1601
• (U) Investigate methods of the slowing of a casualty's metabolic rate (e.g., with the use of recombinant hibernation induction trigger molecules) as a stabilization therapy in the initial treatment of traumatic injury.	*	5294
• (U) Identify and test innovative soft tissue trauma therapies such as lazeroids.	3Q95	681
• (U) Improve techniques of burn wound management to include topical agents, hormones, and skin substitutes.	3Q95	4775
Total		**12351**

(U) Project A875 - Medical Chemical Defense - Exploratory Development: This project funds USAMRDC as the DoD Executive Agent for medical chemical defense exploratory development. The project emphasizes the prevention of chemical casualties through application of pharmaceuticals for treatment of the toxic effects of nerve, blister, respiratory, and blood agents. A majority of the resources applied to this project support exploratory development of prophylaxes, pretreatments, antidotes, decontaminants, and therapeutic compounds that will counteract the lethal, physical, and behavioral toxicity of chemical agents. The remainder supports development of medical chemical defense materiel that insures adequate patient care, field resuscitation, and patient management procedures.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Demonstrated that niacinamide reduced microvesicle formation following exposure to sulphur mustard; characterized vesicant effects using human cells in vitro.	1Q93	7781
• (U) Developed an in vitro biochemical screen for assaying potential pharmaceutical antidotes against cyanide.	3Q93	2782
• (U) Characterized the effects of advanced anticonvulsant candidates following nerve agent exposure; developed methods to detect nerve agent metabolites in biological fluids.	4Q93	3683
• (U) Demonstrated protection against nerve agents using chemical (catalytic and stoichiometric) scavengers.	2Q93	1887
• (U) Demonstrated in animals that surfactant replacement may enhance survival following respiratory agent exposure; standardized in vitro and in vivo models to evaluate therapies for respiratory agent effects.	3Q93	835
Total		**16968**

*This is continuing work which is reviewed periodically to assure quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602787A
PE Title: Medical Technology Budget Activity: #2

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Characterize and validate countermeasures against sulfur mustard; generate monoclonal antibodies to sulfur mustard; investigate reactive components for topical skin protectant.	*	7193
• (U) Characterize and validate countermeasures to cyanide; develop catalytic and immunological scavengers for cyanide.	3Q94	2947
• (U) Characterize and validate countermeasures to nerve agent-induced seizures and pathology; refine methods to detect agents in biological fluids.	2Q94	2993
• (U) Characterize and validate catalytic and immunological scavengers for nerve agents; employ biotechnological approaches to development of scavengers.	*	1655
• (U) Characterize and validate decontamination, diagnostic, prognostic, and treatment procedures directly applicable to patient management.	1Q95	839
Total		**15627**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Characterize and validate countermeasures against sulfur mustard; generate monoclonal antibodies to sulfur mustard; investigate reactive components for topical skin protectant.	4Q95	6861
• (U) Characterize and validate countermeasures to cyanide; develop catalytic and immunological scavengers for cyanide.	3Q95	2145
• (U) Characterize and validate countermeasures to nerve agent-induced seizures and pathology; refine methods to detect agents in biological fluids.	4Q95	3178
• (U) Characterize and validate catalytic and immunological scavengers for nerve agents; employ biotechnological approaches to development of scavengers.	3Q95	1967
• (U) Characterize and validate decomination, diagnostic, prognostic, and treatment procedures directly applicable to patient management.	*	971
Total		**15122**

*This is continuing work which is reviewed periodically to assure quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602787A
PE Title: Medical Technology
Budget Activity: #2

(U) Project D878 - Health Hazards of Military Materiel: The scientific and technical objectives for this project focus on sustaining warfighting capability by reducing health hazards in the military environment. Emphasis is on identification of health hazards inherent to the engineering design and operational use of equipment, systems and materiel used in Army combat operations and training. Specific hazards include: steady-state noise, repeated impact jolt and vibration stress from operation of combat vehicles and aircraft; blast overpressure and impulse noise generated by firing weapons systems; toxic chemical hazards associated with Army materiel such as gun and rocket munitions and their combustion byproducts; non-ionizing radiation directed energy sources (laser and microwave); and environmental stressors (eg. heat, cold, terrestrial altitude). Specific medical research tasks include characterizing the extent of exposure to potential hazards; delineating exposure thresholds for illness or injury; identifying exposure thresholds for performance degradation; establishing biomedical databases to support protection criteria; and developing and validating models for hazard assessment, injury prediction, and health and performance protection.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Demonstrated that exposure to high peak power microwave radiation impairs memory and physical endurance in test animals. Determined injury threshold for picosecond pulsed laser induced retinal damage.	3Q93	1932
• (U) Expanded data base and refined injury prediction modeling on the health effects of blast overpressure, focusing on impulse noise from Army weapons to support design and operation use protection criteria.	*	2069
• (U) Developed methods to characterize the bioeffects of exposures to repeated impact jolt from Army ground vehicles.	*	3077
• (U) Established a toxicological database to support health hazard assessment of liquid gun propellant.	4Q93	834
• (U) Published timely pocket-sized guides for soldiers deploying to Somalia and Yugoslavia, focused on sustainment of health and performance, addressing a broad range of important health issues.	3Q93	181
• (U) Conducted health hazard evaluations of prototype electro-optic visual display systems for aviators.	4Q93	482
• (U) Completed studies in support of developing revised cardiovascular retention and fitness criteria to avoid unnecessary permanent grounding of Army aviators.	4Q93	1460
Total		**10035**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Complete study of pulse duration dependence of laser induced retinal damage at 755 nm. Develop model to assess the visual performance decrements associated with laser exposure.	4Q94	2989

*This is continuing work which is reviewed periodically to assure quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602787A
PE Title: Medical Technology — Budget Activity: #2

• (U) Develop new tolerance limits for freefield mortar muzzle blast overpressure. Validate model of health effects of blast overpressure with tests of the Ranger Anti-Armor Anti-Personnel Weapon System (RAAWS).	*	3889
• (U) Determine auditory temporary threshold shift after repeated exposure to impulse noise in reverberant enclosures.	*	1462
• (U) Determine criteria for chemical contaminants in field potable water.	4Q94	1262
Total		**9602**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Determine permissible eye exposure limits for subnanosecond laser exposures. Provide a diagnostic test battery for field evaluation of laser eye injury. Define safe exposure criteria for continuous microwave pulse exposure.	4Q95	2605
• (U) Complete chemical/physical characterization and acute toxicological studies on developmental smoke/obscurant munitions, and advanced composite materiels used in new Army weapon systems.	3Q95	1004
• (U) Improve methodologies to characterize the repeated impact jolt signatures of major Army ground combat vehicles. Develop new tolerance limits for shoulder fired anti-armor weapons fired from enclosures.	*	3177
• (U) Develop recommended auditory safe exposure criteria for repeated exposure to impulse noise in reverberant enclosures.	4Q95	1337
Total		**8123**

(U) Project A879 - Medical Factors Enhancing Soldier Effectiveness: This project addresses the physiological and psychological factors underlying physical and cognitive performance during combat operations and military training. The primary emphasis is to prevent combat casualties, ameliorate performance degradation, and sustain individual and unit effectiveness across the spectrum of operational environments. Neuropsychiatric and physiological investigations are conducted to identify and quantify nutritional factors; environmental stresses, including heat, cold, and terrestrial altitude; isolation; and dehydration, as they affect soldier health and performance. Research is conducted on sleep and alertness to optimize performance during military operations; and on psychological stress to determine strategies to prevent combat psychiatric casualties. Specific research tasks include defining and validating analytical and assessment methods, developing biomedical data on health and performance effects; and establishing protection criteria, models, and countermeasure tools.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Devised and tested strategies for reduction of musculoskeletal injuries during airborne operations.	3Q93	2383

*This is continuing work which is reviewed periodically to assure quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602787A
PE Title: Medical Technology **Budget Activity: #2**

• (U) Conducted evaluations of prototype electro-optic visual display systems for tactical ground forces and aircrews to assess crewmember performance optimization and impact on human visual system functions.	*	1181
• (U) Evaluated the operational effectiveness of a 400-500 Kcal ration supplement to sustain the immune system function in soldiers subjected to prolonged stress and nutritional deprivation.	2Q93	1559
• (U) Assessed the impact of operational stress on soldiers in contingency actions (e.g. Operation Restore Hope) and recommended means for preventing and/or counteracting adverse health and performance effects.	3Q93	1237
• (U) Evaluated the use of melatonin as a means to induce restorative sleep in air crew members during conditions that normally degrade the effective value of sleep.	4Q93	306
• (U) Examine factors contributing to individual differences in susceptibility to heat injury.	*	2302
Total		**8968**

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Evaluate the use of melatonin and bright light for facilitating the transition from day to night operations.	3Q94	444
• (U) Evaluate the use of erythropoietin for achieving pre-exposure acclimatization to high altitude. Determine the effects of dehydration on thermoregulatory function during cold exposure.	4Q94	2092
• (U) Evaluate the efficacy of health-promoting menus and nutrition education videos for enhancing military readiness.	4Q94	1920
• (U) Conduct study of ground training with hyperstereopsis display to minimize impact of perceptual distortions.	4Q94	1139
• (U) Develop a model for the effects of operational stress on rifle marksmanship. Examine potential moderating factors of operational stress on soldiers in contingency actions.	*	1127
• (U) Examine gender related differences in body composition changes and physical performance responses to physical conditioning programs during basic training. Conduct advanced studies of Army aviator endurance.	*	2676
Total		**9398**

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Investigate resynchronizing effects of monochromatic low-level light.	4Q95	768
• (U) Conduct animal and human laboratory studies of selected performance enhancing nutrients and food components.	*	1239

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FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602787A
PE Title: Medical Technology **Budget Activity: #2**

• (U) Demonstrate behavioral and materiel means to reduce musculoskeletal injuries during military operations. Determine the physiological and morphological limitations to key soldier occupational task performance.	*	2502
• (U) Determine feasibility of using a substance in modulating active skin vasodilation and dry heat loss. Validate a microclimate cooling model for concept support of the 21st Century Land Warrior.	3Q95	2100
• (U) Assess effectiveness of non-invasive technology for assessing stress level in soldiers during field exercises.	*	1472
• (U) Assess visual performance of crewmembers during simulated combat operations while using prototype flat-panel displays.	4Q95	1065
Total		**9146**

(U) Project D881 - Laser Burn Treatment: By Congressional direction, the purpose of this project is to support advanced laser burn treatment diagnostics and therapeutic research.

(U) FY 1993 Accomplishments: Not Applicable

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Complete animal testing and continue software construction (image archiving, image analysis) of burn depth and tissue damage diagnostic system.	2Q94	800
• (U) Complete tissue tests, continue animal studies of large area burn debridement with grafting, and begin integration of feedback control into the Burn Debridement system.	2Q94	1200
Total		**2000**

(U) FY 1995 Planned Program: Not Applicable

(U) Project A882 - Environmental Medical Unit: By Congressional direction, the purpose of this project is to initiate research on the health effects of exposure to low levels of hazardous chemicals including chemical warfare agents especially among persons who served on active duty in Southwest Asia during the Persian Gulf War.

*This is continuing work which is reviewed periodically to assure quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602787A
PE Title: Medical Technology

Budget Activity: #2

(U) FY 1993 Accomplishments: Not Applicable

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Award a competitive contract/grant in accordance with established defense acquisition regulations.	3Q94	300
Total		300

(U) FY 1995 Planned Program:
• (U) Not Applicable

(U) Project A883 - Post-Polio Syndrome: By Congressional direction, the purpose of this project is to initiate research on models of musculoskeletal injury.

(U) FY 1993 Accomplishments: Not Applicable

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Award a competitive contract/grant in accordance with established defense acquisition regulations.	3Q94	1000
Total		1000

(U) FY 1995 Planned Program:
• (U) Not Applicable

(U) Project A884 - Hypoglycemia: By Congressional direction, the purpose of this project is to develop and test new forms of insulin.

(U) FY 1993 Accomplishments: Not Applicable

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Award a competitive contract/grant in accordance with established defense acquisition regulations.	3Q94	1000
Total		1000

(U) FY 1995 Planned Program:
• (U) Not Applicable

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602787A**
PE Title: **Medical Technology** Budget Activity: **#2**

(U) Project A885 - Madigan ENT Project: By Congressional direction, the purpose of this project is to develop virtual reality simulation for training in trauma care and surgical procedures.

(U) FY 1993 Accomplishments: Not Applicable

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Award a competitive contract/grant in accordance with established defense acquisition regulations.	3Q94	2000
Total		**2000**

(U) FY 1995 Planned Program:
• (U) Not Applicable

(U) Work Performed By:
A825: Walter Reed Army Institute of Research, Dental Detachment, Washington, D.C. and the U.S. Army Institute of Surgical Research, Fort Sam Houston, San Antonio, TX. The two contractors are: University of Texas Southwestern Medical School, Dallas, TX; Southern Research Institute, Birmingham, AL.
A870: Walter Reed Army Institute of Research, along with field units in Thailand, Korea, Brazil, and Kenya, the U.S. Army Medical Research Institute of Infectious Diseases perform in-house Army research. The remainder is performed by Naval Medical Research Institute and the U.S. Navy field units and by extramural non-profit organizations, universities, and industries. The five major contractors are the University of Georgia, Athens, GA; University of Miami School of Medicine, Miami, FL; Kenya Medical Research Institute, Nairobi, Kenya; University of North Carolina, Chapel Hill, NC; and Korea University, Seoul, Korea.
A871: The U.S. Army Medical Research Institute of Infectious Diseases, the Walter Reed Army Institute of Research and the U.S. Army Medical Research Institute for Chemical Defense, perform research in-house. The remainder is performed by extramural non-profit organizations, universities, and industries. The major contractors are the University of North Carolina, Chapel Hill, N.C.; Jefferson Medical College, Philadelphia, PA and Imperial College of Science and Technology, London, England.
A873: Contractors are Armed Forces Institute of Pathology, Washington D.C.; National Academy of Sciences, Washington D.C.; Ogden Bioservices Corporation, Gaithersburg, MD; University of Alabama, Birmingham, AL; Harvard University, Cambridge, MA; The New England Deaconess Hospital, Boston, MA; ONRRR, University of California/San Diego, La Jolla, CA; New England Hospital, Boston, MA; The Walter and Eliza Hall Institute Lymphocyte Differentiation Unit, Victoria, Australia; Beilinson medical center, Petah-Tikva, Israel; and Ramot of Tel Aviv University, Tel Aviv, Israel.
A874: Letterman Army Institute of Research, Presidio of San Francisco, CA; Institute of Surgical Research, Fort Sam Houston, San Antonio, TX;

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PE Title: **Medical Technology** Budget Activity: **#2**

Walter Reed Army Institute of Research, Washington, D.C.; Walter Reed Army Medical Center, Washington, D.C.; U.S. Army Medical Materiel Development Activity, Fort Detrick, MD. The top contractors are: University of Massachusetts, Worcester, MA; Medical College of Virginia, Richmond, VA; University of California at San Diego, CA; Oregon Health Sciences University School of Medicine, Portland, OR; Uniformed Services University for the Health Sciences, Bethesda, MD; University of Maryland, Baltimore, MD; Louisiana State University, New Orleans, LA.
A875: In-house research is conducted at the U.S. Army Medical Research Institute of Chemical Defense, Aberdeen Proving Ground, MD; the Walter Reed Army Institute of Research, Washington, D.C.; the U.S. Army Research Institute of Environmental Medicine, Natick, MA; and other government agencies. The remaining research is conducted under contract. Major contractors include: University of Kansas Medical Center, Kansas City, KS; Bio-Technology General Corporation, New York, NY; Purdue University, West Lafayette, IN; University of Cincinnati School of Medicine, Cincinnati, OH; TNO Prins Maurits Laboratory, Rijswijk, The Netherlands; and Johns Hopkins University, Baltimore, MD.
A878: The U.S. Army Research Institute of Environmental Medicine, Natick MA; Walter Reed Army Institute of Research, Washington, DC; U.S. Army Medical Research Detachment, Wright-Patterson Air Force Base, OH; U.S. Army Aeromedical Research Laboratory, Fort Rucker AL; and U.S. Army Medical Research Detachment, Brooks Air Force Base, TX. The top five contractors are: EG&G Special Projects, Las Vegas, NV; JAYCOR, San Diego, CA; Canadian Commercial Corporation, Ottawa, Canada; State University of New York, Albany, NY; and Ohio Weslyan University, Delaware, OH.
A879: The U.S. Army Research Institute of Environmental Medicine, Natick, MA; U.S. Army Aeromedical Research Laboratory, Fort Rucker, AL; and the Walter Reed Army Institute of Research, Washington, DC. The top three contractors are: Louisiana State University, Baton Rouge, LA; Universal Energy Systems, Inc., Dayton OH; and The Uniformed Services University of the Health Sciences, Bethesda, MD.

(U) Related Activities:

PE #0601102A (Defense Medical Sciences)
PE #0602720A (Environmental Quality Technology) (DA Proj 835 only)
PE #0603002A (Medical Advanced Technology)
PE #0603105A (Military Human Immunodeficiency Virus (HIV) Research)
PE #0603807A (Medical Systems-Advanced Development)
PE #0604807A (Medical Materiel/Medical Defense Equipment-Engineering Development)
PE #0605801A (Program wide Activities, Project MMO2)
PE #0605898A (Management Headquarters R&D, Project MM03)

There is no unnecessary duplication of efforts in the Army or DOD programs. Duplication of effort within the Army is avoided through centralized management at the U.S. Army Medical Research and Development Command. This effort is coordinated annually, or more frequently as required, with Department of Defense, Director for Research and Engineering; Joint Technology Coordinating Groups of the Armed Services Biomedical Research Evaluation Management Committee; Joint Services Container Steering Group; DOD Executive Agent for Land-Based Water Resources;

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Program Element: #0602787A
PE Title: Medical Technology

Budget Activity: #2

Program Advisory Group for Bulk Petroleum Fuels Distribution; World and Pan American Health Organizations. Research efforts are also coordinated with Quadripartite, NATO and other cooperative nations through meetings and data exchange agreements.

(U) Other Appropriation Funds: ($ in Thousands) Procurement of completed products is provided for in Other Procurement, Army (OPA), or Operation and Maintenance, Army (OMA) or passed to other procuring agencies of DoD and the Military Departments, as appropriate.

(U) International Cooperative Agreements: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602789A**
PE Title: **Army Artificial Intelligence Technology**

Budget Activity: **#2**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
A880 Army Artificial Intelligence Technology	3111	2696	2388	2177	2196	2218	2455	Cont'd	Cont'd

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Artificial Intelligence (AI) Exploratory Research program is an Army-wide effort, which uses AI technology to achieve the strategic advantage needed to maintain the Army's world-wide mission. The three fold purpose of the program is to: (1) develop/apply AI technology to solve large scale, highly complex management problems, (2) investigate AI technology for use Army-wide (policy, personnel training and management, and applications development), and (3) transfer technology to the Army through exploratory and advanced development research efforts. In addition, the program seeks to identify high potential, but embryonic AI methodologies and mature them for high payoff applications through targeted technology demonstration projects and the development of working prototypes. This program has established a number of sophisticated AI cells (Knowledge Engineering Groups (KEGs)) focusing on the integration and application of AI technologies to problems in functional communities such as command and control, management, force integration, logistics, modeling, intelligence, resource management, test and evaluation, training, and medical. Focus for this science and technology effort is assisted through these functionally oriented cells. In addition, an Office of AI Research, Analysis and Evaluation has been established at the United States Military Academy to conduct AI applications research and development. The AI exploratory research program has established a solid foundation that will enable the Army to centrally manage and prevent duplication of effort in the Artificial Intelligence research and development arena. Work in this program element is consistent with the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan, and Project Reliance.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project A880 - Army Artificial Intelligence Technology:

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Demonstrated applicability of expert systems technology to optimize multi-source/multi-object scheduling problems.	4Q93	60
• (U) Demonstrated use of prognostic and diagnostic intelligent systems.	4Q93	392
• (U) Demonstrated effectiveness of hybrid systems within manufacturing, robotics and decision domains.	4Q93	1246

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602789A**
PE Title: **Army Artificial Intelligence Technology** Budget Activity: **#2**

• (U) Investigated feasibility and requirements framework for interactive repository of knowledge-based systems or components.	4Q93	1413
Total		3111

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Demonstrate use of AI technology in integrating vastly different data and technologies to solve highly complex problems.	*	689
• (U) Demonstrate effectiveness of hybrid systems within manufacturing and robotics domains.	*	320
• (U) Investigate integration of hybrid systems within synthetic environments for command and control AI systems.	*	1401
• (U) Demonstrate the integration of hybrid systems for the testing and evaluation of AI systems.	*	286
Total		2696

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Demonstrate use of AI technology in integrating different data and technologies to solve highly complex problems.	*	612
• (U) Demonstrate effectiveness of hybrid systems within manufacturing and robotics domains.	*	284
• (U) Investigate integration of hybrid systems within synthetic environments for command and control AI systems.	*	1239
• (U) Demonstrate the integration of hybrid systems for the testing and evaluation of AI systems.	*	253
Total		2388

* This is continuing work which is reviewed periodically ensuring quality, relevance, and priority.

(U) Work Performed By: In house efforts are performed primarily by the US Army AI Center, Pentagon; US Army Training and Doctrine Command (TRADOC) AI Center, Ft. Monroe, VA; US Army Transportation Center, Ft. Eustis, VA; and US Army Combined Arms Center, Ft. Leavenworth, KS. Research efforts will be supplemented by contract support by: Ascent Technologies, Boston, MA; American Management Systems, Rosslyn, VA; SRA International, Rosslyn, VA; and other contractors as required.

(U) Related Activities: This program will adhere to Tri-Service Reliance Agreements on Training Systems and Medical with oversight and coordination provided by the Joint Directors of Laboratories. Work in this Program Element contains no unwarranted duplication of effort among the Military Departments.

(U) Other Appropriation Funds: ($ in Thousands) Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602789A**
PE Title: **Army Artificial Intelligence Technology**

Budget Activity: **#2**

(U) International Cooperative Agreements: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603001A**
PE Title: **Logistics Advanced Technology** Budget Activity: **#3**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DC07	Joint Service Food Technology Demonstrations								
	449	2417	1901	1918	1818	1845	1892	Cont'd	Cont'd
DC44	Tactical Logistics								
	1449	420	395	1264	1252	1177	641	Cont'd	Cont'd
DJ28	Test Measurement Technology Development								
	667	948	346	581	599	563	575	Cont'd	Cont'd
DXXA	Soldier Survivability								
	882	2943	4785	4987	4264	4163	4816	Cont'd	Cont'd
D150	Fuels and Lubricants								
	2639	0	0	0	0	0	0	Cont'd	Cont'd
D242	Airdrop Equipment								
	1283	1869	1611	1313	1291	1296	1314	Cont'd	Cont'd
D528	Acousto-Optic Tunable Filter (AOTF) Technology Demonstration								
	4715	0	0	0	0	0	0	0	4715
D543	Ammunition Logistics								
	6382	2668	3500	3799	4373	5623	5661	Cont'd	Cont'd
D544	Cooperative Explosive Safety								
	0	955	929	0	0	0	0	0	1884
D594	Metrology and Calibration								
	614	677	919	1095	1031	1037	1052	Cont'd	Cont'd
PE TOTAL	19080	12897	14386	14957	14628	15704	15951		

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603001A
PE Title: Logistics Advanced Technology

Budget Activity: #3

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program supports development of technology and material essential to support and sustain wartime operations and peacetime readiness both strategically and tactically. Its purpose is to develop, demonstrate, and transfer technologies to reduce the logistics burden on the battlefield, reduce Operation and Support (O&S) costs, and improve logistics system performance. This program funds projects outside of weapon system developments. This work is necessary because logistics support technology has been unable to keep pace with weapons systems technology. It includes diverse projects linked by broad applications benefitting whole categories of weapons systems and resulting in high return on investment. The Fuels and Lubricants project supports the DoD on development of all Petroleum, Oils and Lubricants (POL) for ground vehicles and Army helicopters. This project is terminated in FY 1994. However, fuels and lubricants science and technology efforts will continue at a reduced scope in Program Element #0602786A, Project AH20. Enhancements to airdrop equipment for rapid deployment are required for dropping cargo from higher altitudes and at higher speed, increasing survivability of aircraft and crews and increasing the probability that materials delivered will land in a usable condition. Ammunition Logistics supports weapon system rearm, ammunition management and accountability, and improvements in ammunition packaging, explosive safety and combat service support and sustainment. Metrology and Calibration funds the development of new calibration standards, hardware, and techniques to support increasingly sophisticated Army weapons and Army test, measurement and diagnostic equipment (TMDE). Joint Service Food Technology project demonstrates food service systems and food products, processing, preservation, and serving equipment resulting from technology programs approved by the Joint Services and the Defense Logistics Agency. Tactical Logistics project demonstrates applications of technology for Logistics-Over-the-Shore (LOTS), tactical electric power, and materials handling equipment. The Test Measurement Technology Development program will reduce operations and support costs of weapon systems by increasing the capability to rapidly diagnose and predict failures and by making automatic testing programming faster and more efficient through the use of expert system methodology. Soldier Survivability, through the 21st Century Land Warrior Program, demonstrates the integration of advanced technologies to enhance soldier performance, lethality and survivability achieved by linking the modernized and technologically-advanced dismounted soldier directly to the battlefield via a digitized command and control network. The Cooperative Explosive Safety is a two year effort which continues, to completion, a DOD/Nunn-funded project, resulting from a cooperative agreement between the United States and the Republic of Korea to mature new underground ammunition storage technologies, design concepts, and hazard area prediction models. Application will provide technology reinvestment throughout DOD complex. This research will investigate the use of Acousto-Optic Tunable Filter (AOTF) technology. The work in this program element is consistent with the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan and Project Reliance.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project DC07 - Joint Service Food Technology Demonstrations: Joint Service Food is a DoD program directed towards demonstrating nutritionally advanced rations and logistically streamlined food delivery systems to sustain DoD personnel in all operations and to enhance their combat performance under diverse battlefield scenarios. The project focuses on demonstrations of advances in food technology, materials, energy

utilization, and combination heating technologies to provide extended, simplified field feeding without resupply. It exploits advances in ration formulation and quality, packaging, preservation, and nutritional content to improve morale, extend endurance, and sharpen mental acuity.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Demonstrated single use chemical heating technology suitable for heating bulk rations for group feeding; conducted successful initial technology demonstration of prototype self heating individual and group rations	4Q93	370
• (U) Conducted shipboard demonstration and evaluation of the performance and effectiveness of prototype food service plastic waste handling equipment proposed for Navy applications	4Q93	79
Total		449

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Conduct tech demo of biodegradable eating utensils and trash bags to alleviate shipboard/landfill disposal problem	4Q94	400
• (U) Demonstrate, test and collect data on labor saving convenience food concepts for future ship design and establish algorithms for a design model	*	460
• (U) Demonstrate small scale producibility of mobility enhancing ration components, institutional pouch packaging and state-of-the-art processing technologies; conduct tech demo of self heating rations including environmental extremes	*	515
• (U) Demonstrate new rapid assay procedures for determining ration quality/safety in the field; identify high preference foods from soldier surveys, reformulate ration components to improve functional characteristics in high heat environments	*	382
• (U) Design and fabricate a prototype rapid deployment kitchen based on thermal fluid technology as a technology demonstrator	*	660
Total		2417

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Demonstrate producibility of biodegradable laminated cups, trays, and food packaging materials to enhance waste management/reduce disposal burden on ships and in the field	*	375
• (U) Integrate advanced chemical heaters with rations to increase heat transfer efficiency and reduce hydrogen generation; conduct full scale tech demo of enhanced self-heating individual meals; continue technology insertion of promising food processing technologies	*	575

* This is a continuing effort which is reviewed twice annually by the DoD Food and Nutritional Research and Engineering Board (FNREB) among others, to ensure quality, relevance and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603001A**
PE Title: **Logistics Advanced Technology** Budget Activity: **#3**

• (U) Demonstrate prototype high heat stable rations to improve acceptability and consumption rates; quantify ration acceptability and consumption/nutrient intake to ensure nutritional adequacy in thermally abusive environments	*	209
• (U) Develop, refine, complete, and demonstrate a convenience food model to provide a tool for analyzing food service requirements in future ship design	*	231
• (U) Demonstrate a rapid deployment kitchen based on thermal fluid technology in a field environment; design and fabricate a thermoelectric water heater/generator prototype to demonstrate reliable, low cost, electric power source in field kitchens	*	511
Total		1901

* This is a continuing effort which is reviewed twice annually by the DoD Food and Nutritional Research and Engineering Board (FNREB) among others, to ensure quality, relevance and priority.

(U) Project DC44 - Tactical Logistics: Tactical Logistics supports development of technology and materials to improve Logistics-Over-The-Shore (LOTS) operations, and fuel handling, distribution, supply and storage equipment. LOTS efforts will demonstrate a capability to perform operations in sea states above 1.5. Prevailing sea states in key LOTS areas world-wide average 2 and above 80% of the time. Fuel distribution efforts are directed toward significant reductions in operation and support manpower.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Completed High Sea States Container Transfer System (HISEACOTS) upgrades to include roll on/roll off (RO/RO) ramp interface	*	395
• (U) Designed and evaluated Causeway Dredge	*	500
• (U) Evaluated hardware upgrades to technology demonstrator for the Pontoon Air Cushion Kit (PACK)	4Q93	175
• (U) The 1/16th scale model Automated All-Weather Cargo Transfer System (AACTS) was fabricated and tested, successfully picking up containers from 1/16th scale model LCU 2000 in sea state 3. A full scale model is being fabricated at Belvoir for demonstration	*	379
Total		1449

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Continue component integration for integrated and modular power system rated at 400 watts for microclimate cooling for the soldier system	*	420
Total		420

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603001A**
PE Title: **Logistics Advanced Technology**
Budget Activity: **#3**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Complete effort by demonstrating a 3 lb, 400 watt engine-generator module for Soldier Individual Power Program	4Q95	395
Total		395

(U) Project DJ28 - Test Measurement Technology Development: Efforts are to demonstrate technology for increases to Army weapon systems' reliability and mission availability by improving the speed, accuracy, and reliability of the weapon failure diagnosis as well as failure prognosis. Developed approaches will exploit technologies such as expert systems, micromachining, board built-in-diagnostics (BID), and millimeter/microwave monolithic integrated circuits (MMIC). Demonstration of new test techniques where required using Army-wide expertise and real-system benchmarks.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Designed, built and delivered a 32X32 addressable infrared array scene generator for IR calibration evaluation	4Q93	200
• (U) Completed development of the Diagnostic Analysis and Repair Tool Set (DARTS) concurrent engineering diagnostics toolset and began extensive testing program	*	350
• (U) MMIC brassboard design incorporating prognostics capability successfully demonstrated	*	117
Total		667

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Demonstrate DARTS toolset on a microprocessor for built-in diagnostics (BID)	*	349
• (U) Demonstrate a wearable intelligent maintenance aid to provide rapid forward area diagnostics at the weapon system	*	299
• (U) Fabricate and demonstrate the MMIC technology built-in test (BIT) chip in the Advanced Treat Radar Jammer	*	300
Total		948

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Develop a wearable, light-weight prototype candidate maintenance aid for future Contact Test Set-III (CTS-III) replacement	*	200
• (U) Develop built-in diagnostic capability for Army subsystem benchmark	4Q95	50
• (U) Transfer DARTS concurrent engineering diagnostic technology to Army and industry users	3Q95	25
• (U) Integrate MMIC BIT chips technology into DARTS diagnostic analysis	*	71
Total		346

* This is a continuing work which is reviewed annually to ensure quality, relevance and priority

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603001A**
PE Title: **Logistics Advanced Technology** Budget Activity: **#3**

(U) Project DXXA - Soldier Survivability: Beginning in FY93, the Soldier Survivability project was restructured from PE #0603002A, PROJ D995. Project DXXA addresses the critical Army need to enhance the performance, lethality, survivability, and sustainment of the individual soldier. It includes the Generation II Soldier System technology demonstration, which is part of the 21st Century Land Warrior Program. The GEN II Soldier System will integrate several program elements including advanced electronics, communications, sensors, individual equipment, weaponry, and hazard protection items, into a functioning, balanced, unified system demonstration in FY98. The Gen II Soldier System will demonstrate the enhanced soldier lethality and survivability achieved by linking modernized and technologically-advanced dismounted soldiers directly to the battlefield via a digitized command and control network coupled with other specific enhancements (e.g. new weapon/fire control, small arms protection). This will be accomplished by the use of modular subsystems that will provide flexibility and variety in use, and will allow mission tailoring without the burden of wearing/carrying items unnecessary for the mission. The system will provide the flexibility to optimize the balance between soldier/equipment performance and individual protection in responding to varying threats and operational requirements. GEN II will leverage the commercial microelectronics and telecommunications industries to achieve lightweight, miniaturized components. The U.S. Marine Corps and the Special Operations Forces are active participants in this program.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Successfully completed the Soldier Integrated Protective Ensemble (SIPE) Program; assessed SIPE demo/results and identified technologies for insertion into the follow-on Land Warrior 6.3B development program; defines advanced/emerging technologies with potential for the Gen II Soldier System program	4Q93	882

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Award GEN II system contract (4Q94) to investigate viable state-of-the-art technologies, designs concepts, advanced material systems, etc. to support the full exploitation of all available and emerging technologies for Gen II; identify critical component/systems drivers and technical risks; and coordinate the cognitive, informational and performance requirements with the Gen II user	*	2943

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Develop conceptual designs for the system; evaluate preliminary design concepts; select the most feasible approach(es); initiate breadboard level designs for the critical components/system drivers for FY96 validation	*	4785

* This is continuing work which is reviewed periodically to ensure quality, relevance and priority

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603001A**
PE Title: **Logistics Advanced Technology** Budget Activity: **#3**

(U) Project D150 - Fuels and Lubricants: This technology demonstration program supports the DoD in development of all Petroleum, Oils and Lubricants (POL) for ground vehicles and equipment and Army helicopters. Among the program's objectives are a single battlefield fuel by 1995 and reduction in the number of lubricants by twenty-five percent. Fuels and Lubricants inhouse program is being conducted by Army personnel collocated at USAF Wright Laboratory under Project Reliance.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Completed correlating spectroscopic compositional data with fuel inspection properties and transitioned to Petroleum Quality Analysis system	4Q93	539
• (U) Completed simulator fabrication and component testing with Non-flammable Hydraulic Fluid and transitioned to AFAS	4Q93	303
• (U) Completed database correlating engine oil properties to lubricant compositional data	4Q93	339
• (U) Completed systems evaluation on Single Hydraulic Fluid as a prerequisite for conducting a field demonstration	*	703
• (U) Completed multicylinder engine testing on candidate OW-30 environmentally compliant combat engine oil	*	485
• (U) Completed laboratory evaluation on new fuel biocide/stabilizer and preliminary fuel lubricity criteria	4Q93	270
Total		2639

(U) FY 1994 Planned Program:

- (U) This project is terminated in FY 1994, however, fuels and lubricants science and technology efforts will continue at a reduced scope in Program Element #0602786A, Project AH20

(U) FY 1995 Planned Program: N/A

(U) Project D242 - Airdrop Equipment: This project focuses on the demonstration and development of innovative techniques and equipment for aerial delivery of cargo. The goal is precision delivery of heavier payloads from extremely high altitude (up to 25,000 ft); delivery from high altitudes improves cargo/personnel and aircraft survivability. Starting in FY93, this project was restructured in response to the DoD need for the rapid deployment of combat vehicles and other combat-essential payloads. The current effort will culminate in 1Q96 with the Advanced Airdrop for Land Combat (AALC) demonstration of technology for offset delivery through the deployment of very large ram-air canopies with automated guidance and control of non-powered gliding decelerators and an automated soft landing capability. The conflict in Bosnia focused attention on the need for air delivery systems that reduce the vulnerability of personnel and aircraft and the increase in funding in FY94 is required to achieve the goals of the planned effort. This high priority Army effort will demonstrate precision delivery of 42,000 lb of cargo (e.g., supplies and equipment) from altitudes of up to 25,000 ft.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603001A**
PE Title: **Logistics Advanced Technology** Budget Activity: **#3**

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Demonstrated a 1-ton Supply Container Delivery System from 300 ft and 250 knots	4Q93	660
• (U) Defined concept, selected material systems, and initiated technical evaluation of 42,000 lb payload AALC system	4Q93	623
Total		1283

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Integrate autonomous Global Positioning System (GPS) Guidance, Navigation & Control (GN&C) into existing 15,000 lb prototype parafoil system and conduct airdrop tests	2Q94	604
• (U) Design, fabricate prototypes and conduct instrumented airdrop tests of the 42,000 lb capacity parafoil	*	1156
• (U) Integrate autonomous GPS GN&C into the 42,000 lb prototype parafoil system and conduct instrumented airdrop tests	*	109
Total		1869

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Conclude instrumented airdrop tests of 42,000 lb capacity parafoil	1Q95	35
• (U) Conclude integration and instrumented airdrop tests of 42,000 lb capacity prototype parafoil system with autonomous GPS GN&C	3Q95	480
• (U) Design and integrate soft landing capability into 42,000 lb capacity autonomous prototype parafoil and conduct instrumented airdrop tests	*	1096
Total		1611

(U) Project D528 - Acousto-Optic Tunable Filter (AOTF) Technology Demonstration: This research will investigate the use of AOTF technology in conjunction with Near Infrared (NIR) spectroscopy as a means to identify and assess the quality of fuels in a field environment. The AOTF/NIR will be a principal component of the Petroleum Quality Analysis (PQA) project.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Developed four (4) prototype fuel analyzers using AOTF NIR Spectroscopy for Technology insertion into the Petroleum Quality Analysis (PQA) program	*	2850

* This is continuing work which is reviewed periodically to ensure quality, relevance and priority

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603001A
PE Title: Logistics Advanced Technology Budget Activity: **#3**

• (U) Developed preliminary calibration models and conduct correlation	*	1245
• (U) Conducted Round Robin test program	*	545
• (U) Prepared final test report	*	75
Total		4715

(U) FY 1994 Planned Program: Not Applicable

(U) FY 1995 Planned Program: Not Applicable

(U) Project D543 - Ammunition Logistics: Ammunition Logistics satisfies a critical need for improved systems to project, sustain and support operations and peacetime readiness for both strategic and tactical scenarios. It will improve ammunition and missile packaging/palletization and weapon system rearm for Artillery, Armor, Air Defense, Aviation, and Infantry, as well as enhance Explosive Safety, Combat Service Support and Command, Control, Communication, Computers (C4) for Ammo Management. It also exploits emerging technologies and productivity enhancers/cost savers aimed at quantum improvements to our force projection logistics system (strategic) and our combat focused logistics system (tactical).

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Completed fabrication and engineering testing of Artillery Rearm Module (ARM) II in support of the Future Armored Resupply Vehicle (FARV)	*	1749
• (U) Completed component concept and design for the Modular Aviation Resupply/rearm System (MARRS) to improve helicopter rearm/resupply. Upgraded MARRS Forward Arming and Refueling Point Operational Model (FARPOM)	*	242
• (U) Completed software development and testing/technical demonstration of Standard Army Ammo System-Ammo Transfer Point (SAAS-ATP) prototype in a field Ammunition environment with soldiers	*	424
• (U) Conducted Future Armor Rearm System (FARS) technical demonstration, evaluated results and transitioned to Project Manager Future Armored Resupply Vehicle (PM FARV)	2Q93	251
• (U) Conducted market survey and determined candidate concepts for improved Insensitive Munitions (IM) Packaging Technology (IMPACT)	*	269
• (U) Completed prototype development of Explosive Ordnance (EOD) tele-operated system for SEE and conducted user demonstration	4Q93	140

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603001A**
PE Title: **Logistics Advanced Technology**

Budget Activity: **#3**

• (U) Completed fabrication of the Loose Mine Restraint System (LMRS)	*	153
• (U) Conducted market survey and developed concepts to apply an advanced technology computer controlled arm/"smart" crane to improve rearm of Theater High Altitude Air Defense (THAAD) missiles	*	354
• (U) Develop concepts and prototype designs for future munitions packaging; develop common tri-service test and evaluation data base architecture	*	2800
Total		6382

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Integrate FARPOM upgrade with Louisiana Maneuvers model; Demonstrate MARRS components/procedures; Fabricate prototype extraction system for MARRS rocket/missile weapon system rearm	*	492
• (U) Complete mechanical/controls design of an advanced technology computer controlled arm/"smart" crane to improve rearm of THAAD missiles	*	770
• (U) Complete SAAS-ATP final report and transition technology to PM SAAS	2Q94	58
• (U) Complete IMPACT prototype system designs for candidate munitions	*	900
• (U) Develop crew saving resupply/rearm concepts for the Light Weight 155mm howitzer	*	112
• (U) Complete ARM II safety certification testing, conduct user demonstration, and transition to PM FARV	2Q94	298
• (U) Safety certify LMRS and transition technical data package to the USA Engineer School	2Q94	8
• (U) Conduct evaluation of the latest generation of Radio Frequency (RF) based data transceiving devices for application to ammo asset management systems	*	30
Total		2668

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Select concept and design of resupply/rearm system for the 155mm Light Weight Automated Howitzer	*	1153
• (U) Complete engineering test and evaluation of missile/rocket rearm system for attack helicopters	3Q95	125
• (U) Select concepts and design future munitions packaging prototypes; develop common tri-service test and evaluation database	*	1000
• (U) Fabricate prototype IM munition containers and conduct IM and hazard classification testing of ammo packaging safety improvements	*	997
• (U) Design, install, and test an advanced machine vision fire detection and suppression system for ammo load plants	4Q95	225
Total		3500

* This is continuing work which is reviewed periodically to ensure quality, relevance and priority

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603001A**
PE Title: **Logistics Advanced Technology**

Budget Activity: **#3**

(U) Project D544 - Cooperative Explosive Safety: This project is a continuation of a Nunn fund program and is the direct outgrowth of direction to enter into discussions with the Republic of Korea (ROK) on methods to improve ammunition explosives safety through technology solutions. The effort focuses on the development, testing, and validation of new underground explosives storage techniques which will reduce explosives storage hazards with no reduction in security, operational readiness, or logistical support. Results of the effort are anticipated to produce approved underground storage designs and revised US explosives safety criteria and have the impact of increasing ammunition storage safety throughout the Department of Defense (DoD) ammunition storage complex.

(U) FY 1993 Accomplishments: N/A

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Complete the intermediate-scale testing of the most promising underground storage design concepts to evaluate design performance and conduct large scale validation test program to evaluate full scale performance	*	955
Total		955

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Complete the large-scale validation testing program and develop generic concept designs of full-scale facilities in preparation of technical data packages	*	929
Total		929

(U) Project D594 - Metrology and Calibration: The purpose of this project is to develop essential calibration systems for Army test, measurement, and diagnostic equipment (TMDE). Calibration hardware is required to adjust, maintain, and repair TMDE. New, high technology weapon systems and future systems apply technologies which cannot be supported without metrology and calibration improvements. This project supports field Army, area calibration and repair centers, Army test ranges, proving grounds, research and development centers, and the Army Primary Standards Laboratory (APSL). At the direction of the Joint Logistics Commanders, this work is closely coordinated with the other services. Areas of special concern, where calibration support is inadequate or nonexistent, include millimeter/microwave, electronics, photonics, and physical technologies which are heavily applied to weapon systems.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Developed the world's first lead-free all niobium Josephson Junction array for incorporation into a cycleable primary voltage standard	*	250
• (U) Developed prototype refrigeration unit to provide 4 degree Kelvin cooling of aforementioned array	4Q93	264

Program Element: **#0603001A**
PE Title: **Logistics Advanced Technology** Budget Activity: **#3**

• (U) Completed program to validate gas mask leak test standards on Army equipment	4Q93	100
Total		614

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Developed a downsized, portable, refrigerator-cooled Josephson Junction primary voltage standard	2Q94	300
• (U) Develop a downsized VXI-based microwave calibration workstation for utilization in mobile calibration van	*	300
• (U) Demonstrate a frequency linked (via Global Positioning Satellite) intrinsic voltage standard	4Q94	77
Total		677

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Incorporate the utilization of the Josephson Junction intrinsic voltage standard into the next generation Calibration Van (CalSets 2000)	*	100
• (U) Develop prototype Quantum Hall Effect primary resistance standard	*	200
• (U) Field test the reconfigurable microwave calibration workstation	3Q95	100
• (U) Investigate the parameters required to achieve self-calibration of the CalSets 2000 design so as to eliminate the calibration logistics tail	*	100
• (U) Downsize the prototype Josephson intrinsic voltage standard into a 6X6X3 instrumentation rack for incorporation into the CalSets 2000 design	*	419
Total		919

* This is continuing work which is reviewed periodically, ensuring quality, relevance and priority

(U) Work Performed By: In-house work will primarily be accomplished by the Project Manager for Ammunition Logistics, Picatinny Arsenal, NJ; Belvoir Research, Development and Engineering Center, Ft. Belvoir, VA; Communications Electronics Command, Fort Monmouth, NJ; Tank Automotive Command, Warren, MI; Test Measurement Diagnostic Equipment Support Group, Huntsville, AL; Armament Research Development and Engineering Center, Picatinny Arsenal, NJ; Department of Energy, Oak Ridge National Lab, Oak Ridge, TN; Army Research Laboratory, Aberdeen, MD; Natick Research, Development and Engineering Center, Natick, MA; Yuma Proving Ground, Yuma,AZ; US Army Engineer Waterways Experiment Station, Vicksburg, MS; Tooele Army Depot, Tooele, UT; Southwest Research Institute, San Antonio, TX; National Institute of Standards and Technology, Gaithersburg, MD and Boulder, CO; Construction Engineering Research Lab, Champaign, IL; Defense Ammo Center and School, Savannah Station, IL; Earle Naval Weapons Station, Earle, NJ; Test and Evaluation Command, Aberdeen, MD; U.S. Navy EOD Center; Tobyhanna Army Depot; National Security Agency; AVRADA; AMCCOM; U.S. Forest Products Laboratory, Madison, WI; USAF

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603001A
PE Title: Logistics Advanced Technology

Budget Activity: #3

Packaging Evaluation Activity, Wright-Paterson AFB, OH; USA Crew Station Research and Development Facility, Moffitt Field, CA. Contractors include: Optical ETC; Giordano Automation, Sparta, NJ; Vitro Corp., Silver Spring, MD; New Mexico Institute of Mining and Technology, Socorro, New Mexico; Ferrulmatic, Inc, Totowa, NJ; S-Tron, Mountain View, CA; MTA, Inc., Huntsville, AL; Umass-Amherst, MA; Brandeis University, Waltham, MA; Worcester Polytechnic Institute, Worcester, MA; Framingham State College, Framingham, MA; Mississippi State University; Pioneer Aerospace, South Windsor, CT; Martin Marietta, Burlington, VT; Camber Corp, Mt Arlington, NJ; Optical ETC, Huntsville, AL; S-Cubed/Maxwell Corp, Albuquerque, NM; STC, Inc., McLean, VA; Remtech, Inc., Huntsville, AL; Patrick Harrison Constructors, INC., Tooele, UT; Litton Applied Technologies, San Jose, CA; and International Telephone and Telegraph.

(U) Related Activities: This program adheres to Tri-Service Reliance Agreements on Clothing, Textiles & Food, Explosive Ordnance Disposal, and Fuels and Lubricants with oversight and coordination provided by the Joint Directors of Laboratories. Work in this Program Element is related to and fully coordinated with efforts in PE #0602786A (Logistics Technology), Navy's Integrated Diagnostic Support System, MICOM IR Scene Generation, Advanced Research Project Agency (ARPA) millimeter/microwave integrated circuit (MMIC), and the Joint Services Calibration Coordination Committee. The Ammunition Logistic project is related to PE #0602624A (Weapons And Munitions Technology) and PE #0603004A (Weapons and Munitions Advanced Development). These efforts contains no unwarranted duplication of effort among the Military Departments.

(U) Other Appropriation Funds: ($ in Thousands) Not applicable

(U) International Cooperative Agreements: Memorandum of Agreement between Department of Defense of the USA and the Ministry of National Defense of the Republic of Korea for a Cooperative Research and Development Program for New Underground Ammunition Storage Technologies.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603002A**
Title: **Medical Advanced Technology** Budget Activity: **#3**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D799 Depleted Uranium Effects	0	425	0	0	0	0	0	0	425
D800 Telemedicine Testbed	0	1000	0	0	0	0	0	0	1000
D801 Defense Women's Health Research	0	40000	0	0	0	0	0	0	40000
D803 Louisiana Touro Infirm	0	1200	0	0	0	0	0	0	1200
D804 Prostate Cancer Research	1971	2000	0	0	0	0	0	0	3971
D805 Laser Burn Treatment (Funding moved to PE 602787 Project A881)	1885	0	0	0	0	0	0	0	2872
D806 Breast Cancer Research	206883	30000	0	0	0	0	0	0	206883
D807 Industrial Base/Medical Biological Defense Vaccines and Drugs	13004	15443	15884	13878	14079	14829	15185	Cont'd	Cont'd
D810 Industrial Base/Infectious Disease Vaccines and Drugs	5245	8902	9155	8550	8629	8819	9045	Cont'd	Cont'd
D819 Field Medical Protection and Human Performance Enhancement - Non-Systems Advanced Development	3687	750	0	0	0	0	0	0	11266
D840 Combat Injury Management	3912	2800	3154	2399	2456	2491	2551	Cont'd	Cont'd
D995 Medical Chemical Defense Life Support Materiel - Non-Systems Specific Advanced Development	11773	12480	12835	9946	10061	10658	10913	Cont'd	Cont'd
PE TOTAL	248360	115000	41028	34773	35225	36797	37694		

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603002A
Title: Medical Advanced Technology Budget Activity: **#3**

B: (U) BRIEF DESCRIPTION OF ELEMENT: This program element funds non-system advanced development for the DoD Core Vaccine and Drug Program as well as for development of field medical protective devices and combat injury management. These latter two projects focus on diagnostic imaging devices, clinical studies of combat casualty care treatment modalities, and nutrition and soldier performance enhancement. The DoD Core Vaccine and Drug program provides, in accordance with Food and Drug Administration (FDA) regulations, drugs and vaccines for development which are effective protectants, treatments, and antidotes against chemical and biological threat agents, and military disease threats. Pilot and standard lots of candidate pharmaceutical-grade drugs, antidotes and vaccines are produced. Medical biological and chemical defense development consists of prophylaxes, pretreatments, antidotes and therapeutics; personnel and patient decontamination; medical management of casualties and sustainment of combat effectiveness. The primary goal of this program is to provide, with minimum adverse effects, maximum soldier survivability and sustainability on the integrated battlefield as well as in military operations short of war. The work in this program element is consistent with the Army Science and Technology Master Plan, the Army Modernization Plan, and Project Reliance.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project: D799 - Depleted Uranium Effects: By Congressional direction, the purpose of this project is to study the possible short- and long-term effects on the health of personnel who were exposed to depleted uranium on the battlefield.

(U) FY 1993 Accomplishments:
- Not Applicable

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• **(U) Award competitive contracts/grants in accordance with established defense acquisition regulations.**	3Q94	425
Total		**425**

(U) FY 1995 Planned Program:
- (U) Not Applicable

(U) Project D800 - Telemedicine Testbed: By Congressional direction, the purpose of this project is to conduct research on imaging, diagnosis, and electronic connectivity of military and federal facilities to demonstrate emerging telemedicine capabilities.

(U) FY 1993 Accomplishments: Not Applicable

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603002A
Title: Medical Advanced Technology

Budget Activity: #3

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Award competitive contracts/grants in accordance with established defense acquisition regulations.	3Q94	1000
Total		1000

(U) FY 1995 Planned Program: Not Applicable

(U) Project D801 - Defense Women's Health Research: By Congressional direction, the purpose of this project is to develop a coordinated tri-service program of multi-disciplinary and multi-institution research on women's health issues related to service in the Armed Forces.

(U) FY 1993 Accomplishments: Not Applicable

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Establish a program to support health research into matters relating to the service of women in the military.	3Q94	40000
Total		40000

(U) FY 1995 Planned Program: Not Applicable

(U) Project D803 - Louisiana Touro Infirm: By Congressional direction, the purpose of this project is to evaluate an antibacterial treatment for the Gulf War Illness.

(U) FY 1993 Accomplishments: Not Applicable

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Award the grant in accordance with established defense acquisition regulations.	3Q94	1200
Total		1200

(U) FY 1995 Planned Program: Not Applicable

(U) Project D804 - Prostate Cancer Research: By Congressional direction, the purpose of this project is to establish a prostate disease research center at the Walter Reed Army Institute of Research.

(U) FY 1993 Accomplishments:	Complete	Cost

Program Element: #0603002A
Title: Medical Advanced Technology — Budget Activity: #3

• (U) Supported a cooperative research program involving the Walter Reed Army Institute of Research, the Walter Reed Army Medical Center, and the Uniformed Services University of Health Sciences.	*	1971
Total		**1971**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Establish a cell biology laboratory to characterize the various types of prostate cancer.	*	2000
Total		**2000**

(U) FY 1995 Planned Program: Not Applicable

(U) Project D805 - *Laser Burn Treatment:* By Congressional direction, the purpose of this project is to support advanced laser burn treatment diagnostics and therapeutic research.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Designed, constructed and tested a diagnostic system for burn depth and tissue assessment. A prototype Burn Debridement System (Laser Robot for Removal of Burned Tissue) is fully operational.	4Q93	1885
Total		**1885**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Program moved to PE #0602787 Project A881		0

(U) Project D806 - Breast Cancer Research: By Congressional direction, the purpose of this project is to initiate breast cancer research within the Department of Defense.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Recruited and trained new scientists in breast cancer research.	*	26500
• (U) Enhanced breast cancer research infrastructure to improve registries, information and biological material banks.	*	20500
• (U) Conducted a broad range of investigator initiated breast cancer research projects that will explore causes,		

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

diagnostic detection, prevention and therapeutic measures.	*	147883
• (U) USAMRDC management of the breast cancer program to include the contract costs for peer review and administrative support.	*	12000
Total		**206883**

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Establish a Center of excellence in breast cancer at the National Naval Medical Center principally for the training of medical personnel in early detection and treatment.	2Q94	5000
• (U) Execute FY 94 grant programs in accordance with the Institute of Medicine recommendations.	4Q94	25000
Total		**30000**

(U) FY 1995 Planned Program: Not Applicable

(U) Project D807 - Industrial Base/Medical Biological Defense Vaccines and Drugs: Research conducted in this project focuses on preclinical development of safe and effective prophylaxis and therapy (vaccines and drugs) for exposure to biological threat agents. This project also supports the non-system advanced development of kits to rapidly diagnose exposure to biological agents in clinical samples. A broad range of technologies involved in the targeting and delivery of prophylactic and therapeutic medical countermeasures are evaluated to ensure the protection of U. S. Forces. USAMRDC functions as the DoD Executive Agent for medical biological defense research.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Confirmed in animal models that the F-1 producing E. coli recombinant vaccine against plague does not cause adverse reactions.	3Q93	768
• (U) Performed biochemical and biological characterization of genetically engineered Protective Antigen products under consideration for use in improved anthrax vaccine.	2Q93	921
• (U) Produced genetically engineered candidate Venezuelan equine encephalitis (VEE) vaccines containing multiple attenuating genetic mutations.	4Q93	148
• (U) Prepared transition package for the Fiber Optic Biosensor for confirmation diagnosis of exposure to biological threat agents.	*	1837

* This is continuing research which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603002A
Title: Medical Advanced Technology **Budget Activity: #3**

• (U) Evaluated efficacy of candidate ricin toxoid vaccine against an aerosol challenge of ricin in non-human primates. Three immunizations protected against lethality.	2Q93	2319
• (U) Evaluated the efficacy of formalinized Staphylococcal enterotoxin B (SEB) toxoid and SEB microspheres vaccines in non-human primates.	1Q93	2278
• (U) Evaluated the protective efficacy of an abbreviated immunization schedule against an inhalation challenge of botulinum toxin type A.	4Q93	2312
• (U) Prepared purified lipopolysaccharide from Brucella abortus strain extracted for use in a vaccine candidate.	3Q93	366
• (U) Developed reagent sets for diagnosis of exposure to Brucella, SEB, and VEE.	2Q93	1763
• (U) Evaluated efficacy of combined artificial ventilation and saxitoxin antibody treatment in reversing saxitoxin induced cardio-respiratory failure.	*	292
Total		**13004**

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Evaluate the efficacy of the Cutter Plague vaccine against an aerosol challenge of Yersina pestis.	2Q94	1102
• (U) Demonstrate the expression of protective immunity induced by candidate Brucella vaccines.	*	695
• (U) Demonstrate the efficacy of candidate Anthrax vaccines in non-human primates.	*	1217
• (U) Demonstrate the efficacy of Vibrio cholerae vaccine against aerosol challenge.	*	248
• (U) Conduct advanced screening for safety, efficacy and toxicity of candidate Venezuelan equine encephalitis (VEE) vaccines.	*	640
• (U) Conduct demonstrations of a candidate technology for field diagnosis of biological threat agents.	3Q94	1708
• (U) Assess and validate models, assays and manufacturing technologies to support product development of diagnostic confirmation assays of biological threat agents.	*	1771
• (U) Conduct advanced pre clinical pharmacology studies on medical countermeasures of sodium channel neurotoxins.	4Q94	222
• (U) Conduct safety and toxicity screening of a candidate solution for ricin intoxication. Transition ricin toxoid to advanced development.	3Q94	2499
• (U) Complete the evaluation of the efficacy of the candidate Staphylococcal enterotoxin B (SEB) products in non-human primates.	3Q94	2426
• (U) Conduct demonstrations of candidate technology solutions for botulinum intoxication.	*	2915
Total		**15443**

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FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603002A
Title: Medical Advanced Technology — **Budget Activity: #3**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Conduct demonstrations of candidate solutions for treatment of Yersina pestis.	*	1089
• (U) Demonstrate the expression of protective immunity induced by candidate Brucella vaccines.	2Q95	844
• (U) Demonstrate the efficacy of candidate Anthrax vaccines in non-human primates.	3Q95	1438
• (U) Demonstrate the efficacy of Vibrio cholerae vaccine against aerosol challenge.	*	124
• (U) Conduct advanced screening for safety, efficacy and toxicity of candidate Venezuelan equine encephalitis (VEE) vaccines.	2Q95	692
• (U) Assess and validate models, assays and manufacturing technologies to support product development of diagnostic confirmation assays of biological threat agents.	2Q95	2015
• (U) Conduct demonstrations of candidate solutions for the treatment sodium channel neurotoxins.	*	767
• (U) Conduct advanced pre clinical pharmacology studies on medical treatment for ricin intoxication.	*	2904
• (U) Conduct safety and toxicity screening of a candidate solution for Staphylococcal enterotoxin B (SEB) intoxication. Transition SEB toxoid to advanced development.	4Q95	2824
• (U) Conduct demonstrations of candidate technology solutions for botulinum intoxication.	*	3187
Total		**15884**

(U) Project D810 - Industrial Base/Infectious Disease Vaccines and Drugs: This project funds preclinical development of vaccines and drugs effective against militarily significant infectious diseases affecting mobilization, deployment and mission accomplishment. These vaccines and drugs result from research in exploratory development on many diseases, such as malaria, diarrheal diseases, meningitis, infectious hepatitis, dengue fever, typhus fevers, and leishmaniasis. USAMRDC is the congressionally designated DoD lead agency for infectious disease research.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Demonstrated that proteosomes of *Shigella sonnei*-lipopolyaccharide complexes are promising candidates for clinical study.	*	619
• (U) Demonstrated for the first time that immunizations of humans with killed falciparum malaria sporozoites induced a beneficial immune response.	*	1058
• (U) Prepared a microencapsulated oral vaccine against enterotoxigenic E. coli, causative agent of incapacitating traveler's diarrhea.	*	323

* This is continuing research which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603002A
Title: Medical Advanced Technology — Budget Activity: #3

• (U) Topical antileishmanial lotion (WR6026 + Gentamicin) was formulated for animal efficacy and stability testing.	4Q93	1932
• (U) Produced live, attenuated dengue vaccines for all four serotypes in new cell line for Phase I clinical testing.	4Q93	713
• (U) Developed animal model for safety and efficacy studies of candidate calpylobacter vaccines. Meningococcal vaccine effective in human trials.	4Q93	600
Total		**5245**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Perform Phase I testing of a vaccinia vectored or baculovirus vectored circumsporite malaria vaccine in human volunteers.	*	1730
• (U) Conduct Phase I clinical testing of candidate shigella immunogen to select preparations for transition to advanced development.	*	600
• (U) Develop animal model for evaluation of safety and efficacy of meningitis vaccines for transition to clinical trials.		150
• (U) Evaluate means of enhancing immune response to candidate dengue vaccine.	4Q	675
• (U) Prepare technical data package to transition scrub typhus diagnostic assay to advanced development.	4Q	200
• (U) Evaluate camplobacter vaccine components in preclinical safety and efficacy trials in animal models.	*	350
• (U) Conduct preclinical safety tests and Phase I clinical trials of drugs against multidrug-resistant malaria and leishmaniasis.	*	3934
• (U) Perform Phase I safety testing of candidate vaccines for prevention of enterotoxigenic E. coli diarrhea.	*	384
• (U) Conduct clinical trial of live, attenuated hepatitis A vaccine (at request of National Institutes of Health).	*	350
• (U) Establish field site for conducting of vaccine and drug trials in endemic disease areas.	*	529
Total		**8902**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Determine immunogenicity to evaluate single and multiple component vaccine candidates against *Campylobacter* diarrhea.	*	570
• (U) Complete safety and immunogenicity studies of candidate liposomal malaria vaccines in humans prior to and after exposure to malaria.	3Q95	1440
• (U) Conduct safety and immunogenicity studies in volunteers of an attenuated Shigella vaccine modified		

* This is continuing research which is reviewed periodically, ensuring quality, relevance, and priority.

by the deletion of a virulence gene.	*	850
• (U) Develop algorithms for predicting protective malarial immunity. Complete safety and immunogenicity studies of candidate malaria vaccines to select candidate for advanced development.	1Q95	650
• (U) Perform Phase II immunogenicity and safety testing of candidate vaccines for prevention of enterotoxigenic *E. coli* diarrhea to select candidate for advance development.	*	730
• (U) Prepare preclinical and technical data packages for transition of antimalarial drug to advance development.	3Q95	425
• (U) Complete immunogenicity and safety studies of a candidate live attenuated hepatitis A vaccine.	4Q95	680
• (U) Conduct Phase I trials of a candidate vaccine against meningitis.	*	500
• (U) Formulate and conduct preclinical and pharmacokinetic studies of candidate antimalaria and antileishmanial drugs.	*	3080
• (U) Complete preparation of field sites for efficacy trials of vaccines and drugs.	4Q95	230
Total		9155

(U) Project D819 - Field Medical Protection and Human Performance Enhancement - Non-Systems Advanced Development: This project supports laboratory and field demonstration studies focused on soldier protection, sustainment, and enhancement associated with soldiers operating, wearing and consuming materiel systems in all climatic and operational conditions. Specific support includes medical non-systems advanced development of laser eye protection technologies and laser bioeffects treatment, medical protection against military electromagnetic radiation hazards, environmental health monitoring methods to link soldier physiological status with climatic and environmental conditions, methods to enhance sleep and alertness during continuous/sustained operational scenarios, nutritional strategies to enhance soldier mental and physiological performance, and medical protection from vibration and repeated shock hazards arising from the operation of combat vehicle and aircraft systems.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Assesed nutrition of female soldiers during basic training; and of Army Special Forces candidates for weight loss, body composition, strength, sleep quality and quantity, cognitive, performance, and immune function.	4Q93	1198
• (U) Demonstrated a survival advantage of heat injury treatment with hypertonic saline dextran over normal saline for heat injury.	3Q93	254
• (U) Specified, developed, and evaluated the first laser and ballistic protective outserts for the M17 and M40 protective masks focusing on laser hazard protection and performance impacts.	4Q93	868
• (U) Validated procedures for using a high-fidelity, Multi-Axis Ride Simulator for evaluating injury and performance		

* This is continuing research which is reviewed periodically, ensuring quality, relevance, and priority.

Program Element: #0603002A
Title: Medical Advanced Technology — Budget Activity: #3

changes in crew members exposed to repeated impact signatures simulating Army ground and air combat vehicles.	4Q93	600
• (U) Initiated congressionally directed project to examine effects of ethanol on synaptic transmission. Proposal has been reviewed, contract is under negotiation.	*	767
Total		**3687**

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Project designation eliminated. Planning, programming, and execution of this research will occur under the PE #0602787 exploratory development research projects A878 and A879 commencing in FY94.		
• (U) Conduct congressionally directed program to evaluate health promoting benefits of "heart-healthy" choices in garrison mess hall.	2Q94	750
Total		**750**

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Project designation eliminated in FY94. Planning, programming, and execution of this research will occur under the PE #0602787 exploratory development research projects 878 and 879 (commencing in FY 94).	*	0

(U) Project D840 - Combat Injury Management: This project funds advanced development prototypes of non-system specific medical material items for far forward medical management of shock and trauma, and for casualty resuscitation, including preclinical testing of large standard lots of candidate compounds and equipment, to obtain data necessary for Food and Drug Administration (FDA) approval for human use.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Characterized toxic hemoglobin alterations caused by cross-linked and unmodified human hemoglobin in a swine hemorrhage model. Continued characterization of toxic effects of hemoglobin solutions.	*	1425
• (U) Secondary Damage After Injuries: Showed that high frequency flow interruption is effective in a smoke-injured primate model. Continued fabrication and evaluation of biodegradable bone screws.	*	1425
• (U) Far-Forward Systems for Airway, Anesthesia Delivery, Surgery, and Casualty Management: Conducted market investigation of commercially available suction devices, anesthesia machines, and x-ray tables.	3Q93	1062
Total		**3912**

* This is continuing research which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603002A
Title: Medical Advanced Technology Budget Activity: #3

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Blood Loss and Fluid Resuscitation: Investigate hypertensive effect of model hemoglobin compounds in animal models. Test tissue adhesive for wound stabilization, hemorrhage control, and healing.	4Q94	791
• (U) Secondary Damage After Hemorrhage or Injuries; Musculoskeletal and Maxillofacial Injuries; Wound Healing: Formulate large biodegradable macro beads for use in infection control of large traumatic injuries.	*	654
• (U) Complete technical demonstration of medic bag and supply packet for casualty aid. Complete evaluations and testing for Field Triage Light and Field Anesthesia Machine.	3Q94	1355
Total		**2800**

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Minimizing Blood Loss and Optimizing Fluid Resuscitation: Assess safety of acellular hemoglobin for use as blood substitute. Provide doctrine to incorporate Hypertonic Saline Dextran into military medicine.	4Q95	821
• (U) Secondary Damage After Hemorrhage or Major Injuries; Musculoskeletal and Maxillofacial Injuries; Wound Healing: Identify mechanisms controlling new blood vessel growth during wound healing.	3Q95	736
• (U) Far-Forward Systems for Airway, Anesthesia Delivery, Surgery, and Casualty Management: Refine high frequency mechanical ventilator. Investigate innovative technologies for improving field medical care.	*	1597
Total		**3154**

(U) Project D995 - Medical Chemical Defense Life Support Materiel - Non-Systems Specific Advanced Development: This non-system specific advanced development project supports the investigation of new medical countermeasures to include antidotes, pretreatment drugs, and topical skin protectants to protect U.S. forces against known and emerging chemical warfare (CW) threat agents. Capabilities are maintained for preformulation, formulation, and scale-up of candidate compounds using current good laboratory practices (CGLP). Analytical stability studies, and safety and efficacy screening in addition to preclinical toxicology studies are performed prior to full scale development on promising pretreatment or treatment compounds. This program also supports the DOD core drug program as well as the development of prototypes and models for the development of medical chemical defense devices and materiel.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Developed analytical methods for the detection of sulfur mustard and lewisite in biological samples; developed		

* This is continuing research which is reviewed periodically, ensuring quality, relevance, and priority.

Program Element: #0603002A
Title: Medical Advanced Technology — Budget Activity: #3

18 new software tests to predict decrements in military performance.	1Q93	9968
• (U) Performed toxicity and safety assessments of two methemoglobin formers in preparation for transition of a cyanide pretreatment.	4Q93	558
• (U) Screened candidate advanced anticonvulsants, replacement oximes, and novel anticholinergic compounds; screened candidate decontaminants; modeled impacts of replacement countermeasures.	1Q93	588
• (U) Established and improved in vitro source of catalytic and immunological scavengers of nerve agents.	3Q93	497
• (U) Established in vitro and in vivo models to conduct large scale screening of candidate therapies for respiratory agent exposure.	2Q93	162
Total		**11773**

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Validate countermeasures to sulfur mustard; produce reactive components for topical skin protectant; validate tests for vesicants in biological fluids.	3Q94	8056
• (U) Prepare to transition to advanced development a methemoglobin forming pharmaceutical for protection against cyanide.	4Q94	2307
• (U) Develop antibodies to specific biochemical stages of the nerve agent poisoning process; validate methods to detect agents in biological fluids.	2Q94	1280
• (U) Validate advanced biotechnological approaches to development of catalytic and immunological scavengers for nerve agents.	*	837
Total		**12480**

(U) FY 1995 Planned Program:		
• (U) Validate countermeasures to sulfur mustard; produce reactive components for topical skin protectant; validate tests for vesicants in biological fluids.	3Q95	7823
• (U) Transition to advanced development a methemoglobin forming pharmaceutical for protection against cyanide. Ends FY95.	1Q95	2351
• (U) Develop antibodies to specific biochemical stages of the nerve agent poisoning process; validate methods to detect agents in biological fluids.	*	585
• (U) Validate advanced biotechnological approaches to development of catalytic and immunological scavengers for nerve agents.	4Q95	667

* This is continuing research which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603002A**
Title: **Medical Advanced Technology**

Budget Activity: **#3**

• **(U)** Validate decontamination, diagnostic, prognostic, and treatment procedures directly applicable to patient management.		
Total	3Q95	1409 12835

(U) Work Performed By:
D807: U.S. Army Medical Research Institute of Infectious Diseases, Fort Detrick, MD; U.S. Army Medical Research Institute of Chemical Defense, Aberdeen Proving Grounds, MD; Walter Reed Army Institute of Research, Washington, D.C.,; Naval Medical Research Institute, Bethesda, MD; the remainder is performed by extramural contractors (nonprofit organizations, universities, and industries). The largest contractors are Battelle Memorial Institute, Columbus, OH and Southern Research Institute, Birmingham, AL.
D810: Walter Reed Army Institute of Research, along with field units in Thailand, Korea, Brazil, and Kenya, the U.S. Army Medical Research Institute of Infectious Diseases perform in-house Army research. The remainder is performed by Naval Medical Research Institute and the U.S. Navy field units and by extramural non-profit organizations, universities, and industries. Herner and Company, Arlington, VA; University of California, San Francisco, CA; SRI International, Menlo Park, CA
D819: Walter Reed Army Institute of Research, Washington, D.C.; Army Medical Research Detachment, Brooks Air Force Base, TX; US Army Research Institute of Environmental Medicine, Natick, MA; US Army Aeromedical Research Laboratory, Fort Rucker, AL. The two largest contractors are: Louisiana State University, Baton Rouge, LA; Guthrie Foundation, Sayre, PA.
D840: Letterman Army Institute of Research, Presidio of San Francisco, CA; Institute of Dental Research, Washington, D.C.; US Army Medical Materiel Development Activity, Fort Detrick, MD ; Walter Reed Army Institute of Research, Washington, D.C.;
D995: In-house research is performed by the U.S. Army Medical Research Institute of Chemical Defense, Aberdeen Proving Ground, MD; the Walter Reed Army Institute of Research, Washington, DC; the U.S. Army Research Institute of Environmental Medicine, Natick, MA; U.S. Navy laboratories; U.S. Air Force laboratories; and various other government laboratories. Contractors are Battelle Memorial Institute, Columbus, OH; Rolm and Haas Company, Spring House, PA; Science Application International Corporation, McLean, VA; Research Triangle Institute, Research Triangle Park, NC; Ash Stevens, Inc., Detroit, MI; Starks Associates, Inc., Buffalo, NY; University of Iowa, Iowa City, IA; SRI International, Menlo Park, CA; University of California, San Francisco, CA; Southern Research Institute, Birmingham, AL; Herner and Company, Arlington, VA.

(U) Related Activities:
PE #0601102A (Defense Medical Sciences)
PE #0602720A (Environmental Quality Technology) (DA Proj 835 only)
PE #0602787A (Medical Technology)
PE #0603105A (Military HIV Research)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603002A
Title: Medical Advanced Technology

Budget Activity: #3

PE #0603807A (Medical Systems-Advanced Development)
PE #0604807A (Medical Materiel/Medical Biological Defense Equipment-Engineering Development)

Centralized management is used to avoid duplication within the Army. Inter-service duplication is avoided through Joint Service coordination. The Army is designated by Congress as the lead agency for infectious disease research, and by the DOD as the Executive Agent for chemical and biological defense. In this capacity, the Army executes formal coordination under the Joint Service Agreement and the Armed Services Biomedical Research, Evaluation and Management (ASBREM) Committee. Coordination with Quadripartite and NATO nations is accomplished through meetings and Data Exchange Annexes.

(U) Other Appropriation Funds: ($ in Thousands) Procurement of completed products is provided for in Other Procurement, Army (OPA) or Operation and Maintenance, Army (OMA) or passed to other procuring agencies as appropriate.

(U) International Cooperative Agreements: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603003A**
PE Title: **Aviation Advanced Technology** Budget Activity: **#3**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D313 Research Aircraft Systems	2361	10669	4937	16137	13088	32184	32677	Cont'd	Cont'd
D391 Tractor Will	0	0	9529	9990	5216	0	0	0	24735
D435 Aircraft Weapons	496	935	3158	2978	0	0	0	0	33045
D436 Rotary Wing Controls and Rotors	15007	8007	12730	25976	19918	6950	4854	Cont'd	Cont'd
D447 Aircraft Demonstration Engines	7429	4505	6015	7194	8052	7949	7891	Cont'd	Cont'd
DB38 Tractor Cone	5842	2469	0	0	0	0	0	0	14628
DB39 Advanced Distributed Simulation	5436	12601	9873	0	0	0	0	Cont'd	Cont'd
DB97 Aircraft Avionics Equipment	3688	2220	5108	4728	0	0	0	0	37334
PE TOTAL	40259	41406	51350	67003	46274	47083	45422		

B. (U) BRIEF DESCRIPTION OF ELEMENT: The technology is applicable for required continuous improvement of existing DOD/Army rotorcraft and future rotorcraft. The Army has the DoD lead for rotorcraft technology and in fact this PE and PE 0602211 provide the majority of Federal Government funding for rotorcraft technology in this country. Essential to our national competitiveness in rotorcraft, this PE funds partnerships with NASA, Industry and Academia such as the National Rotorcraft Center planned for FY95 at the NASA Ames Research Center, Mountain View, CA. home of the Army's Aeroflightdynamics Directorate. Modern Army rotorcraft will be required to support the Army's global mission. Army aviation will face advanced air defense threats including optically and radar equipped 23mm and 30mm air defense guns; SA-11, -13, -14, and -15 infrared and radar guided missiles; lasers; and potential nuclear/biological/chemical threats. As a result, rotorcraft must possess improved mobility, agility, firepower, durability, safety and sustainability for extended periods of combat at an affordable cost. Army aircraft must

be durable, damage tolerant, easy to repair and maintain including in a Nuclear, Biological and Chemical (NBC) environment, and possess the highest level of availability possible. The application of fiber optic technology, advanced powertrain technology, integration of advanced weapons and fire control, advanced simulation technology, artificial intelligence, and advanced avionics for command and control and navigation are the keys to providing reliable, survivable and safe Army aircraft essential to the future battlefield. This program element provides for the integration and demonstration of advanced technology components and subsystems. Emphasis is placed on application of advanced composites structures; ballistically tolerant materials; digital avionics and displays to enable day/night adverse weather nap-of-the-earth operations; advanced propulsion systems (engine and drive train) and rotors for improved mobility, maneuverability, agility, reduced weight/cost and fuel consumption; advanced digital flight controls for reduced weight and cost; advanced weapons integration; improved safety, survivability, reliability, maintainability; reduced pilot workload/training requirements; and selective application of Integrated Product and Process Development (IPPD) techniques. In addition, this program element standardizes rotorcraft simulator component interfaces to facilitate system growth and affordability in terms of full mission simulation performance. A rapidly reconfigurable data base is integrated to provide nap-of-the-earth resolutions for Army pre-mission planning and training. A crew station full mission simulator demonstrates future rotorcraft man-machine interaction and performance. Efforts conducted in this PE will develop simulation capabilities used for demonstrating and assessing advancements in distributed large scale, networked real-time, man-in-the-loop, upward compatible simulation architectures, and emerging tri-service/industry standards and methods for representing battlefield behaviors through use of selective levels of simulation fidelity and network participation. Demonstrations will develop and demonstrate a verified, validated and accredited (VV&A) Distributed Interactive Simulation (DIS) capability to assess weapon system virtual prototyping, concept formulation, requirements definition, effectiveness evaluation, and mission area analysis on a combined arms battlefield at the Battalion Task Force or Brigade level. The work in this PE is consistent with the Army Science and Technology Master Plan (ASTMP), the Army Aviation Modernization Plan; and DoD Project Reliance agreements.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project D313 - Research Aircraft Systems: This project provides for technology demonstration in support of research for advanced airframes/structures, drivetrains and rotors/controls. Focus is on technology to allow rotorcraft to meet the challenge from peacekeeping to the future battlefield. The project also provides Army support for cooperative research efforts conducted with industry and with the National Aeronautics and Space Administration (NASA) in the area of advanced rotary wing aircraft. Growth in this project is due to a classified program initiated in FY94, transferred to Project D391 in FY95. Project supports development and establishment of the DoD/Army National Rotorcraft Center (NRC) starting in FY95 and continuing. NRC will serve as Army/NASA focal point for cooperative R&D with industry on technologies critical to U.S. rotorcraft military and economic competitiveness. Approach is similar to the highly successful National Automotive Center at the U.S. Army TACOM.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603003A**
PE Title: **Aviation Advanced Technology**

Budget Activity: **#3**

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Conducted simulation/flight test to establish baseline handling qualities for cargo helicopters	4Q93	708
• (U) Developed technologies integration of mission planning/maneuver control/Intel functionality into a cohesive aviation command post infrastructure	3Q93	1000
• (U) Evaluated integration concepts for aviation command and control within the combined arms team	4Q93	653
Total		**2361**

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) This is a classified program		10669

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Establish the National Rotorcraft Center for rotorcraft technologies emphasizing application of Integrated Product and Process Development (IPPD) principles in research, development, manufacturing and education	*	1437
• (U) Design and demonstrate the benefits of applying fuzzy logic theory to rotorcraft digital flight control technology	4Q95	3500
Total		**4937**

(U) Project D391 - Tractor Will:

• (U) This is a classified program transferred from Project D313.		
Total		

(U) Project D435 - Aircraft Weapons: This project demonstrates rotorcraft weaponization technologies utilizing an integrated system approach. Integration of advanced missile, rocket and gun systems' fire control, target acquisition and weapon system selection processes are demonstrated. Project supports Rotorcraft Pilot's Associate (RPA) program.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Completed evaluation of flight demonstration of Universal Tracker Enhancement Kit (UTEK) for air-to-air tracking	2Q93	210

* This is continuing work which is reviewed periodically, ensuring quality, relevance and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603003A**
PE Title: **Aviation Advanced Technology** Budget Activity: **#3**

• (U) Completed final evaluation of Integrated Air-to-Air Weapons (INTAAW) program	4Q93	286
Total		**496**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Provide weaponization and target acquisition support for the RPA conceptual design	2Q94	640
• (U) Develop rotorcraft weapons and target acquisition modeling to support development of Distributed Interactive Simulation (DIS)	4Q94	295
Total		**935**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Develop cognitive decision aids, conduct weapons/target acquisition integration to support RPA preliminary design	4Q95	2500
• (U) Provide weapons and target acquisition support to RPA baseline aircraft evaluation in Battlefield Distributed Simulation-Developmental (BDS-D) DIS environment	4Q95	658
Total		**3158**

(U) Project D436 - Rotary Wing Controls and Rotors: The objective of this project is to demonstrate man-machine integration, rotors and control technology to provide enhanced helicopter pilotage capability, improved crew workload distribution, increased maneuverability/agility, with reduced vibration and maintenance. Provides for the demonstration of rotorcraft crew stations utilizing knowledge based information systems to develop Cognitive Decision Aiding (CDA) for crews. Advanced technology in information technology computing methods, sensors, displays, and controls are demonstrated to maximize combat helicopter mission effectiveness and survivability for day/night adverse weather operations. Provides for the demonstration of simulation capability to evaluate combined rotorcraft control and crew performance via virtual prototyping and Battlefield Distributed Simulation-Developmental (BDS-D).

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Developed RPA program computational environment	4Q93	2000
• (U) Performed concept analysis and preliminary system design for RPA program	4Q93	8368
• (U) Demonstrated Crew Station Research and Development Facility (CSRDF) and BDS-D network link & conducted initial simulation of aided target recognition/sensor fusion in support of Multi-Sensor Aided Targeting-Air technology demonstration	4Q93	4639
Total		**15007**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603003A**
PE Title: **Aviation Advanced Technology**

Budget Activity: **#3**

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Develop the RPA conceptual design including System Software Build ("Build 1")	4Q94	3165
• (U) Develop DIS environment capability for RPA baseline simulations	3Q94	2430
• (U) Perform preliminary acceptance of mission equipment simulation and preliminary design of 4-axis side arm controller	4Q94	2412
Total		**8007**

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Complete RPA system hardware and software preliminary design, system hardware critical design review and initiate baseline aircraft evaluation in BDS-D simulation network environment	4Q95	11369
• (U) Develop SPIRIT 4-axis side arm controller critical design and airworthy helmet mounted display preliminary design	4Q95	1361
Total		**12730**

(U) Project D447 - Aircraft Demonstration Engines: The objective of this project is to competitively perform design, fabrication and test of advanced technology engines and integrated components to demonstrate achievable improved performance levels for current and future DOD aircraft emphasizing Army unique requirements. The current/planned Joint Turbine Advanced Gas Generator (JTAGG) efforts are all fully coordinated/aligned with the phases/goals of the DOD Integrated High Performance Turbine Engine Technology (IHPTET) program and industry. IHPTET/JTAGG goals focus on reducing specific fuel consumption (SFC) and increasing the power to weight (P/W) ratio of turboshaft engines.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Completed JTAGG I+ component design and tested axial compressor	4Q94	2125
• (U) Demonstrated JTAGG I+ combustor performance goals	4Q94	1550
• (U) Fabricated JTAGG I+ rig/gas generator hardware, initiated final configuration gas generator hardware	4Q94	3754
Total		**7429**

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Demonstrate JTAGG I+ turboshaft engine goals (25% reduction SFC/40% increase P/W)	4Q94	2075
• (U) Conduct JTAGG I+ alternate fuels test, 30 hour gas generator durability test, and starter/generator operation verification in gas generator	4Q94	960
• (U) Conduct JTAGG II demonstrator initial design, component fabrication and test	*	1470

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603003A**
PE Title: **Aviation Advanced Technology**

Budget Activity: **#3**

Total		**4505**

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Conduct JTAGG II component rig test in support of IHPTET Phase II goals (30% reduction SFC/80% incr. P/W)	*	1132
• (U) Conduct preliminary build-up of JTAGG II gas generator and conduct preliminary testing	*	2857
• (U) Conduct JTAGG II performance optimization design, fabrication, rig test in support of IHPTET Phase II goals	*	2026
Total		**6015**

(U) Project DB38 - Tractor Cone: This is a classified program.

(U) Project DB39 - Advanced Distributed Simulation: This project supports the Battlefield Distributed Simulation-Developmental (BDS-D) program and the Anti Armor (A2) Distributed Interactive Simulation (DIS) program. In FY93, the A2 program was supported by PE #0603654A, Project D460 The BDS-D program simulation capabilities will be used for demonstrating and assessing advancements in distributed large scale, networked real-time, man-in-the-loop, upward compatible simulation architectures, and emerging tri-service/industry standards and methods for representing battlefield behaviors through use of selective levels of simulation fidelity and network participation. The A2 program is intended to develop and demonstrate a verified, validated and accredited (VV&A) Distributed Interactive Simulation (DIS) capability to assess anti armor weapon system virtual prototyping, concept formulation, requirements definition, effectiveness evaluation, and mission area analysis on a combined arms battlefield at the Battalion Task Force or Brigade level. The results of this evaluation will support virtual prototyping effectiveness analysis; and make future weapon system improvements more timely, effective and affordable.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Developed baseline for semi-automated forces and development of BDS-D architecture	*	2378
• (U) Demonstrated first phase expanded DIS Version 1.0 and site-to-site linkage between CSRDF Moffet Field, CA, Ft. Rucker, AL, Ft. Knox, KY. and U.S. Army Tank-Automotive Command	3Q93	43
• (U) Develop Corps level command and control virtual simulation work station capability for Depth and Simultaneous Attack Battle Laboratory critical mobile target demonstrations and tactics development	*	3015
Total		**5436**

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603003A**
PE Title: **Aviation Advanced Technology** Budget Activity: **#3**

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Develop Verification, Validation and Accreditation (VV&A) plans for weapons systems supporting A2 program and develop detailed Integrated Engineering Plans for all experiments	3Q94	1300
• (U) Initiate development of AGS, JAVELIN, NLOS, LOSAT, M2A3/M3A3, Comanche, and Apache simulations and VV&A plans	*	5375
• (U) Conduct experiments with M1A2 IOTE live simulations and M1A2, LOSAT, and NLOS virtual simulators	4Q94	2200
• (U) Establish baseline for modular semi-automated forces and conduct developmental research in support of BDS-D architecture	*	3726
Total		**12601**

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Link JANUS Semi-Automated Force model to BDS-D DIS perform VV&A	3Q95	300
• (U) Conduct Rapid Force Projection Initiative DIS experiments using JANUS as a SAFOR, M2A3/M3A3, Apache and Comanche virtual simulators	4Q95	2473
• (U) Conduct DIS experiments using AGS, JAVELIN, Apache, and Comanche virtual simulators and perform VV&A	3Q95	7100
Total		**9873**

(U) Project DB97 - Aircraft Avionics Equipment: This project supports development and demonstration of advanced, integrated avionics equipment in support of aviation integration into the digitized battlefield. Evolving concepts in digital avionics, will provide new functional capability in the areas of situational awareness, flight path guidance, position reportings and digital data transfer. Work in this project supports the RPA program.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Implemented intelligent message handling capability in Tactical Data Acquisition and Correlation (TDAC) and developed documentation for transfer to RPA program	4Q93	1346
• (U) Completed fabrication of prototype Army Aviation Command and Control (A2C2) console and demonstrated operational capabilities	4Q93	1301
• (U) Provided RPA mission equipment integration support in the areas of communications, navigation, pilotage, voice recognition, controls and displays, and artificial intelligence	4Q93	1041
Total		**3688**

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FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603003A
PE Title: Aviation Advanced Technology

Budget Activity: #3

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Design an advanced architecture for advanced automated and integrated cockpits to improve situational awareness	3Q94	1000
• (U) Provide RPA mission equipment integration support in the areas of communications, navigation, pilotage, voice recognition, controls and displays, and artificial intelligence	*	490
• (U) Develop integrated information transfer technologies to allow crew head-up, eyes-out operation of rotorcraft operation	4Q94	730
Total		**2220**

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Demonstrate real-time CDA for information transfer between advanced avionics and c ·w in a full mission simulation	4Q95	2935
• (U) Provide RPA mission equipment integration support in the areas of communications, navigation, pilotage, voice recognition, controls and displays, and artificial intelligence	*	841
• (U) Develop information/data fusion approach for integrating information from advanced mission equipment and communications systems	4Q95	1332
Total		**5108**

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(U) Work Performed By: Contractors include: McDonnell Helicopter Company, Meza, AZ., Boeing Helicopter Company, Philadelphia, PA., Loral Western Development Laboratories, San Jose, CA., Bell Helicopter Textron Incorporated, Ft. Worth, TX., Martin Marrietta, Atlanta, GA., General Electric, Lynn, MA., Textron Lycoming, Stratford, CT., Allied Signal Power and Engine, Phoenix, AZ., Honeywell, Minneapolis, MN., BDM International, Albuquerque, NM., MITRE, McClean, VA. and CAE Electronics, Montreal, Canada. Primary in-house developers of the technology under this program element include Simulation and Training Command (STRICOM), Orlando, FL; Aviation and Troop Command (ATCOM), St. Louis, MO; Communications Electronics Command (CECOM), Ft Monmouth, NJ; Structures Directorate/Army Research Laboratory (ARL), NASA Langley Research Center, Hampton, VA; Aeroflightdynamics Directorate/ATCOM, NASA Ames Research Center, Moffett Field, CA; Vehicle Propulsion Directorate/ARL NASA Lewis Research Center, Cleveland, OH; and Aviation Applied Technology Directorate, ATCOM, Ft Eustis, VA. Related activities are performed by National Aeronautics and Space Administration.

(U) Related Activities: This program adheres to DoD Project Reliance Agreements on Aeropropulsion and Air Vehicles (Rotary) with oversight and

coordination provided by the Joint Directors of Laboratories; and Training Systems with oversight and coordination provided by the Training and Personnel Systems Science & Technology Evaluation Management Committee (TAPSTEM). Related concept exploration is conducted under PE #0602211A (Aviation Technology).

Efforts under this PE transition and provide risk reduction for and lead into Demonstration/Validation and Engineering Development programs supported by PE #0603801A (Aviation - Advanced Development) PE #0604801A (Aviation - Engineering Development) and PE #0604270A (Electronic Warfare Development). In addition, this PE's deliverables provide technical support and technology transition to PE #0604223A (RAH-66 Comanche), PE #0604816A (Longbow), PE #0203744A (Aircraft Modifications/Product Improvement).

As a part of our total coordination, the Army participates on and with the following groups, organizations and programs: the DOD Tri-service Joint Technical Coordination Group for Munitions Development and Aircraft Survivability; Acoustical Society of American Standards, Committee on Acoustics Group for Aerospace Research and Development; Aircraft Instruments and Aircrew Station Working Group; the NATO Military Agency for Standardization Air Armament Working Party; the Joint Integrated Avionics Working Group (JIAWG); Integrated High Performance Turbine Engine Technology (IHPTET) Steering Committee; the Air Armament Working Party of NATO; The Army's Combined Arms Weapon System (TACAWS) Executive Steering Committee and the Executive Steering Committee for the RPA Program. This participation enables the gathering of technical information and assets in determining the joint use and standardization of airborne weaponization items. The Army Munitions Research and Development Committee, an organization within the Office of the Secretary of Defense, functions to establish Joint Service requirements and the development of air munitions. There is no unnecessary duplication of effort within the Army or Department of Defense.

(U) Other Appropriation Funds: ($ in Thousands) Not applicable.

(U) International Cooperative Agreements: The international related activities are the Technical Cooperation Programs with Australian, Canadian and United Kingdom governments, Defense Development Share Plans. Formal Memorandums of Understanding (MOUs) and Data Exchange Agreements (DEAs) with various friendly nations are actively pursued to allow technology information exchange.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603004A**
PE Title: **Weapons and Munitions Advanced Technology**

Budget Activity: **#3**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DL05 Bunker Defeat Munition	4715	0	0	0	0	0	0	0	10624
DL94 Electric Gun Systems Demonstration	39884	10895	8887	9994	11033	12096	12133	Cont	Cont
DL95 Land Mine Warfare Development	0	0	3142	2993	2249	2490	2796	Cont	Cont
D43A Advanced Weaponry Technology Demonstrations	7571	12623	11706	10349	12648	20318	17783	Cont	Cont
D232 Advanced Warhead Demonstration	4105	3751	1827	2635	2589	3478	3531	Cont	Cont
D439 Advanced Armaments Demonstrations	2786	0	0	0	0	0	0	0	2786
PE TOTAL	59061	27269	25562	25971	28519	38382	36243		

B. (U) BRIEF DESCRIPTION OF ELEMENT: The objective of this Program Element (PE) is to demonstrate advanced weapons and munitions technologies that will increase battlefield lethality and survivability. This PE funds several stand-off, anti-armor weapons demonstrations under the Rapid Force Projection Initiative (RFPI) to significantly increase the capability of our early entry air deployable forces. The RFPI demonstrations funded within this PE include: the Precision Guided Mortar Munition, Advanced Submunition Sensor Technology, and 155mm Light Weight Automated Howitzer. Beginning in FY 1995, this PE includes an Intelligent Minefield demonstration (Project DL95), the funds for which were moved from PE 0603606A in a zero sum transfer to consolidate all weapons advanced technology demonstrations under this PE. The primary objective of gun propulsion activities is to significantly enhance lethality by maximizing muzzle velocity and increasing range. The technologies being pursued for this effort include emphasis on electromagnetic (EM) weapons for tank, other direct fire and indirect fire applications, with an oversight role in an electrothermal-chemical (ETC) application. In the area of combat vehicle anti-armor munitions, advanced explosively formed penetrator warheads exploit technologies in explosives, liner materials, and demonstrate increased armor penetration through advanced warhead concepts. Also, new, more energetic formulations for warheads, including Insensitive Munition (IM) technology, will be demonstrated. Under field artillery technologies, new cannon-fired smart munitions technologies will be demonstrated to provide upgrade options. Technologies are being

developed to demonstrate an artillery projectile capable of ranges in excess of 40 kilometers. FY 1993 funds supported Cased Telescoped Ammunition (CTA) and a congressionally mandated program to validate a throwaway munition for neutralizing earth and timber bunker field fortifications. Work in this program element is consistent with the Army Science and Technology Master Plan, the Army Modernization Plan, and Project Reliance.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project DL05 - Bunker Defeat Munition: This program was established in response to congressional interest in fielding an interim system to meet the Multi-Purpose Individual Munition requirement. One year funding was provided to test candidate systems.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Achieved generic Type Classification of BDM performance specifications, awarded contracts and initiated the side-by-side test	3Q94	4715

(U) FY 1994 Planned Program: N/A

(U) FY 1995 Planned Program: N/A

(U) Project DL94 - Electric Gun Systems Demonstration: This project utilizes pulsed electrical energy concepts and technologies to demonstrate the propulsion of hypervelocity projectiles. The Electromagnetic (EM) technology will be demonstrated by this project. EM guns use an intense magnetic field to achieve velocities not possible by conventional means. There are two major efforts in the EM arena; Cannon Caliber EM Gun (CCEMG) system and the Focused Technology Program (FTP). The CCEMG is the joint Army and U.S. Marine Corps (USMC) program to develop EM gun component technologies with specific application to a more lethal cannon caliber (20-40mm) EM gun system. The FTP program, presently developing generic EM technologies to support all mission areas, will redirect its efforts in FY 95 and beyond to focus mainly on the development of a compact, high energy density rotating machine pulsed power source (minimum 5 kilojoules/kilogram) to support potential large caliber applications. Evaluation of ETC for the anti-armor mission area will be completed in FY 1994. Follow on ETC activities will only be in support of Navy technology developments (the Navy has prime ETC development responsibility), mainly in the area of energetic materials.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Completed Phase I of the Joint Army/USMC Cannon Caliber EM Gun program (CCEMG); performed trade-off studies,		

analyses and design of components	*	2900
• (U) Completed Phase I, technology enhancement, of the Focused Technology Program (FTP) to determine which technology approach will achieve program goals	*	13800
• (U) Developed and tested advanced EM integrated launch packages to demonstrate launch ability of novel designs	*	2000
• (U) Developed new assembly procedures for pulsed package supplies to mitigate risk in assembly	*	5300
• (U) Tested/fired large and small caliber EM and ETC guns/launch packages to study effects on materials and verify computer models	*	4600
• (U) Supported hypervelocity physics and electromechanics analyses with the Federally Funded Research and Development Center, Institute of Advanced Technology, for tactical EM gun development	*	4282
• (U) Developed components to advance pulsed power, launch and launch package technology to support tactical 9 megajoule (MJ) gun development	*	1402
• (U) Completed Phase I of General Dynamics ETC propulsion program for artillery application	4Q94	5600
Total		**39884**

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Complete Phase II, Component & System Design/Fabricate/Integrate/Test, of Joint Army/USMC Cannon Caliber EM Gun program	*	3889
• (U) Complete Phase IIa, critical experiments, of the Focused Technology Program to validate technology selected through experimentation	*	2889
• (U) Fire Sabot Launched Electric Gun Kinetic Energy projectiles at 8 MJ with both plasma and solid armatures	*	1889
• (U) Deliver 9MJ Skid Gun to Yuma Proving Ground; initiate Army's first "out of laboratory" EM firings	*	1888
• (U) Complete ETC anti-armor evaluation program	4Q94	340
Total		**10895**

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Conduct Cannon Caliber EM Gun technical demonstration of system performance	4Q95	4500
• (U) Initiate Phase IIb, Critical Component Design of Focused Technology Program, to finalize design of high energy density rotating machine pulsed power supply	*	3000
• (U) Initiate 9MJ Skid Gun long range testing at Yuma Proving Ground	*	1300

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FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603004A**
PE Title: **Weapons and Munitions Advanced Technology**

Budget Activity: **#3**

- (U) Develop components to advance state-of-the-art for pulse power and launch/launch package to increase tactical potential of EM Gun development — * 87

Total — **8887**

(U) Project DL95 - Landmine Warfare Development: This project funds the Intelligent Mine Field (IMF) demonstration, which is a weapon candidate under the Rapid Force Projection Initiative (RFPI). The IMF will demonstrate the flexibility and battlefield effectiveness of coordinated smart mine attack utilizing Artificial Intelligence (AI), decision aids, Automatic Target Recognition (ATR), intermine communication, and extended range command and control. Mines that can defeat targets over a wide area have a tremendous payoff, especially for light forces that are weight and space constrained when they deploy. Additionally, such features such as a high probability of kill provided by top attack and command and control (e.g., on/off capability), make such mines very effective force multipliers. Beginning in FY 1995, funds for this project were transferred from PE 0603606A, project D006, in a zero sum restructure. The purpose of this action was to consolidate all weapons and munitions demonstrations under the same PE and laboratory management structure.

(U) FY 1993 Accomplishments: See Project D006, PE 0603606A

(U) FY 1994 Planned Program: See Project D006, PE 0603606A

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Complete IMF simulator prototype and provide IMF support to RFPI early version demonstration	*	3142

(U) Project D43A - Advanced Weaponry Technology Demonstrations: This project includes most of the stand-off weapons demonstrations under the Rapid Force Projection Initiative (RFPI). These weapons demonstrations are vital to assessing new tactics and technologies for light forces to defeat tanks. Collectively, these weapons constitute stand-off killer options for the RFPI "Hunter/Stand-off Killer" approach. The Precision Guided Mortar Munition (PGMM) demonstration will feature an extended range, top-attack, anti-armor capability for light forces. It will include assessments of both 81mm and 120mm candidates. The Advanced Sensor Submunition Technology (ASST) program will demonstrate an advanced sensor, lethal mechanism and aerostability devices to increase the footprint of smart munitions, enhancing their effective against moving targets. It will also demonstrate an autonomous smart munition with an Identification, Friend-or-Foe (IFF) feature to reduce the potential for fratricide. A 155mm Lightweight Automated Howitzer study will assess the potential of such a system and help define its necessary characteristics (e.g., weight, ammunition handling, and fire control). Demonstrations of new energetic materials address the dual challenge of improving performance of high explosives while providing improvements in safety by avoiding undesired or unintentional detonation. An extended range artillery projectile

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demonstration will move the Army closer to resolving its artillery range deficit. Most of the concepts to be demonstrated herein are candidates for technology insertions and many provide significant enhancement to the Army's early entry forces.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Conducted performance and Insensitive Munition (IM) testing for HELLFIRE	4Q93	1960
• (U) Conducted fast cook-off, bullet impact, fragment impact, and sympathetic detonation IM testing for tank munitions	*	1175
• (U) Conducted loading study of IM explosives, PAX2A and PBXN-9 in support of Javelin/TACAWS	*	785
• (U) Demonstrated mounted mortar enhanced operational capability over existing manual fire control techniques in support of Mounted Warfighting Battlespace Lab digitized battlefield exercise	4Q93	251
• (U) Awarded Extended Range Artillery (ERA) projectile, XM982, metal parts contracts and conducted comprehensive ballistic testing of rocket motor, aft baseburn motor and expulsion system	*	3400
Total		**7571**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Demonstrate advanced warhead concept for 81mm Smart Mortar; design/fabricate lightweight mortar fire control for 120mm PGMM	*	2443
• (U) Test and evaluate LADAR/MMW radar sensor and IFF for ASST	*	992
• (U) Test IM explosives for performance/environmental requirements; develop tank munitions IM technology to support TACAWS	*	2553
• (U) Define lightweight howitzer automation parameters, investigate recoil attenuation techniques, and conduct composite component studies	*	381
• (U) Conduct flight testing of prototype XM982 ERA projectile with brassboard imbedded fuze and cargo ejection at 50km range	4Q94	5000
• (U) Demonstrate IM technology for Javelin and Wide Area Mines (WAM)	*	1254
Total		**12623**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Develop/test/integrate 81/120mm PGMM components for RFPI demonstration	*	5626
• (U) Conduct tests and analysis to define concept for ASST	*	5204

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FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603004A
PE Title: Weapons and Munitions Advanced Technology

Budget Activity: #3

• (U) Demonstrate IM technology to support future anti-armor warheads	4Q95	688
• (U) Perform lightweight automated howitzer trade-off studies to determine optimum technical approach	*	188
Total		**11706**

(U) Project D232 - Advanced Warhead Demonstration: This project demonstrates advanced warhead concepts, such as novel explosively formed penetrators (EFP), that can be applied to product improvements to fielded and developmental anti-armor munitions (e.g., Advanced Sensor Submunition Technology (ASST), Wide Area Mines (WAM), Smart Target Activated Fire and Forget (STAFF), and The Army Combined Arms Weapons System (TACAWS)). It advances warhead technology to enhance the lethality of smart projectiles by providing multi-role, multi-effect warheads capable of defeating point and area targets. New Kinetic Energy (KE) Precursor warhead concepts will also be demonstrated that are capable of defeating explosive reactive armors designed to defeat long rod penetrators. It provides opportunities to enhance several weapons options, such as the Precision Guided Mortar Munition.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Evaluated EFP warhead designs to provide multi-role capability for target defeat	*	3700
• (U) Incorporated most promising component technologies to enhance EFP warheads	*	205
• (U) Evaluated the performance enhancements of EFP warheads	*	200
Total		**4105**

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Optimize designs for multi-role capability against heavy or light armor EFP warheads	*	1000
• (U) Fabricate and test full scale selectable against heavy or light armor EFP warheads	*	751
• (U) Design and fabricate promising KE precursor concepts and conduct 120mm tank gun launched tests	4Q94	2000
Total		**3751**

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Static feasibility demonstration of selectable EFP and Dual Liner EFP warheads; transition to TACAWS, STAFF, WAM	4Q95	325
• (U) Fabricate and conduct dynamic test of selectable EFP warhead	4Q95	400
• (U) Optimize design/demonstrate telescoping EFP warhead	4Q95	1102
Total		**1827**

* This is continuing work which is reviewed periodically, ensuring quality, relevance and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603004A
PE Title: Weapons and Munitions Advanced Technology **Budget Activity: #3**

(U) Project D439 - Advanced Armaments Demonstration: This program was established as part of a restructuring of the Armored Systems Modernization program. Funds were transferred to this PE from PE #0603645A to investigate cased telescoped ammunition for a future fighting vehicle or potential upgrades to the Bradley Fighting Vehicle System.

(U) FY 1993 Accomplishments:

• (U) Multi-service mission analysis completed	4Q93	2786

(U) FY 1994 Planned Program: N/A

(U) FY 1995 Planned Program: N/A

(U) Work Performed By: Management of this PE will be accomplished primarily by the U.S. Army Armament Research, Development and Engineering Center (ARDEC). In-house efforts are accomplished by ARDEC, Picatinny Arsenal, NJ and the U.S. Army Research Laboratory (ARL), Aberdeen Proving Ground, MD. Weapons demonstrations included under the Rapid Force Projection Initiative (RFPI) have management oversight of the RFPI top level demonstration program manager at the U.S. Army Missile Research, Development and Engineering Center, Huntsville, AL. Contractors include: Bell Aerospace Textron, Niagara Falls, NY; Thiokol Corp., Elkton, MD; Alliant Tech Systems, Minneapolis, MN; Olin, Charlton, TN; ARMTEC, Palm Springs, CA; General Dynamics Land Systems Division, Warren, MI and Mason County, WV; Science Applications International Corp (SAIC), McLean, VA; LTV Aerospace, Dallas, TX; The Center for Electro Mechanics (CEM), University of Texas, Austin, TX; FMC Corporation, Minneapolis, MN; Textron, Lowell, MA; Hercules, Kenvil, NJ; Mason & Hanger, Middletown, IA; Textron, Inc., Willington, MA; TSI, Mesina Park, NM; Ferrulmatic, Inc. Totowa, NJ; Byrne Int, Lincoln Park, NJ; Talley Defense, Mesa, AZ; KDI Inc., Cincinnati, OH; Ratheon, Bedford, MA; Boeing, Huntsville, AL; Aerojet, Azusa, CA; and Martin Marietta, Orlando, FL; Kaman Projectile Group,

Colorado Springs, CO; IAP, Dayton, OH; Maxwell Labs Inc., San Diego, CA; Parker Kinetics Design, Austin, TX; and Nomura Enterprise, Rock Island, IL.

(U) Related Activities: This program adheres to Tri-Service Reliance Agreements on Conventional air/surface weaponry with oversight provided by the Joint Directors of Laboratories. Work in this Program Element is related to and fully coordinated with efforts in PE #0601101E, PE #0601104A (Electromechanics & Hypervelocity Physics), PE #0602624A (Weapons & Munitions Technology), PE #0604802A (Weapons & Munitions-Engineering Development), PE #0603645A (Armored Systems Modernization-Advanced Development) and in accordance with the on-going Reliance joint planning process and contains no unwarranted duplication of effort among the Military Departments.

(U) Joint Agreements: The Army chairs the OSD Joint Electric Armaments Committee (JEAC) and participates in the following joint projects:

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603004A**
PE Title: **Weapons and Munitions Advanced Technology** Budget Activity: **#3**

ARPA/Army Electromagnetic Gun Memorandum of Understanding (MOU); ARPA/Army/Marine Corps Armor/Anti-Armor (MOU). Joint Electrothermal (ET) Gun Technology work with the Navy is being conducted under the Balanced Technology Initiative (BTI) program. There is no unnecessary duplication of efforts within DOD.

(U) Other Appropriation Funds: ($ in Thousands) Not applicable

(U) International Cooperative Agreements: A two year extension to the Memorandum of Understanding between the UK & US concerning Electromagnetic Launch Technology for tactical applications was signed. Development and coordination of a US/FR/GE umbrella MOU concerning Electric Armament Technology was initiated in 1993. The Netherlands is proposing work on a low voltage electromagnetic armature for Non-Recurring Cost (NRC) funding.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603005A
PE Title: Combat Vehicle and Automotive Advanced Technology **Budget Activity: #3**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D221 Combat Vehicle Survivability	18353	10478	14426	11486	9309	9372	10669	Cont	Cont
D340 Producibility Technology	0	0	0	2650	3479	2928	3337	0	12394
D440 Advanced Combat Vehicle Technology	6669	19798	32217	17472	27958	28859	28428	Cont	Cont
D441 Combat Vehicle Mobility Technology	1765	2097	2314	2650	4350	13815	16003	Cont	Cont
D444 Combat Vehicle Track, Wheel and Suspension	1400	0	0	0	0	0	0	Cont	Cont
D497 Combat Vehicle Electronics	13007	6671	10457	10602	10439	9625	3555	Cont	Cont
PE TOTAL	41194	39044	59414	44860	55535	64599	61662	Cont	Cont

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program demonstrates technical feasibility and operational potential of technologies which contribute to continued upgrades of currently fielded combat vehicles and future ground combat systems. It places emphasis on solutions to post-Cold War deficiencies, providing opportunities for more deployable, survivable, and lethal power projection capabilities than are available today. The technology areas supported by this program element include: survivability, mobility, vehicle electronics and integration of diverse vehicle technologies developed by the Army and other DoD laboratories and industry. In FY 1993, the Component Advanced Technology Test Bed (CATTB) demonstrated integrated components that could be applied to an Abrams upgrade program or other chassis, such as that used for the Advanced Field Artillery System (AFAS). The budget request funds programs designed to address critical technical barriers to making future heavy forces more deployable as part of the Advanced Vehicle Technology umbrella program. Prospects for a smaller future Army with fewer forces deployed overseas, combined with growing regional instability, make power projection of forces with decisive advantages an imperative. New initiatives conducted under this program element include: the advancement of composite materials to reduce weight of ground vehicle structures and armor; integrated survivability (e.g., threat sensors and countermeasures such as jammers, obscurants and decoys); crew size reduction through automation of crew functions and better crew/vehicle integration; low cost, non-development, light class vehicles incorporating sensor technologies to

serve as a "Hunter"; and advanced mobility technologies to improve agility, reduce propulsion system size and weight, and decrease operation and support costs. The superb performance of fielded ground combat systems in Operation Desert Storm was made possible in large part by science and technology investments over the past two decades. Continued investment is necessary, if we are to be as successful in the future. Explanations for changes in program funding are contained in project descriptions. Work in this program element is consistent with the Army Science & Technology Master Plan (ASTMP), the Army Modernization Plan and Project Reliance.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project D221 - Combat Vehicle Survivability: This project funds demonstrations in a laboratory or vehicle test beds of diverse survivability technologies, usually those which have transitioned from exploratory development. Emphasis is on hit avoidance technologies which can be integrated into any ground vehicle system to provide light weight protection against precision guided and smart weapons, which are becoming more prevalent. This approach provides the most practical protection solution against top attack threats because adding ballistic armor, alone, would be unacceptably heavy. A modular approach is applicable to both current and future ground combat vehicles. This project supports a Hit Avoidance demonstration, a program consisting of a system integration laboratory (SIL) for component integration and threat countermeasure simulation, followed by the vehicle demonstration of hemispherical protection. It will provide hardware performance and modeling prediction for an operationally optimal suite of threat sensors and countermeasure devices. Computer control of these suites using expert system software will provide greater combat survival without the weight penalty associated with conventional armor protection. This project also provides increased protection through integration of Identification Friend or Foe (IFF) technologies to reduce fratricide. Survivability technologies that are integrated and demonstrated under this project include those transitioned from the following exploratory developmental programs: advanced armor and other innovative survivability concepts from industry (PE #0602618A); development of a flexible system architecture for the integration of hit avoidance technology on ground combat vehicles (PE #0602601A); active protection countermeasure technology development (PE #0601102A); sensors and countermeasures (PE #0602270A); and development of obscurants and chemical/nuclear sensing (PE #0602622A). FY 1993 funding was increased by OSD to demonstrate top attack protection technologies for the Advanced Field Artillery System, thereby resulting in a relative decrease in FY 1994 funding. Due to the environmental impact of Halon 1301, the Montreal Protocol and the Clean Air Act restrictions on ozone depleting compounds, alternate fire extinguishing agents are needed to maintain current readiness levels and combat vehicle survivability. This effort also supports dual use technology begun under the Strategic Environmental Research and Development Program. The program to identify and evaluate non-ozone depleting substances will be administered by the National Automotive Center which is funded under PE #0602601A.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Demonstrated capability of active radar, ultraviolet and laser sensors to detect and track threats	4Q93	7000
• (U) Adapted and designed countermeasures including laser jammer, active protection and millimeter wave (MMW) jammer for application to ground vehicles	4Q93	6000

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Program Element: #0603005A
PE Title: Combat Vehicle and Automotive Advanced Technology — **Budget Activity: #3**

• (U) Developed modeling architecture for sensor and countermeasure optimization	4Q93	3000
• (U) Developed Hit Avoidance architecture compatible with the standard Army vehicle electronics architecture	4Q93	2353
Total		**18353**

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Conduct trade-off analysis of hit avoidance to determine affordability	4Q94	591
• (U) Demonstrate threat sensors and countermeasures against top attack threats	4Q94	7507
• (U) Deliver technology demonstration assessments for Advanced Field Artillery System	4Q94	2380
Total		**10478**

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Construct System Integration Laboratory for integrated defense system	4Q95	6611
• (U) Demonstrate optimized active protection (physical disrupt) against horizontal smart threats	4Q95	1065
• (U) Construct laser countermeasure for combat vehicle application	4Q95	1750
• (U) Select ozone depleting engine fire extinguishing agent, conduct integration, crew performance and toxicity testing (managed by the National Automotive Center)	4Q95	5000
Total		**14426**

(U) Project D440 - Advanced Combat Vehicle Technology: This program constitutes the critical step in demonstrating the operational potential, technical feasibility and maturity of advanced combat vehicles technologies for potential product improvements andfor the next generation of combat vehicles. The objective is to demonstrate innovative future combat vehicle configurations, technologies and integration techniques through hardware technology demonstrations, computer simulation and full-scale mock-ups, thereby accomplishing more rapid transition of advanced technologies to systems applications. All demonstrations include User and Developer participation in a field or laboratory environment. Efforts examine technologies applicable to lighter weight, more lethal and survivable systems that offer significantly improved deployability over current systems. The budget request funds two major initiatives, continuation of a demonstration of composite materials for vehicle structures, the Composite Armored Vehicle (CAV) program, and separate demonstrations of modified, non-development very light vehicles as "hunters" for the Rapid Force Projection Initiative (RFPI) "hunter/stand-off killer" concept. A contract for the Composite Armored Vehicle (CAV) demonstration was awarded competitively to the FMC Corporation in the first quarter FY 1994. The CAV contract specifies that Integrated Product and Process Development (IPPD) will be employed. A government/industry, multifunctional team approach will be used, concurrently addressing products and their related processes. The CAV will demonstrate a vehicle structure made of composite materials with advanced, lightweight armor and signature management technology to reduce weight and improve survivability. Exploratory development leading to this demonstration began in FY 1992. Many issues, such as manufacturing methods and technology, reparability, ballistic performance, and nondestructive testing, remain to be resolved before

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603005A
PE Title: Combat Vehicle and Automotive Advanced Technology Budget Activity: #3

composite technology can be expected to transition to systems. Lightweight Hunter vehicles, using modified non-development systems, are key elements of the RFPI top level demonstration. A Hunter vehicle is an essential sensor platform candidate for the "Hunter/Stand-off Killer" concept combining technologies and new tactics to enhance anti-armor capabilities of early deploying, light forces. Several cost-effective chassis, with different characteristics and capabilities, will be examined. Among the features to be included are varying detectability levels, wheel versus track, and internal versus external CH-47D helicopter transportability. FY 1993 funding supported the Component Advanced Technology Test Bed (CATTB). Growth from FY 1993 to FY 1994 occurred because of the completion of the CATTB in FY 1993, and the start of CAV and Hunter demonstrations in FY 1994. FY 1995 funding increases because of extensive ballistic, mechanical and chemical testing of small and large composite samples, detailed design activities based on FY 1994 simulations, and procurement of long lead items, all of which are necessary to complete the demonstration in FY 1997.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Completed Laboratory CATTB system integration	4Q93	4196
• (U) Demonstrated Standard Army Vetronics Architecture (SAVA) in CATTB	4Q93	1923
• (U) Demonstrated Vehicle Control and Operating System (VCOS) techniques on CATTB	4Q93	130
• (U) Demonstrated CATTB capabilities in field tests	4Q93	255
• (U) Validated CATTB signature reduction simulation model using demonstrator field tests	4Q93	165
Total		6669

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Form cross-functional concurrent engineering team; add contractor to concurrent engineering team and conduct Six Sigma training; develop light weight composite material/structure approach for CAV demonstration	*	7395
• (U) Develop preliminary design and interface control for CAV demonstration through the IPPD process	*	4190
• (U) Develop advanced production concepts, vehicle concepts and simulation tools for the CAV demonstration vehicle	*	3395
• (U) Perform coupon tests of advanced armors and composite structural configurations to validate approach	*	1768
• (U) Procure wheeled Magic Warrior as Hunter candidate and integrate sensor and communications for Rapid Force Projection Initiative early version demonstration	4Q94	1518
• (U) Acquire Hunter simulator to permit force-on-force simulations	*	739
• (U) Procure multi-spectral applique camouflage for low cost Hunter signature reduction evaluation	*	399
• (U) Perform alternative Hunter chassis requirements analysis	4Q94	394
Total		19798

* This is continuing work which is reviewed periodically, ensuring quality, relevance and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603005A
PE Title: Combat Vehicle and Automotive Advanced Technology Budget Activity: #3

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Develop minimum weight composite demonstrator structural design, addressing all concurrent engineering areas (e.g., manufacturing tools/processes, man-machine interface, and survivability); assess dual-use opportunities	*	12871
• (U) Integrate and validate advanced composite vehicle concepts and simulation tools into the virtual prototyping environment	*	9050
• (U) Perform advanced material, structural component and full scale quarter section tests to optimize structural configuration and validate simulations and manufacturing methods	*	3350
• (U) Purchase advanced survivability, mobility and electronics long lead components required to construct CAV	*	4246
• (U) Construct initial Hunter force-on-force simulations	4Q95	886
• (U) Modify non-developmental item or commercial chassis (including application of low cost signature management) for Hunter (based on FY94 requirements analysis)	*	1814
Total		32217

(U) Project D441 - Combat Vehicle Mobility Technology: This project demonstrates mobility technology (e.g., engines, transmissions, track, suspension) vital for lighter, more deployable ground combat vehicles. The budget request funds advanced mobility technology demonstrations. The principle elements of the mobility demonstration are electric drive, light weight track, and active suspension systems. Military requirements for vehicle power are unique because of the need for very high power with low volume and weight. Operation Desert Storm highlighted the criticality of mobility to battlefield success as our forces executed a lightning fast "left hook" to defeat Iraq. Mobility gaps during this move in command and control vehicles and artillery were significant negative "lessons learned". Despite past accomplishments, the challenges of the post-Cold War era make further advances necessary if future combat vehicles are to be affordable in peacetime, deployable to theater, and more agile than the threat in combat. The need to power vehicles under armor complicates cooling and exhaust signature reduction. Size is crucial as under armor space is at a premium, especially as vehicles become smaller, yet with more power requirements. Above 700 horsepower, there is no commercial basis for compact, high performance engines, so the development of such engines must be funded by the government. In the case of the Abrams tank, track and the propulsion systems are the greatest hardware spares replenishment cost drivers. In a typical combat vehicle, the mobility components contribute to about 40% of the vehicle volume and weight. Future lighter more deployable systems will require significant reductions in propulsion system volume and weight. Future combat vehicle propulsion systems will require a "power density" at least 50% greater than presently available. Mobility technologies can contribute to reducing the logistics burden through increased reliability and accurate prognostics. Better fuel efficiency can make a critical contribution to total force deployability. Advances in electric drive, light weight, long life track, and predictive active suspensions are key to providing a mobility edge. This project was restructured in FY 1994, combining Projects D441 and D444.

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FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603005A
PE Title: Combat Vehicle and Automotive Advanced Technology

Budget Activity: #3

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Conducted investigations of high temperature lubricants and cylinder heads for diesel Advanced Integrated Propulsion System (AIPS)	*	1765

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Design electric drive motor sets for use in combat vehicles	4Q95	200
• (U) Fabricate suspension test bed and demonstrate integrated dynamic track tensioner and external suspension system with lockout and height control	4Q94	800
• (U) Conduct laboratory demonstration of semi-active external suspension components	4Q94	250
• (U) Evaluate high temperature diesel engine lubricants and components	4Q94	847
Total		**2097**

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Demonstrate in laboratory, advanced variable gap and advanced induction electric motor sets	4Q95	1151
• (U) Integrate semi-active damping suspension control into suspension technology demonstrator	4Q95	772
• (U) Complete suspension test bed technology demonstration	4Q95	391
Total		**2314**

(U) Project D444 - Combat Vehicle Track, Wheel and Suspension: This project demonstrated advanced track, wheel and suspension technologies to improve performance, reduce weight and ownership costs. Activities through FY 1993 were focused on demonstrating external suspensions and more durable, lightweight track in the Component Advanced Technology Test Bed (CATTB). This project has been restructured by combining it with Project D441, formerly called Combat Vehicle Propulsion Technology, and renamed Combat Vehicle Mobility Technology.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Integrated lockout and height control features into external suspension system design	4Q93	38
• (U) Conducted laboratory evaluation of dynamic track tensioning system	4Q93	163
• (U) Fabricated suspension test bed hull for integration of dynamic track tensioner and external suspension system with lockout and height control	4Q93	558
• (U) Designed Abrams semi-active suspension components for laboratory test and evaluation	4Q93	282
• (U) Refined XT166 hybrid track design for laboratory and vehicle test hardware fabrication	4Q93	359
Total		**1400**

* This is continuing work which is reviewed periodically, ensuring quality, relevance and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603005A
PE Title: Combat Vehicle and Automotive Advanced Technology

Budget Activity: #3

(U) FY 1994 Planned Program: Not applicable

(U) FY 1995 Planned Program: Not applicable

(U) Project D497 - Combat Vehicle Electronics: This project demonstrates technologies to control power and data distribution in ground combat vehicles, as well as improving the soldier-machine interface through advanced crew station configurations. This project funds the Crewman's Associate demonstration. The Crewman's Associate will demonstrate the feasability of operating a combat vehicle with a smaller crew than is currently possible without degrading overall system capability. Crew size has a large and direct impact on vehicle weight and size by driving under armor volume requirements. Using laboratory soldier-in-the-loop simulators, the Crewman's Associate two-man crew station will demonstrate how the use of improved Soldier Machine Interfaces (i.e., displays and controls) and other advanced crew task aids (e.g., expert systems) can enhance the crew's operation of complex subsystems. Simulation will allow the User to continuously influence and evaluate the capabilities of the Crewman's Associate and refine system requirements prior to building more expensive prototypes and vehicles. The Crewman's Associate will integrate relevant products from the Hit Avoidance, Target Acquisition and Combined Arms Command and Control demonstrations to show that the crew can perform essential combat vehicle functions (e.g., survive, shoot, communicate). The Crewman's Associate provides preplanned product improvement opportunities for the existing fleet (e.g., Abrams, Bradley), as well as contributing to systems in development, such as the Advanced Field Artillery System. FY 1993 funding was increased by OSD to support the restructured Armored Systems Modernization program. FY 1995 funding increases because of increased activity to validate and verify the simulation facility and to conduct laboratory force-on-force simulations, the preparations for which were made in FY 1994.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Defined Crewman's Associate concept/design	4Q95	4907
• (U) Upgraded vehicle electronics simulation facility	4Q93	5000
• (U) Installed and tested Distributed Interactive Simulation (DIS) node	4Q93	500
• (U) Completed vehicle electronics for Component Advanced Technology Test Bed	4Q93	2100
• (U) Took delivery and installed/tested the vehicle electronics system architecture design	4Q93	500
Total		**13007**

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Complete crew task analysis and definition of task aids for Crewman's Associate	4Q94	325
• (U) Design Crewman's Associate crew station	4Q94	2454
• (U) Construct Crewman's Associate two-man crew station	4Q94	1741
• (U) Conduct four-man crew M1A2 baseline exercises	4Q94	2151

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Program Element: #0603005A
PE Title: Combat Vehicle and Automotive Advanced Technology — **Budget Activity: #3**

Total		**6671**

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Complete Crewman's Associate simulator	4Q95	3550
• (U) Conduct Crewman's Associate static simulation exercises	4Q95	2499
• (U) Conduct DIS-based Crewman's Associate force-on-force simulation exercises	4Q95	2476
• (U) Conduct dynamic Crewman's Associate simulations	4Q95	942
• (U) Define standard Army vehicle electronics architecture electronic integration requirements	4Q95	990
Total		**10457**

(U) Work Performed By: Work performed primarily by the U.S. Army Tank-Automotive Command (TACOM), Warren, MI, is responsible for the management, development and systems integration of this program. Contractors include: Cummins Engine Company, Columbus, IN; FMC, San Jose, CA; Emerson Electric, St. Louis, MO; General Electric, Lynn, MA; General Dynamics Land Systems Division, Warren, MI; Texas Instruments, Dallas, TX; General Motors, Indianapolis, IN; Armored Vehicles Technologies Associates, Troy, Teledyne Continental Motors, Muskegon, MI; Cadillac Gage, Warren, MI; Textron Lycoming, Stratford, CT; BMY, York, PA; and Michigan Technological University, Houghton, MI.

(U) Related Activities: This program adheres to Tri-Service Reliance Agreements on Advanced Materials, Fuels and Lubes, and Ground Vehicles with oversight and coordination provided by the Joint Directors of Laboratories. Work in this Program Element is related to and fully coordinated with PE #0602624A (Weapons & Munitions Technology) and contains no unwarranted duplication of effort among the Military Departments.

(U) Other Appropriations Funds: ($ in Thousands) Not applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603006A
PE Title: Command, Control and Communications Advanced Technology

Budget Activity: #3

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D247 Tactical Command, Control & Communications (C3) Technology Integration	8116	8028	7985	6127	8184	9853	12408	Cont	Cont
D257 Digital Battlefield Communications	0	0	8947	10908	12383	8959	5613	0	46810
D492 Space Technology Integration	2931	0	0	0	0	0	0	Cont	Cont
D592 Space Application Technology	0	0	247	250	251	252	253	Cont	Cont
PE TOTAL	11047	8028	17179	17285	20818	19064	18274		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element consist of three projects that will advance command, control, and communications (C3) technology to provide the soldier with high quality real-time battlefield information and integrate space technologies into Army tactical applications. The Tactical C3 Technology Integration project provides software application development demonstrations, communications system integration and prototype products for distributed, mobile, secure, fully automated spread spectrum radio networks with measures to enhance the survivability, efficiency and efficacy of Army tactical command, control, communications and computer systems. This program specifically addresses Joint Service demonstrations coordinated through the Joint Director of Laboratories (JDL) Technology Applications and Demonstrations Panel, and provides key demonstrations of systems integration on Army battlefield functional areas. The Survivable Adaptive System (SAS) technology demonstration will provide multimedia network communications while on-the-move with gateway connectivity to both high-speed and legacy communications assets. It also tests and evaluates net radio, common user, and distributed communications equipment and automated spectrum management aids which have potential to solve user needs, equipment deficiencies, and provide critical future capabilities and supports new radio development and evaluation usually in conjunction with ARPA and the Air Force. The Space Applications Technology project will support demonstrations of applications of data derived from space payloads as potential solutions to operational needs of the Army emphasizing integration of various individual efforts into a single cohesive effort. The Digital Battlefield Communications project will support the Army's battlefield digitization effort by demonstrating technology to integrate communications hardware and software capable of providing seamless communications

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603006A
PE Title: Command, Control and Communications Advanced Technology — **Budget Activity: #3**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Perform assessments of ATM applicability to projected future seamless communications	*	1355
• (U) Deliver first exploratory development model of a reconfigurable Multiband Multimode Radio (MMR). This is a Joint Service effort with ARPA/AF lead	*	1257
• (U) Conduct final laboratory tests and demonstrations of wireless, fiber optic LAN and network management techniques for Survivable Adaptive Systems (SAS). Establish enhanced comm capability within field application with SAS technology	*	2495
• (U) Develop scenario to integrate SAS technologies into advanced warfighting experiment to support use of advanced networks for enhanced command and control on-the-move	*	1000
• (U) Port software algorithms and conduct voice-interoperability demonstration with battalion-and-below command and control hardware and software, in conjunction with User	*	1274
• (U) Fabricate satellite communications tactical paging system breadboard; perform SATCOM on-the-move experiments	*	647
Total		**8028**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Conduct laboratory demonstration of wideband (high capacity) wireless LAN to handle Ethernet, voice, and fiber optic data distribution interface for SAS	4Q95	2221
• (U) Conduct laboratory test of all SAS technologies to demonstrate interoperability and survivability of communications systems. Conduct warfighting demonstration encompassing all SAS technologies	4Q95	1741
• (U) Develop new circuit/packet features of target wide area communications/radio wire integration to determine feasibility and applicability of future enhancements to communication peripherals	*	800
• (U) Modify second breadboard of multiband multimode radio to incorporate technology upgrades (Joint Service effort)	*	1700
• (U) Integrate battalion and below command and control technology into horizontal integration initiative	*	750
• (U) Integrate wideband communications technologies with advanced antenna technology to enhance capability for communications on the move	*	773
Total		**7985**

* This is continuing work which is reviewed periodically, ensuring quality relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603006A**
PE Title: **Command, Control and Communications Advanced Technology** Budget Activity: **#3**

(U) Project D257 - Digital Battlefield Communications: The objective of this project is to integrate communications hardware and software capable of providing seamless, multimedia communications for the digitized battlefield, designed to meet emerging requirements for high capacity, on-the-move (OTM) information exchange. Force projection and evolving doctrine are expected to require significantly more communications bandwidth, drastically altered traffic patterns, new services (e.g. imagery), and higher mobility, especially at Echelons Brigade and Below, than is currently supported by today's communications systems. This project will develop and demonstrate a series of products, through an evolutionary process, capable of transitioning into field units to support the future Digitized Brigade and Digitized Division. Through an extensive modeling and simulation activity, utilizing the Distributed Interactive Simulation (DIS), the project will build on the early performance analyses begun under the Combined Arms Command and Control (CAC2) program, in order to identify appropriate non-developmental wideband communications systems to supplement the data capacity of existing lower echelon networks. Once data "hot spots" and congestion points are identified in the existing architecture, warfighter demonstrations will be used to demonstrate the warfighter benefit of added capacity at key locations on the digitized battlefield, and to identify and size fieldable deployment packages consisting of wideband digital communications and support devices to supplement existing tactical communications systems. Technology demonstration units of a wide-bandwidth digital radio will be required. Laboratory demonstrations and protocol development to permit ATM traffic to interface with tactical radio/satellite equipment will be conducted. A mobile radio access point (RAP) consisting of a trunk radio, powerful portable switch (ATM or other) and legacy and wide bandwidth digital will be prototyped and exercised by troops in the field. The RAP will provide a high bandwidth OTM trunk feed in support of combat net radio, single channel radio access (SCRA), and wideband data subscribers, all communicating OTM. Network planning tools and dynamic internetwork management schemes will be exploited for both pre-battle communications planning and dynamic reconfiguration during deployment. Development of OTM SATCOM antennas begun in prior years will be extended to provide fieldable, low profile antennas better suited to SATCOM needs to connect forward mobile elements in split based deployments. Wideband surrogate satellite terminals will be investigated as potential transmission media for high data rate traffic.

(U) FY 1993 Accomplishments:
- **(U)** Not applicable

(U) FY 1994 Planned Program:
- **(U)** Not applicable

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• **(U)** Demonstrate wideband data comms network to alleviate CAC2 "hotspots" and satisfy high data rate intelligence rqts.	*	3500

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FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603006A**
PE Title: **Command, Control and Communications Advanced Technology** Budget Activity: **#3**

• (U) Develop, link and network models, enhance system performance models and develop trunk radio simulation; evaluate alternative architectures	*	700
• (U) Develop digitized battlefield network planning tools	*	800
• (U) Demonstrate tactical radio & satellite communications interface to Commercial-Off-the-Shelf (COTS) ATM products	*	1550
• (U) Develop OTM satellite-communications low-profile antennas	*	1450
• (U) Design and systems-engineer radio access point	*	947
Total		**8947**

(U) Project D492 - Space Technology Integration: Addresses technology development and early system definition of space applications. Army thrusts include: space medicine experiments, data analysis on ionospheric composition to support imaging and communications, uncooled infrared (IR), detection of chemical and biological agents, integration of real-time weather into tactical decision aids, unique applications of Global Positioning System (GPS) signals, cooperative Extremely High Frequency (EHF) demonstration on National Aeronautics and Space Administration's (NASA) Advanced Communications Technology Satellite (ACTS), development of more effective platform control for improved tactical targeting, exploration of the feasibility of man-assisted orbital multispectral imagery, and demonstration of a tunable, real-time hyperspectral imaging capability.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Completed Phase I design for GPS azimuth determining system	3Q93	530
• (U) Initiated EHF ACTS mobile terminal development for the SATCOM on-the-move demo	4Q94	470
• (U) Completed engineering design to interface ACTS' terminals with Battle Command Battle Laboratory's MAGIC network and defense simulation internet	2Q93	100
• (U) Purchased hardware to multiplex voice and imagery through ACTS	4Q93	320
• (U) Fabricated and ground-tested a 0.48-0.76 micron AOTF hyperspectral imager	4Q93	645
• (U) Developed concept design and performed system analysis for an airborne hyperspectral imager (0.5-1.0 micron)	2Q93	285
• (U) Completed study to show Defense Meteorological Satellite Program (DMSP) necessary to satisfy Army-met requirements and published report entitled "Comparison of DMSP Capabilities and Army Tactical Weather and		

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FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603006A
PE Title: Command, Control and Communications Advanced Technology

Budget Activity: #3

Environmental Data"	4Q93	90
• (U) Developed algorithms to obtain initial visibility from satellite data	4Q93	360
Total		2931

(U) FY 1994 Planned Program: Not applicable.

(U) FY 1995 Planned Program: Not applicable.

(U) Project D592 - Space Application Technology: Addresses technology development and early definition of ground-based space exploitation capabilities and applications. Develops plans and evaluates technologies that will influence the design and operation of space satellites to improve warfighting capabilities.

(U) FY 1993 Accomplishments: Not applicable.

(U) FY 1994 Planned Program: Not applicable.

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Develops plans for utilization of civil space assets for military applications	3Q95	100
• (U) Evaluate techniques to extract visibility estimates from satellite imagery data	3Q95	147

(U) Work Performed By: Efforts under Projects D247 (Tactical C3 Technology Integration) and D257 (Digital Battlefield Communications) are performed primarily by the US Army Communications-Electronics Command Center for C3 Systems, Fort Monmouth, NJ. Contractors include: SRI International, Menlo Park, CA; Bolt, Beranek & Newman, Boston, MA; and Jet Propulsion Laboratories, Pasadena, CA. Work under the Sapce Project D492 (Space Technology Integration) and D592 (Space Application Technology) are managed by the Space and Strategic Defense Command with effort on the FY1993 program performed by the US Army Corps of Engineers Topographic Engineering Center, Fort Belvoir, VA; US Army Surgeon General Medical Research and Development Command, Fort Detrick, MD; US Army Research Laboratory, White Sands, NM; and National Aeronautics and Space Administration. Contractors include: Applied Physics Laboratory of John Hopkins University, Columbia, MD; and Perkin Elmer, Norwalk, CT.

(U) Related Activities: This program adheres to Tri-Service Reliance Agreements on Communications Command and Control and Space with oversight provided by the Joint Directors of Laboratories. Work in this Program Element is related to and fully coordinated with efforts in PE #0602782A (Command, Control & Communications Technology), PE #0203740A (Maneuver Control System), PE #0203726A (Advanced Field

Artillery Tactical Data System), and PE #0602783A (Computer & Software Technology) in accordance with the ongoing Reliance Joint planning process. There is no unnecessary duplication of effort within the Army or DoD.

(U) Other Appropriation Funds: ($ in Thousands) Not applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603007A**
PE Title: **Manpower, Personnel and Training Advanced Technology**

Budget Activity: #3

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
A792 Manpower and Personnel	3957	4247	3074	3325	3557	3707	3627	Cont'd	Cont'd
A793 Training Systems and Education	1993	3817	2624	2713	3008	3168	3097	Cont'd	Cont'd
A794 Education and Training	5106	0	0	0	0	0	0	Cont'd	Con't
A796 Human Factors Engineering in Systems Design	4883	0	0	0	0	0	0	Cont'd	Cont'd
PE TOTAL	15939	8064	5698	6038	6565	6875	6724		

B. (U) BRIEF DESCRIPTION OF ELEMENT: The objective of this program is to develop and demonstrate soldier-oriented technologies to enhance soldier and unit performance. These include: 1) training strategies for simulation-based training, 2) methods that develop the knowledge and skills required for successful battle command on the increasingly digitized battlefield, 3) accurate behavioral models of individual and unit warfighting performance for use in synthetic environments, 4) optimized design of battle command staff groups for improved command and control (C2), and 5) a new selection and assignment technology for better soldier/job matching to maintain warfighting capabilities in a downsized Army. Work in this program is consistent with the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan, and Project Reliance. This program element (PE) was restructured in FY93 as a result of the transfer of the Manpower and Personnel Integration (MANPRINT) System Acquisition function from the U.S. Army Research Institute for the Behavioral Sciences (ARI) to the Army Research Laboratory (ARL). The remaining ARI program was then realigned into two projects in order to simplify the funding structure. To better reflect the programmatic continuity within the PE, the FY93 Accomplishments (and corresponding funding) for projects A792 and A793 are based on the new project structure. As a result, the $5106K from A794 is distributed between A792 ($1958K) and A793 ($3148K).

C. (U) JUSTIFICATION FOR PROJECTS:

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603007A
PE Title: Manpower, Personnel and Training Advanced Technology **Budget Activity: #3**

(U) Project A792 - Manpower and Personnel: This project develops and demonstrates soldier-oriented technologies that will lead to improved Army personnel utilization, including enlisted, officers, civilians, and families. A major focus of the project is on the human leader and decision maker in evolving digitized, battle command systems. The research will also demonstrate new methods for identifying high quality male and female enlistees, for assigning them to Military Occupational Specialties (MOS) that maximize total force readiness, and for retaining the most effective performers. It also develops and demonstrates behavioral science-based methods to achieve optimized designs of Army decision-making staff organizations. Other efforts will develop innovative, simulation-based methods for career-long leader development, e.g., to ensure that some of today's lieutenants and captains are grown into tomorrow's division commanders for the digitized battlefield. This program supports the Manpower and Personnel Defense Technology Area. As noted, the FY93 Accomplishments reflect the current project structure and include $1958K of A794 funds.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Completed needs analysis for the design of a division-level battle command performance data base	*	1959
• (U) Demonstrated link between selection and classification tests and measures of combat performance	*	2475
• (U) Developed MOS restructuring tools which were validated in an analysis of Field Artillery MOSs	*	442
• (U) Developed improved procedures for assessing the performance of Special Forces (SF) candidates	*	729
• (U) Demonstrated that improved family support translates into enhanced combat readiness during Desert Storm	*	310
Total		5915

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Construct guidelines for organizational design with respect to leader span-of-control	*	1586
• (U) Identify relationship between peacetime performance and rated combat performance	*	1073
• (U) Complete development of MOS restructuring tools	*	326
• (U) Develop and evaluate a prototype career decision aid for SF recruits	*	1052
• (U) Assess impact of family support measures during Operation Restore Hope	*	210
Total		4247

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Integrate the Battle Command Training Program (BCTP) data base into the Louisiana Maneuvers Task Force data base for analyses on C2 decision-making	4Q95	1470
• (U) Validate a psychomotor and spatial test battery for classifying initial entry soldiers into the combat arms MOS	*	714

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603007A**
PE Title: **Manpower, Personnel and Training Advanced Technology** — **Budget Activity: #3**

• (U) Demonstrate prototype MOS restructuring decision support technology	4Q95	220
• (U) Demonstrate prototype career decision aids for Special Forces recruits	*	670
Total		3074

(U) Project A793 - Training Systems and Education: The objective of this project is to develop and demonstrate theory-based training strategies, i.e., prescriptions for the cost-effective allocation of training resources. The focus of the research is on how to best use distributed interactive simulation (DIS) networks in the creation of synthetic training environments. The research program is predicated on the knowledge that the training effectiveness of simulations, simulators, and devices is largely a function of how they are used in training, including the adequacy of performance measurement techniques and performance feedback methods. In future years, the project will leverage on the successful demonstration of the Digitized Division to develop training strategies for the increasingly digitized battlefield. This research also supports the TRADOC Battle Labs and will utilize emerging Battlefield Distributed Simulation-Developmental (BDS-D) capabilities. This program supports the Training Systems Defense Technology Area. As noted, the FY93 Accomplishments reflect the current project structure and thereby include $3148K of A794 funding.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Demonstrated Unit Performance Assessment System (UPAS) software and user's guide for collecting and analyzing DIS performance data on SIMNET/Close Combat Tactical Trainer (CCTT)	*	808
• (U) Developed Commander's Battle Staff Training Handbook	*	1262
• (U) Conducted analysis of National Guard unit performance at the National Training Center to determine homestation training requirements	*	652
• (U) Developed task analytic methods for identifying critical combat functions in support of the Army Combined Arms Training Strategy (CATS)	*	929
• (U) Determined requirements for low-cost, modular, rotary wing training devices for initial and advanced tactical skills training	*	1150
• (U) Identified the most effective current classroom training methods in cooperation with the Navy as part of the Tri-Service Reliance agreement	*	340
Total		5141

(U) FY 1994 Planned Program:	**Complete**	**Cost**

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603007A
PE Title: Manpower, Personnel and Training Advanced Technology **Budget Activity: #3**

• (U) Determine training objectives that are appropriate for DIS as part of CATS	*	710
• (U) Demonstrate asynchronous computer conferencing technology for cost-effective battalion staff training	*	1342
• (U) Develop a device-based tank gunnery training strategy for Reserve Components	*	514
• (U) Conduct a detailed analysis of the 24 most critical combat functions for training in a DIS environment	*	606
• (U) Evaluate the training effectiveness of low cost aviation part-task training devices	*	512
• (U) Demonstrate the Navy's "What Works" for classroom training in Army schools as part of Tri-Service Reliance Agreement	*	133
Total		3817

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Develop a training strategy and prototype training program for CCTT	*	1436
• (U) Demonstrate a simulation-based tank gunnery training program for the Reserve Components	4Q95	333
• (U) Develop a prototype combined arms training program for the Army's Combined Arms Training Strategy (CATS)	*	311
• (U) Demonstrate a preliminary aviation training package with an emphasis on low cost, part-task simulations and training devices	*	427
• (U) Evaluate a prototype instruction and control architecture for less resource intensive classroom training	4Q95	117
Total		2624

(U) Project A794 - Education and Training: Work restructured under A793, this PE, for FY 1994 and beyond. See A793 description above.

(U) FY 1993 Accomplishments: Refer to FY 1993 accomplishments in A793, this PE.

(U) FY 1994 Planned Program: Not Applicable

(U) FY 1995 Planned Program: Not Applicable

(U) Project A796 - Human Factors Engineering in System Design: Rapid changes in technology combined with increased emphasis on the soldier-machine interface have resulted in increased demands for human factors engineering expertise and the transfer of this technology into the materiel development and acquisition process. This project develops the methods, models, analysis tools, techniques, design guidelines, and non-

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603007A
PE Title: Manpower, Personnel and Training Advanced Technology — Budget Activity: #3

system specific technology demonstrators for human factors engineering integration throughout the combat development and weapon system design process. Beginning in FY94, project funding was transferred to PE #0602716A, Project AH70, under the U.S. Army Research Laboratory.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Completed development of a human factors engineering (HFE) knowledge-based, expert system, including the integration of decision aids which facilitate preparation of HFE/MANPRINT input into weapon system design documentation	4Q93	950
• (U) Completed software development efforts to add motion, enhanced strength, and reach to the man-model "JACK"	4Q93	1010
• (U) Addressed critical design deficiencies in HARDMAN III, a computer-based system that allows prediction of manpower, personnel and training (MPT) requirements and costs	4Q93	1734
• (U) Developed a model to predict the consequences of intelligence production on changing MPT requirements	4Q93	1189
Total		4883

(U) FY 1994 Planned Program: Dollars transition to PE #0602716A, Project AH70, because of function transfers to the U.S. Army Research Laboratory

(U) FY 1995 Planned Program: Not applicable.

(U) Work Performed By: The primary in-house developing organization for Projects A792, A793, A794, and A795 is the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI), Alexandria, VA. Contractors include: Human Resources Research Organization, Alexandria, VA; CAE Link Corporation, Binghamton, NY; The BDM Corporation, Albuquerque, NM; Evidence Based Research, Vienna, VA; STATCOM, Inc, McLean, VA; Quantum Research International, Huntsville, AL; Metrica Incorporated, Bryan, TX; and Dynamics Research Corporation, Wilmington, MA.

(U) Related Activities: This program adheres to Tri-Service Reliance Agreements on Manpower & Personnel and Training Systems with oversight and coordination provided by the Armed Services Training and Personnel Systems Science and Technology Evaluation and Management (TAPSTEM) Committee. Work in this Program Element contains no unwarranted duplication of effort among the Military Departments.

(U) Other Appropriation Funds: ($ in Thousands) Not applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603105A
PE Title: Military HIV Research

Budget Activity: #3

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DH29 Military HIV Research	53656	33410	3185	2961	3021	3167	3345	Cont'd	Cont'd

B. (U) BRIEF DESCRIPTION OF PROGRAM ELEMENT: This program element funds Congressionally directed Acquired Immune Deficiency Syndrome (AIDS) research to control the infection in military environments, to protect the military blood supply and to protect military personnel from unusual risks associated with infection. AIDS research is focused on the following thrust areas: diagnosis; natural history; epidemiology; vaccine development; and drug therapy. Efforts are directed to answer militarily unique questions affecting manning, mobilization and deployment.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project DH29 - Military Human Immunodeficiency Virus (HIV) Research: Provides concept exploration of candidate prevention and treatment strategies such as vaccines, drugs, and behavioral interventions to include safety and efficacy in model systems to prepare and conduct clinical studies.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Developed a plasmid based, attenuated Simian Immunodeficiency Virus for use as a strategy for preparing an intramuscular HIV vaccine for humans	*	3950
• (U) Utilized North American primers successfully to identify HIV in Thai clinical samples	*	1088
• (U) Sequenced and grouped HIV isolates into six distinct genotypes worldwide. The different envelope proteins of these groups are important for developing HIV vaccines with global efficacy	*	1318

* This is continuing work which is reviewed periodically to assure quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603105A
PE Title: Military HIV Research

Budget Activity: #3

• (U) Demonstrated safety and immunogenicity of recombinant HIV vaccine in infected persons leading to clinical evaluation for the treatment of HIV infection	*	4030
• (U) Developed HIV exposure prevention programs for active duty personnel based on the findings from the Army-Wide HIV/AIDS Survey.	*	5593
• (U) Demonstrated that virus specific human serum IgA antibody can neutralize HIV-1 infection	*	3950
• (U) Validated technical performance and application of PCR assay to detect presence of viral genomic products at earliest stages of infection	*	1679
• (U) Refined assay for detecting point mutations associated with HIV drug resistance to screen seroconverters in the military for HIV drug resistance	*	3062
• (U) Formulated immunogenic liposomal vaccine which is safe and easily produced in large quantities	*	3856
• (U) Demonstrated immunogenicity and safety of a HIV envelope vaccine against early stage HIV infection	*	5130
• (U) Established a program of studies to acquire sufficient information to select the best vaccine for a Phase III trial of HIV vaccine therapy.	3Q94	20000
Total		**53656**

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Design and evaluate methods for rapid diagnosis and quantification of HIV	*	2398
• (U) Evaluate candidate prophylactic and immunotherapeutic vaccines	*	6210
• (U) Assess behavior modification to control the spread of HIV infection in response to intervention methods	*	5590
• (U) Evaluate unique HIV peptides, carriers and adjuvants for inclusion in future vaccines	*	4380
• (U) Develop appropriate models to conduct studies of pathogenesis and evaluate new approaches to treatment	*	4750
• (U) Identify possible prophylactic vaccine testing sites	*	1080
• (U) Collect and characterize HIV strains worldwide	*	2240
• (U) Evaluate combination therapy to prevent/treat drug resistance HIV strains and opportunistic infections	*	3512
• (U) Evaluate results of Phase II gp160 HIV vaccine trial	*	3250
Total		**33410**

* This is continuing work which is reviewed periodically to assure quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603105A
PE Title: Military HIV Research **Budget Activity: #3**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Prepare technical data package to transition a recombinant vaccine to advanced development	*	1115
• (U) Develop technical data to guide policy on unit level behavior modification	*	2070
Total		**3185**

(U) Work Performed By: Walter Reed Army Institute of Research, along with field units in Thailand and Brazil perform in-house Army research. The remainder is performed by the Naval Medical Research Institute and the US Navy OCONUS units and by extramural non-profit organizations, universities, and industries. The major contractor is Henry M. Jackson Foundation for the Advancement of Military Medicine, Rockville, MD

(U) Related Activities:
PE #0601102A (Defense Medical Sciences)
PE #0602787A (Medical Technology)
PE #0603002A (Medical Advanced Technology)
PE #0603807A (Medical Systems-Advanced Development)
PE #0604807A (Medical Materiel/Medical Biological Defense Equipment-Engineering Development
PE #0605801A (Programwide Activities, Project MMO2)
PE #0605898A (Management Headquarters R&D, Project MM(03)
The Army has been designated by Congress as the lead agency for infectious disease RDT&E. The Military HIV R&D program is under the management of the Assistant Secretary of Defense (Health Affairs). There is no unnecessary duplication of efforts in the Department of Defense programs. Military HIV research is coordinated with the National Institutes of Health.

(U) Other Appropriation Funds: ($ in Thousands) Procurement of completed products is provided for in Other Procurement, Army (OPA) or Operation and Maintenance, Army (OMA), or passed to other procuring agencies as appropriate.

(U) International Cooperative Agreements: Not Applicable.

* This is continuing work which is reviewed periodically to assure quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603238A
PE Title: Air Defense/Precision Strike Technology

Budget Activity: #3

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D160 Missile System Demo	19861	0	0	0	0	0	0	0	19861
D177 Joint Air/Land/Sea Precision Strike Demonstration (JPSD)	0	10967	31653	17673	13050	15749	16003	Cont'd	Cont'd
D182 Tractor Hole	0	9432	9255	8836	8700	4375	0	0	40598
D189 Tractor Hike	12732	476	926	10603	14790	21875	13335	Cont'd	Cont'd
D197 Seeker Advanced Development	4715	0	0	0	0	0	0	0	4715
PE TOTAL	37308	20875	41834	37112	36540	41999	29338		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element provides for demonstration of an enhanced land warfare counterfire and precision strike capability to locate, identify, and kill high-value, time-sensitive targets and assess damage at extended ranges within tactically useful timelines. The FY94 and 95 efforts focus on demonstrating major improvements to the U.S. Army's ability to locate and destroy through counterfire and precision strike, critical, short-dwell precision strike targets. These demonstrations are supported by TRADOC's Depth and Simultaneous Attack (D&SA) Battle Lab, Ft. Sill, OK. Enhancements include an all-weather, day/night, end-to-end, sensor-to-shooter precision strike capability. Key program objectives are to reduce timelines to minutes; achieve a quantifiable improvement in location, identification, weapons effectiveness, and damage assessment; and, advance precision strike employment concepts including real-time weapons sensor cueing, near-real-time data dissemination, seamless sensor-to-shooter node communication, and dynamic retargeting. JPSD will conduct a series of risk reduction and system-specific demonstrations in an operational environment in conjunction with the D&SA Battle Lab at Ft. Sill, OK, incorporating improved technologies, concepts, tactics and procedures. These demonstrations include integration of advanced weapons and architectures in live fire tests, constructive simulations and Distributed Interactive Simulations (DIS). JPSD efforts in FY93 were conducted in PE #0603772A. In addition, this program element demonstrated technologies for a short range anti-air missile capable of attacking low altitude targets buried in clutter and an advanced missile seeker. Work in this program element is consistent with the users, TRADOC Battle Labs and materiel developers. It will leave

behind an in-theater, improved precision strike capability. This project restructures from PE #0603772A, Project D289.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) **Project D160 - Missile System Demo:** This project demonstrates advanced semi-active (SA) (laser designated) and infrared (IR) focal plane array (FPA) seeker versions of the Stinger missile. Work in this project completes in FY 1994.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Simulated fire and forget approach and laser-designated SA approach for comparison	3Q93	350
• (U) Conducted SA STINGER (SAS) seeker performance simulation	2Q93	1550
• (U) Simulated and demonstrated laser tracker performance	4Q93	1850
• (U) Prepared operational analysis studies of line-of-sight lock for ground-to-air and air-to-air applications	4Q93	220
• (U) Conduct trade studies and analysis to determine best IR FPA approach	1Q94	2600
• (U) Conduct analysis and simulations to demonstrate compatibility of a small IR FPA seeker	2Q94	2941
• (U) Design, fabricate and demonstrate IR FPA seeker hardware	4Q94	9900
• (U) Complete fire-and-forget and laser designated SA approach comparison simulation operation	4Q94	450
Total		**19861**

(U) **FY 1994 Planned Program:** Not applicable

(U) **FY 1995 Planned Program:** Not applicable

(U) **Project D177 - Joint Air/Land/Sea Precision Strike Demonstration:** The purpose of the JPSD program is to enhance joint service precision strike capabilities to locate, identify, and kill high-value time critical targets. JPSD will concentrate on the design, development, integration and demonstration of an all-weather, day/night, end-to-end, sensor-to-shooter capability against specific medium and long range time sensitive targets. JPSD will conduct a series of risk reduction demonstrations to accomplish its objectives. It will include a focus on a real-world time critical target set problem in the Korean Theater of Operations. This latter demonstration will be accomplished by the integration of actual and simulated sensors, weapons, processors, and communication systems. It will include current, emerging and advanced concepts, tied together by the users, TRADOC Battle Labs, and materiel developers. It will leave behind an in-theater, improved precision strike capability. This project was a restructure from PE #0603772A, Project D289.

(U) **FY 1993 Accomplishments:** (Funded under PE #0603772A, Project D289)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603238A
PE Title: Air Defense/Precision Strike Technology

Budget Activity: #3

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Prepare final report on FY93 Demonstration	3Q94	50
• (U) Begin operation of the JPSD Integration and Evaluation Center	*	3500
• (U) Concept development, DIS, CINC and Battle Lab Support	*	2650
• (U) Conduct the FY94 Demonstration	4Q94	4500
• (U) Participate in ARPA's War Breaker Program	*	267
Total		**10967**

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Preparation of FY94 Final Demonstration Report	3Q95	100
• (U) Concept Development, DIS, CINC and Battle Lab Support	*	7050
• (U) Conduct FY95 Korean Scenario Precision Strike Demonstration	4Q95	13000
• (U) Continue Development of the Integration and Evaluation Center	*	8200
• (U) Continue FY96 Korean scenario Precision Strike Demonstration Planning	*	3000
• (U) Participate in ARPA's War Breaker Program	*	303
Total		**31653**

(U) **Project D182 - Tractor Hole:** This is a classified program.

(U) **Project D189 - Tractor Hike:** This is a classified program.

(U) **Project D197 - Seeker Advanced Development:** This project includes the demonstration of infrared (IR) seekers using advanced technology to targets in clutter. Work in this project completed in FY 1993.

(U) FY 1993 Accomplishments:

• (U) Selected mechanical implementation of seeker head	2Q93	2500
• (U) Performed selection of a packageable electronics approach	3Q93	1500
• (U) Developed imaging techniques to accommodate Stinger Rolling Airframe	4Q93	715
Total		**4715**

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603238A** Budget Activity: **#3**
PE Title: **Air Defense/Precision Strike Technology**

(U) FY 1994 Planned Program: Not Applicable

(U) FY 1995 Planned Program: Not Applicable

(U) Work Performed By: The JPSD program is managed by the JPSD Office, Program Executive Officer, Intelligence and Electronic Warfare (PEO-IEW), Falls Church, VA. Contractors include: Raytheon, Bedford, MA; SAIC, Rosslyn, VA; MRJ, Oakton, VA; TASC, McLean, VA; and MTC, Shrewsbury, NJ. Joint Precision Strike Demonstration operational sponsors include CINC USFK and the TRADOC D&SA Battle Lab. The missile system demonstration project is managed by Program Manager, Air-to-Air Missile (PM ATAM), Huntsville, AL. In-house work is supported by the U.S. Army Communications and Electronics Command, Research Development and Engineering Center, Ft. Monmouth, NJ; Topographic Engineering Center, Ft. Belvoir, VA; the U.S. Army Research Laboratory, Aberdeen Proving Ground, MD; and the Missile Command Research Development and Engineering Center, Huntsville, AL.

(U) Related Activities: This program adheres to Tri-Service Reliance agreements on Communications, Command, Control and Intelligence (C3I) and Conventional Air/Surface Weaponry. Close coordination is being effected by the JPSD Task Force with the Global Surveillance and Synthetic Environments initiatives of the DDR&E and DUSD(AT) as well as the U.S. Air Force and Navy efforts. ARPA's WARBREAKER program and distributed node simulation efforts are important contributors to this program. Product-improved ATACMS will be used in JPSD related demonstrations. Technology developed in the Seeker Advanced Development project will compete for potential application to the Army Combined Arms Weapon System (TACAWS) Advanced Technology Demonstration in PE #0603313A (Missile and Rocket Advanced Technology). The efforts of all these programs will contribute to DoD level precision strike demonstrations between 1997-99. Work in the program element contains no unwarranted duplication of effort and is fully compliant with the Army Science and Technology Master Plan, the Army Modernization Plan and addresses several of the JCS Joint Operational Warfare capabilities.

(U) Other Appropriation Funds: ($ in Thousands) Not applicable.

(U) International Cooperative Agreements: Data exchange agreements with France, Germany, and the United Kingdom, for infrared systems and technology.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Budget Activity: #3

Program Element: #0603270A
PE Title: Electronic Warfare Technology

A. (U) RESOURCES: ($ in Thousands)

Project Number Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DK15 Advanced Communications Electronics Countermeasures Demonstration	4495	4207	3110	2978	3517	4373	5270	Cont'd	Cont'd
DK16 Non-communications Electronic Countermeasures Technology Demonstration	3378	5326	3857	1062	2581	2419	4844	Cont'd	Cont'd
DK18 STINGRAY	32289	23020	0	0	0	0	0	0	75109
PE TOTAL	40162	32553	6967	4040	6098	6792	10114		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program provides the Science and Technology funding for three projects which support current and future Electronic Warfare (EW) systems. The project DK15 provides technology demonstrations in communication countermeasures (CM) and information collection and reporting for transition to Army Intelligence Electronic Warfare (IEW) systems through the use of common module and open architecture processes.

This project also supports demonstrations of automatic fusion of intelligence data from multiple sources. Project DK16 demonstrates the feasibility and effectiveness of non-communications electronic warfare hardware and software countermeasures and Electronic Support Measures/Electronic Intelligence (ESM/ELINT) for self protection from radar, electro-optical, and infrared guided anti-aircraft artillery, surface to air missiles, artillery, and top attack weapons, and provide precise targeting information on non-communications emitters. Area protection technology from radar threats is also developed. Work in these projects will lead to technology applications which will significantly contribute to winning the battlefield information war by controlling the electromagnetic spectrum. It supports the Radar Deception and Jamming (RDJ) technology demonstration, and provides component technology for the Hit Avoidance technology demonstration. Project DK18 funds STINGRAY, which is an Electro-Optical Countermeasure (EOCM) system mounted on a Bradley Fighting Vehicle. STINGRAY provides protection from enemy Optical and Electo-Optical (OEO) target acquisition and fire control systems. It automatically detects and attacks threat OEO systems using in-band laser energy

thereby degrading the enemy's ability to acquire and target the host vehicle or other vehicles in proximity to STINGRAY. Work in this program element is consistent with the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan and Project Reliance.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project DK15 - Advanced Communications Electronics Countermeasures Demonstration:

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Developed Stand-Off Communications Jammer technology for the AN/TLQ-17 and conducted laboratory demonstration of capability	*	1400
• (U) Developed and demonstrated intelligence fusion equipment for the 101st Airborne based on operational analysis of fusion system flows	*	500
• (U) Demonstrated automatic Intelligence Preparation of the Battlefield generation and manipulation	*	595
• (U) Completed demonstration of continuous look-through techniques prior to integration into remote jamming package	*	1100
• (U) Developed and tested signal processing and control equipment, and software techniques to identify and jam digital data radio signals	*	900
Total		4495

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Demonstrate capability to simultaneously jam & receive threat signals for upgrades to IEW Common Sensor (IEWCS) and Unmanned Aerial Vehicles	*	1890
• (U) Demonstrate & test evolutionary software to significantly upgrade enhanced maps, smart databases, fusion/correlation modules and intelligent networks	*	815

* This is continuing work which is reviewed periodically ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603270A **Budget Activity: #3**
PE Title: Electronic Warfare Technology

• (U) Integrate signal processing, control equipment and software techniques to demonstrate capability to identify and jam digital radios signals	*	1502
Total		**4207**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Demonstrate effectiveness of surgical jamming and electronic countermeasure (ECM) deception techniques using automatic and signal identification methods	*	800
• (U) Integrate Smart Jammer Controller with automated map based intelligence support system for a demonstration of battlefield ECM planning and sensor placement	4Q95	400
• (U) Demonstrate electronic attack against multiple frequencies networks, multiple modes & modern communication emitters	*	900
• (U) Respond to new threats with use of reprogrammable waveform generator for receiver/jammer operation	*	460
• (U) Demonstrate battlefield visualization and data presentation techniques to allow commander to quickly assess status of friendly and enemy troops	4Q95	250
• (U) Demonstrate general purpose terrain reasoning and feature data algorithms to resolve IEW issues	4Q95	300
Total		**3110**

(U) Project DK16 - Non-Communication Electronics Countermeasures Technology Demonstrations: This program demonstrates the feasibility and effectiveness of non-communication electronic warfare hardware and software CM technology for self protection against radar, optical, electro-optical and infrared threats for ground and airborne platforms. It supports the Radar Deception and Jamming (RDJ) technology demonstration, and provides component technology for the Hit Avoidance technology demonstration.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Held Preliminary Design Review (PDR) and Critical Design Review (CDR) and began system fabrication on RDJ sensor suite for protection of aviation assets against enemy targeting systems	*	3378

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Evaluate and assess advanced aviation sensor protection technologies to apply to ground vehicles utilizing Horizontal Technology Integration (HTI) concepts to insure commonality across force structure	*	2826

* This is continuing work which is reviewed periodically ensuring quality, relevance, and priority.

• (U) Complete RDJ sensors fabrication and conduct ground and simulator tests	*	2500
Total		**5326**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Procure applicable sensors and integrate to ground testbed in preparation for field war fighting demonstrations with Battle Laboratories	*	2500
• (U) Conduct flight tests and transition RDJ to Program Manager (PM)-Aircraft Electronic Combat (AEC) programs	4Q95	1357
Total		**3857**

(U) Project DK18 - STINGRAY: The STINGRAY Combat Protection System (CPS) provides increased survivability along with added time to engage the threat with convention armament systems. The STINGRAY CPS is an Electro-Optical Countermeasure (EOCM) system for area protection in combat. The system is being delivered on Bradley Fighting Vehicle System (BFVS) for user testing and evaluation but systems will be available for contingency operations. This system provides protection from enemy optical and electro-optical (OEO) target acquisition and fire control systems by automatically detecting threatening OEO systems and prompts for a countermeasure response which would apply in-band laser energy. This CM thereby degrades the enemy's ability to acquire and target friendly forces in the area being protected. In addition, STINGRAY provides unique target acquisition, tracking a[illegible] handoff capability for the host vehicle.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Completed Phase I simulation program	2Q93	500
• (U) Conducted hardware critical design review	4Q93	23840
• (U) Completed critical hardware technology development and fabrication	4Q93	7949
Total		**32289**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Execute Phase II & III Simulation Program	3Q94	823
• (U) Complete contract technology development effort and obtain test equipment	3Q94	17156
• (U) Conduct government technical testing	4Q94	2376
• (U) Conduct government operational testing and handoff to user	4Q94	2665
Total		**23020**

* This is continuing work which is reviewed periodically ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603270A
PE Title: Electronic Warfare Technology

Budget Activity: #3

(U) FY 1995 Planned Program: Program Not Funded

(U) Work Performed By:
DK15/DK16: In-House - Primarily performed by the US Army Communication-Electronics Command (CECOM) Intelligence Electronic Warfare Directorate, Warrenton, VA and Night Vision Electronic Sensors Directorate, Fort Belvoir, VA; U.S. Navy Naval Weapons Center, China Lake, CA; U.S. Army Test and Experimentation Command, Fort Rucker, AL. U.S. Contracts include: GTE Government Systems Corporation, Mountain View, CA; DIRAD, Redondo Beach, CA; SCS Telecom, Port Washington, NY; Hughes Corporation, Fullerton, CA; Microwave Semiconductor Corporation, Somerset, NJ; PAR Technology, Utica, NY; SRS Technologies, Newport Beach, CA; EMRC, Lockport, IL. Whittaker Systems, Inc., Semi Valley, CA; Loral Imaging Systems, Lexington, MA; Lockheed Sanders, Nashua, NJ; Northrop, Rolling Meadows, IL; and IT&T, Nutley, NJ.
DK18: In-House - Primarily performed for Program Executive Officer (PEO) IEW, Vint Hill Farms Station, Warrenton VA. by PM Night Vision and Electro-Optics, Fort Monmouth, NJ. Technology support provided by CECOM Night Vision Electronic Sensors Directorate, Fort Belvoir, VA. Contractor: Martin Marietta, Orlando, FL.

(U) Related Activities: This program adheres to Tri-Service Reliance Agreements on Electronic Warfare with oversight provided by the Joint Directors of Laboratories. Work in this Program Element is related to and fully coordinated with efforts in PE #0602270A (Electronic Warfare Technology), PE #0603270N, PE #0603792N, PE #0602204F, PE #O603270F, PE #0604550N, PE #0204575N, PE #0604573N, PE #0604738F, PE #0604793F and PE #0604710F in accordance with the on-going Reliance joint planning process. Navy developments are conducted in PEs #060455N (Surface Electronic Warfare), #0204575N (Electronic Warfare Support), and #0604573N (Shipboard Electronic Warfare Improvements). Air Force developments are conducted in PEs #0604738F (Protective Systems), #0604793F (Tactical Protective Systems) and #0604710F (Reconnaissance Electronics Warfare Systems). STINGRAY is currently the only tactical laser directed energy system in any of the Military Services. Coordination is effected between the Services and ARPA to eliminate duplication of effort and ensure the interchange of technical data. Work in this Program Element contains no unwarranted duplication of effort among the Military Departments.

(U) Other Appropriation Funds: ($ in Thousands) Not applicable

(U) International Cooperative Agreements: Current Memorandum of Understanding (MOU) on Electro-Optical Countermeasures (EOCM) with United Kingdom. The Technical Cooperation Program (TTCP) Subgroup Q (EW), Defense Exchange Agreement (DEA) with Israel, France and Canada.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603313A
PE Title: Missile and Rocket Advanced Technology
Budget Activity: #3

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D206	Missile Simulation								
	3274	3824	4032	3154	4046	4492	4556	Cont'd	Cont'd
D263	The Army Combined Arms Weapon System (TACAWS) Technology Demonstration(s)								
	7608	17842	14566	19802	22548	32973	39625	Cont'd	Cont'd
D271	Multi-role Survivable Radar								
	3314	0	0	0	0	0	0	0	48610
D380	Multi-Platform Launcher								
	0	0	1383	3798	3309	0	0	0	8490
D387	Multi-Purpose Individual Munition								
	0	0	1778	4598	3911	0	0	0	10287
D401	Insensitive Munitions for Missile Propulsion								
	5632	4758	0	0	0	0	0	0	17795
D404	Dual Mode Seeker								
	134	0	0	0	0	0	0	0	134
D486	Rapid Force Projection Simulation								
	0	8101	7374	5565	5220	6125	5334	Cont'd	Cont'd
D493	Rapid Force Projection Demonstration								
	0	1430	4165	9012	13685	27523	22838	Cont'd	Cont'd
D496	Enhanced Fiber Optic Guided Missile (EFOG-M) Demonstration								
	0	10483	61304	79355	45856	48590	8890	Cont'd	Cont'd
PE TOTAL	19962	46438	94602	125284	98575	119703	81243		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element provides advanced missile technologies to enhance U. S. Army force structure. Major objectives for investigation are system deployability, lethality, survivability, flexibility and affordabiliity. Work is conducted

through system simulation/virtual prototyping, system design, hardware development and test, and demonstration in laboratory and operational scenarios. This program element provides for the demonstration of advanced tactical missiles and systems using missiles and include realtime hardware-in-the-loop simulation technology, multi-role fire-and-forget seeker technologies capable of locating targets in clutter, lightweight launcher improvements and enhanced rocket accuracy,advanced technologies for missile guidance, and smart, stealthy, smokeless missile propulsion. This program element also provides full integration of battlefield technologies including hunters (forward sensors) and killers (weapons) integrated through advanced command and control. These components will demonstrate a system of systems approach through the umbrella of the Rapid Force Projection Initiative (RFPI) Demonstration, which will provide enhanced survivability and lethality for light, early-entry U.S. forces in a contingency role. The RFPI demo supports one of the top five future joint warfighting capabilities, " to promptly engage regional forces in decisive combat on a global basis" and is supported by the Dismounted Warfighting Battle Lab with participation from the 18th Airborne Corps. This program element now contains the only Army demonstration of fiber optic guided missile technology. Multiple Enhanced Fiber Optic Guided Mssile (EFOG-M) fire units and multiple missiles (with a limited manrating) will participate in RFPI field tests. The work in this program element is consistent with the Army Science and Technology Master Plan, the Army Modernization Plan, and Project Reliance. This program element supports the six U.S. Army Training and Doctrine Command (TRADOC) Battle Labs.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project D206 - Missile Simulation: This project supports two separate, but related tasks: (a) development, expansion and improvement of hardware-in-the-loop (HWIL) simulation capabilities applicable to the evaluation of tactical missiles guided by signals in radio frequency (RF), millimeter wave (MMW), electro-optical (EO), and infrared (IR) electromagnetic spectral regions, thus providing cost effective support to missile development throughout weapon system life cycles, permitting reduction in the number of flight tests required, and increasing productivity of flight tests actually performed. This HWIL simulation employs actual missile guidance and control hardware operating in realtime in a nondestructive laboratory environment; and (b) Battlefield Environment Future Weapon System Simulation (BEFWSS) provides an all-analytical simulation of a weapon system engaging multiple targets in a simulated battlefield environment which includes the effects of natural and battle-caused obscurants and disturbances.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Implemented Distributed Interactive Simulation (DIS) node and supporting local area network	4Q93	800
• (U) Completed and validated environmental models for Battlefield Environment Weapon System Simulation (BEWSS)	4Q93	248
• (U) Completed prototype multi-element digital signal processor for RF HWIL simulation	4Q93	450
• (U) Completed computer upgrades for MMW chambers	3Q93	800

• (U) Completed prototype IR laser diode projector for dual mode simulation	4Q93	648
• (U) Completed design of new, high performance MMW simulation chamber	4Q93	328
Total		**3274**

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Complete development of a high performance, low cost, multi-element digital signal processor configured from HWIL signal environment simulation with application to microwave and millimeter wave HWIL simulation	4Q94	200
• (U) Integrate and test fully configured Millimeter Simulation System 2 (MSS2) for specific missile system HWIL simulation applications	3Q94	1300
• (U) Integrate the low cost host processor for SIMSTAR hybrid computers into the Imaging Infrared HWIL Simulation Laboratory (IIRL)	2Q94	300
• (U) Integrate and interface the next generation realtime HWIL simulation target and background scene generator for electro-optically guided missiles into the IIRL	3Q94	650
• (U) Perform detailed tests on the multi-channel laser diode-based infrared target and background scene projector and commence integration into a dual mode (MMW/IR) HWIL simulation configuration	4Q94	1000
• (U) Expand the development/incorporation of MMW obscurant countermeasure models into BEWSS and verify with field test data collected from other programs	4Q94	374
Total		**3824**

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Develop a reconfigurable missile workstation for the Battlefield Distributed Simulation - Developmental (BDS-D) environment	3Q95	382
• (U) Complete the verification of battlefield obscurant models introduced into BEWSS	4Q95	400
• (U) Develop a Very Wideband Digital Quadrature Modulator (VWDQM) integrated circuit design suitable for millimeter wave seeker signal generation for HWIL simulation	4Q95	700
• (U) Complete the integration of the multi-channel IR laser diode scene projector into a dual mode HWIL simulation	4Q95	850
• (U) Upgrade the microwave HWIL simulation capability by integrating the previously developed low cost, multi-element digital signal processor into two RF channels	3Q95	500
• (U) Modify target signature, clutter, chaff, and multi-path control software for the upgraded RF channels	4Q95	350
• (U) Extend the design of the next generation real time target and background scene projector for HWIL simulation to the application solely of standardized, off-the-shelf computer components	3Q95	250

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603313A**
PE Title: **Missile and Rocket Advanced Technology**
Budget Activity: **#3**

• (U) Design a HWIL simulation facility capable of generating in-band acoustic signals required by acoustically guided tactical missiles	4Q95	600
Total		**4032**

(U) Project D263 - The Army Combined Arms Weapon System (TACAWS) Technology Demonstration(s): This project provides for the demonstration of advanced tactical missile technologies including seekers, propulsion, airframes, warheads, and guidance and control. The project will demonstrate lightweight multi-role missile technology in support of air-to-air, ground-to-air, air-to-ground, and ground-to-ground missions. Particular attention will be given to the development of IR seeker technology capable of defeating helos buried in cluttered backgrounds, the innovative use of RF data links for identification friend or foe, and the attack of targets masked from the launch platform. The missile system demonstration includes the integration of guidance, control, propulsion, airframe and warhead technologies capable of performing in high clutter/obscurants, adverse weather environments and under countermeasure conditions. Missile control and guidance system technology will explore capabilities such as lock-on before/lock-on after launch, fire and forget, command guidance, imaging infrared signal and image processing, and wide band secure data links. Variable thrust smart propulsion will be demonstrated. Multimission seeker (M^2S) technology transitioned from the Balanced Technology Initiative program will be evaluated. Demonstrated missile system performance (i.e.; weight, range, kill ratio, speed, lethality) will be optimized to exceed current baseline parameters of air-to-air STINGER, air-to-ground HELLFIRE, ground-to-ground TOW and ground-to-air STINGER in a size compatible with the TOW launcher. The TACAWS Demonstration Program is the only 6.3a Science and Technology program to develop and demonstrate the "key" enabling technologies for the Joint Advanced Weapons System (JAWS), an Army/Marine Corps multi-purpose, multi-platform missile and to provide technology options for a missile to replace TOW which is needed immediately in the next century. Final approval for a JAWS Mission Needs Statement (MNS) is pending. TACAWS will permit the testing of the key JAWS technologies before committing to a Demonstration/Validation program.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Refined missile design through missile simulation studies and user input	4Q93	2350
• (U) Conducted seeker, datalink, data compression, motor tests with limited hardware	4Q93	2258
• (U) Completed trade studies on alternative missile configurations and determine optimum configuration to satisfy multi-role/multi-target design goal	4Q93	700
• (U) Performed in-depth contractor study of seeker design	4Q93	950
• (U) Developed advanced simulations of missile and seeker for digital and Hardware-in-the-Loop (HWIL)	4Q93	700
• (U) Explored multi-mission seeker technology	4Q93	650
Total		**7608**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603313A**
PE Title: **Missile and Rocket Advanced Technology** Budget Activity: **#3**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Complete evaluation of Multi-Mission Seeker (MMS) through tower & captive flight tests	4Q94	3500
• (U) Develop TACAWS seeker design	2Q94	1800
• (U) Complete detailed design of flight test gel bipropellant motor	4Q94	2650
• (U) Complete evaluation of alternate gel bipropellant motors as fallback option	4Q94	1050
• (U) Conduct hardware design of RF datalink in support of flight test	3Q94	1300
• (U) Complete end-to-end autotracker design and development for flight test	2Q94	600
• (U) Complete evaluation of imaging infrared data compression techniques	3Q94	600
• (U) Preliminarily design ground platform prototype reconfigurable simulator gunner's station in support of Battlefield Distributed Simulation-Developmental (BDS-D) virtual & live experiments in a Distributed Interactive Simulation (DIS) environment	4Q94	1500
• (U) Evaluate automatic target recognition schemes	4Q94	800
• (U) Develop and conduct preliminary simulations of TACAWS missile and launch vehicle	4Q94	4042
Total		**17842**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Finalize seeker design and build five TACAWS seekers to support captive flight test, HWIL simulations, and flight tests	4Q95	6200
• (U) Build-up flight test motor hardware components	1Q95	2000
• (U) Complete Design of Gunner's Station	2Q95	2000
• (U) Finalize design and build ground platform prototype reconfigurable simulator gunner's station in support of BDS-D virtual & live experiments in a DIS environment	1Q95	2616
• (U) Conduct hardware build of RF datalink in support of flight test	4Q95	1750
Total		**14566**

(U) Project D271 - Multi-role Survivable Radar (MRSR): This project will provide an air defense radar that can effectively operate in intense electronic countermeasures and not be destroyed by antiradiation missiles (ARMs). In addition to customary radar functions, MRSR will have the capability to perform non-cooperative target recognition and to communicate with remote sites through the radar's main beam transmissions. The system incorporates the latest available technologies such as very low sidelobe antennas, microwave integrated circuits (MIC), and very high speed integrated circuits (VHSIC). Work in this project completed in FY 1993.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603313A**
PE Title: **Missile and Rocket Advanced Technology**

Budget Activity: **#3**

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Conducted survivability demonstration tests	4Q93	1657
• (U) Conducted Non-cooperative target recognition tests	4Q93	663
• (U) Conducted main beam communication tests	4Q93	663
• (U) Conducted weapon cuing tests with CHAPARRAL missile system	4Q93	331
Total		**3314**

(U) FY 1994 Planned Program: Not applicable

(U) FY 1995 Planned Program: Not applicable

(U) Project D380 - Multi-Platform Launcher (MPL): This project is of particular importance to the early entry forces. When inserting the initial force into a region of potential conflict, the force must have the capability to protect itself from a threat of superior numbers. The MPL program will investigate the integration of a lightweight launcher system, capable of firing the full family of MLRS munitions into the Rapid Force Projection Initiative. The first aspect of the MPL program will address improving the accuracy of the MLRS free-flight rocket, thereby reducing the number of rockets required to defeat the target. This results in both a more lethal force and a reduced logistics burden. The second aspect of the program will support the design and testing of the High Mobility Army Rocket System (HIMARS), a C-130 transportable MLRS launcher. This program is transitioning from PE #0602303A, project A214.

(U) FY 1993 Accomplishments: Not applicable

(U) FY 1994 Planned Program: Not applicable

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Design wind tunnel models and perform wind tunnel tests	2Q95	480
• (U) Select, test and qualify the inertial measurement unit	3Q95	330
• (U) Perform guidance and control analyses	4Q95	283
• (U) Design and test control system	4Q95	240
• (U) Support HIMARS testing and demonstration	1Q95	50
Total		**1383**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603313A
PE Title: Missile and Rocket Advanced Technology Budget Activity: **#3**

(U) Project D387 - Multi-Purpose Individual Munition (MPIM): This project will provide for demonstration of an advanced individual soldier weapon capable of defeating Advanced Armored Armor Personnel Carriers such as the BMP3, personnel inside masonry, MOUT structures of 8-inch reinforced concrete and 12-inch brick, and personnel inside earth and timber bunkers. The Army needs one weapon to defeat all of the targets and to reduce the carry weight required for three weapons, each individualized for each target. There is no known weapon system in production or development that is capable of meeting the MPIM requirements for lethality against the three targets and that can be safely fired from an enclosure. The Army and U. S. Marine Corps have initiated discussions for a potential cooperative effort in this demonstration. The demonstration will integrate the warhead and propulsion technologies transitioned from 6.2 in FY95 to address MPIM requirements. A cooperative effort would integrate an Army warhead with the USMC Short Range Anti-Tank Weapon (SRAW) propulsion system as a demonstration option. This program is transitioning from PE #0602303A, project A214.

(U) FY 1993 Accomplishments: Not applicable

(U) FY 1994 Planned Program: Not applicable

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Issue Request for Proposals (RFPs) for demonstration and live fire tests of MPIM system to include potential demonstration of MPIM warhead integration with USMC SRAW propulsion system	1Q95	100
• (U) Evaluate proposals and select contractor	2Q95	100
• (U)Design and build subsystems for testing	3Q95	1578
Total		**1778**

(U) Project D401 - Insensitive Munitions (IM) for Missile Propulsion: This project will develop and demonstrate propulsion systems with insensitive munitions properties for use in present and future Army missile systems to meet the requirements of the Joint Services Operational Requirement (JSOR) for Insensitive Munitions and the subsequent Army Insensitive Munition Policy. The program will develop appropriate propulsion prototype systems and demonstrate techniques, propellants, shielding procedures, mitigating devices, safety guidelines and inert components. Work in this project completes in FY 1994. IM technology for TOW2B follow-on systems continues in PE #0602303A.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Determined ballistic and IM properties of nitramine polymer formulations	4Q93	500
• (U) Fabricated graphite composite (GC) technical demonstration motors with AN/CP minimum smoke propellant and test for performance and IM characteristics	3Q93	3000

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603313A**
PE Title: **Missile and Rocket Advanced Technology** Budget Activity: **#3**

• (U) Demonstrated case mitigation device for fast cook-off/slow cook-off (FCO/SCO) response	4Q93	250
• (U) Designed and fabricate components for a gel feasibility study for IM	4Q93	1500
• (U) Characterized gel propellants	4Q93	200
• (U) Originated development and characterization of high performance non-deflagrating composite smoke formulations for IM use	4Q93	182
Total		**5632**

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Identify approaches and ingredients for high performance minimum signature propellants and inert structures to yield IM propulsion systems	4Q94	1885
• (U) Formulate and initiate performance evaluation of graphite composite (GC) formulations for use in ducted rocket engine (DRE) and hybrid propulsion applications	4Q94	300
• (U) Develop and evaluate new candidate oxidizers and energetic monomers/polymers	4Q94	500
• (U) Demonstrate bipropellant gel components	4Q94	1573
• (U) Design IM bipropellant gel system based on tested components	4Q94	300
• (U) Demonstrate ballistic and IM characteristics of composite propellant in a GC or roll bonded test vessel	4Q94	200
Total		**4758**

(U) FY 1995 Planned Program: Not applicable.

(U) Project D404 - Dual Mode Seeker: This project originally supported the Army portion of a joint Air Force/Army millimeter wave and infrared seeker development. The program next supported the DoD-directed international effort with Japan on a Dual Mode Seeker. This support was used in place of SDIO funding, which was not forthcoming for the US/Japan program. The dual mode seeker program developed seeker concepts for joint analysis and trade studies between the two countries. In addition, simulation techniques were investigated in both countries for dual mode seekers. Algorithm work in the international program concentrated on data registration work. Work in this project was completed in FY 1993.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Identified dual mode seeker concepts for joint trade studies and analyses	4Q93	45
• (U) Identified dual mode data set for sensor data registration algorithm development	4Q93	44
• (U) Investigated dual mode simulation capabilities in both the Unites States and Japan	4Q93	45
Total		**134**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603313A
PE Title: Missile and Rocket Advanced Technology **Budget Activity: #3**

(U) FY 1994 Planned Program: Not applicable.

(U) FY 1995 Planned Program: Not applicable.

(U) Project D486 - Rapid Force Projection Simulation: This project will provide the requisite baseline performance and effectiveness analysis of candidate weapon, sensor, and communication combinations for the Rapid Force Projection Initiative (RFPI). Systems will be simulated in a combined arms mode and a candidate RFPI architecture will be chosen based on weapon effectiveness, transportability, and cost considerations. High fidelity simulations will be evaluated and utilized to obtain a synthetic battlefield environment. Virtual prototyping will be incorporated to evaluate one-on-one weapon effectiveness. Candidate system models will be refined for incorporation into aggregated effectiveness models. Additional refinements in approved scenarios will be integrated into the RFPI demonstration simulations. Work in this project transitioned from PE #0602303A, project A214.

(U) FY 1993 Accomplishments: Not applicable

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Established modeling requirements and Measures of Merit for candidate systems and aggregate RFPI force structures	2Q94	500
• (U) Conduct transportability analysis	4Q94	500
• (U) Examine RFPI technology effectiveness using aggregated simulations	4Q94	3000
• (U) Implement light force anti-armor scenario	2Q94	601
• (U) Establish RFPI BDS-D node	2Q94	500
• (U) Provide simulation support to RFPI Early Version demonstration	4Q94	3000
Total		**8101**

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Develop specifications for BDS-D interface with candidate systems	3Q95	474
• (U) Expand virtual prototyping and synthetic battlefield capability	4Q95	2450
• (U) Perform sensitivity analyses to identify preferred RFPI element mixes	4Q95	1950
• (U) Develop interface requirements between BDS-D and RFPI constructive simulations	2Q95	1000
• (U) Provide simulation support to RFPI Early Version demonstration multi sensor/shooter	4Q95	1500
Total		**7374**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603313A
PE Title: Missile and Rocket Advanced Technology — Budget Activity: #3

(U) Project D493 - Rapid Force Projection Demonstration: This project will investigate the effectiveness of a technology mix for air deployable, first-to-fight forces to make them both lethal and highly survivable against armor. The approach is to demonstrate new technology and tactics for the hunter/standoff killer concept through a combination of field tests and force-on-force simulations. Features include the use of non-line-of-sight weapons, command and control, and sensors developed by other programs that permit the massing of firepower on high priority, fast moving armor and the use of real time situational awareness information by the battle commander to reduce fratricide. Target information will be supplied by highly mobile scout sensor vehicles with data augmentation from remote sentry sites and aerial platforms. Real time virtual players via Battlefield Distributed Simulation - Developmental (BDS-D) will be utilized. Work in this project transitioned from PE #0602303A, project A214.

(U) FY 1993 Accomplishments: Not applicable

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Establish demonstration scenarios and define demonstration architecture	2Q94	200
• (U) Develop interface requirements for RFPI advanced demonstrations and BDS - D components	2Q94	250
• (U) Assess new technologies for inclusion into RFPI	4Q94	33
• (U) Identify candidate information architecture for RFPI	4Q94	150
• (U) Conduct an early version of RFPI demonstration with emphasis on sensor to shooter connectivity	4Q94	712
• (U) Complete preliminary site survey for RFPI demonstration location	2Q94	85
Total		**1430**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Initiate development of real time test control system	4Q95	1200
• (U) Develop interface specifications for integrating candidate systems	3Q95	800
• (U) Assess new technologies for inclusion into RFPI	4Q95	165
• (U) Develop interface requirements, specifications, and implementation plan for the RFPI/Fiber Optic Guided - Missile (FOG-M) Demonstration	1Q95	2000
Total		**4165**

(U) Project D496 - Enhanced Fiber Optic Guided Missile (EFOG-M) Demonstration: The Enhanced Fiber Optic Guided Missile (EFOG-M) is the primary "killer" within the "hunter-killer" concept of the Rapid Force Projection Initiative demonstration. The EFOG-M system is a multi-purpose, precision kill weapon system. The primary mission of the EFOG-M is to engage and defeat threat armored combat vehicles, other high value ground targets, and hovering or moving rotary wing aircraft that may be masked from line of sight direct fire weapon systems. EFOG-M is a

day, night, adverse weather capable system that allows the maneuver commander to extend his battle space beyond his line of sight to ranges up to 15 kilometers. The system consists of a gunner's station, a tactical missile, and a fiber optic data link. The missile can navigate to the target area, and the gunner can intervene at any time to lock on and engage any detected targets. The gunner views the flightpath and target via a seeker on the missile linked to the gunner's video console. The data link provides a secure path for transmission of missile seeker video and operation commands with the gunner's station. This project will demonstrate an enhanced fiber optic guided missile which will incorporate an IR imaging seeker, a variety of advanced targeting functionalities and global positioning system (GPS) based inertial measurement unit for accurate targeting. Fire units will be provided for the RFPI/EFOG-M demonstration. Work in this project transitioned from PE #0602303A, project A214. In FY94, work on EFOG-M was also contained in PE #0603617A, project D496, (6.3b).

(U) FY 1993 Accomplishments: Not applicable

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Evaluate EFOG-M contract proposals	4Q94	600
• (U) Award EFOG-M contract/initiate design and fabrication	4Q94	9185
• (U) Participate in Early Version Demonstration (EVD)	4Q94	698
Total		**10483**

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Preliminary design of initial system hardware	4Q95	19404
• (U) Fabrication of initial system hardware for demonstration	4Q95	31100
• (U) Initial design/fabrication of missile surrogate and manned simulator	4Q95	2200
• (U) System integration and engineering management of design and fabrication effort	4Q95	8600
Total		**61304**

(U) Work Performed By: Work is performed primarily by the Research, Development, and Engineering Center, U.S. Army Missile Command, Redstone Arsenal, AL. Contractors include: Raytheon Company, Bedford, MA; LTV Aerospace and Defense Company, Dallas, TX; Boeing Aerospace Company, Seattle, WA; and Electronic Associates, Inc., West Long Branch, NJ. For the EFOG-M project, the prime contract to be awarded competitively. Responsible materiel developer is the Project Management Office, Non-Line of Sight; PEO Tactical Missiles, Redstone Arsenal, AL.

(U) Related Activities: This program adheres to Tri-Service Reliance Agreements on Conventional Air/Surface Weaponry with oversight provided

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603313A**
PE Title: **Missile and Rocket Advanced Technology** Budget Activity: **#3**

by the Joint Directors of Laboratories. Work in this Program Element is related to and fully coordinated with efforts in PE #0601104A (Federally-Funded Research & Development Center Electromechanics & Hypervelocity Physics), PE #0602303A (Missile Technology), PE #0603238A (Air Defense/Precision Strike Technology), and PE #0603363F in accordance with the ongoing Reliance joint planning process and contains no unwarranted duplication of effort among the Military Departments.

(U) Other Appropriation Funds: ($ in Thousands) Not applicable.

(U) International Cooperative Agreements: Data exchange agreement pending with Japan on Dual Mode Seeker.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603604A
PE Title: Nuclear Munitions - Advanced Development **Budget Activity: #4**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D135 Nuclear Development Support	1159	0	0	0	0	0	0	0	17326
D153 Nuclear Effects Support Team (NEST)	1710	2003	0	0	0	0	0	0	32033
PE TOTAL	2869	2003	0	0	0	0	0	0	49359

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Nuclear Effects Support Team (NEST) provides nuclear weapons effects expertise to developers of Army materiel with nuclear survivability requirements. This program also funds efforts to effectively terminate Research and Development efforts within the Office of the Project Manager for Nuclear Munitions.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:

(U) Project D135 - Nuclear Development Support: This project was orderly terminated in FY93 in accordance with a Presidential order to terminate tactical nuclear programs.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Termination of Research and Development efforts.	4QFY93	1159

(U) FY 1994 Planned Program: Program not funded.

(U) FY 1995 Planned Program: Program not funded.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603604A
PE Title: Nuclear Munitions - Advanced Development

Budget Activity: #4

(U) Project D153 - Nuclear Effects Support Team (NEST): This project supports a team that assesses the nuclear survivability of mission essential deployed equipment and identifies corrective measures needed to improve nuclear survivability. The effort supports the development of nuclear hardened systems.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Conducted nuclear survivability assessments of developmental systems.	4QFY93	549
• (U) Assessed test and evaluation master plans for adequacy of nuclear survivability testing.	4QFY93	465
• (U) Maintained and updated the Army database on nuclear survivability of systems.	4QFY93	381
• (U) Continued development of expert system design aids to assist the nuclear survivability efforts of Army project managers.	4QFY93	315
Total		1710

(U) FY 1994 Planned Program:		
• (U) Conduct nuclear survivability assessments of developmental systems.	4QFY94	651
• (U) Assess test and evaluation master plans for adequacy of nuclear survivability testing.	4QFY94	552
• (U) Maintain and update the Army database on nuclear survivability of systems.	4QFY94	452
• (U) Development of expert system design aids to assist the nuclear survivability efforts of Army project managers.	4QFY94	348
Total		2003

(U) FY 1995 Planned Program: Not applicable; program terminated.

(U) Work Performed By: In-house efforts are performed by U.S. Army Research Laboratory Survivability/Lethality Analysis Directorate at Adelphi, Md and Aberdeen Proving Ground, MD. There are no major contractors.

(U) Related Activities:
PE #0602120A (Electronic Survivability and Fuzing Technology). This program element is used to transfer survivability and hardening technology. It has been coordinated with the Quadripartite and NATO nations by standardization agreements.
PE #0604603A (Nuclear Munitions Engineering Development). This program has been terminated.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603604A
PE Title: Nuclear Munitions - Advanced Development

Budget Activity: #4

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603606A
PE Title: Landmine Warfare and Barrier Advanced Technology

Budget Activity: #3

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D006 Landmine Warfare Development	2536	2330	0	0	0	0	0	Cont'd	Cont'd
D608 Countermine & Barrier Development	15468	7652	11950	11414	8594	11854	11941	Cont'd	Cont'd
PE TOTAL	18004	9982	11950	11414	8594	11854	11941		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element has provided for advanced development of landmine and countermine capabilities, but will concentrate on countermine in the future. Landmine development technology is transferred to PE #0603004A after FY94. Mines effectively complement natural obstacles to slow, canalize and attrite forces, thus enhancing the performance of direct and indirect fire weapons and multiplying combat power. Typically, conventional mines must be laid in large numbers to be effective and this is very time and labor intensive. Modern mines developed under Project D006 have the following enhanced capabilities: increased lethality, controllability, and rapid emplacement with fewer people. Mines employed against our forces have similar effects of slowing, canalizing, injuring our soldiers and damaging or destroying our equipment. The countermine capabilities developed under Project D608 are directed at negating the effects of threat mines by developing means to detect and neutralize them. This includes remote detection of minefields, detection of individual mines from moving vehicles and advanced hand held detectors all of which must work against both traditional (metal) mines and mines made from advanced materials. Breaching techniques must also be developed for both conventional and electronically activated mines that can act at a distance. The Army's deficiencies in countermine capabilities were highlighted by Operation Desert Storm (ODS) where large numbers of advanced mines hindered the mobility of the U.S. and allied forces. Mines are becoming increasingly sophisticated and available world wide at low cost, thereby representing a significant threat to U.S. forces in power projection situations. Even small numbers of unsophisticated mines negatively impact operations as witnessed by the U.S. humanitarian operations in Somalia. The work in this program element is consistent with the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan and Project Reliance.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603606A
PE Title: Landmine Warfare and Barrier Advanced Technology

Budget Activity: #3

C. (U) JUSTIFICATION FOR PROJECTS:

(U) **Project D006 - Landmine Warfare Development:** Landmine warfare development includes improved sensors, mine command and control data links, target discrimination logic, and explosive mechanisms to improve the effectiveness, lethality and application of mines. The intelligent minefield concept will demonstrate the flexibility and battlefield effectiveness of a coordinated smart mine attack utilizing Artificial Intelligence (AI), decision aids, Identification Friend-or-Foe (IFF), inter-mine communications, and command and control. This demonstration is a key part of the Rapid force Projection initiative which will demonstrate enhanced lethality for the "first to fight" forces. This program has been transferred to PE 0603004A beginning in FY 1995 to consolidate weapons and munitions advanced technology in a single PE, which is executed by the U.S. Army Armament Research, Development and Engineering Center.

(U) **FY 1993 Accomplishments:**

	Complete	Cost
• (U) Awarded 3 intelligent minefield (IMF) demonstration contract in support of the IMF gateway, advanced sensors and IMF simulator	*	2536
Total		2536

(U) **FY 1994 Planned Program:**

	Complete	Cost
• (U) Conduct early field demonstration of key intelligent minefield (IMF) components (e.g., breadboard gateway, sensor, and mines).	4Q94	2330
Total		2330

(U) **FY 1995 Planned Program:** Not applicable.

(U) **Project D608 - Countermine and Barrier Development:** Operation Desert Storm and the humanitarian operations in Somalia have highlighted the need for new equipment to detect and neutralize land mines. As an interim solution, mine clearing rakes were fabricated and successfully used to breach minefields during Operation Desert Storm. The Army's highest priority requirements are in-stride detection and breach, and man-portable stand-off and close-in detection and neutralization of landmines. Mine detection and neutralization efforts are applicable to the full range of conflict, from heavy force scenarios to low intensity conflicts. Close-in Man Portable Mine Detectors will use multi-sensor fusion to augment and complement present metal detectors in discriminating mines from clutter. Similarly, multi-sensor fusion will be used in a vehicle-mounted mine detector system to sense surface-laid and buried mines. The Army has focused its resources and is expediting these important programs in coordination with the USMC.

* This is continuing work which is reviewed periodically, ensuring quality, relevance and priority

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603606A**
PE Title: **Landmine Warfare and Barrier Advanced Technology**

Budget Activity: **#3**

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Designed ground penetrating radar and electro optic sensors for Vehicle Mounted Mine Detector test bed and field tested a remote controlled pulse inducting/thermal neutron detector.	*	2900
• (U) Evaluated IDX subsystems testing and finalized program management documentation for transition to DEM/VAL (6.3b) and Milestone I IPR.	4Q93	2117
• (U) Completed directed energy subsystems development for integration into ground mobile platforms; transitioned technology to CECOM.	4Q93	6251
• (U) Designed three ground penetrating radar and one infrared Close-In Man Portable Mine detector test beds.	*	4200
Total		15468

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Fabricate and lab test ground penetrating radar and electro optic sensors for Vehicle Mounted Mine Detector test beds and evaluate results of FY1993 field test.	*	3662
• (U) Build and initiate testing of three ground penetrating radar and one infrared Close-In Man Portable Mine Detector test beds.	*	3990
Total		7652

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Field test and evaluate performance of ground penetrating radar and electro optic Vehicle Mounted Mine Detector test beds.	*	4250
• (U) Demonstrate countermeasure techniques to overcome terminal sensors (IR,MMW) of top and side attack mines using smart mine emulator developed in 6.2.	*	1000
• (U) Demonstrate and evaluate performance of Close-In Man Portable Mine Detector test beds; and finalize program management documentation for transition to DEM/VAL (6.3b).	4Q95	4000
• (U) Conduct "Expand the Lodgement" and "Breakout from Beach" field experiments and accompanying simulations as part of a countermine field demonstration.	*	2700
Total		**11950**

* This is continuing work which is reviewed periodically, ensuring quality, relevance and priority

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603606A
PE Title: **Landmine Warfare and Barrier Advanced Technology** Budget Activity: #3

(U) Work Performed By: In-House efforts will be accomplished by Armaments Research, Development and Engineering (RD&E) Center, Picatinny, NJ; Belvoir RD&E Center, Ft. Belvoir, VA; Army Research Office, Chapel Hill, NC; Waterways Experiment Station, Vicksburg, MS; and U.S. Army Tank-Automotive Command, Warren, MI. Contractors include: Textron, Wilmington, MA; Texas Instruments, Dallas, TX; General Electric, Burlington, MA; Harris, Melbourne, FL; Ferranti, Manchester, United Kingdom; Alliant Tech Systems, Minneapolis, MN; Jaycor, San Diego, CA; IITRI, Chicago, IL; Johns Hopkins University, Baltimore, MD; Auburn University, Auburn, AL; General Dynamics, Pomona, CA; Martin Marietta, Orlando, Fl; and Physics International, San Leandro, CA.

(U) Related Activities: This program adheres to Tri-Service Reliance Agreements on Conventional air/surface weaponry and Ground vehicles with oversight provided by the Joint Directors of Laboratories. Work in this Program Element is related to and fully coordinated with PE #0602784A (Military Engineering Technology) and PE #0602786A (Logistics Technology) and contains no unwarranted duplication of effort among the Military Departments.

(U) Other Appropriation Funds: ($ in Thousands) Not applicable.

(U) International Cooperative Agreements: Data Exchange Agreements with France, Great Britain, and Federal Republic of Germany for Countermine Systems and Technology.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603607A**
PE Title: **Joint Service Small Arms Program**

Budget Activity: **#3**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D627 Joint Service Small Arms Program (JSSAP)	5444	7522	5746	4486	5379	4893	5324	Cont	Cont

B. (U) BRIEF DESCRIPTION OF ELEMENT: The objective of this Program Element (PE) and its sole project is to demonstrate key technologies leading to more effective small arms weapons and munitions for all Services. This program provides part of the lethality portion for the 21st Century Land Warrior (21CLW) program. The JSSAP is designed to overcome the technological barriers associated with small arms/munitions/fire control for individual and crew-served weapons. The goal is to achieve substantial improvements in threat defeat under all environmental conditions while reducing the soldier's load. This PE funds several efforts, including the following: (1) Objective Individual Combat Weapon (OICW), which will provide a 200% to 300% increase in incapacitation probability and increase range to 1000 meters; (2) Crew Weapons Test Bed, which will demonstrate the next generation crew-served weapon to replace selected M249 Squad Automatic Weapons, the M60 machine gun, the M2 machine gun, and the MK19 grenade machine gun (GMG) with a 2-man portable system that maintains comparable firepower while featuring a 60-75% weight reduction; (3) Multi-platform Ballistic Sight, for an all weather day/night capability against materiel and personnel, increasing first burst hit probabilities from the present 15% to 90%; (4) Modular Fire Control to reduce life cycle cost and improve effectiveness; (5) Controlled Penetration Ammunition, intended to minimize collateral damage in confined operational environments; and (6) Training Ammunition, to yield realistic training with 50-90% range reduction. All JSSAP efforts are based upon approved Joint Service Science and Technology Objectives (JSSTO) and the emerging Joint Service Small Arms Master Plan (JSSAMP) which are drawn from the following Service documents: the Army Battlefield Development Plan and Small Arms Master Plan, the U.S. Marine Corps' (USMC) emerging Small Arms Modernization Plan, the Special Operations Command Destructive Capabilities Master Plan, the Air Force Air Base Ground Defense, Navy requirements, and the Coast Guard Small Arms Master Plan. The work in this PE is consistent with the Army Science & Technology Master Plan (ASTMP), the Army Modernization Plan, and Project Reliance.

C. (U) JUSTIFICATION FOR PROJECT:

(U) Project D627 - Joint Service Small Arms Program:

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603607A**
PE Title: **Joint Service Small Arms Program**

Budget Activity: **#3**

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Developed MK19 GMG modular fire control engineering design and started technical tests	*	670
• (U) Selected a contractor for multi-platform ballistic sight based on conceptual design and trade-off study	*	2864
• (U) Developed feasibility options for near term improvements to the M203 40mm Grenade Launcher as input to OICW assessment for 21CLW	*	638
• (U) Awarded development contract for controlled penetration, low collateral damage rifle ammunition	*	701
• (U) Developed concept designs for Cal .50 limited range and 5.56mm limited range (lead free) training ammunition	*	571
Total		**5444**

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Award contract for MK19 GMG studies to reduce size/weight and provide night vision capability	*	525
• (U) Fabricate and test a prototype multi-platform ballistic sight and develop baseline data for Joint Service use	*	2417
• (U) Award multiple OICW contracts and conduct systems analysis towards 21CLW demonstration	*	1895
• (U) Complete evaluation of initial designs for low collateral damage rifle ammunition and evaluate final designs.	*	387
• (U) Verify Cal .50 limited range training ammunition performance	*	298
• (U) Develop the Enhanced Infantry Rifle, Combat Shotgun and Close Quarters Battle Weapon for USMC and special units	4Q94	2000
Total		**7522**

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Complete evaluation of final design for multi-platform ballistic sight	*	573
• (U) Conduct technology demonstration of multi-platform ballistic sight and prepare for transition	*	573
• (U) Design, fabricate and demonstrate the OICW component technology for 21CLW	*	4600
Total		**5746**

(U) Work Performed By: This program is managed by a Joint Service Small Arms Program Management Committee. The primary in-house organization is U.S. Army Armament Research, Development and Engineering Center, Picatinny Arsenal, NJ, with major efforts at the U.S. Army Research Laboratory, Aberdeen Proving Ground, MD; U.S. Naval Surface Warfare Center, Crane, IN; and U.S. Air Force Wright Laboratory Armament Directorate, Eglin Air Force Base, FL. Contractors include: Olin Corporation., East Alton, IL; Contraves USA, Pittsburg, PA; SNC Industrial Technologies, Inc., Montreal, Canada; Elbit Systems of America, Grand Rapids, MI; Indiana Ordnance, Connersville, IN; Norma Goerz Instruments, Edgewater, MD; Ferrulatic Inc., Rockaway, NJ; and Battelle Columbus Labs, Columbus, OH.

* This is continuing work which is reviewed periodically, ensuring quality, relevance and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603607A**
PE Title: **Joint Service Small Arms Program** Budget Activity: **#3**

(U) Related Activities: This program adheres to Tri-Service Reliance Agreements on Conventional Air/Surface Weaponry with oversight provided by the Joint Directors of Laboratories. Work in this Program Element is related to and fully coordinated with efforts in PE #0602623A (Joint Service Small Arms Program), PE #0602624A (Weapons & Munitions Technology), PE #0603802A (Weapons & Munitions Advanced Development), and PE #0604802A (Weapons & Munitions Engineering Development) in accordance with the on-going Reliance joint planning process and contains no unwarranted duplication of effort among the Military Departments.

(U) Other Appropriation Funds: ($ in Thousands) Not applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603617A
PE Title: Non-Line of Sight (NLOS)

Project Number: D095
Budget Activity: #4

A. (U) RESOURCES: ($ in Thousands)
Project Title: Non-Line of Sight Missile

Popular Name Program	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
NLOS	199	25000	0	0	0	0	0	0	25199

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The NLOS system is a multi purpose, precision kill weapon system. The primary mission of the NLOS System is to engage and defeat threat armored combat vehicles, other high value ground targets, and hovering or moving rotary wing aircraft that may be masked from line of sight direct fire weapon systems. NLOS is a day, night, adverse weather capable system that allows the maneuver commander to extend his battle space beyond his line of sight to ranges up to 15 kilometers. The system consists of a gunner's station, a tactical missile, and a fiber optic data link. The missile can navigate to the target area, and the gunner can intervene at any time to lock on and engage any detected targets. The gunner views the flightpath and target via a seeker on the missile linked to the gunner's video console. The data link provides a secure path for transmission of missile seeker video and operation commands with the gunner's station.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

	Complete	Cost
(U) FY 1993 Accomplishments:		
• (U) Completed four Contractor Analyses contracts	4Q93	199
(U) FY 1994 Planned Program:		
• (U) Prepare and release Request for Proposal (RFP) for a non-line of sight system	4Q94	822
• (U) Perform engineering studies and analyses	4Q94	2465
• (U) Initiate system design and fabrication	4Q94	20271
• (U) System integration and engineering management of design and fabrication effort	4Q94	1442
TOTAL		25000
• (U) Funds and program efforts above are planned to be transferred to PE 0603313A-D496 in FY94.		
• (U) These efforts will be performed under PE 0603313A-D496.		

(U) FY 1995 Planned Program: Not Applicable

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603617A
PE Title: Non-Line of Sight (NLOS)

Project Number: D095
Budget Activity: #4

D. (U) WORK PERFORMED BY: Prime contract to be awarded competitively. Responsible materiel developer is the Project Management Office, Non-Line of Sight; PEO Tactical Missiles, Redstone Arsenal, AL.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** None
2. **SCHEDULE CHANGES:** None
3. **COST CHANGES:** The FY94 Defense Appropriation Bill funded initial development of a non-line of sight fiber optic guided missile (FOG-M) system.

F. (U) PROGRAM DOCUMENTATION:

- Mission Needs Statement, 8/93
- System Threat Assessment Report, 4/93

G. (U) RELATED ACTIVITIES: Work in this Program Element is related to and fully coordinated with efforts in Program Element # 0603313A (Missile and Rocket Advanced Technology) and contains no unnecessary duplication of effort within the Army or DoD.

H. (U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Procurement	None	None	None	None	None	None	None
Military Construction	None	None	None	None	None	None	None

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. (U) MILESTONE SCHEDULE:

Milestones	Dates
Award Technology Demonstration Contract	4QFY94

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603619A** Budget Activity: **#4**
PE Title: **Landmine Warfare and Barrier - Advanced Development**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D005 Landmine Advanced Development	2907	5244	0	0	0	0	0	Cont	Cont
D606 Countermine/Barrier Advanced Development	7046	16365	23944	25850	5873	4401	11496	Cont	Cont
PE TOTAL	9953	21609	23944	25850	5873	4401	11496	Cont	Cont

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element provides for advanced development of new mine and countermine systems by prototyping modern munitions technology, advanced development sensors, logic networks, fuzes, power sources, warheads, components and modules into complete systems. Minefield command and control development will provide new capabilities in landmine warfare and will move the future Army toward the intelligent minefield. It provides for initiation of advanced development of the Airborne Stand-off Minefield Detection System (ASTAMIDS), the Close-in Man portable Mine Detection and for mine neutralization with Explosive Stand-off Minefield Breacher (SMB).

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:

(U) Project D005 - Landmine Advanced Development: Program to improve the capability of mines used by US Army. This project modernizes M15 mines by providing an advanced technology fuze. Follow-on efforts will provide command and control of mines.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Completed radio design and initiated test plan for Wide Area Mine Command and Control (WAM C2)	4Q93	800
• (U) Established communications concept for - WAM C2	4Q93	400
• (U) Established coordinated attack function, evaluated/established mission profile design parameters	4Q93	1707
Total		**2907**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603619A** Budget Activity: **#4**
PE Title: **Landmine Warfare and Barrier - Advanced Development**

(U) FY 1994 Planned Program:

• (U) Conduct component level tests for WAM C2	4Q94	1244
• (U) Complete POP, set power budget, establish intermine communication links for WAM C2	4Q94	3000
• (U) Develop and initiate Engineering and Manufacturing Development (EMD) plan for WAM C2	4Q94	1000
Total		**5244**

(U) FY 1995 Planned Program:

- (U) No planned program.

(U) Work Performed By: The Project for Manager Mines, Countermine and Demolitions, Picatinny Arsenal, NJ, is assigned the responsibility for landmine, countermine and explosive demolition development. The major supporting laboratories are the Armament Research, Development and Engineering Center, Picatinny Arsenal, NJ. The prime contractor is Textron Defense System, Wilmington, MA.

(U) Related Activities: Component work and exploratory development for this program are conducted in PE #0602624A (Weapons and Munitions Technology) #0602786A (Logistics Technology), #0602784A (Military Engineering Technology) and #0603606A (Landmine Warfare and Barrier Advanced Technology). Engineering development efforts which result from this program are accomplished in PE #0604808A (Landmine Warfare/Barrier Engineering Development) and #0604619A (Landmine Warfare). Mine and countermine efforts are closely coordinated to incorporate counter-countermeasures as applicable. The Project Manager for Mines, Countermine and Demolitions monitors related programs to ensure no unnecessary duplication of effort within the Army or DoD. Development information on mines is coordinated and exchanged among the services by the Tri-Service Joint Technical Coordinating Group for Unpowered Weapons. DoD's Office of Munitions monitors the scatterable mine program to avoid service duplication. There is no unnecessary duplication of effort within the Army or DoD.

(U) Other Appropriation Funds: None

(U) International Cooperative Agreements: None.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603619A**
PE Title: **Landmine Warfare and Barrier - Advanced Development**

Project Number: **D606**
Budget Activity: **#4**

A. (U) RESOURCES: ($ in Thousands)
Project Title: Countermine/Barrier Advanced Development

Popular Name	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
Stand-Off Minefield Detection System (ASTAMIDS)/Explosive SMB/APOBS	7046	16365	23944	25850	5873	4401	11496	Cont.	Cont.

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project provides for advanced development of new countermine systems by prototyping advanced sensors evaluating neutralizing, clearing, breaching and detection concepts which will enhance the U.S. capability in countermine warfare. The program provides for proof-of-principle for these systems.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

	Complete	Cost
(U) FY 1993 Accomplishments:		
• (U) Completed ASTAMIDS source selection	4Q93	2456
• (U) Initiated ASTAMIDS Advanced Development Design	4Q93	4390
• (U) Initiated Anti-personnel Obstacle Breaching System (APOBS) reliability improvement program	4Q93	200
Total		**7046**
(U) FY 1994 Planned Program:		
• (U) Conduct ASTAMIDS component system design review	3Q94	15000
• (U) Conduct Explosive Stand-Off Minefield Breaching (SMB) component design	4Q94	365
• (U) Conduct Anti-Personnel Obstacle Breaching System (APOBS) Reliability Improvement program	3Q94	1000
Total		**16365**
(U) FY 1995 Planned Program:		
• (U) Continue ASTAMIDS Prototype development	4Q95	22744

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603619A
PE Title: Landmine Warfare and Barrier - Advanced Development

Project Number: D606
Budget Activity: #4

• (U) ASTAMIDS test planning and site preparation	1Q96	1000
• (U) Conduct APOBS milestone III review	2Q95	200
Total		23944

D. (U) WORK PERFORMED BY: The Project Manager for Mines, Countermine and Demolitions, Picatinny Arsenal, NJ is assigned responsibility for countermine development. The prime contractors for ASTAMIDS are Westinghouse, Baltimore, MD and Raytheon, Bedford, MA. The major supporting laboratory is the Belvoir Research, Development and Engineering Center, Fort Belvoir, VA.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:
NARRATIVE DESCRIPTION OF CHANGES

1. TECHNICAL CHANGES: None

2. SCHEDULE CHANGES: Milestone I for ASTAMIDS slipped from 4Q92 to 1Q93 Milestone II for ASTAMIDS slipped from 1Q96 to 2Q97

3. COST CHANGES: None

F. (U) PROGRAM DOCUMENTATION: Not applicable

G. (U) RELATED ACTIVITIES: Component work and exploratory development for the program are conducted in PE #0603606A (Landmine Warfare/Barrier Advanced Technology). There is no unnecessary duplication of effort within the Army or DoD.

H. (U) OTHER APPROPRIATION FUNDS:
($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Other Procurement, Army Activity 3 (OPA-3):							
ASTAMIDS - MX8050	0	0	0	0	0	8347	0

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603619A**
PE Title: **Landmine Warfare and Barrier - Advanced Development**

Project Number: **D606**
Budget Activity: **#4**

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

J. (U) MILESTONE SCHEDULE:

Milestones	Dates
ASTAMIDS Milestone I	1QFY93
ASTAMIDS Milestone II	2QFY97
ASTAMIDS Milestone III A	4QFY99
ASTAMIDS Milestone III	3QFY00
ASTAMIDS FUE	2QFY02
Explosive SMB Milestone I	3QFY94
Explosive SMB Milestone II	4QFY97
Explosive SMB Milestone III	4QFY01
APOBS Milestone III	2QFY95

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603627A**
PE Title: **Smoke, Obscurant and Target Defeating Systems - Advanced Development**
Budget Activity: **#4**

A.(U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DE78 Target Defeating Systems	1	953	0	0	0	0	0	Cont.	Cont.
DE79 Smoke, Obscurant-Advanced Development	14836	5086	2821	0	0	0	0	Cont.	Cont.
PE TOTAL	14837	6039	2821	0	0	0	0		

B. (U) BRIEF DESCRIPTION OF ELEMENT: U.S. Forces must be able to effectively neutralize and degrade directed energy weapon systems and threat electro-optical systems/smart weapons that operate in the full range of the electromagnetic spectrum. This program element supports the Advanced Development (AD) of logistically supportable, high performance smoke and obscurant agents, munitions, and devices to improve the survivability of the combined arms force and complement weapons systems. Improvements are sought across the entire multispectral range from visual through infrared (IR) and millimeter wavelengths (MMW - radar) for incorporation into large area and projected smoke systems. The smoke obscuration technologies supported by this program enhance smoke systems as combat multipliers.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:

(U) Project DE78 - Target Defeating Systems: Provides Advanced Development (AD) of non-lethal riot control devices.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Conducted Advanced Riot Control Agent Device (ARCAD) configuration analysis	2Q93	1
• (U) Updated ARCAD Testing and Evaluation Master Plan (TEMP)	3Q93	

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603627A
PE Title: Smoke, Obscurant and Target Defeating Systems - Advanced Development
Budget Activity: **#4**

• (U) Completed preliminary manufacturing plan for ARCAD	4Q93	
(U) FY 1994 Planned Program:		
• (U) Award ARCAD development contract	2Q94	850
• (U) Initiate ARCAD prototype design and hardware fabrication	3Q94	103
Total		**953**

(U) FY 1995 Planned Program:
• (U) Project not funded

(U) Project DE79 - Smoke/Obscurant Systems: Resources the XM1101 Mechanized Smoke Obscurant Carrier to provide maneuver commanders a capability to screen large areas in unfavorable wind conditions and threat locations. The XM1101 will counter the threat arising from wide proliferation of advanced visual and infrared sensors. The XM1101, formerly the Large Area Mobile Projected Smoke System, will integrate a rocket launching system using XM264 Smoke Rockets with the XM56 Mechanical Smoke Generator on a stretched M113A3 chassis. The heavy division version of the XM56 will also be mounted on a M113A3 carrier and is designated the Generator, Smoke, Mechanical XM58. The XM58 significantly enhances the operational capability of smoke units through upgrades in vehicle maneuverability and survivability and provides visual, IR, and MMW smoke coverage for combat units. This program also funds a multi-fuel Materiel Change (MC) for the M157 Smoke Generator System (SGS). Program funding will also support the Light Vehicle Obscuration Screening System (LVOSS) project to provide an on-board screening system for the High Mobility Multi-Purpose Wheeled Vehicle (HMMWV). The LVOSS will maximize the use of standard grenade and launcher components and technology to disseminate smoke/obscurant material. The XM81 is a bi-spectral smoke grenade which provides screening in both MMW and IR spectra. It is designed to launch from 66mm grenade launchers.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Procured long lead items for planned XM1101 Pre-Production Qualification Testing (PPQT): Thermal imagers; M113A3 Reliability Improved Selected Equipment (RISE) packages; Modular Azimuth Position System (MAPS), and meteorological system	4Q93	3933

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603627A**
PE Title: **Smoke, Obscurant and Target Defeating Systems - Advanced Development**
Budget Activity: **#4**

• (U) Procured and evaluated alternative turbine engines for XM1101 large area smoke system application	4Q93	749
• (U) Conducted XM1101 Pre-Production Testing (PPT) on large area smoke system	4Q93	883
• (U) Completed initial hardware development on XM1101 projected smoke system	4Q93	4109
• (U) Conducted joint XM1101 and XM58 Milestone I/II In-Process Review (IPR)	4Q93	4422
• (U) Transition XM1101 and XM58 to PE #0604609, Proj D200	4Q93	140
• (U) Transition XM81 MMW/IR Grenade to PE #0604609, Proj D200	1Q93	
• (U) Approved LVOSS Mission Need Statement (MNS)	4Q93	
• (U) Initiated M157 SGS multi-fuel Materiel Change (MC)	4Q93	600
Total		**14836**

(U) FY 1994 Planned Program:

• (U) Approve LVOSS Acquisition Strategy (AS)	2Q94	
• (U) Conduct LVOSS Milestone 0 IPR	2Q94	
• (U) Participate in three LVOSS Battle Lab evaluations	4Q94	1800
• (U) Complete M157 SGS multi-fuel Materiel Change	4Q94	2786
• (U) TECOM testing of LVOSS 4Q94	500	
Total		**4586**

(U) FY 1995 Planned Program:

• (U) Conduct LVOSS MS I/II In-Process Review (IPR)	3Q95	
• (U) Evaluate LVOSS prototypes for further development	3Q95	1111
• (U) Select materials and hardware for LVOSS system design	4Q95	1210
• (U) LVOSS systems engineering, planning, and documentation	4Q95	500
Total		**2821**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603627A**
PE Title: **Smoke, Obscurant and Target Defeating Systems - Advanced Development**

Budget Activity: **#4**

(U) Work Performed By: The Product Manager for Smoke/Obscurants, Aberdeen Proving Ground (APG), MD; U.S. Army Chemical and Biological Defense Command, APG, MD; Edgewood Research, Development and Engineering Center, APG, MD; and contractor TBD.

(U) Related Activities: Program Elements #0602622A (Chemical, Smoke and Equipment Defeating Technology) and #0604609A (Smoke, Obscurant and Target Defeating Systems-Engineering Development). In order to meet the other services' needs and to prevent unnecessary duplication of effort, coordination is maintained with the other services through joint participation in the Smoke and Aerosol Working Group of the Joint Technical Coordinating Group; joint participation and attendance at Smoke Weeks and Smoke/Obscurant symposia; personal contacts and joint distribution of relevant project reports. There is no unnecessary duplication of effort within the Army or DoD.

(U) Other Appropriation Funds: Not Applicable

(U) International Cooperative Agreements: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Budget Activity: #4

Program Element: #0603640A
PE Title: Artillery Propellant Development

A. (U) RESOURCES: ($ in Thousands)

Project Number Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DB91 Unicharge	16087	30533	8137	0	0	0	0	0	44087

B. (U) BRIEF DESCRIPTION OF EFFORT: Artillery Propellant Development is a duel faceted program consisting of the XM230 Unicharge 155mm, Solid Propellant, Combustible Case System and a 52 Caliber Solid Propellant Armament System. XM230 Unicharge achieves zoning through the use of multiple increments. Each increment is self-contained with an ignition system, wear additives, flash and blast reducers, and decoppering agent. The accompanying 52 Caliber Solid Propellant Armament System, using XM230 unicharge, is intended to increase range from 30KM to 40KM and achieve a rate of fire from six to eight rounds per minute. Program objectives include fabrication and assembly of a cannon barrel and breech, and testing of components. The culmination of which is to verify the design and assembly of the breech and barrel mechanism and a fiber optic laser ignition system.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:	Complete	Cost
U) Project DB91 - :		
(U) FY 1993 Accomplishment:		
• (U) Product Development (ICI: Load/assemble/pack; ARMTEC: Combustible Cases; Hercules: Propellant; AMCCOM: Charge & Packaging engineering services; Other Services: Insensitive munitions & packaging engineering services)	4Q FY93	$13770
• (U) Support and Management (Other Services: Project Management support)	4Q FY93	$400
• (U) Test and Evaluation (AMCCOM; Other Services: Packaging & environmental testing)	4Q FY93	$1917

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603640A
PE Title: Artillery Propellant Development

Project Number: DB91

(U) FY 1994 Planned Program:		
• (U) Product Development (ICI: Load/assemble/pack; ARMTEC: Combustible Cases; Hercules: Other Services: Insensitive munitions & packaging engineering services)	4Q FY94	$9077
• (U) Support and Management (Other Services: Project Management support)	4Q FY94	$350
• (U) Test and Evaluation (AMCCOM; TECOM; Other Services: Packaging & environmental testing; 52 Caliber)	4Q FY94	$2606
• (U) 52 Caliber Development	4Q FY94	$18500
(U) FY 1995 Planned Program:		
• (U) Product Development (AMCCOM: Charge & Packaging engineering services; Other Services: Insensitive munitions & packaging engineering services	4Q FY95	$2630
• (U) Support and Management (Other Services: Project Management support)	4Q FY95	$350
• (U) Test and Evaluation (AMCCOM; TECOM)	4Q FY95	$5157

(U) Program Plan to Completion: Program concludes in FY95

(U) Work Performed By: Management is accomplished by the Project Manager for the Advanced Field Artillery System with primary engineering support provided by the U.S. Army Armament, Research, Development, and Engineering Center, both of which are located at Picatinny Arsenal, NJ. Other government agency support is provided by the Army Research Laboratory, Watervliet Arsenal, NY, and Biomedical Research and Development Laboratory, MD. Contractor support is provided by Hercules (Radford Army Ammunition Plant), VA; ICI Americas (Indiana Army Ammunition Plant), IN; Armtec, Coachella, CA; Olin, St. Marks, FL; Wright-Malta Corp., Malta, NY; Northern Industrial Services, Albany, NY.

(U) Related Activites: None

(U) International Cooperative Agreements: 155mm Joint Ballistic Memorandum of Understanding, December 1991. Members include Italy, Germany, United Kingdom, France, and the United States.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603645A**
PE Title: **Armored Systems Modernization (ASM) - Advanced Development**

Budget Activity: **#4**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DB82 System Engineering Analysis (SEA)	740	854	0	0	0	0	0	0	2677
DB83 Common Chassis Advanced Technology Transition Demo (CCATTD)	161340	0	0	0	0	0	0	0	354811
DB87 Combat Vehicle Survivability	0	22099	15421	0	0	0	0	0	39524
DB88 Future Armored Resupply Vehicle (FARV)	19245	21071	21839	74580	92280	119994	83619	Cont.	Cont.
DB98 Component Development	0	48703	23559	0	0	0	0	0	72089
D409 Advanced Field Artillery System (AFAS)	132035	55149	114657	138018	190868	229976	108726	Cont.	Cont.
PE TOTAL	313360	147876	175476	212598	283148	349970	192345	Cont.	Cont.

B. (U) BRIEF DESCRIPTION OF ELEMENT: ASM has been restructured to reflect the change in direction making the Advanced Field Artillery System (AFAS) and the Future Armored Resupply Vehicle (FARV) the lead PEO-ASM future system. The Conventional Systems Committee and the Defense Acquisition Executive concurred in the ASM restructured program and notification was provided to Congress on 1 Jun 92. Consequently, the process lays the framework for follow-on systems in the same close combat vehicle class to adapt common components where economically and operationally beneficial. The current mobility systems efforts have been descoped and focused toward the AFAS and FARV vehicles truncating development efforts relating to the Block III Tank, the Future Infantry Fighting Vehicle (FIFV) and Combat Mobility Vehicle (CMV). Delivery of performance specifications occurred in the second quarter of FY 1993. This program element also provides for a System Engineering Analysis effort in support of PEO management. Project DB83 (CCATTD) has been restructured to Project DB98 (Component Development) in FY 1994.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603645A
PE Title: Armored Systems Modernization (ASM) - Advanced Development

Budget Activity: #4

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:

(U) Project DB82 - System Engineering Analysis (SEA): SEA is a contract effort in support of the PEO/PM's assisting in the preparation of technical plans for ASM, coordinating data/information flow between the AFAS and FARV, and ensuring optimum commonality and reduced performance risk.

	COMPLETE	COST
(U) FY 1993 Accomplishment: Continued SEA contract support until award of AFAS and FARV Dem/Val contract	4Q FY93	$740
(U) FY 1994 Planned Program: Conclude SEA contract support until award of AFAS and FARV Dem/Val contract	4Q FY94	$854
(U) FY 1995 Planned Program: Program concludes in FY 1994		

(U) Work Performed By: Management of the SEA contract is accomplished by the Program Executive Office for Armored Systems Modernization (ASM), Warren, MI, in conjunction with its various Program Managers. The major contractor for the SEA contract is TRW, Anaheim Hill, CA.

(U) Related Activities: - There is no unnecessary duplication of effort within the Army or the Department of Defense.
- PE #0602601A (Combat Vehicle and Automotive Technology)
- PE #0602624A (Weapons and Munitions Technology)
- PE #0203735A (Combat Vehicle Improvement Programs)
- PE #0602120A (Electronic Survivability and Fusing Technology)
- PE #0602716A (Human Factors Engineering Technology)
- PE #0603004A (Weapons and Munitions Advanced Technology)
- PE #0603005A (Combat Vehicle and Automotive Advanced Development)
- PE #0603001A (Logistics Advanced Technology)
- PE #0603774A (Night Vision Systems Advanced Development)
- PE #0602618A (Ballistics)

(U) Other Appropriation Funds: None

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603645A
PE Title: Armored Systems Modernization (ASM) - Advanced Development

Budget Activity: #4

(U) International Cooperative Agreements: None

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603645A**
PE Title: **Armored Systems Modernization (ASM) - Advanced Development**

Project Number: **DB87**
Budget Activity: **#4**

A. (U) RESOURCES: ($ in Thousands)
Project Title: Combat Vehicle Survivability-Advanced Development

Popular Name Program	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
Survivability	0	22099	15421	0	0	0	0	0	37559

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This effort evaluates methods of reducing AFAS and FARV susceptibility to smart/guided top and horizontal attack threats and characterizes methods of reducing system vulnerability to ballistic and non-ballistic threats. Susceptibility reduction efforts consist of: analytical characterization of top and direct fire engagement timelines (the time required for a threat weapon or smart top attack munition to detect and engage its target), identification of sensor and countermeasure options and performance criteria; and simulation and field tests verifying the operational performance of selected devices. This work, performed in coordination with TACOM Advanced Land Combat efforts, develops close-in self-protection concepts capable of detecting, tracking, and defeating both direct and indirect fire threats. AFAS and FARV vulnerability reduction activities emphasize the following, development and demonstration of the potential to compartmentalize Liquid Propellant (LP) and 155mm HE projectiles; generation of ballistic shock specifications; definition of interior shielding technologies providing integrated radiation and spall protection for the crew; maturation and demonstration of NBC collective protection technologies; and demonstration of standoff chemical agent detection. This work will provide the basis for development of a performance specification supporting AFAS and FARV as well as ASM Future Vehicles.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

	COMPLETE	COST
(U) FY 1993 Accomplishment: Program funded under Project DB83		
(U) FY 1994 Planned Program:		
• (U) Product Development	4Q FY94	$17847
• (U) Support and Management	4Q FY94	$3632
• (U) Testing and Evaluation	4Q FY94	$620

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603645A**
PE Title: **Armored Systems Modernization (ASM) - Advanced Development**

Project Number: **DB87**
Budget Activity: **#4**

(U) FY 1995 Planned Program:

• (U) Product Development	4Q FY95	$13486
• (U) Support and Management	4Q FY95	$1920
• (U) Testing and Evaluation	4Q FY95	$15

(U) Program Plan to Completion: Program concludes in FY 1995

D. (U) WORK PERFORMED BY: Management is accomplished by the Project Manager for the Survivability Systems. Other government agency support is provided by the Tank Automotive Command, MI, U.S. Army Communications-Electronics Command, Directorate for Night Vision Electronic Sensors, Ft. Monmouth, NJ; US Army Research Laboratory, Army Materiel Systems Analysis Agency, Survivability/Lethality Analysis Directorate; Edgewood Research, Development and Engineering Center, APG, MD, and other contractors to be determined.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** None
2. **SCHEDULE CHANGES:** None
3. **COST CHANGES:** None

F. (U) PROGRAM DOCUMENTATION: None

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603645A**
PE Title: **Armored Systems Modernization (ASM) - Advanced Development**

Project Number: **DB87**
Budget Activity: **#4**

G. (U) RELATED ACTIVITIES: - There is no duplication of effort within the Army or the Department of Defense
- PE #0602601A (Combat Vehicle and Automotive Technology)
- PE #0603005A (Combat Vehicle and Automotive Advanced Development)
- PE #0602618A (Ballistics)
- PE #0602105A (Materials Technology)
- PE #0602270A (Electronic Warfare Technology)
- PE #0602622A (Chemical, Smoke and Equipment Defeating Technology)
- PE #0603806A (NBC Defense System - Advanced Development)

H. (U) OTHER APPROPRIATION FUNDS: None

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. (U) TEST AND EVALUATION DATA:

Milestones	Dates
Monitor demonstrations of Top Attack Active Protection (AP)	FY 1994
Demonstration of self-protection systems sensors & countermeasures	FY 1994/95
Complete PSA/CATOX filtration studies	FY 1994
Complete Chemical Standoff Detection (LSCAD) tech demonstration	FY 1994
Complete Artillery System BDS-D Survivability Experiments	FY 1994/95
Complete NBCCS Materials Compatibility Study	FY 1995

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603645A
PE Title: Armored Systems Modernization (ASM) - Advanced Development
Project Title: Future Armored Resupply Vehicle (FARV)

Project Number: **DB88**
Budget Activity: **#4**

POPULAR NAME: FARV

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603645A
PE Title: Armored Systems Modernization (ASM) - Advanced Development
Project Title: Future Armored Resupply Vehicle (FARV)

Project Number: **DB88**
Budget Activity: **#4**

A. (U) SCHEDULE/BUDGET INFORMATION: ($ In Thousands)

SCHEDULE	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	To Complete
Program Milestones		MS I 4Q FY94						
Engineering Milestones	Perf Spec 2Q FY93			Dem/Val PDR	Dem/Val CDR		Prototype Delivered (2)	
T&E Milestones		TEMP 3Q FY94					System EDT	
Contract Milestones			DEM/VAL Contract Award 2Q FY95				EMD Solicitation Release FY00	
BUDGET ($000)	**FY 1993**	**FY 1994**	**FY 1995**	**FY 1996**	**FY 1997**	**FY 1998**	**FY 1999**	**Program Total (to complete)**
Major Contract	0	0	3661	57502	75025	101151	62775	(Continued)
Support Contract	8420	4314	4003	1500	1500	2000	2000	(Continued)
In-House Support	10825	16757	14175	15578	15755	16843	18844	(Continued)
GFE/ Other	0	0	0	0	0	0	0	(Continued)
Total	19245	21071	21839	74580	92280	119994	83619	(Continued)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603645A
PE Title: Armored Systems Modernization (ASM) - Advanced Development
Project Title: Future Armored Resupply Vehicle (FARV)

Project Number: DB88
Budget Activity: #4

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The present 155mm artillery system has lightly protected resupply vehicles with limited payload/mobility and exposed crews during rearm/resupply operations. The Future Armored Resupply Vehicle (FARV) will increase ammunition payload and will provide automated, rapid transfer of ammunition, liquid propellant and top off fuel to the Advanced Field Artillery System (AFAS). The FARV will support the decentralized and continuous operations of the AFAS thereby increasing AFAS mission effectiveness. Automation and robotics in the FARV will allow crew reduction resulting in life cycle cost benefits over current systems. The FARV will have increased ballistic and non-ballistic survivability features. Mobility improvements feature increased vehicle range (405 km) and speed (39 to 48 km) cross country and position navigation.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:	Complete	Cost
(U) FY 1993 Accomplishment:		
• (U) Support and Management (Martin Marietta: 155mm artillery rearm module with Liquid Propellant; Other Services: Robotic handling, ammunition transfer and ammo marking, management system decision aid, software, robotic resupply and matrix support)	4Q FY93	$19245
(U) FY 1994 Planned Program:		
• (U) Support and Management (Martin Marietta: 155mm artillery rearm module with Liquid Propellant; Other Services: Robotic handling, ammunition transfer and ammo marking, management system decision aid, software, robotic resupply and matrix support)	4Q FY94	$21071
(U) FY 1995 Planned Program:		
• (U) Product Development (Dem/Val Contract; Other Services)	4Q FY95	$ 3961
• (U) Support and Management (Martin Marietta: 155mm artillery rearm module with Liquid Propellant; Other Services: Robotic handling, ammunition transfer and ammo marking, management system decision aid, software, robotic resupply and matrix support)	4Q FY95	$17878

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603645A**
PE Title: **Armored Systems Modernization (ASM) - Advanced Development**
Project Title: **Future Armored Resupply Vehicle (FARV)**

Project Number: **DB88**
Budget Activity: **#4**

(U) Program Plan to Completion:

• (U) Product Development	Unknown	Unknown
• (U) Support and Management	Unknown	Unknown
• (U) Test and Evaluation	Unknown	Unknown

D. (U) WORK PERFORMED BY: Management is accomplished by the Project Manager for the Future Armored Resupply Vehicle with primary engineering and contractual support provided by the U.S. Army Armament, Research, Development, and Engineering Center, both of which are located at Picatinny Arsenal, New Jersey. Significant other government agency support is provided by the Tank Automotive Command, MI, Army Research Laboratory, MD, Aberdeen Proving Grounds, MD, and Belvoir Research Development and Engineering Center, Ft. Belvoir, VA, Oak Ridge National Laboratory, TN. Principal contract work performed by Martin Marietta, Burlington, VT.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** None
2. **SCHEDULE CHANGES:** The Army Acquisition Executive directed an Acquisition Strategy requiring a single contract for AFAS and FARV. The Dem/Val anticipated contract award is 2Q FY95. This is an acceleration from the previously planned FY 1996 FARV Dem/Val contract award. As a result, there will be a small amount of schedule concurrency in the completion of the CED and the initiation of Dem/Val.
3. **COST CHANGES:** None

F. (U) PROGRAM DOCUMENTATION:
Draft TEMP, 7/93
Operational Requirement Document, 12/93
AFAS/FARV Draft Acquisition Strategy, 16 Sep 93

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603645A
PE Title: Armored Systems Modernization (ASM) - Advanced Development
Project Title: Future Armored Resupply Vehicle (FARV)

Project Number: DB88
Budget Activity: #4

G. (U) RELATED ACTIVITIES: - There is no duplication of effort within the Army or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS: None

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. (U) TEST AND EVALUATION:

Milestones	Dates
Critical component maturation testing and demonstration	4Q FY94 - 2Q FY95
ARM II LP Demonstrator	
- Government testing	3Q FY95
- User assessment	4Q FY95

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603645A**
PE Title: **Armored Systems Modernization (ASM) - Advanced Development**

Project Number: **DB98**
Budget Activity: **#4**

A. (U) RESOURCES: ($ in Thousands)
Project Title: Component Development

Popular Name Program	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
Comp Dev	0	48703	23559	0	0	0	0	0	72089

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Congress has directed the acceleration of the AFAS program. This project develops and matures certain mobility technologies specifically required for the AFAS and FARV and which are critical to the AFAS and FARV milestone I decision in FY 1994. Included will be competing propulsion systems (both mechanical and electric drive) and the Vehicle Control and Operating System (VCOS), including software and vehicle electronics.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

	Complete	Cost
(U) FY 1993 Accomplishment:		
• (U) Program funded under Project DB83		
(U) FY 1994 Planned Program:		
• (U) Product Development (Teledyne Continental Motors: Develop mobility and electronic components; Other services: Liquid propellant maturation and SSEB efforts)	4Q FY94	$46502
• (U) Support and Management	4Q FY94	$2201
• (U) Test and Evaluation (Program Management Office and other Government agencies support)		
(U) FY 1995 Planned Program:		
• (U) Product Development (Teledyne Continental Motors: Develop mobility and electronic components; JPO: Turbine engine development; Other services: Liquid propellant maturation and SSEB efforts)	4Q FY95	$21409
• (U) Support and Management	4Q FY95	$1875
• (U) Test and Evaluation (Program Management Office and other Government agencies support)	4Q FY95	$ 275

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603645A
PE Title: Armored Systems Modernization (ASM) - Advanced Development

Project Number: DB98
Budget Activity: #4

(U) **Program Plan to Completion:** Program concludes in FY 1995

D. (U) WORK PERFORMED BY: Management of the contractors who will be developing and maturing critical subsystems and components will be accomplished by the Project Manager of AFAS. The prime contractors are Teledyne Continental Motors (TCM) of Muskegon, MI; Teledyne Brown Engineering (TBE) Huntsville, AL; Teledyne Electronic Systems (TES) Northridge, CA; and the Joint Program Office (JPO) of Stratford, CT (a joint venture of General Electric and Textron Lycoming).

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. TECHNICAL CHANGES: By direction of Congress, the CCATTD program was restructured by deleting tank specific work from the contracts and focusing on the AFAS. Contract effort was downscoped including stopping work on the demonstrator. FARV design work was inserted.
2. SCHEDULE CHANGES: Because of the Congressional emphasis on AFAS and direction to defer the Block III tank, all ASM milestones for the tank were rescinded by the Conventional Service Committee. Milestone I for AFAS is now scheduled for 4Q FY94.
3. COST CHANGES: Funding for projects DB83 and DB98 were realigned per direction of Congress and OSD/DA.

F. (U) PROGRAM DOCUMENTATION:

Test and Evaluation Master Plan (Draft) 6/91
Operational Requirements Document (ORD) 10/93
AFAS/FARV Computer Resources Life Cycle Management Plan (CRLCMP - DRAFT) 9/93

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603645A
PE Title: Armored Systems Modernization (ASM) - Advanced Development

Project Number: DB98
Budget Activity: #4

G. (U) RELATED ACTIVITIES: - There is no unnecessary duplication of effort within the Army or the Department of Defense.
- PE #0602601A (Combat Vehicle and Automotive Technology)
- PE #0602624A (Weapons and Munitions Technology)
- PE #0203735A (Combat Vehicle Improvement Programs)
- PE #0602120A (Electronic Survivability and Fuzing Technology)
- PE #0602716A (Human Factors Engineering Technology)
- PE #0603004A (Weapons and Munitions Advanced Technology)
- PE #0603005A (Combat Vehicle and Automotive Advanced Development)
- PE #0603001A (Logistics Advanced Technology)
- PE #0603774A (Night Vision Systems Advanced Development)
- PE #0602618A (Ballistics)

H. (U) OTHER APPROPRIATION FUNDS: None

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. (U) TEST AND EVALUATION DATA:

Milestones	Dates
Automotive Test Rig (ATR) roll out	2Q FY94
ATR 2000 Km test	2Q FY94 - 3Q FY94
Final software SIL demonstration	3Q FY94

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603645A**
PE Title: **Armored Systems Modernization (ASM) - Advanced Development**
Project Title: **Advanced Field Artillery System (AFAS)**

Project Number: **D409**
Budget Activity: **#4**

POPULAR NAME: AFAS

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603645A**
PE Title: **Armored Systems Modernization (ASM) - Advanced Development**
Project Title: **Advanced Field Artillery System (AFAS)**

Project Number: **D409**
Budget Activity: **#4**

A. (U) SCHEDULE/BUDGET INFORMATION: ($ In Thousands)

SCHEDULE	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	To Complete
Program Milestones		MS I - 4Q FY94						
Engineering Milestones	Perf. Spec. 2Q FY93 ATD CDR 3Q FY93	ATD Delivery 2Q FY94	Perf. Spec. 3Q FY95 XM46 Characterized 3Q FY95 ACTS Module Delivered 4Q FY95	Dem/Val PDR Armament EDT	Dem/Val CDR	Prototype Delivered (1)	Prototype Delivered (1)	
T&E Milestones	Mount & Cannon Test	ATD EDT	Complete RLPG ATD Test				System EDT	
Contract Milestones	Definitized RLPG Contract 2Q FY93	DEM/VAL RFP Released 3Q FY94	DEM/VAL Contract Award 3Q FY95				EMD Solicitation Release	
BUDGET ($000)	**FY 1993**	**FY 1994**	**FY 1995**	**FY 1996**	**FY 1997**	**FY 1998**	**FY 1999**	**Total Program (to complete)**
Major Contract	91556	31292	76810	101437	142302	180358	70260	(Continued)
Support Contract	2330	1600	2000	2000	2000	2000	2000	(Continued)
In-House Support	31845	16791	27847	31581	42066	38618	28966	(Continued)
GFE/ Other	6304	5466	8000	3000	4500	9000	7500	(Continued)
Total	132035	55149	114657	138018	190868	229976	108726	(Continued)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603645A
PE Title: Armored Systems Modernization (ASM) - Advanced Development
Project Title: Advanced Field Artillery System (AFAS)

Project Number: D409
Budget Activity: #4

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: AFAS is the Army's next generation 155mm self-propelled howitzer system providing high payoff technology capabilities in support of the maneuver force. This project develops the AFAS Advanced Technology Demonstrator (ATD), matures the Regenerative Liquid Propellant Gun (RLPG), matures the processing, packaging, and formulation development of XM46 Liquid Propellant, matures the fire control/artillery accuracy componentry, and finances the Demonstration/Validation (DEM/VAL) phase. AFAS requirements include leap-ahead capabilities in range, rate-of-fire, sustained fire, time-on-target, accuracy, responsiveness, automated ammunition handling/resupply, reduced crew size, and survivability.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishment:	Complete	Cost
• (U) Product Development (FMC: Advanced Technology Demonstration; Martin Marietta: Regenerative Liquid Propellant Gun Development & ACT/BCT; Olin: Pilot Plant; Grumman: Projectile Tracking System; LB&M: DES/DMS; Other Contracts: Fire Control/Propellant Development/Armament Development; AMCCOM: ATD/ armament/fire control/propellant engineering, mount/cannon design, gymnasticator/ SSEB; LABCOM: Fire control and propellant engineering services; Jet Propulsion Lab: Liquid propellant characterization & oscillations assessment; Other Services)	4Q FY93	$116121
• (U) Support and Management (TRW: Scientific & engineering analysis; Other Contracts: Project and engineering management services; AMCCOM: Management engineering services; PM AFAS: Project office support)	4Q FY93	$9610
• (U) Test and Evaluation (Olin: Liquid Propellant purchase; Morton Thiokol: Liquid Propellant purchase; TECOM: ATD integration, Armament/Mount Reliability, LP Testing; Other Services: Insensitive munition testing/Test projectiles)	4Q FY93	$6304

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603645A
PE Title: Armored Systems Modernization (ASM) - Advanced Development
Project Title: Advanced Field Artillery System (AFAS)

Project Number: D409
Budget Activity: #4

(U) FY 1994 Planned Program:		
• (U) Product Development (FMC: Advanced Technology Demonstration; Martin Marietta: Regenerative Liquid Propellant Gun Development & ACT/BCT; Grumman: Projectile Tracking System; Other Contracts: Fire Control/Propellant Development/Armament Development; AMCCOM: ATD/armament/fire control/propellant engineering, mount/ cannon design, gymnasticator/SSEB; LABCOM: Fire control and propellant engineering services; Jet Propulsion Lab: Liquid propellant characterization & oscillations assessment; Other Services)	4Q FY94	$42690
• (U) Support and Management (TRW: Scientific & engineering analysis; Other Contracts: Project and engineering management services; AMCCOM: Management engineering services; PM AFAS: Project office support; Other Services)	4Q FY94	$6993
• (U) Test and Evaluation (TECOM: ATD integration, Armament/Mount Reliability, LP Testing; Other Services: Insensitive munition testing/Test projectiles)	4Q FY94	$5466
(U) FY 1995 Planned Program:		
• (U) Product Development (FMC: Advanced Technology Demonstration; Martin Marietta: Regenerative Liquid Propellant Gun Development; AFAS DEM/VAL; Other Contracts: Fire Control/Propellant Development/Armament Development; AMCCOM: ATD/ armament/fire control/propellant engineering, mount/cannon design, gymnasticator/ SSEB; Jet Propulsion Lab: Liquid propellant characterization & oscillations assessment; Other Services)	4Q FY95	$99307
• (U) Support and Management (TRW: Scientific & engineering analysis; Other Contracts: Project and engineering management services; AMCCOM: Management engineering services; PM AFAS: Project office support; Other Services)	4Q FY95	$7350
• (U) Test and Evaluation (Liquid Propellant purchase; TECOM: ATD integration, Armament/Mount Reliability, LP Testing; Other Services: Insensitive munition testing/ Test projectiles)	4Q FY95	$8000

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603645A
PE Title: Armored Systems Modernization (ASM) - Advanced Development
Project Title: Advanced Field Artillery System (AFAS)

Project Number: D409
Budget Activity: #4

(U) Program Plan to Completion:

• (U) Product Development	Unknown	Unknown
• (U) Support and Management	Unknown	Unknown
• (U) Test and Evaluation	Unknown	Unknown

D. (U) WORK PERFORMED BY: Management is accomplished by the Project Manager for the Advanced Field Artillery System with primary engineering support provided by the U.S. Army Armament, Research, Development, and Engineering Center, both of which are located at Picatinny Arsenal, NJ. Significant other government agency support is provided by the Tank Automotive Command, MI; Laboratory Command, MD; Army Research Laboratory, MD; Aberdeen Proving Grounds, MD; Yuma Proving Grounds, AZ; and Rock Island Arsenal, IL. Major contractors include FMC, Minneapolis, MN; Magnavox, Ft. Wayne, IN; Martin Marietta Defense Systems, Pittsfield, MA; Olin, Charleston, TN; Thiokol, Elkton, MD; and Grumman, Great River, NY.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. TECHNICAL CHANGES: In accordance with Congressional directed restructuring of the Armored System Modernization (ASM) program, AFAS is now the lead vehicle being developed in ASM. As a result, the Project Manager for AFAS now has total system responsibility to include development of mobility and survivability components. Direct support will be provided by the Project Manager for Survivability systems.

2. SCHEDULE CHANGES: None

3. COST CHANGES: AFAS Dem/Val funding requirements have been revised to reflect AFAS assumption of mobility and survivability development.

F. (U) PROGRAM DOCUMENTATION:
ORD, 10/93
TEMP (Draft), 7/93

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603645A**
PE Title: **Armored Systems Modernization (ASM) - Advanced Development**
Project Title: **Advanced Field Artillery System (AFAS)**

Project Number: **D409**
Budget Activity: **#4**

G. (U) RELATED ACTIVITIES: - There is no unnecessary duplication of effort within the Army or Department of Defense
- PE #0604645 (Armored System Modernization Advanced Development) Project D175 AFAS Multi-Option Fuze for Artillery (MOFA)

H. (U) OTHER APPROPRIATION FUNDS: None

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. (U) TEST AND EVALUATION: In FY93, AFAS testing centered around the Regenerative Liquid Propellant Gun (RLPG) and the Projectile Tracking System (PTS). All test objectives were met. The RLPG test at Yuma Proving Ground confirmed the mount and recoil is ready to be integrated into the AFAS ATD. The PTS test at Yuma Proving Ground demonstrated both structural integrity and a tracking capability. The test results proved that a transponder placed in a projectile could be successfully tracked while in flight. During FY94, evaluation will center on evaluation of the AFAS ATD to include the firing platform and crew mission module as well as selected compatibility tests of the RLPG.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603649A
PE Title: Engineer Mobility Equipment - Advanced Development

Project Number: **DG24**
Budget Activity: **#4**

A. (U) RESOURCES: ($ in Thousands)
Project Title: M1 Breacher Advanced Development

Popular Name	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
Breacher	14463	29433	111339	0	0	0	0	0	55111

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The Breacher will be developed around the Abrams tank chassis and will integrate a versatile/survivable Mine Clearing Blade with Automatic Depth Control, a Power Driven Arm, and an armored Commander's Control Station. The Breacher will provide the Combat Engineer with significantly improved mission effectiveness and crew/vehicle survivability while clearing minefields and removing complex natural and man-made obstacles at the forward edge of the battlefield. The Breacher will be capable of moving with, and be as survivable as, the force it is supporting. It will provide the force with the freedom of maneuver required to successfully execute AirLand Battle doctrine.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

	COMPLETE	COST
(U) FY 1993 Accomplishments:		
• (U) Breacher contract modification (negotiations and preliminary vehicle design)	1QFY93	$5.062
• (U) Vehicle design and preparation for Critical Design Review	4QFY93	$9.401
(U) FY 1994 Planned Program:		
• (U) Complete vehicle design, conduct Critical design Review, start chassis refurb.	1QFY94	$7.358
• (U) Prototype fabrication and subcomponent testing.	3QFY94	$17.630
• (U) Contractor shakedown testing and training.	4QFY94	$4.476

Program Element: #0603649A
PE Title: Engineer Mobility Equipment - Advanced Development

Project Number: DG24
Budget Activity: #4

G. (U) RELATED ACTIVITIES: PE #0604649, Project DG25, Breacher Development, is the follow-on RDT&E project supporting further design changes to the prototype vehicles to finalize vehicle configuration prior to Low Rate Initial Production. There is no unnecessary duplication of effort within the Army or Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS:

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Breacher System Mod, GZ3200	0	0	0	5643	75174	153699	149452
Initial Spares GAO176						1019	1222

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. (U) TEST AND EVALUATION:

Milestones	Dates
Contract Modification to current contract	4QFY92
Early User & Operational Testing	1QFY95-3QFY95
Milestone II Review	3QFY95
Engr. & Mfg Development Contract Award	4QFY95
Low Rate Initial Production Long Lead Items Award	4QFY96
Low Rate Initial Production I contract	2QFY97
Low Rate Initial Production deliveries	4QFY98-4QFY00
Production Qualification Test (PQT)	4QFY98-2QFY99
Initial Operational Test & Evaluation (IOT&E)	1QFY99-2QFY99
Production Long Lead Item Contract Award	2QFY99
Milestone III Review	4QFY99
Low Rate Initial Production II contract	2QFY98
Initial Operational Capability (IOC)	1QFY00

Program Element: #0603649A
PE Title: Engineer Mobility Equipment - Advanced Development

Project Number: DG24
Budget Activity: #4

(U) FY 1995 Planned Program:

• (U) Delivery of 2 prototypes, conduct of technical testing	2QFY95	$4.536
• (U) Design refinement, Conduct validation of logistics functions and apply changes to prototypes identified during test and conduct of MSII.	3QFY95	$3.062
• (U) Vehicle refurbishment and prepare for continued testing (PPQT I)	4QFY95	$3.650

D. (U) WORK PERFORMED BY: As an Acquisition Category III project-managed system, management of the Breacher program is provided by the Office of the Project Manager, Combat Mobility Vehicles, within the overall management structure of the Program Executive Officer, Armored Systems Modernization. The program management effort includes engineering, logistics, and maintenance support planning, reliability predictions and assessments, configuration management, quality assurance, procurement and production planning, and cost and schedule management. The program management office receives matrix support from the Army Tank-Automotive Command (TACOM) and other subordinate commands (Belvoir Research, Development and Engineering Center, Waterways Experimentation Station, and the Test and Evaluation Command). Vehicle prime contractor is BMY Combat Systems, a Division of Harsco Corporation, York, Pennsylvania.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

TECHNICAL CHANGES: No changes from previous submission.
SCHEDULE CHANGES: No changes from previous submission.
COST CHANGES: No changes from previous submission.

F. (U) PROGRAM DOCUMENTATION:

(U) Mission Needs Statement (MNS)	Approved May 1992
(U) Operational Requirements Document (ORD)	Approved May 1992
(U) System Threat Assessment (STAR)	Approved May 1992
(U) Integrated Program Summary (IPS)	Approved May 1992
(U) Program Life Cycle Cost Estimate	Completed May 1992
(U) Test and Evaluation Master Plan (TEMP)	Approved April 1992
(U) Cost & Operational Effectiveness Analysis (COEA)	Approved February 1990
(U) Acquisition Decision Memorandum (ADM)	Approved May 1992

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0603653A
PE Title: **Advanced Tank Armament System (ATAS)**

Project Number: **DB99**
BudgetActivity: **4**

A. (U) RESOURCES: ($ in Thousands)
Project Title: Advanced Tank Armament System

Popular Name	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
ATAS	0*	0	10075	10002	10026	10063	10104	Cont	Cont

* 24821, Prior to FY94 this effort was funded under PE 0604630A, Advanced Tank Cannon (ATAC)

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The Armor success in Desert Storm was due in large part to the U.S. tank main armaments technological superiority over the older Iraqi tanks. We were able to see, hit and kill the enemy long before the Iraqis were even aware of our presence. The ATAS program goals are to maintain that edge over more technologically superior future tanks.

The objective of ATAS is to integrate existing and developing technologies into system demonstrations which will increase the capability to SEE, HIT, and KILL tanks at ranges beyond those of existing systems. SEE will include the latest developments in target detection, recognition, and identification at extended ranges under conditions of darkness and adverse weather. HIT includes a fire control system capable of computing the location of moving targets and precise laying from a moving or stationary platform. KILLing a harder target at longer ranges requires a more energetic gun/ammunition system than any currently fielded.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments: (Funded under PE 0604630A DB80/DB81)

• (U) Initiated Safety Release of XM291 Gun (120mm)	(4Q96) (6,600)
• (U) Initiated ATAS Turret Advanced Technology Demonstration (ATD) I with PEO-ASM	(2Q95) (8,300)
• (U) Initiated ATAS Extended Range Gunnery Fire Control System ATD II Systems Integration Lab	(2Q94) (9,921)
Total	**24,821**

(U) FY 1994 Planned Program: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **0603653A**
PE Title: **Advanced Tank Armament System (ATAS)**

Project Number: **DB99**
Budget Activity: **4**

(U) FY 1995 Planned Program:

• (U) Initiate integration of target acquisition devices, fire control system and XM291 Gun into modified M1A2 vehicle (ATD I)	(1Q95) (4,400)
• (U) Complete systems integration lab and initiate turret integration (ATDII)	(2Q95) (5,000)
• (U) Design, fabricate and test new gun tube based on FY94 results	(4Q94) (600)
Total	**10,000**

D. (U) WORK PERFORMED BY: Computing Devices of Canada, Ottawa, Ontario, Canada; Cadillac Gage, Warren, MI; Texas Instruments, Dallas, TX; Martin Marietta, Orlando, FL; Hughes Aircraft, El Segundo, CA; General Dynamics Land Systems, Warren, MI; Hercules, Radford, VA; In-house; PM, Tank Main Armament Systems, Picatinny Arsenal, NJ; Armament Research, Development and Engineering Center, Picatinny Arsenal, NJ; Tank-Automotive Command, Warren, MI; Test and Evaluation Command, Aberdeen Proving Ground, MD; Watervliet Arsenal, Watervliet, NY; Rock Island Arsenal, Rock Island, IL; Anninston Army Depot, Anniston, AL.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** Terminate development of 120mm XM291 gun.
2. **SCHEDULE CHANGES:** Demonstration of M1A2 integration test bed delayed from FY94 to FY98. Safety release testing of 120mm XM291 gun will be canceled.
3. **COST CHANGES:** Outyear (FY95-FY99) funding reduced approximately $20M per year.

F. (U) PROGRAM DOCUMENTATION: Required Operational Capability: Abrams Mission Need Statement (MN) Annex H; Critical Operational Issues & Criteria (COIC) May 93

G. (U) RELATED ACTIVITIES: PE 0203735A (M1A1 Block Improvement Program, Project D330) and PE 0604630A (Advanced Tank Cannon, Projects DB80 and DB81) - There is no unnecessary duplication of effort within the Army or Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS: N/A

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Memorandum of Agreement (MOA) with France, Germany and Great Britain to harmonize parameters of the Future Main Armament (FTMA).

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **0603653A**
PE Title: **Advanced Tank Armament System (ATAS)**

Project Number: **DB99**
Budget Activity: **4**

J. (U) MILESTONE SCHEDULE:

- Turret (ATD I) Demo 2QFY98
- Extended Range Gunnery Fire Control (ATD II) Demo 2QFY99

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603654A **Budget Activity: #3**
PE Title: Line-of-Sight Antitank (LOSAT) Technology Demonstration

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D460 LOSAT Technology Demonstration	111860	5000	4937	2000	0	0	0	0	151697

B. (U) BRIEF DESCRIPTION OF ELEMENT: LOSAT is a mobile, direct fire, antitank system and provides overwhelming lethality with a high rate of kill at long range. The LOSAT weapon system consists of a kinetic energy (KE) missile launcher mounted on an armored combat vehicle chassis. The LOSAT program was returned to the Science and Technology base in FY 1992 due to budgetary constraints and the Army's desire to study further the utility of the LOSAT technologies before commitment to the formal acquisition process. The proposed level of funding insures a sound technology demonstration where components of the system can be matured, and affords the greatest probability that the technology risks have been addressed prior to further acquisition steps. The work in this program element is consistent with the Army Science and Technology Master Plan, the Army Modernization Plan and Project Reliance.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project D460 - LOSAT Technology Demonstration: This project will develop improved technologies for KE missile defeat of robust armor targets and evaluate integration of the LOSAT capability into an air mobile configuration to help remedy the early entry force's lethality shortfall against heavy armors. Project objectives are to position the technology for future acquisition decisions, reduce fire control system risks, upgrade key subsystems to incorporate new technologies, and demonstrate subsystem capabilities in flight tests and simulations.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Procured and fabricated six missiles for flight testing	4Q94	26296
• (U) Modified existing fire control system and conduct plume tests	2Q94	18283
• (U) Upgraded fire control system (2nd generation FLIR, robust target and missile trackers, high resolution controls and displays, object oriented Ada software)	4Q94	54565
• (U) Upgraded instrumentation and test facilities to support increased tracking accuracy needed during flight test program	4Q94	1625

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603654A — **Budget Activity: #3**
PE Title: Line-of-Sight Antitank (LOSAT) Technology Demonstration

• (U) Supported Anti-Armor Advanced Technology Demonstration	4Q94	2789
• (U) Conducted lethality analysis/tests and precursor technology investigation	4Q94	3162
• (U) Evaluated long wave length laser	2Q94	855
• (U) Analyzed missile flight simulation	4Q94	2785
• (U) Developed and qualified lower cost Attitude Control Motor	4Q94	1500
Total		**111860**

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Conduct missile flight test program with six missiles (hardware-in-the-loop evaluation, pre and post flight simulation analysis)	3Q95	2000
• (U) Evaluate LOSAT technology integration and operational issues on an early entry concept vehicle	4Q95	2500
• (U) Evaluate second generation FLIR in dirty battlefield environment under desert conditions	4Q95	500
Total		**5000**

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Conduct missile flight test program with six missiles (hardware-in-the-loop evaluation, pre and post flight simulation analysis)	3Q95	3142
• (U) Evaluate LOSAT technology integration and operational issues on an early entry concept vehicle	4Q95	450
• (U) Evaluate second generation FLIR in dirty battlefield environment under desert conditions	4Q95	415
• (U) Conclude dirty battlefield and flight test analysis and final documentation	4Q95	930
Total		**4937**

* This is continuing work which is reviewed periodically, ensuring quality, relevance and priority.

(U) Work Performed By: In-house efforts performed by the Armored Systems Modernization Program Executive Office, Line-of-Sight Antitank Weapon Systems Project office, and the U.S. Army Missile Command, Redstone Arsenal, AL. Loral Vought Systems of Dallas, TX, was the selected contractor for the LOSAT development program and has subcontracted with Texas Instruments of Dallas, TX (fire control subcontractor).

(U) Related Activities: Not applicable. There is no unnecessary duplication of effort within the Army of DoD.

(U) Other Appropriation Funds: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603710A
PE Title: Night Vision Advanced Technology
Budget Activity: #3

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DK70 Night Vision Advanced Technology	17510	17499	16880	18977	19909	16363	19743	Cont'd	Cont'd
DK86 Night Vision, Airborne Systems	9212	10816	7904	9417	5219	5230	8892	Cont'd	Cont'd
DK87 Night Vision, Combat Vehicles	3237	6447	8828	9430	11523	3496	2401	Cont'd	Cont'd
PE TOTAL	29959	34762	33612	37824	36651	25089	31036		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program develops new and improved tactical night vision and electro-optics target acquisition and pilotage sensor technology for infantry, anti-armor, air defense, combat vehicle, and airborne applications. The development of this high performance target acquisition and engagement technology essential to meet the target servicing, night pilotage, and driving requirements of future weapon systems. This technology will provide the capability to acquire and engage hostile targets at extended ranges during day/night, smoke, obscured weather and battlefield conditions, significantly enhancing the warfighting capability and survivability of US systems. In addition, multisensor target acquisition suites are demonstrated which meet the stringent fire control requirements of combat vehicles. These sensor suites are developed to provide the range and sensitivity necessary to align with the target engagement capabilities inherent in weapon fire control systems of ground vehicles. Efforts are directed toward technology for wide-field-of-view sensors to support day/night nap-of-the-earth pilotage at high speeds. This PE will provide the target acquisition sensors for the Advanced Vehicle Technologies, Rapid Force Projection Initiative, and 21st Century Land Warrior technology demonstrations. Technology advances achieved under this PE have tri-service applications. Funding in this PE includes transition of second generation Forward Looking Infrared (FLIR) technology from PE #0602709A for application to scout sensors and increased effort in the remote sentry technology. Work in this program element is consistent with the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan, and Project Reliance.

C. (U) JUSTIFICATION FOR PROJECTS:

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603710A
PE Title: Night Vision Advanced Technology **Budget Activity: #3**

(U) Project DK70 - Night Vision Advanced Technology: This project will develop and demonstrate high performance, sensor/multisensor technology to meet the target servicing requirements for weapon systems upgrades. Emphasis is placed upon development of multisensor aided targeting technology for aviation and ground vehicle applications, 2nd generation scout sensor and remote sentry technology, and infrared (IR) search and track technology for air defense applications, In addition this project addresses the individual soldier/requirements for an advanced manportable sensor integrating the weapon sight into the soldier protective ensemble. In FY 94, $3476 will be applied to this project from projects DK86 and DK87, this PE, to support development of scout sensor suite technology

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Successfully demonstrated and field tested the advanced air defense electro-optical system, an infrared search and track capability to target helicopters in high clutter environments	3Q93	1400
• (U) Completed laboratory testing and simulation of FLIR/Longbow feature fusion automatic target recognition algorithms. Integrated fusion software into the Multi-Sensor Aided Targeting (MSAT)-Air fusion processor testbed and conducted full mission flight simulations Initiated integration of 2nd generation (gen) FLIR and Longbow radar into airborne testbed	*	13000
• (U) Completed technology development of Standardized Advanced Dewar Assembly (SADA) and transitioned to second generation FLIR development program	3Q93	2110
• (U) Conducted battlefield scenario trade-off determining the remote sentry technology for the Army's rapid force projection initiative to assess critical technology requirements/capabilities	*	1000
Total		**17510**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Complete integration of FLIR and Longbow sensors to airborne testbed and integrate MSAT-Air processor in surrogate airborne platform to conduct field trials in preparation for advanced warfighting experiment	*	8000
• (U) Design remote sentry hardware and conduct early warfighting demonstrations and integrated simulation with the Army's Dismounted Battle Laboratory (Lab)	*	3500
• (U) Develop low-cost integration system (Advanced Integrated Manportable System (AIMS)) technology: ultra-lightweight sensor, display and laser modules which can be combined to meet a variety of infantry missions for soldier modernization applications	*	1725
• (U) Design and conduct early warfighting demonstrations of extended range 2nd gen/scout sensor suite technology with on-line targeting and transfer to non-line-of-sight weapon platforms	*	4274
Total		17499

*This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603710A
PE Title: Night Vision Advanced Technology

Budget Activity: #3

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) MSAT-Air field testing and multi-sensor fusion advanced warfighting experiment. Transition technology to Comanche and Longbow Apache	1Q95	1100
• (U) Deliver and field test remote sentry technology demonstrator	*	4485
• (U) Complete helmet mounted flat panel displays for AIMS and conduct laboratory/field evaluation of performance	*	2450
• (U) Package and integrate sensor technology demonstrator for the scout sensor FY96 demonstrations	*	8845
Total		16880

* This is continuing work which is reviewed periodically, ensuring quality, relevance and priority.

(U) **Project DK86 - Night Vision, Airborne Systems:** This project concentrates on the development and flight evaluation of imaging sensor and display technology and automated obstacle warning technology to meet the night nap-of-the-earth (NOE) requirements of future aviation platforms, and to enhance the operational capabilities and survivability of currently fielded attack, scout, cargo and utility helicopters. This technology will significantly enhance the survivability of Army aviation assets by permitting rotorcraft to fly at NOE altitude/airspeed profiles and avoid natural obstacles and wires in day/night/adverse weather conditions, thereby significantly reducing exposure to air defense artillery, and radar and heat seeking missile threats. Technology includes high-performance multi-sensor pilotage technology and single-sensor advanced I2 technology for lower-cost applications. Current aviation systems are single-sensor (FLIR or I2) with limited field of view (40 deg). Research and flight experience have shown that dual spectrum (FLIR and I2) pilotage sensors are needed to provide a robust capability for NOE flight in low-light-level and adverse-weather conditions. The FLIR supports flight in low-light-level conditions; the I2 sensor, in conditions with low thermal signature. Increased field of view is needed for improved situation awareness and to reduce pilot workload. In addition, the imagery must be of high quality (improved resolution and, in the case of thermal sensors, adequately sampled). The advanced helicopter pilotage technology demonstration will provide, in both demonstration hardware and flight evaluation, a high-quality dual-spectral pilotage sensor with the field of view and resolution required for advanced aircraft, and the displays needed to provide this imagery to the pilot. It is the only Army program demonstrating this capability. Benefits include both demonstration of the technical feasibility of components (I2 tubes and high-frame-rate focal plane, data bus, and image processing electronics) for Comanche and for future aviation pilotage sensor upgrades, and flight evaluation data to permit the User to better write the pilotage sensor requirements and the developer to write pilotage sensor specifications. The advanced image intensification (AI2) technology demonstration provides an improved night vision goggle capability with higher resolution, larger field of view, and integrated symbology; it demonstrates technology for applications where an advanced, dual-spectral sensor is not affordable, but additional capability over existing goggles is needed. These applications include utility and cargo aircraft, driving, and the dismounted solider. Technology developed under Project DK86 is also directly applicable to the night flying requirements of the other Services and Special Operations Command's rotary wing aircraft.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603710A
PE Title: Night Vision Advanced Technology

Budget Activity: #3

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Completed development and conducted successful flight evaluation of the capability of the Obstacle Avoidance System (OASYS) technology to detect and warn pilots of wires and other obstacles within the flight path	3Q93	6812
• (U) Evaluated state-of-the-art advanced helicopter pilotage sensor/display technologies with significant improvement in field-of-view (FOV) to reduce technology risk and demonstrate feasibility/performance of technology alternatives for the Comanche program and night pilotage sensor upgrades	*	1600
• (U) Issued Broad Area Announcement for design and demonstration of advanced night vision goggle technology for low-cost aviation, infantry and driving applications. The AI2 technology demonstration will significantly improve low light visual acuity and increase FOV, and will include an integrated display for concurrent viewing of symbology and weapons sight imagery	*	800
Total		**9212**

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Design and develop advanced helicopter pilotage sensor and display technology to provide technology risk reduction and support refinement of user requirements for enhancement efforts in support of Comanche/future night pilotage sensor and display requirements	*	5005
• (U) Determine AI2 configuration which maximizes commonality and meets aviation, infantry and driver's viewer operational requirements	*	3610
• (U) Transferred from this project to project DK70, this PE, to support design and conduct of extended 2nd gen\scout sensor suite technology	*	2201
Total		**10816**

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Demonstrate high bandwidth/resolution standardized advanced dewar assembly (SADA) I focal plane array and high resolution, helmet mounted image intensified/charge coupled device (CCD) camera with advanced signal processing for Comanche risk reduction/ future aviation upgrades. Integrate sensors and display into testbed aircraft and demonstrate to aviation user	3Q95	4429
• (U) Demonstrate AI2 to aviation user and develop infantry version with higher resolution symbology/graphics integrated display	*	2475

* This is continuing work which is reviewed periodically, ensuring quality, relevance and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603710A
PE Title: Night Vision Advanced Technology
Budget Activity: #3

• (U) Investigate technology for low-cost aerial sensors for detection of tactical ground targets, applicable to manned and unmanned aerial platforms	*	1000
Total		**7904**

(U) Project DK87 - Night Vision, Combat Vehicles: This project demonstrates target acquisition sensor technology to meet the stringent fire control requirements of combat vehicles This sensor technology will provide the range and sensitivity necessary to support the target engagement capabilities inherent in weapon fire control systems of ground vehicles.

(U) FY 1993 Accomplishments:

• (U) Developed high performance 2nd Gen Tank Sight (SGTS) for demonstration of technical capability to armor community	*	3237
Total		**3237**

(U) FY 1994 Planned Program:

• (U) Integrate SGTS into an M1 Tank and conduct live fire field demonstration with Battle Labs; transition technology to Program Executive Officer (PEO) Armaments		
• (U) Conduct technology trade-off determinations and sensor evaluations to determine the optimum Electronic Integrated Sensor Suite (EISS) to provide an on-the-move capability for passive, automated wide-area search, acquisition, identification, and ranging with handoff to Air Defense weapon platforms. Integrate "hot mock-up" testbed; field evaluate in static environment	2Q94	2172
• (U) Evaluate technology for demonstration of a moving target indicator (MTI) ground radar to provide the tank commander with capability for all-weather search, target acquisition and tracking at extended ranges against moving targets	*	3275
• (U) Transferred from this project to project DK70, this PE, to support design and conduct of extended 2nd gen/scout sensor suite technology	*	1000
Total	*	1275
		6447

(U) FY 1995 Planned Program:

• (U) Incorporate results of the EISS test bed experiment and trade-off studies into best technical approach for "on-the-move suite". Evaluate test bed results again	*	1900

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603710A
PE Title: Night Vision Advanced Technology

Budget Activity: #3

• (U) Procure MTI radar demonstrator and integrate into a M1tank testbed in preparation for user/developer test under the Army's Advanced Vehicles Technology demonstration	*	1970
• (U) Establish parameters and design an advanced targeting acquisition suite for future reduce tank crew applications	*	4958
Total		8828

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

(U) Work Performed By: The work is primarily performed by the US Army Communications and Electronics Command (CECOM) Night Vision and Electronic Sensors Directorate at Fort Belvoir, VA and Fort Monmouth, NJ. Contractors include: Martin Marietta Corporation, Orlando, FL and Utica, NY; Texas Instruments, Inc., Dallas, TX; Hughes Aircraft Company, El Segundo, CA; Honeywell, Inc., Minneapolis, MN; and Rockwell International, Anaheim, CA.

(U) Related Activities: This program adheres to Tri-Service Reliance Agreements on Electro-optics with oversight and coordination provided by the Joint Directors of Laboratories. Work in this Program Element is related to and fully coordinated with efforts in PE #0602709A (Night Vision Technology), PE #0603774A (Night Vision Systems-Advanced Development), and PE #0604710A (Night Vision Systems-Engineering Development) in accordance with ongoing Reliance joint planning process. Work in this Program Element contains no unwarranted duplication of effort among the Military Departments.

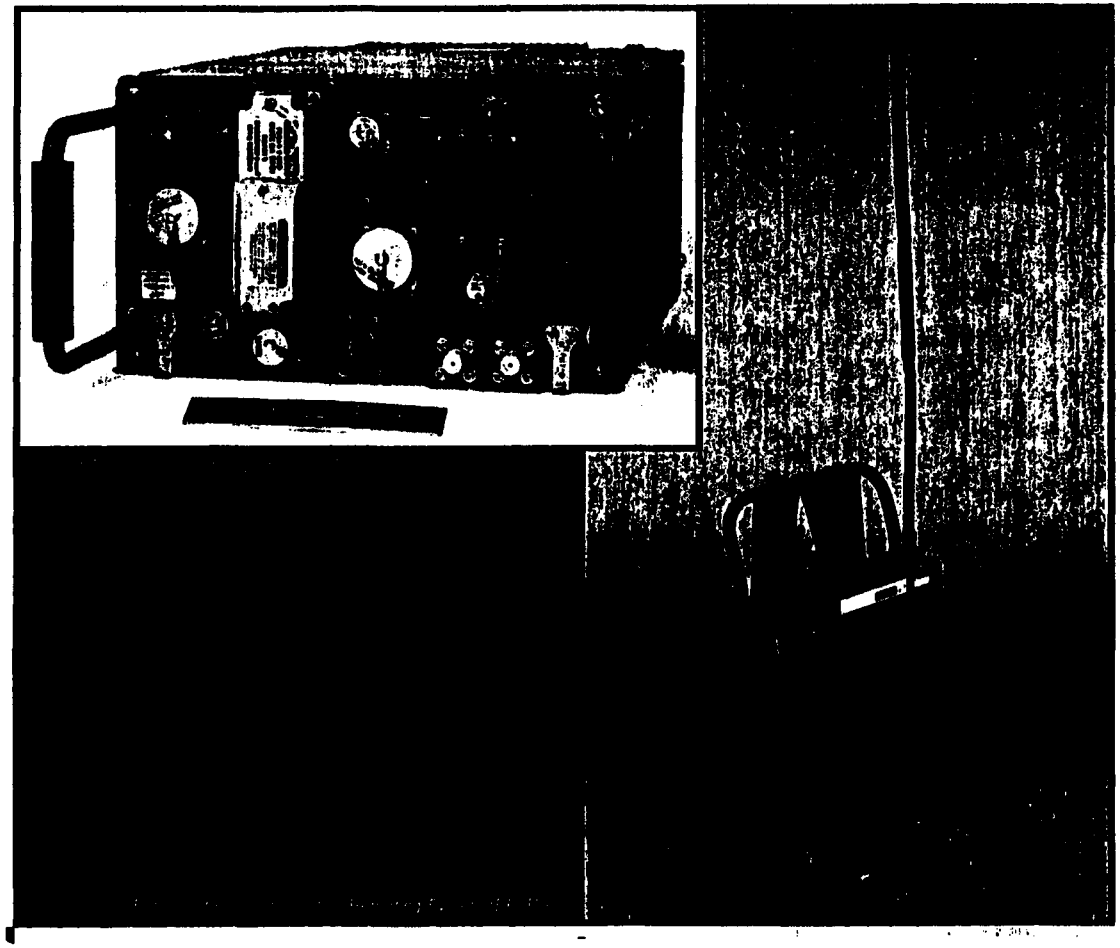
(U) Other Appropriation Funds: ($ in Thousands) Not applicable.

(U) International Cooperative Agreements: International interchange of information is accomplished primarily through active participation on various NATO working groups, the Technical Cooperation Program (United States, United Kingdom, Canada, Australia), and the International Standardization Program.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603713A
PE Title: Army Data Distribution System
Project Title: JTIDS/EPLRS (Formerly known as PJH-PLRS/JTIDS Hybrid)

Project Number: D370
Budget Activity: #4



POPULAR NAME: ADDS

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603713A | **Project Number: D370**
PE Title: Army Data Distribution System | **Budget Activity: #4**
Project Title: JTIDS/EPLRS (Formerly known as PJH-PLRS/JTIDS Hybrid)

A. (U) SCHEDULE/BUDGET INFORMATION: ($ In Thousands)

SCHEDULE	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	To Complete
Program Milestones			LRIP DECISION FOR CL2M TERMINALS 2nd QTR					
Engineering Milestones								
T&E Milestones	Completed JTIDS Sys TT - 1st Qtr	CL2M RDT 1st Qtr	CL2M LUT 1st QTR NCS-E(D) OT 2nd QTR	CL2M IOTE 4th QTR				
Contract Milestones	Complete NCS/ J/DJRU S/W Dev 3rd Qtr	EPLRS SIP AWARD 3rd Qtr		CL2M LRIP AWARD 2nd QTR				
BUDGET ($000)	**FY 1993**	**FY 1994**	**FY 1995**	**FY 1996**	**FY97**	**FY 1998**	**FY 1999**	**Program Total (To Complete)**
Major Contract	9629	15878	3442					267310 (0)
Support Contract	0	0	0					14872 (0)
In-House Support	2318	2995	2145					37458 (0)
GFE/ Other	720	774	0					9894 (0)
Total	12667	19647	5587					329534 (0)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603713A
PE Title: Army Data Distribution System
Project Title: JTIDS/EPLRS (Formerly known as PJH-PLRS/JTIDS Hybrid)

Project Number: D370
Budget Activity: #4

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The project under this program element provides secure, jam-resistant data communications, position location reporting, navigation and identification capability to support the Army's Command and Control and automated battlefield systems of the 1990's. The Army Data Distribution System (ADDS), which consists of the Enhanced Position Location Reporting System (EPLRS) and the Joint Tactical Information Distribution System (JTIDS), provides support to the Army's air defense, fire support, maneuver control, intelligence and combat service support automated system. The ADDS will satisfy equipped unit's data communication needs and provide the capability to obtain their position, range and bearing to other units, location of other units, aircraft corridor guidance, and alarms when entering predesignated restricted areas, e.g. mine fields. The ADDS network automatically utilizes surface and airborne user units as relays to achieve over-the-horizon line-of-sight transmission. The JTIDS program and EPLRS Downsized Net Control Station(NCS) efforts and EPLRS System Improvement Program (SIP) are within this project.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Continue JTIDS Development	4Q95	$3177
• (U) Completed JTIDS System Technical Test	1Q93	$576
• (U) Completed JTIDS NCS-J/Dedicated J-TIDS Relay Unit (DJRU) Software Development	3Q93	$1816
• (U) Continued EPLRS downsized Net Control Station-EPLRS (NCS-E) development	4Q94	$7098
Total		**$12667**

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Continue JTIDS Development	4Q95	$3886
• (U) Conduct JTIDS Class 2M (CL2M) Reliability Development Test	1Q94	$227
• (U) Conduct JTIDS CL2M Limited User Test (LUT)	1Q95	$2029
• (U) JTIDS First Unit Equipped (FUE) with Research & Development assets	1Q94	$0
• (U) Begin JTIDS Life Cycle Suftware Engineering (LCSE)	4Q95	$1000
• (U) Complete EPLRS Downsized NCS-E	4Q94	$7505
• (U) Initiate EPLRS System Improvement Program	1Q95	$5000
Total		**$19647**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603713A | **Project Number: D370**
PE Title: Army Data Distribution System | **Budget Activity: #4**
Project Title: JTIDS/EPLRS (Formerly known as PJH-PLRS/JTIDS Hybrid)

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Continue JTIDS Development	4Q95	$1326
• (U) Conduct Operational Test (OT) Test of EPLRS Downsized NCS-E	2Q95	$2500
• (U) Continue JTIDS LCSE	4Q95	$1761
Total		$5587

D. (U) WORK PERFORMED BY: The program is managed by Project Manager, ADDS, Fort Monmouth, NJ. In-house effort will be accomplished by the Army Communication-Electronics Command (CECOM), Fort Monmouth, NJ. Program management support is provided by the MITRE Corporation, Bedford, MA. The major contractors are Hughes Aircraft Company, Fullerton, CA and GEC-Marconi Electrical Systems, Little Falls, NJ.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES: None**
2. **SCHEDULE CHANGES: Funding changes will delay JTIDS by 1 year (to FY96) and will maintain JTIDS in RDTE thru FY95.**
3. **COST CHANGES: Congressional increase of $8 million in FY94 for EPLRS upgrade and system improvement.**

F. (U) PROGRAM DOCUMENTATION:

- Required Operational Capability (ROC) - 9/86
- Organization & Operation Plan (O&O) - 10/86
- Acquisition Program Baseline (APB) - 3/91

G. (U) RELATED ACTIVITIES:

- PE #0604805A Command, Control, Communications System-Engineering Development
- PE #0203726A Advanced Field Artillery Tactical Data System
- PE #0604741A Air Defense Command, Control and Intelligence-Engineering Development
- PE #0604321A All Source Analysis System - ASAS

There is no unnecessary duplication of effort within the Army or DOD

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603713A
PE Title: Army Data Distribution System
Project Title: JTIDS/EPLRS (Formerly known as PJH-PLRS/JTIDS Hybrid)

Project Number: D370
Budget Activity: #4

H. (U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Other Procurement, Army (OPA 2)							
(SSN BU1400)	53004	36978	9558	54274			

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. (U) TEST AND EVALUATION DATA:

	Dates
EPLRS PROGRAM:	
Technical Test III	05/93 -07/93
Operational Test and Evaluation	07/94 -09/94
JTIDS PROGRAM	
CL2M Reliability Development Test (RDT)	10/93
CL2M Limited User Test (LUT)	10/94

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603730A (TIARA)
PE Title: Tactical Surveillance System
Advanced Development

Project Number: #D560
Budget Activity: #4

A. (U) RESOURCES: ($ in Thousands)
Project Title: Tactical Surveillance System - Advanced Development

Popular Name	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
Tactical Surveillance System - Advanced Development	12300	15371	11870	11693	10869	19763	12586	Cont	Cont

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project supports advanced development work directed at meeting the deep intelligence and targeting needs of tactical commanders, as stated in Field Manual 100-5 and under Airland Battle tactics, to fight out-numbered and win. Specific tactical imagery exploitation studies are under the auspices of Army's Tactical Exploitation of National Capabilities (TENCAP) program and includes studies, advanced prototyping efforts for Hybrid Optical Automatic Target Recognition (HOATR) image processing, secondary imagery dissemination, and the Miniaturized Imagery Receive System (MIRS). HOATR image processing is being developed to meet the need to rapidly exploit an exponentially increasing volume of imagery while decreasing system size and cost, as well as lowering manning requirements. HOATR is directly applicable to the Enhanced Tactical Radar Correlator (ETRAC), the Imagery Exploitation Systems (IES), and the MIRS. The MIRS will be a downsized imagery system incorporating all current capabilities and provide increased throughput from sensors currently processed by the Tactical Radar Correlator (TRAC), ETRAC, Imagery Exploitation System (IES), and organic sensors assigned to CORPS and Echelon Above CORPS (EACs). MIRS will employ the latest state-of-the-art technology to consolidate these inputs while reducing size, increasing mobility, and decreasing manning requirements. The Secondary Imagery Dissemination (SID) effort will continue the work on standardization of imagery transmissions to be compliant with the National Imagery Transmission Format (NITF). In addition, the SID effort will begin development of a manportable system to receive secondary imagery and signals intelligence in support of early entry forces. In FY93 and FY94, this Program Element also provided advanced development efforts to the Imagery Processing and Dissemination System (IPDS) (which is the Army name for the Joint Services Imagery Processing System (JSIPS)), the IES, and the ETRAC. In FY95, however, development efforts for IPDS/JSIPS, IES, and ETRAC are moved to PE 0305154D, Defense Airborne Reconnaissance Program. Further details may be found in the Tactical Intelligence and Related Activities (TIARA) Congressional Justification Book, Volume III, and the TENCAP Master Plan.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603730A (TIARA) | Project Number: #D560
PE Title: Tactical Surveillance System | Budget Activity: #4
Advanced Development

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Continued joint development within the IPDS/JSIPS program. (Effort funded under PE 0305154D in FY95.)		2,411
• (U) Conducted user evaluation of initial IPDS/JSIPS.	3Q93	300
• (U) Continued imagery exploitation studies to include Secondary Imagery Dissemination (SID) and low-volume tactical terminals.	4Q93	366
• (U) Initiated development (through joint collaboration with other Defense organization) of Automatic Target Recognizer (ATR) which is a tactical processing and exploitation enhancement for new sensor technology.	3Q95	800
• (U) Continued development of imagery processing algorithms and the DoD Common SAR Processor (CSARP) for the ETRAC. (Effort funded under PE 030154D in FY95.)		5,320
• (U) Continued support to TENCAP program management and administrative activities (e.g. Federally Funded Research and Development Center (FFRDC) (Aerospace), U.S. Topographic Engineering Center (TEC) support, U.S. Army Space Program Office (ASPO) support and Scientific Engineering and Technology Assistance (SETA) support.	4Q93	3,103
Total		**12,300**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Develop the Triband Satelite System (TSS), which is a multiband communication terminal for tactical imagery dissemination. (Effort funded under PE 0305154D in FY95.)		2,400
• (U) Continue development of ATR.	3Q95	1,600
• (U) Continue development of imagery processing algorithms and DoD CSARP for ETRAC. (Effort funded under PE 030154D in FY95.)		3,722
• (U) Continue joint support within JSIPS program. (Effort funded under PE 0305154D in FY95.)		2,772
• (U) Continue SID and low volume tactical terminals studies.	4Q94	1,250

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603730A (TIARA)
PE Title: Tactical Surveillance System
Advanced Development

Project Number: #D560
Budget Activity: #4

	Complete	Cost
• (U) Continue support to TENCAP program management and administrative activities (e.g. FFRDC (Aerospace), U.S. Topographic Engineering Center (TEC) support, U.S. Army Space Program Office (ASPO) support and Scientific Engineering and Technology Assistance (SETA) support.	4Q94	3,627
Total		**15,371**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Initiate studies for the development of the Miniaturized Imagery Receive Station (MIRS) which is a miniaturized tactical national imagery receipt and exploitation system.	4Q95	3,665
• (U) Continue SID and low volume tactical terminals studies.	4Q95	1,275
• (U) Continue development of ATR (Test Prototype).	3Q95	2,000
• (U) Continue support to TENCAP program management and administrative activities (e.g. FFRDC (Aerospace), U..S. Topographic Engineering Center (TEC) support, U.S. Army Space Program Office (ASPO) support and Scientific Engineering and Technology Assistance (SETA) support.	4Q94	4,930
Total		**11,870**

D. (U) WORK PERFORMED BY:
In-house efforts accomplished by U.S. Army Topographic Engineering Center (TEC), Ft Belvoir, VA. Contractors: E-Systems, Garland, TX; Aerospace Corp, El Segundo, CA; MRJ, Inc., Fairfax, VA; and Science Applications International Corporation, Tucson, AZ; Westinghouse, Baltimore, Md; Paramax, Salt Lake City, UT.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: Development of second Engineering Development Model (EDM) IPDS has been delayed pending an affordability Analysis.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603730A (TIARA)
PE Title: Tactical Surveillance System
Advanced Development

Project Number: #D560
Budget Activity: #4

3. (U) COST CHANGES: All efforts supporting IPDS/JSIPS, IES, and ETRAC have transferred to Program Element 03054154D (Defense Airborne Reconnaissance Program (DARP)), Project P515 (Imagery Processing System, Army)

F. (U) PROGRAM DOCUMENTATION:
Material needs for U.S. Army TENCAP Master Plan (TS/TK).
Memorandum of Understanding (MOU), establishing JSIPS 8 Jan 87.

G. (U) RELATED ACTIVITIES:
Through FY94, PE #0604740A (Tact[illegible]al Surveillance System ^^ Engineering Development) provided the continued engineering development efforts for timely and accurate tactical receipt, exploitation and dissemination of digital imagery. In FY95, development efforts for IPDS/JSIPS, ETRAC, and IES transferred to PE #0305154D (Defense Airborne Reconnaissance Program (DARP)). To ensure no duplication of effort, this work is coordinated with the Secretary of Defense, Defense Airborne Reconnaissance Office, Navy, and Air Force TENCAP offices, the Central Imagery Office, Defense Intelligence Agency, Army Materiel Command, and other classified agencies. Coordination is also accomplished as part of the program reviews conducted by the Office of the Secretary of Defense (Director for Research and Engineering).

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands) Not Applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE:

Milestones	Milestone Dates
Initiate development of ETRAC/common SAR processor (CSARP)	3Q92
Initial IPDS user test/ Full Operational Capability (FOC)	3Q93
Award Contract for TSS	2Q94
Initiate Studies for Devlopment of MIRS	2Q95
Test Prototype ATR	3Q95

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603734A
PE Title: Military Engineering Advanced Technology **Budget Activity: #3**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DT08 Combat Engineering Systems	3210	2910	2214	3099	3890	5305	5467	Cont	Cont
DT10 Total Distribution Advanced Technology Demonstration	0	0	10615	15014	4614	0	0	0	30234
PE TOTAL	3210	2910	12829	18113	8504	5305	5467		

B. (U) BRIEF DESCRIPTION OF ELEMENT: Two separate demonstration programs are included in this program element. The first will address a) capabilities to generate, update and manage digital terrain data; b) capabilities to accurately represent dynamic environment and terrain in distributed, interactive simulations that will insure that a single standard for environmental effects representation is available to all Army units and; c) mission planning decision support for the Combat Engineer. The second demonstration program, the Total Distribution Advanced Technology Demonstration (TDATD), will address current inadequacies in logistics management to consistently move and distribute supplies to the warfighter. These deficiencies were readily apparent during Operation Desert Storm and continue to limit our capability to efficiently accomplish the power projection mission. The TDATD will focus on transitioning technologies, systems, and models developed outside the logistics arena and will demonstrate an integrated logistics management system incorporating computer aided planning, integrated command and communication, and automated equipment tracking to provide a more responsive logistics system requiring less material in the pipeline. Technologies such as distributed interactive simulations will be used to assist in integration of logistics technologies in combat operations and to provide a comprehensive capability to conduct simulated logistics operations. Potential capability enhancements will be evaluated in terms of reduced logistics timelines and support costs, and increased capability to support logistics planning at tactical, operational and strategic levels. The FY93 and FY94 work on the Total Distribution Program is being conducted as part of Project DT08 and transitions to Project DT10 in FY95. The work in this program element is consistent with the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan, and Project Reliance.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project DT08 - Combat Engineering Systems: Digital terrain data are not available to support mission planning, operations and simulations. No capability is available to manage and update terrain data in the field. The Army is deficient in its capability to evaluate the impact of the environment on operations. Our dependence on high technology systems to conduct precision, deep strike operations is growing and use of

sophisticated simulations to evaluate all phases of these operations is increasing. Effective exploitation of environmental effects across the entire spectrum of military activities is required to guard against environmental surprise and to insure consistency between live operations and simulations. The FY93 and FY94 work on the Total Distribution Program is being conducted as part of Project DT08 and transitions to Project DT10 in FY95.

(U) FY 1993 Accomplishments:

	Complete	Costs
• (U) Developed Air Land Battlefield Environment (ALBE) tactical decision aid (TDA) software in support of REFORGER-92; revised ALBE TDA software installed on ten systems of the 649th Engineer Battalion (Topo)	*	3200
• (U)Prepared coordinated draft of TDATD Technology Demonstration Plan (TDP)	*	10
Total		**3210**

(U) FY 1994 Planned Program:

	Complete	Costs
• (U) Finalize TDATD TDP	4Q94	100
• (U) Finalize TDATD Test Plan	4Q94	500
• (U) Baseline Logistics Command and Control Architecture	*	1000
• (U) Establish TDATD testbed by networking Strategic, Operational, and Tactical nodes in a Distributed Interactive Simulation environment	*	1310
Total		**2910**

(U) FY 1995 Planned Program:

	Complete	Costs
• (U) Demonstration of capability to provide hasty map backgrounds and digital topographic feature data from imagery in support of the 1994 Louisiana Maneuvers (LAM-94) early entry exercise	*	750
• (U) Baseline demonstration of integrated decision support using hasty digital topographic data to allow commanders to better utilize terrain and weather in connection with a TRADOC Battle Lab Advanced Warfighting Demonstration	*	700
• (U) Demonstration showing value-added of mission simulation that maps seamlessly to operational decision support technology and dynamic environment and terrain capability supporting TRADOC Battle Lab Advanced Warfighting	*	764
Total		**2214**

(U) Project DT10 - Total Distribution Advanced Technology Demonstration (TDATD): Operation Desert Storm showed that the logistics distribution system needed major improvements to increase its efficiency and effectiveness. The TDATD has been established to demonstrate potential enhancements in situational awareness and course of action analyses supporting distribution management, in-transit asset visibility and

* Continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603734A
PE Title: Military Engineering Advanced Technology — Budget Activity: #3

logistics automation and communication. The TDATD will demonstrate automated logistics planning tools, computer simulation and modeling techniques, advanced microelectronics, satellite tracking and communications technology to support an advanced objective logistics capability. These tools will be demonstrated within the context of an integrated, four module situational awareness and analysis system: (1) U.S. based mobilization, deployment and sustainment as it unfolds ("Strategic" module); (2) theater level reception and processing of equipment and supplies as they arrive in theater by air and sea ("Operational" module); (3) the theater being supported ("Tactical" Module); and (4) decision support information ("Asset Management" module). The FY93 and 94 work on this ATD is being conducted as part of Project DT08 and transitions to Project DT10 in FY95.

(U) FY 1993 Accomplishments:	Complete	Costs
• (U) Work conducted under DT08 in FY 1993		

(U) FY 1994 Planned Program:	Complete	Costs
• (U) Work conducted under DT08 in FY 1994		

(U) FY 1995 Planned Program:	Complete	Costs
• (U) Conduct First Log Demonstration	4Q95	3000
• (U) Participate in LAM-95 Exercise	4Q95	1000
• (U) Participate in TDATD Field Training Exercise #1	*	3700
• (U) Establish a Course of Action analysis capability	*	2915
Total		**10615**

(U) Work Performed By:
DT08: The work is performed by the Topographic Engineering Center, Fort Belvoir, VA; the Waterways Experiment Station, Vicksburg, MS; and the Cold Regions Research and Engineering Laboratory, Hanover, NH.
DT10: The work is performed by the Topographic Engineering Center, Fort Belvoir, VA; the Waterways Experiment Station, Vicksburg, MS; Communications and Electronics Research Development and Engineering Center, Fort Monmouth, NJ, Missile Research Development and Engineering Center, Huntsville, AL; Army Research Laboratory, Aberdeen Proving Ground, MD; and the Belvoir Research Development and Engineering Center, Fort Belvoir, VA.

(U) Related Activities: This program adheres to Tri-Service Reliance Agreements on Civil Engineering and Environmental Sciences with oversight provided by the Joint Directors of Laboratories and Joint Engineers. Work in this Program Element is related to and fully coordinated with efforts

* Continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603734A
PE Title: Military Engineering Advanced Technology

Budget Activity: #3

in PE #0602784A (Military Engineering Technology) and PE #0601102A (Defense Research Sciences). There is no unnecessary duplication of effort within the Army or DoD.

(U) Other Appropriation Funds: ($ in Thousands) Not applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603745A (TIARA)
PE Title: Tactical Electronic Surveillance Systems - Adv Dev

Budget Activity: #4

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D535 Intelligence Fusion Analysis Demonstration	2931	4363	1718	2952	2106	0	0	0	14070

B. (U) BRIEF DESCRIPTION OF ELEMENT: Program funds application and validation of advanced computer software and hardware technologies to intelligence fusion analysis functions and prototype development, integration and evaluation of improved tactical intelligence fusion capabilities. This project supports the urgent requirement for an automated tactical intelligence processing system through technology insertion into, and development and evaluation of, prototype upgrades to the All Source Analysis System (ASAS) during development and after fielding.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:

(U) Project D535 - Intelligence Fusion Analysis Demonstration:

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Generated initial prototype software packages and toolsets	4Q93	1673
• (U) Initiated support for development, integration and evaluation of operational prototypes of functional and performance upgrades/improvements to ASAS.	4Q93	783
• (U) Prototyped parallel processing neural network software for map separates generation. Developed initial configuration of a high performance neural computer for map separates generation and terrain/weather/mobility analysis.	4Q93	475
TOTAL		2931

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Complete basic prototypes of high-performance, parallel processor-based terrain analysis and data fusion servers . Continue development of ASAS operational prototypes.	4Q94	963
• (U) Support the general development, integration and evaluation of operational prototypes of functional and performance upgrades/improvements to ASAS, per the Joint Prototyping Plan.	4Q94	1800
• (U) Support the development, integration and evaluation of operational prototypes for intelligence fusion.	4Q94	1600
TOTAL		4363

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603745A (TIARA)
PE Title: Tactical Electronic Surveillance Systems - Adv Dev

Budget Activity: #4

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Continue to expand and improve the capabilities and performance of the techbase prototypes for collection management, image processing and intelligence analysis.	4Q95	1062
• (U) Continue to support the development, integration and evaluation of operational prototypes of functional and performance upgrades/improvements to ASAS per the Joint Prototyping Plan.	4Q95	656
TOTAL		1718

(U) **Work Performed By:** Major Contractors for Intelligence Fusion Analysis Technology Insertion and Prototyping are Jet Propulsion Laboratory, Pasadena, CA; and Mystech Associates, Inc., Falls Church, VA. In-house developing organizations are: the ASAS Project Office, McLean, VA; and the US Army Communications-Electronics Command Intelligence Electronic Warfare Directorate, Warrenton, Va.

(U) **Related Activities:** PE #0604321A All Source Analysis System
There is no unnecessary duplication of effort within the Army or DoD.

(U) **Other Appropriation Funds:** ($ in Thousands) Not applicable.

(U) **International Cooperative Agreements:** Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603746A
PE Title: SINCGARS Advanced Development

Budget Activity: #4

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D555 SINCGARS-V Advanced Development	4918	2500	0	0	3658	10651	10229	Cont	Cont

B. (U) BRIEF DESCRIPTION OF ELEMENT: The single project in this element funds advanced development of Single Channel Ground and Airborne Radio Systems (SINCGARS) Combat Net Radio to enhance electronic counter countermeasures capability, to initiate interoperability improvements, to reduce power and to include other improvements generated by the user, as determined in the SINCGARS System Improvement Plan (SIP). Improvements include backward compatibility with current SINCGARS family of radios; over the shoulder handset; joint/combined interoperability; external integration of Global Positioning System technology to provide common net timing; automatic position reporting and navigation assistance. Other key features as required by the us include reduced weight of the manpack receiver-transmitter (RT), improved message completion performance, reduced cosite interference and improved manprint for better manpower and personnel integration and maintainability.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:

(U) Project D555 - SINCGARS-V Advanced Development: Program provides for analysis and implementation of overall product improvements to the SINCGARS Combat Net Radio. Priorities for the product improvement program are Global Positioning System (GPS) interfaces and Forward Error Correction (FEC) (data transmission enhancement techniques) (Phase I improvement), improved data capability, weight reduction, MANPRINT (ease of operations), vehicular system re-engineering, improved electronic counter-counter measure (ECCM) performance and switched system dial up interfacing. Program provides simplified operations, improved performance of existing capabilities, new operational capabilities and reduced life cycle costs. This special appropriation for the FY94 program supplements the efforts currently being performed under Program Element 0604805A for the SINCGARS System Improvement Program effort.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603746A **Budget Activity: #4**
PE Title: SINCGARS Advanced Development

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Initiated design plans for General Dynamics System Improvement efforts	2Q94	$1000
• (U) Completed cosite improvements for the SINCGARS radio	2Q93	$1500
• (U) Initiate design plans for ITT System Improvement Plan effort	4Q94	$2418
Total		**$4918**

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Continue efforts for GPS interface for accessing GPS time and position information	4Q94	$1100
• (U) Continue development of SINCGARS FEC hardware/development for ITT	4Q94	$1200
• (U) Continue System Improvement Plan development and interoperability efforts	4Q94	$200
Total		**$2500**

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) No planned program		0

(U) Work Performed By: Program management is provided by Project Manager, SINCGARS reporting to the Program Executive Officer for Communications at Fort Monmouth, New Jersey with support from the US Army Communications-Electronics Command. The Contractors for these efforts are ITT/Aerospace/Communications, Ft. Wayne, Indiana, and General Dynamics, Tallahassee, Florida.

(U) Related Activities: PE 0604805A Command, Control and Communications Systems- Engineering Development, relates to Engineering Development of the System Improvement Program for the SINCGARS Combat Net Radio, Program Element #0604805A, (C3 Systems Eng Dev). There is no unnecessary duplication of effort within the Army or Department of Defense.

(U) International Cooperative Agreements: None

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element #0603747A
PE Title: Soldier Support and Survivability

Budget Activity #4

A.(U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DC09 Unit/Organizational Equipment	6885	2658	2002	2504	1813	1788	1896	Cont.	Cont.
D603 Enhanced Land Warrior	0	0	5533	3665	0	0	0	Cont.	Cont.
D610 Food Development	2018	3602	2172	2173	2146	2524	2894	Cont.	Cont.
D669 Clothing and Equipment	7079	6916	2088	3527	3549	3222	3195	Cont.	Cont.
PE TOTAL	15982	13176	11795	11869	7508	7534	7985		

B. (U) BRIEF DESCRIPTION OF ELEMENT: Development of improved clothing and equipment which will enhance soldier battlefield efficiency and survivability. Development of individual clothing and equipment items to lighten the soldier's load and incorporate protection against chemical and biological agents, thermal nuclear flash, ballistic threats, visual and electronic detection and environmental hazards. Enhanced Land Warrior is a NEW START in FY95. This project will develop components for an integrated system for combat soldiers.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:

(U) DC09 - Unit/Organizational Equipment Advanced Development: Develop and field lightweight tents and shelters to improve unit sustainability.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Completed preliminary designs of the Transportable Helicopter Enclosure frame and air beam concepts	3Q93	150
• (U) Prepared a mission needs statement for Solar Shade Aramunition Covers	2Q93	20

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element #0603747A
PE Title: Soldier Support and Survivability

Budget Activity #4

• (U) Erected prototype Solar Shade Ammunition Covers at the National Training Center (NTC) for long-term evaluations to solve solar loading problems of high tech ammunition	3Q93	30
• (U) Fabricated three Tactical Aircraft Shelter prototypes using tensioned-fabric design and conducted technical evaluations	2Q93	150
• (U) Completed design and fabrication of prototype Laundry and Dry Cleaning system (LADS)	4Q93	330
• (U) Developed and integrated a prototype Force Provider (FP) system	4Q93	1000
• (U) Developed streamlined FP acquisition strategy	2Q93	330
• (U) Acquired and delivered FP test module to Fort Bragg for operational testing and transition to Engineering Development	4Q93	3000
• (U) Transitioned to Engineering Development pre-planned product improvements of waste water treatment systems and containerized latrines	3Q93	1334
• (U) Conducted Technical Feasibility Test (TFT) on 35K British Thermal Unit (BTU) Convection Space Heater	1Q93	441
• (U) Developed water reuse systems for M85 trailer mounted laundry	3Q93	100
Total		**6735**

(U) FY 1994 Planned Program:

• (U) Complete testing of prototype Laundry Dry Cleaning System (LADS) and fabrication of three advanced prototypes	4Q94	1500
• (U) Complete demonstration/validation and transition the 35K BTU Convection Space Heater to Engineering and Manufacturing Development	4Q94	300
• (U) Fabricate developmental prototypes for the 10K BTU Soldier Crew Tent Heater and Arctic Tent Heater	4Q94	474
• (U) Complete concept designs and conduct user assessment of lightweight maintenance tent	3Q94	181
• (U) Redesign fabric and support systems for Solar Shades and perform testing at NTC with user troops	3Q94	203
Total		**2658**

(U) FY 1995 Planned Program:

• (U) Complete fabrication of the three advanced prototype LADS and conduct technical testing to validate and refine improvements to field laundry operations	4Q95	300
• (U) Complete demonstration and transition the 10K BTU Soldier Crew Tent Heater and Arctic Tent Heater to Engineering and Manufacturing Development (EMD)	4Q95	250
• (U) Redesign lightweight maintenance tent based upon user assessment and move to operational testing	3Q95	660

• (U) Develop first generation design for containerized laundry and shower system	3Q95	386
• (U) Complete testing of the Solar Shade Ammunition Covers and transition to EMD	3Q95	250
• (U) Develop designs for ballistic protection of ammunition and fuel stocks, command posts, and personnel	3Q95	156
Total		**2002**

(U) D603 - Enhanced Land Warrior: This program includes all soldier system modernization: Land Warrior (LW); Mounted Warrior (MW); and Air Warrior (AW). LW is a first generation, integrated fighting system for dismounted combat soldiers, that encompasses anything the soldier wears or carries. The backbone of LW will be a radio/computer/Global Positioning System (GPS) and head mounted display. LW will incorporate/integrate equipment from ongoing RDA programs, to include into the digital backbone, when appropriate. MW will be a similar system for the mounted crewman, and the AW will support air crew soldiers.

(U) FY 1993 Accomplishments: Not applicable. Project established in FY95.

(U) FY 1994 Planned Program: Not applicable. Project established in FY95.

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Manage contract to include source selection for Land Warrior	4Q95	4000
• (U) Contractor initiate LW system design	4Q95	1533
Total		**5533**

(U) Project D610 - Food Advanced Development: Conduct advanced development of improved subsistence and subsistence support items to enhance soldier effectiveness and quality of life in all four services as part of an integrated DoD Food Research, Development, Test, Evaluation and Engineering (RDT&E) program.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Developed improved sanitation methods that utilize waterless sanitation technology	4Q93	173
• (U) Evaluated and upgraded selected new field subsistence components which resulted in improved menus, operational readiness, and Operations and Support Cost Reduction (OSCR)	3Q93	761
• (U) Transitioned Special Operations Forces (SOF) Long Range Patrol assault ration Technical Data Package (TDP) to the Defense Logistic Agency (DLA) for procurement	4Q93	89
• (U) Evaluated equipment required to package water for field operations	2Q93	249

• (U) Completed market survey and customer test of candidate NDI for the Army Containerized Kitchen	1Q93	92
• (U) Developed prototype refrigeration system for field hospital food service operations	4Q93	389
• (U) Conducted a market survey and procured commercially available powered multifuel burners for test and evaluation	4Q93	265
Total		**2018**

(U) FY 1994 Planned Program:

• (U) Conduct technical evaluation of new field subsistence items to improve producibility, organoleptic quality and operation and support costs	4Q94	425
• (U) Develop labeling for operational rations as required by changes in Federal Law	4Q94	175
• (U) Develop a Unitized Group Ration (UGR) to simplify logistics and streamline procedures for hot food field preparation	4Q94	277
• (U) Design galley system extended operation aboard Navy P-3 sub chaser aircraft as part of DoD-wide food program responsibility	4Q94	480
• (U) Develop food service equipment from composite materials that is lighter and more compact for use aboard submarines as part of DoD-wide food program responsibility	4Q94	275
• (U) Assemble special components for an improved Special Operations Forces (SOF) assault ration for extended operations	4Q94	320
• (U) Conduct market surveys and investigate improvements to Army Field Feeding System to provide quality of life/safety improvements for soldiers operating in extreme cold environments	4Q94	460
• (U) Complete design and development of improved field food service refrigeration to provide higher quality food and meet environmental concerns on ozone depleting chlorofluorocarbons	3Q94	280
• (U) Conduct user test of powered multifuel burners to improve operational efficiency and operations and to effect cost savings	4Q94	440
• (U) Complete design and initiate fabrication of prototype Soldier Sustainment Module to improve food service at remote field sites	4Q94	470
Total		**3602**

(U) FY 1995 Planned Program:

• (U) Perform operational testing of candidate powered multifuel burners used in field food preparation	1Q95	300
• (U) Conduct user/technical tests with Soldier Sustainment Module	3Q95	375

• (U) Conduct tests of cold weather improvement for the Army Field Feeding System to provide improved warmth for food service personnel, greater equipment safety and responsive food service in extreme environments	3Q95	326
• (U) Automate the Joint Service Recipe System	4Q95	235
• (U) Test galley improvements aboard Navy P-3 sub chaser aircraft	4Q95	260
• (U) Transition TDP for UGR and the Joint Service nutritional labeling to Defense Logistics Agency (DLA) for procurement	3Q95	167
• (U) Transition new field subsistence items to services	4Q95	210
• (U) Conduct initial Special Operations Forces (SOF) evaluation of Improved Long Range Patrol Rations	3Q95	299
Total		2172

(U) Project D669 - Clothing and Equipment: Improve clothing and individual equipment to enhance soldier effectiveness and survivability.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Conducted user evaluation of the Self-Contained Toxic Environment Protective Outfit (STEPO) for depot and EOD personnel; modified Technical Test/User Test designs	4Q93	2609
• (U) Conducted tests (agent, human factors, heat stress, materials) of chemical protective garments for Joint Service Lightweight Integrated Suit Technology (JSLIST) program	4Q93	1555
• (U) Finalized design concepts and procured items for evaluation of the Advanced Combat Vehicle Crewman (CVC) Helmet		80
• (U) Type Classified a single canister Toxicological Agent Protective (TAP) Hood	3Q93	62
• (U) Participated in the Physiological and Psychological Effects of the Nuclear, Biological and Chemical Environment and Sustained Operations of Systems in Combat (P2NBC2) test of the Individual Soldier Microclimate Cooling System (IMCS)	4Q93	591
• (U) Completed trade-off determination for and trade-off analysis of Land Warrior		2026
• (U) Approved Mission Needs Statement for Land Warrior on 8 Sep 93, as an ACAT III program.	4Q93	
• (U) Tasks in support of advanced eye protection and body armor conducted throughout the FY	4Q93	156
Total		7079

(U) FY 1994 Planned Program:		
• (U) Procure test items for TT/UT of the Self-Contained, Toxic Environment Protective Outfit (STEPO)	4Q95	2004
• (U) Procure test items for Liquid Microclimate Cooling Vest	3Q94	180

• (U) Complete evaluations of Individual Microclimate Cooling System for transition to engineering development	4Q94	610
• (U) Initiate design concepts for the Land Warrior	4Q94	3503
• (U) Complete Concept Formulation Process for Land Warrior	4Q94	
• (U) Achieve Milestone I Program Decision for Land Warrior	4Q94	
• (U) Prepare Land Warrior Request for Proposal for FY95 release	4Q94	
• (U) Reviewed test results of flechette/fragment protective vests for transition to engineering development	4Q94	194
• (U) Prepare requirement documents and conduct market surveys on multiple tasks including modular body armor and advanced eye protection	4Q94	425
Total		**6916**

(U) FY 1995 Planned Program:

• (U) Complete testing and type classify STEPO	4Q95	700
• (U) Complete design concepts and fabricate prototypes for Advanced LASER Eye program	4Q95	400
• (U) Conduct testing of the Liquid Microclimate Cooling Vest	3Q95	200
• (U) Finalize design concepts for the Modular Body Armor system	4Q95	450
• (U) In-house support (payroll and travel) for the PM office and other support to the PM office	4Q95	338
Total		**2088**

(U) Work Performed By: In-house efforts will be accomplished by U.S. Army Natick Research, Development and Engineering Center, Natick, MA; Project Manager Soldier, Woodbridge, VA. Other supporting government agencies include U.S. Army Test and Evaluation Command, Aberdeen Proving Ground (APG), MD; Yuma Proving Ground, AZ; Dugway Proving Ground, Dugway, UT; USMC Project Manager Combat Soldier Support, Quantico, VA; U.S. Navy Clothing and Textile Facility, Natick, MA; U.S. Army Chemical and Biological Defense Agency, APG, MD; and U.S. Army Research Institute of Environmental Medicine, Natick, MA; U.S. Army Aviation Research Laboratory, Fort Rucker, AL; Oak Ridge National Laboratories, Oak Ridge, TN; U.S. Army Tank Automotive Command, Warren, MI; U.S. Army Cold Regions Test Center, Fort Greeley, AK; and U.S. Army Quartermaster Center and School, Fort Lee, VA. Contractors include: Foster-Miller, Inc., Waltham, MA; Air Lock Inc., New Haven, CT; Analytics Inc., Willow Grove, PA; Metrick, Inc., Elverson, PA; East/West Industries, Inc., Hauppauge, NY; Battelle Corporation, Columbus, OH; Uvex Winter Optics, Southfield, RI; KPM-Tek, Inc., Inwood, PA; American Optical Corp., South Bridge, MA; Research Inc., Waynesville, NC; Teledyne Inc., Northridge, CA; Environmental Technologies Group Inc., Towson, MD; Gentex Corporation, Carbondale, PA; Mine Safety Appliance, Murrayville, PA; Bose, Framingham, MA; GEOMET Technologies, Germantown, MD; American Kleaner, MFG., Co. Inc., Pico Rivera, CA; Carlin MFG., Inc., Fresno, CA; Modern Technologies, Inc., Xenia, OH; Babington Engineering, McClean, VA; Internat'l Thermal Research, Ltd., Richmond, BC, Canada; Tech Research Group, East Providence, RI; Gould Associates, Hillard, OH.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element #0603747A
PE Title: Soldier Support and Survivability

Budget Activity #4

(U) Related Activities: PE #0604713A (Combat Feeding, Clothing and Equipment). The DoD Food and Nutrition Research, Development, Test, Evaluation and Engineering Program is established by DoD 3235.2-R. The Army is the Executive Agent for management of this fully coordinated joint services effort. To prevent duplication of clothing and individual equipment item development, close coordination is maintained through joint working groups, joint service agreements and circulation of requirements documents. There is no unnecessary duplication of effort within the Army or DoD.

(U) Other Appropriation Funds:

Number Title	FY93 Actual	FY94 Estimate	FY95 Estimate	FY96 Estimate	FY97 Estimate	FY98 Estimate	FY99 Estimate
OPA 3							
LADS - SSN M86200	0	0	0	0	927	2024	8171
Force Provider - SSN MA6810	0	0	10741	18712	18417	18399	0
Land Warrior - SSN MA6801	0	0	0	0	0	0	10229

(U) International Cooperative Agreements: None.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603759A**
PE Title: **Chemical Biological Defense and Smoke Advanced Technology**

Budget Activity: **#3**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DE83 Chemical Biological Defense Systems Advanced Technology	4298	2631	198	3998	6019	8830	9816	Cont'd	Cont'd

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element funds demonstrations of technologies and materiel in support of deterrence and defense against chemical and biological warfare as well as for equipment defeating munitions. Army is the DOD Executive Agent for Chemical Warfare (CW) and Chemical and Biological Defense (CBD) research. These efforts comprise risk-reducing demonstrations conducted in an operational environment with active user and developer participation. These demonstrations integrate diverse technologies to improve DOD CW deterrence and CB defense. Upon review of the requirements and priorities, the original Flame/Incendiary Munitions demonstration (FY 95-97) was restructured to support the Multi-Purpose Individual Munition.

C. (U) JUSTIFICATION FOR PROJECT:

(U) Project DE83 - Chemical Biological Defense Systems Advanced Technology: This project demonstrates technology advancements in the areas of agent detection and identification, decontamination, individual and collective protection, and smoke/novel effects munitions which will speed maturing of advanced technologies to reduce risk in system-oriented Demonstration/Validation (Dem/Val) (6.3B).

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Evaluated preliminary designs for Respo 21 general purpose and lightweight protective mask systems	*	1781
• (U) Established design of fixed site collective protection temperature swing adsorption (TSA) unit and conducted limited testing of novel TSA bed heating approaches	*	769
• (U) Identified and tested several sorbents with better decontamination efficacy than existing sorbent	*	756
• (U) Developed specific agent algorithms to support the lightweight standoff chemical agent detector	*	992
Total		**4298**

* This is a continuing effort that is reviewed periodically, ensuring quality, relevance, and priority.

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FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603759A
PE Title: Chemical Biological Defense and Smoke Advanced Technology **Budget Activity: #3**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Fabricate Respo 21 prototypes and conduct demonstration. Support 21st Century Land Warrior/special applications	4Q94	1071
• (U) Fabricate fixed site collective protection system and conduct demonstration. Transition to programs such as deployable medical system and Air Force shelter	4Q94	835
• (U) Optimize, characterize and demonstrate sorbent decontamination. Transition to Dem/Val	4Q94	725
• (U) Demonstrate agent algorithms for lightweight standoff chemical agent detector	1Q94	0
Total		**2631**

(U) FY 1995 Planned Program:		
• (U) Support the Multipurpose Individual Munition (MPIM) effort by reviewing and providing design help for the flame payload approaches.	4Q95	198
Total		**198**

(U) Work Performed By: Work is primarily performed by the U.S. Army Edgewood Research, Development and Engineering Center (ERDEC) and has responsibility for program management. Other Government activities providing support include Belvoir Research, Development and Engineering Center (BRDEC), Natick Research, Development and Engineering Center (NRDEC). The major supporting laboratory is ERDEC, Aberdeen Proving Ground, MD. Contractors include: Battelle Memorial Institute, OH, Guild Inc., OH, Geomet Inc., MD, Reutner, OH, University of Maryland, MD.

(U) Related Activities: This program adheres to Tri-Service Reliance Agreements on Chemical and Biological Defense with oversight and coordination provided by the Joint Directors of Laboratories. Work in this Program Element contains no unwarranted duplication of effort among the Military Departments. Work in this program element is consistent with the resource constrained Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan and Project Reliance.

(U) Other Appropriation Funds: ($ in Thousands). N/A

(U) International Cooperative Agreements: Trinational MOU with United Kingdom/Canada/U.S. on Research, Development, Production and Procurement of Chemical and Biological Defensive Materiel.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603760A
PE Title: Distributive Interactive Simulation - Advance Development

Project Number: #DC80
Budget Activity: #4

A. (U) RESOURCES: ($ in Thousands)
Project Title: Battle Lab Reconfigurable Simulators

Popular Name Program	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total
Battle Lab Reconfigurable Simulators	0	0	11787	0	0	0	0	cont	cont

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This is a New Start in FY95
Initiates advanced development of reconfigurable Simulators for use in TRADOC Battle Laboratories. Program provides advanced development of modular software and hardware architectures for reconfigurable simulators. Devilment will provide a common framework for the development of a new generation of simulators that can be used to explore a wide variety of critical issues for the Force Projection Army. FY95 efforts will include work on a reconfigurable generic rotary wing aircraft simulator, an armored vehicle simulator which will provide a basis for work on any system designed on the M2 Bradley vehicle chassis, a battle command and control vehicle, a fire support vehicle for use by both artillery and air defense efforts, and combat service support module.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments:
- (U) N/A

(U) FY 1994 Planned Program:
- (U) N/A

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Software architecture development	3Q95	7500
• (U) Modular hardware definition	4Q95	3000
• (U) Generic module definition	1Q96	1287
Total		11787

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603760A | **Project Number: #DC80**
PE Title: Distributive Interactive Simulation - Advance Development | **Budget Activity: #4**

D. (U) WORK PERFORMED BY: To be determined

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** This is a New Start in FY95
2. **SCHEDULE CHANGES:**
3. **COST CHANGES:**

F. (U) PROGRAM DOCUMENTATION:

G. (U) RELATED ACTIVITIES: PE #0604715A Non-System Training Devices - Engineering Development Project DC91 Distributive Interactive Simulations. There is no unnecessary duplication of effort within the Army or DoD.

H. (U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
None							

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: N/A

J. (U) MILESTONE SCHEDULE:

Milestones	Dates

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603766A (TIARA)
PE Title: Tactical Electronic Surveillance System - Advanced Development

Project Number: #D907
Budget Activity: #4

A. (U) RESOURCES: ($ in Thousands)
Project Title: Tactical Electronic Surveillance - Advanced Development

Popular Name	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
Tactical Electronic Surveillance System - Advanced Development	13989	15295	15008	22000	12756	10773	25590	Cont	Cont

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Supports the tactical commander's intelligence requirements for contingency force development and deep battle targeting as stated in Field Manual 100-5. Specific signal intelligence and multispectral developments are managed within the Army's Tactical Exploitation of National Capabilities (TENCAP) program. The scope of the program is to seek specific data and information available from existing and emerging national and selected theater capabilities that meet stated Army tactical intelligence information and targeting needs to correct deficiencies, and develop concepts, techniques and prototype processors to exploit critical data for near-real time integration into the appropriate tactical echelon. This project supports the advanced development/enhancement of the Electronic Tactical User Terminal (ETUT), Mobile Integrated Tactical Terminal (MITT), Forward Area Support Terminal (FAST), Electronic Processing and Dissemination System (EPDS), Tactical High Mobility Terminal (THMT). Specific details are provided in the Tactical Intelligence and Related Activities (TIARA) Congressional Justification Book, Volume III, and in the Army TENCAP Master Plan.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Initiated evaluation and field testing of the MITT, based on commercial open architecture standards applicable to PEO IEW's production efforts.	4Q93	500
• (U) Completed redesign study of the ETUT system and development for continued tactical interface with emerging national systems' mix.	4Q93	200
• (U) Continued to refine concepts, procedures, applications and systems to ensure compatibility of source interfaces, and maintain close/joint efforts with other service TENCAP offices to enhance intelligence dissemination.	4Q93	3424

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603766A (TIARA)
PE Title: Tactical Electronic Surveillance System - Advanced Development

Project Number: #D907
Budget Activity: #4

	Complete	Cost
• (U) Initiated advanced development to retrofit ETUT with enhanced MITT hardware and software.	4Q93	6100
• (U) Continued support to TENCAP program management and administrative activities (e.g. Federally Funded Research and Development Center (FFRDC) (Aerospace), Army Research Laboratory (ARL) support, U.S. Army Space Program Office (ASPO) support and Scientific Engineering and Technology Assistance (SETA) support.	4Q93	3765
Total		**13989**

(U) **FY 1994 Planned Program:**	Complete	Cost
• (U) Continue to pursue technology and refine techniques for fully exploiting national capabilities to meet the changing threat environment.	4Q94	7307
• (U) Initiate advanced development of five additional MITTS to replace existing THMTs.	4Q94	2100
• (U) Continue advanced development to retrofit ETUT with enhanced MITT hardware and software.	4Q95	2300
• (U) Continue support to TENCAP program management and administrative activities (e.g. FFRDC (Aerospace), Army Research Laboratory (ARL) support, U.S. Army Space Program Office (ASPO) support and Scientific Engineering and Technology Assistance (SETA) support.	4Q94	3588
Total		**15295**

(U) **FY 1995 Planned Program:**	Complete	Cost
• (U) Continue to pursue technology and refine techniques for fully exploiting national capabilities to meet the changing threat environment.	4Q95	6971
• (U) Initiate analysis for the advanced development to retrofit or replace EPDSs with state-of-the-art hardware and software, based on an open architecture and complimenting other TENCAP systems.	4Q95	2000
• (U) Complete build/field of five additional MITTs to replace THMTs.	4Q95	2400
• (U) Complete advanced development to retrofit ETUT with enhanced MITT hardware and software.	4Q95	350
• (U) Continue support to TENCAP program management with administrative activities (e.g. FFRDC (Aerospace)), Army Research Laboratory (ARL) support, U.S. Army Space Program Office (ASPO) support and Scientific Engineering and Technology Assistance (SETA) support.	4Q95	3287
Total		**15008**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603766A (TIARA)
PE Title: Tactical Electronic Surveillance System - Advanced Development

Project Number: #D907
Budget Activity: #4

D. (U) WORK PERFORMED BY:
In-house development agencies: Army Research Laboratories (ARL), Adelphi, MD; US Army Information Systems Command, Fort Huachuca, AZ.
Contractor: Aerospace Corporation, El Segundo, CA.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:
NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: None.
3. (U) COST CHANGES: None.

F. (U) PROGRAM DOCUMENTATION:
Technological Objective, Army Tactical Application of SIGINT Special (ATASS), 7/81 Appendix I, Technological Objective, ATASS, 1/89.

G. (U) RELATED ACTIVITIES:
PE #0604766A (Tactical Electronic Surveillance Systems - Engineering Development) provides continuing related engineering developments. To avoid duplication effort, coordination is made with the National Security Agency, Defense Intelligence Agency, Navy and USAF TENCAP offices, Army Materiel Command, and other classified agencies at the national level.

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands) Not applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE:

Milestones	Milestones Dates
Completed ETUT Retrofit Design Studies	4Q93
Initiate MITT field testing with MITT #1	4Q93
Complete Advanced Development ETUT Retrofit	4Q95
Complete field testing of MITT 2, 3, 4, 5, 6	2Q94
Build and field additional five MITTs	4Q94-4Q95
Initiate Analysis for Retrofit or Replacement of EPDS	1Q95-4Q95

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603772A
PE Title: **Advanced Tactical Computer Science and Sensor Technology**

Budget Activity: #3

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D101 Tactical Automation	2299	12724	20542	23837	22524	14295	16115	Cont'd	Cont'd
D243 Sensors and Signal Processing	4937	7724	6175	3305	2024	4354	5705	Cont'd	Cont'd
D281 Ground Combat ID Demonstrations	4715	5990	8278	7008	7383	3543	0	0	36917
D289 Joint Air/Land/Sea Precision Strike Demonstration	7715	*0	0	0	0	0	0	0	7715
PE TOTAL	19666	26438	34995	34150	31931	22192	21820		

*Transitioned to PE #0603238A

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program contains projects in four technology areas. Project D101 develops advanced computer science and technology for solution of Army-unique Command and Control (C2) deficiencies in the area of combined arms operations. Specifically, this program addresses solutions to horizontal integration of the battlefield, synchronization of combined arms forces, synchronization of joint forces, C2 on the move, and integrated situation awareness. This project supports digitizing the battlefield through the combined arms command and control technology demonstration. Key technologies utilized include expert system decision support technology, data base architecture development, data compression, man machine interfacing, information filtering, advanced information display technology, digital terrain display and manipulation and automated navigation/geopositioning. Major program goals development and display of common battlefield view, including integration of battlefield combat identification information; development and implementation of a lower echelon data base architecture; and demonstration of advanced C2 mission planning and battle execution monitoring. Demonstrations will be conducted in conjunction with the Mounted, Dismounted and Battle Command Battle Laboratories. Technology will be transitioned to PEO CCS, PEO Aviation and PEO ASM for integration within their systems and subsequent fieldings. Project D243 includes the common ground station technology demonstration to provide fusion of intelligence data from airborne and spaceborne sensors, and the bistatic radar technology demonstration to reduce ground radar vulnerabili-

ty. The project provides critical sensor and signal processing technology for real-time, all-weather, automatic detection, classification and identification of fixed or moving high-priority targets for the commander. Technologies in the following areas will be pursued: bistatic radar, lightweight, Synthetic Aperture Radar (SAR), ultra-wide-band and three-dimensional SAR, modular Moving Target Indicator (MTI) radar, hybrid digital-optical processing, Very High Speed Integrated Circuitry (VHSIC), and Gallium Arsenide (GaAs) based digital processors. Project D281 supports the combat identification technology demonstration, which will develop integrated situation awareness and point of engagement identification approaches to reduce fratricide for ground forces. It provides the ground-to-ground and rotorcraft-to-ground combat identification technology under the coordinated DoD combat identification effort. Work in this program element is consistent with the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan, and Project Reliance.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project D101 - Tactical Automation: This is the Army's major science and technology program to provide the architecture and products to implement the vision of a digitized battlefield as defined by the Chief of Staff as being essential to winning the "Information War". It develops advanced computer science and technology for solution of Army unique command and control deficiencies in the area of Combined Arms operations. Specifically, this project addresses solutions for lower echelon digital information transfer and display for horizontal integration of the battlefield, synchronization of Combined and Joint Forces, command and control on the move, integrated situation awareness, command and control for light force insertion and platform C2 down to the individual soldier. Key technologies utilized include expert system decision support technology, data base architecture development, data compression, man-machine interfacing, information filtering, advanced information display technology, digital terrain display and manipulation and automated navigation/geopositioning. Major program goals include improved force synchronization and fratricide reduction through the development and display of a common battlefield view. The common battlefield view will be created through the development and implementation of a lower echelon data base architecture in the combined arms command and control demonstration. Joint developer/user Warfighting Demonstrations will be conducted in conjunction with the Mounted, Dismounted, and Battle Command Battle Labs. Products will be transitioned to PEO's (CCS, Aviation, ASM, etc.) for integration within their systems and subsequent fielding.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Completed Battlefield Synchronization Demo (BSD) in conjunction with the Mounted Warfighting Battle Lab	4Q93	200
• (U) Demonstrated Division and above Headquarters decision aids	*	1744
• (U) Completed Combined Arms Command & Control (CAC2) front-end analysis requirements phase.	*	200

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

• (U) Established a common information transfer protocol (Mil Std. 188-220)	4Q93	155
Total		**2299**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Develop a digital database architecture for brigade and below	*	7441
• (U) Complete Division-and-above decision aids	2Q94	950
• (U) Establish an R&D and user digital integration lab to simulate key functions necessary to demonstrate horizontal force\ integration	*	323
• (U) Develop, model and simulate architecture and platforms for National Training Exercise Desert Hammer 6 in conjunction with PEO CCS, PEO Aviation, PEO ASM and the Mounted Warfighting Lab	*	3500
• (U) With the User, complete a operational requirements analysis for the Rapid Force Projection capability	*	500
Total		**12724**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Use distributed interactive simulation facilities at Ft. Knox and Ft. Rucker to validate and refine user requirements, system architecture, doctrine and soldier machine interface for lower echelon digital information transfer and display	*	5500
• (U) Initiate command and control technology demonstration for the Rapid Force Projection Initiative (RFPI) demo	*	2000
• (U) Conduct digital brigade command post exercise simulation at Ft. Knox Battle Lab	*	3285
• (U) Develop baseline lower echelon data-base/ comms design and evaluate C2 with distributed digital integration labs	*	5000
• (U) Develop soldier platform C2 system architecture	*	3595
• (U) Demonstrate initial decision support package for battalion and below force synchronization	*	1162
Total		**20542**

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

(U) Project D243 - Sensors and Signal Processing: This project provides for advanced development of new radar and signal processing concepts including bistatic radar and develops technology options for the common ground station to support the ground station Engineering and Manufacturing Development planned by Program Manager Joint Stars in FY1996. The common ground station (CGS) technology demonstration is focused on the intelligence requirements of the Brigade commander for near-real-time data, but will provide technology options for receiving, processing and displaying multi-spectral intelligence information and dissemination of intelligence products to the maneuver, fire support or intelligence mission

areas. This project was partially restructured to project D281.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Constructed Bistatic Radar for Weapons Location (BRWL) receiver; designed expendable transmit antenna	*	2464
• (U) Conducted, at National Training Center, a successful evaluation of Moving Target Indicator (MTI) radar technology suitable for unmanned aerial vehicles or other low-cost aviation applications	4Q93	1527
• (U) Demonstrated CGS processing technology with Operation Desert Capture data, on computer workstation; completed initial man-in-the-loop simulation	*	546
• (U) Initiated design & development of CGS hardware, for user evaluation including Brigade-level advanced warfighting experiment	*	400
Total		**4937**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Integrate BRWL software and transmitter/receiver components and conduct in-house laboratory testing and simulation	*	3500
• (U) Common Ground Station advanced antenna proof-of-concept stationary demo and HQ-TRADOC-coordinated operational system concept	*	2112
• (U) Laboratory demonstration of multimedia distributed data base for common ground station applications	*	2112
Total		**7724**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Test and demonstrate bistatic radar technology in field environment	4Q95	3200
• (U) Integrate sensors to airborne test platforms to demonstrate multisensor air-to-ground targeting technology applicable for low-cost aerial platforms, including unmanned aerial vehicles	*	1075
• (U) Common Ground Station brigade proof-of-concept demonstration in conjunction with TRADOC	4Q95	1900
Total		**6175**

(U) Project D281 - Ground Combat Identification Demonstrations: The objective of this program is to select, develop, and demonstrate techniques (both target identification and situational awareness) that minimize fratricide during ground-to-ground and air-to-ground engagements and

*This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603772A
PE Title: Advanced Tactical Computer Science and Sensor Technology — Budget Activity: #3

to demonstrate integration of battlefield target identification and situational awareness information in the overall Joint battlefield architecture. This includes selection of appropriate target identification and situational awareness techniques using architecture study investigations and modeling and simulation evaluations, development and fabrication of prototype equipment which will be integrated onto weapon platforms, simulation of force on force wargames, and a force demonstration to collect real data to verify and validate the modeling. The results will support specifications for engineering and manufacturing development of the combat identification systems. Work in this project was restructured from project D243, this PE.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Completed initial architectural planning for hierarchical command & control structure for improved maneuver situational awareness (SA) capability	4Q93	1900
• (U) Completed initial planning for mid- and far-term demos *including* assessment of technologies, operational requirements, system concepts, and Joint/Allied interoperability issues	4Q93	2815
Total		**4715**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Complete modeling/simulation of alternative combat identification (CI) systems including situational awareness and target identification (TI) capabilities to determine optimal performance vs. cost	4Q94	1400
• (U) Complete millimeter wave, hardware/software emulator and experiments to define enhancements to near-term CI system. Define air-to-ground CI approach. Define architecture for local digital data link	4Q94	3100
• (U) Develop algorithms for integration/correlation of data from battlefield combat identification system, on board sensors and situational awareness (SA) database. Develop interface with 2nd Generation thermal sight	4Q94	1490
Total		**5990**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Complete demonstration of integrated situational awareness/target ID through distributed interactive simulation with the Mounted Warfighting Battle Lab	4Q95	2200
• (U) Investigate hardware/software enhancements to optimize battlefield combat identification system performance vs. cost when operated with the engagement SA approach as selected from the FY94 modeling/simulation effort	4Q95	3800
• (U) Begin construction, assembly and integration of engagement SA technology demonstrator components including digital processing, interfaces with thermal sight and tactical display, and digital data links	*	2278
Total		**8278**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603772A
PE Title: Advanced Tactical Computer Science and Sensor Technology Budget Activity: **#3**

(U) Project D289 - Joint Air/Land/Sea Precision Strike Demonstration: This project supports the Joint Precision Strike technology demonstration of all-weather, day/night, precision strike against 21st Century critical mobile and fixed targets. Work was restructured to PE #0603238A, Project D177 starting in FY1994.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Army Tactical Missile System - Extended Range (ATACMS-ER) and Jayhawk Thunder Distributed Interactive Simulation (DIS) demonstrations	4Q93	3220
• (U) Advanced concept development, DIS and Battle Laboratory support	*	2966
• (U) Input to ARPA's War Breaker program	4Q93	415
• (U) Input to Precision Strike Global Positioning Sattelite demonstration	3Q93	1114
Total		**7715**

*This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

(U) FY 1994 Planned Program: Restructured to PE #0603238, D177.

(U) FY 1995 Planned Program: Program restructured to PE #0603238A, Project D177.

(U) Work Performed By: Work is performed primarily by the U.S. Army Communications-Electronics Command (CECOM) Night Vision Electronic Sensors Directorate, Fort Belvoir, VA and Intelligence Electronic Warfare (IEW) Directorate, Vint Hill Farms Station, Warrenton, VA. Project D281 is managed by Project Manager, Combat Identification, Alexandria, VA and Fort Monmouth, NJ. Contractors include: Lockheed Corp, Austin, TX; SRI International, Menlo Park, CA; Computer Science Corp, Shrewsbury, NJ; TRW, Redondo, CA; GE Corp, Valley Forge, PA; TELOS Corp, Shrewsbury, NJ; Syracuse Research Corp, Syracuse, NY; Systems Planning Corp, Arlington, VA.

(U) Related Activities: This program adheres to Tri-Service Reliance Agreements on Communications, Command and Control, Radar, Electro-Optics, and Electronic Warfare with oversight provided by the Joint Directors of Laboratories. Work in this Program Element is related to and fully coordinated with efforts in PE #0602783A (Computer & Software Technology), PE #0602782A (Command, Control & Communications Technology), PE #0603006A (Command, Control & Communications Advanced Tecnnology), PE #0602709A (Night Vision Technology), and PE #0603710A (Night Vision Advanced Technology) in accordance with the ongoing Reliance joint planning process. Work performed under Project 281 is part of the coordinated DoD Combat Identification program; the Army portion of the program addresses ground-to-ground and air(rotorcraft)-to-ground technology. There is no unnecessary duplication of effort within the Army or DoD.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603772A
PE Title: Advanced Tactical Computer Science and Sensor Technology

Budget Activity: **#3**

(U) Other Appropriation Funds: ($ in Thousands) Not applicable

(U) International Cooperative Agreements: Not applicable

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603774
PE Title: Night Vision Systems Advanced Development
Budget Activity: #4

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	Total Complete	Total Program
D131 Night Vision Systems Advanced Development	7421	4768	2715	4441	4378	4871	4822	Cont	Cont

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element encompasses the advanced development phase of the Army Acquisition cycle for night vision and electro-optic (NVEO) devices/systems and prepares them for engineering development. The key objective of this program is to provide NVEO devices/systems for acquisition and engagement of enemy targets at maximum weapon system ranges under degraded battlefield/weather conditions and in countermeasure environments. The efforts are centered around development of countermeasure and electro-optic sensors for the individual soldiers and combat vehicles to meet stated Army deficiencies.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:

(U) D131 Night Vision Systems Advanced Development: This project provides the mechanism to transition Tech Base programs for electro-optical sensors to the Engineering Manufacturing Development (EMD) phase of the Acquisition Cycle. This project provides the funding necessary to institute advances for product improvement or horizontal integration to upgrade current capabilities.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Continued program for Standardized Advanced Detector/dewar Assemblies (SADA) for infrared systems systems for combat vehicles.	4Q94	3000
• (U) Initiated the 2nd Generation Forward Looking Infra red (FLIR) Horizontal Technology Integration Special Task Force.	4Q94	1590
• (U) Completed two SADA compatible detector/dewar assemblies and transitioned to the 2nd Generation Tank Sight Program for integration.	4Q94	2831
Total		7421

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603774
PE Title: Night Vision Systems Advanced Development — Budget Activity: #4

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Complete Standardized Advanced Detector/dewar Assembly program. This program developed the Tri-Service Standard High/Mid-to-High Dewar Assembly for 2nd Generation Infrared sensors to meet future weapon systems requirements (such as Horizontal Technology Integration). Twenty-five (25) units will be delivered and integrated into on-going development of 2nd Gen Infrared systems such as Improved Tow Acquisition System.	4Q94	2519
• (U) Complete 2nd Generation FLIR Horizontal Technology Integration Special Task Force and transition to PEO-IEW.	3Q94	1000
• (U) Implement development of an integrated helmet mounted display program (Mounted Warrior) for the combat vehicles crewman to permit viewing of the vehicle's tactical displays while operating in an "open hatch" mode.	3Q96	1249
Total		**4768**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Continue development of Mounted Warrior helmet mounted display with miniaturization of electronics components and optimal optical design.	3Q96	2000
• (U) Preparation of contract modification documentation for Natick AIMS contract and witness demonstration of 640 X 480 passive matrix display.	3Q96	395
• (U) Coordinate requirements for battlelab simulation exercise for mounted warrior display with mounted battlelab at Ft. Knox.	4Q96	320
Total		**2715**

(U) **Work Performed By:** In house efforts accomplished by U.S. Army Communications and Electronics Command (CECOM), Research, Development and Engineering Center (RDEC), Night Vision and Electronic Sensors Directorate (NVESD), Fort Belvoir, VA. Contractors are SBRC, El Segundo, CA; Advanced Design Corporation, Alexandria, VA; and EOIR, Inc., Fredericksburg, VA.

(U) **Related Activities:**
PE #0603710A (Night Vision Advanced Technology) relates to development of prototype demonstrators.
PE #0604710A (Night Vision Systems Engineering Development) supports engineering and manufacturing development of prototypedemonstrators. There is no unnecessary duplication of effort within the Army or DoD.

(U) **Other Appropriations Funds: ($ in Thousands)** Not Applicable

(U) **International Cooperative Agreements:** None

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603778A
PE Title: MLRS Product Improvement Program **Budget Activity: #7**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D050 Improved Fire Control System	10785	23589	35381	30119	15031	0	0	0	125118
D054 Extended Range Rocket	12826	17326	20318	18435	17280	0	0	0	96185
PE TOTAL	23611	40915	55699	48554	32311	0	0	0	221303

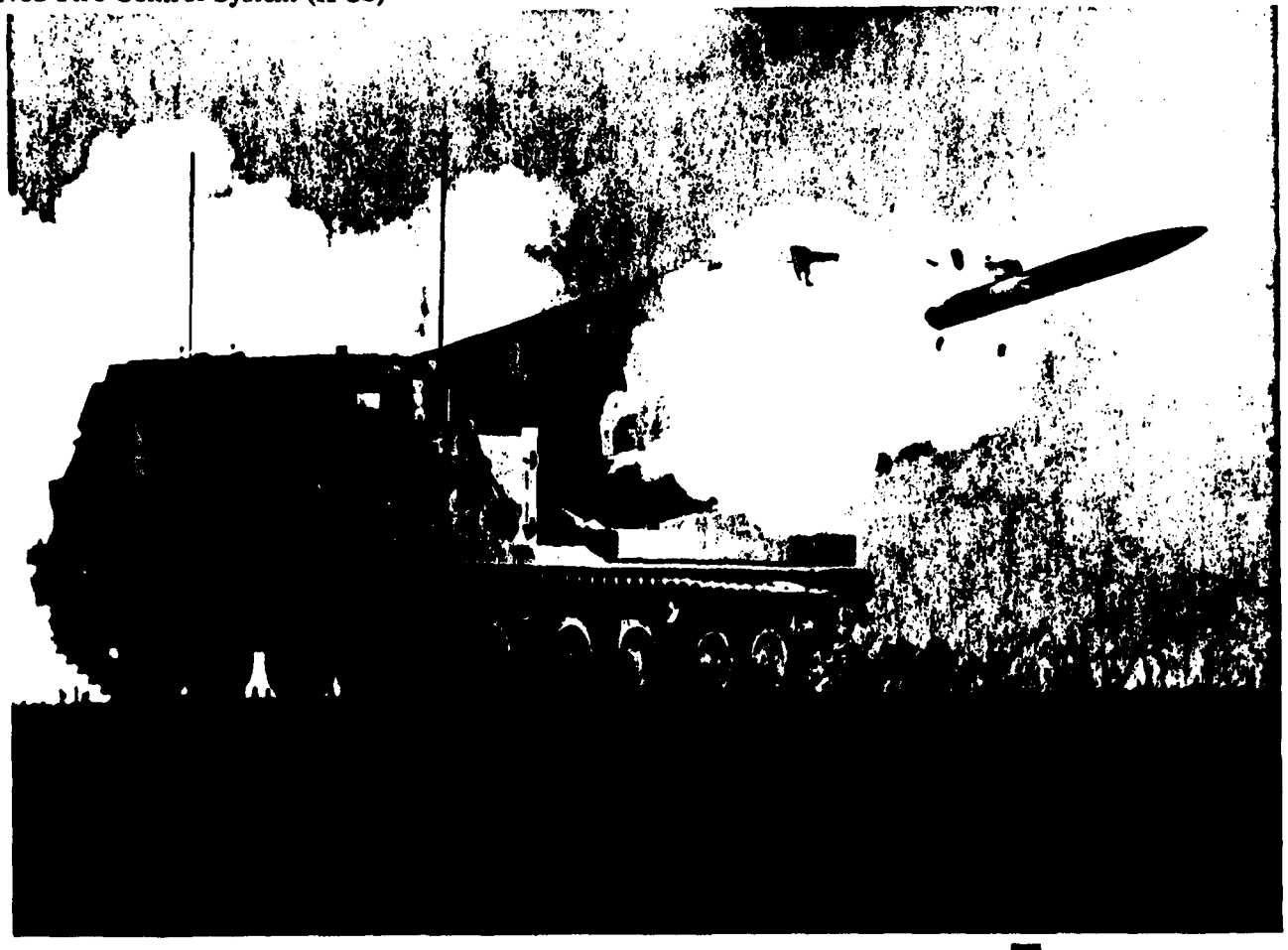
B. (U) BRIEF DESCRIPTION OF ELEMENT: Expanding Regional Power Threats require an evolutionary improvement program to maintain the effectiveness of the Multiple Launch Rocket System (MLRS). The MLRS Product Improvement Program (PIP) provides for the Engineering and Manufacturing Development of an Extended Range Rocket (ER-MLRS) and Improved Fire Control System (IFCS) for the MLRS. The ER-MLRS project will enhance the capability of the existing MLRS by providing improvements in range, accuracy and effectiveness, and maneuver force safety. The IFCS corrects present and future supportability problems resulting from electronic component obsolescence in the existing design. This effort will result in reduced operation and support cost due to addition of built-in test equipment and will provide growth capabilities for existing and future MLRS Family of Munitions (MFOM) weapon systems.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995: Not Applicable

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603778A
PE Title: MLRS Product Improvement Program
Project Title: Improved Fire Control System (IFCS)

Project Number: D050
Budget Activity: #7



Multiple Launch Rocket System

Missiles and Electronics Group
Missiles Division

POPULAR NAME: IMPROVED FIRE CONTROL SYSTEM (IFCS)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603778A
PE Title: MLRS Product Improvement Program
Project Title: Improved Fire Control System (IFCS)

Project Number: D050
Budget Activity: #7

A. (U) SCHEDULE/BUDGET INFORMATION: ($ In Thousands)

SCHEDULE	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	To Complete
Program Milestones					MSIII 4Q			
Engineering Milestones	SYSTEM DESIGN REV 9/93	PRELIMINARY DESIGN REV 2Q CDR 4Q						
T&E Milestones	APPROVED TEMP 1/93 COORDINATE TEST PRO 1/93	PROTOTYPE INTEGRATION LAB OPERATIONAL 3Q	INTEGRATION TEST RSA & LVS 3Q	SYSTEM INT TEST 2Q TEST FIRINGS 3Q	OPERATIONAL TEST 3Q			
Contract Milestones		DEFINITIZE LTR KTR 1Q			CONTRACT COMPLETE 4Q			
BUDGET ($000)	**FY 1993**	**FY 1994**	**FY 1995**	**FY 1996**	**FY 1997**	**FY 1998**	**FY 1999**	**Program Total (To Complete)**
Major Contract	8000	20558	30216	23732	10456			98462 (0)
Support Contract	929	506	1569	1540	461			6826 (0)
In-House Support	1161	2025	2975	3881	3323			14637 (0)
GFE/ Other	695	500	621	966	791			5193 (0)
Total	10785	23589	35381	30119	15031	0	0	125118 (0)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603778A
PE Title: MLRS Product Improvement Program
Project Title: *Improved Fire Control System (IFCS)*

Project Number: D050
Budget Activity: #7

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The current Multiple Launch Rocket System (MLRS) Fire Control System (FCS) provides position data, communication interface through which fire missions are received, processes data, controls the launcher, inputs mission critical data to the weapons and fires the weapon. This project provides for the Engineering and Manufacturing Development (EMD) of an Improved Fire Control System (IFCS) which will correct present and future supportability problems resulting from electronic component obsolescence in the existing design. This effort will result in reduced operation and support costs due to addition of built-in test equipment (BITE) to the circuit card and cable level and will provide growth capabilities for existing and future MLRS Family of Munitions (MFOM) weapon systems.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
(U) GFE Program Support	4Q93	0472
(U) Software Development	4Q93	0135
(U) System Design Trade Studies, PNU and LRU Design	3Q94	8000
(U) OGA, In House General Support and Support Contracts	4Q93	2178
TOTAL		10785

(U) FY 1994 Planned Program:	**Complete**	**Cost**
(U) GFE Rational Maintenance	4Q94	0210
(U) Software Development	4Q94	0300
(U) Launcher Mock-Up Design, PNU and LRU Design	4Q94	21000
(U) OGA, In House General Support and Support Contracts	4Q94	2079
TOTAL		23589

(U) FY 1995 Planned Program:	**Complete**	**Cost**
(U) GFE Rational Maintenance	4Q95	0210
(U) Software Development	4Q95	0400
(U) Launcher Pool	4Q95	0431
(U) System EDT Integration, Subsystem EDT and Final LRU Design Activities	4Q96	32000
(U) OGA, In House General Support and Support Contracts	4Q95	2340
TOTAL		35381

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603778A
PE Title: MLRS Product Improvement Program
Project Title: Improved Fire Control System (IFCS)

Project Number: D050
Budget Activity: #7

D. (U) WORK PERFORMED BY: LVS is the prime contractor and integrator with primary subcontractors being Harris, Raytheon and Allied-Signal.

Government technical organization is Research, Development, and Engineering Center at MICOM.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** NONE
2. **SCHEDULE CHANGES:** NONE
3. **COST CHANGES:** NONE

F. (U) PROGRAM DOCUMENTATION:

Operational Requirement Letter (Jun 92)
Acquisition Plan (Jan 92)
Acquisition Program Baseline (Feb 92)
Integrated Program Summary (Sep 92)
EMD Contract Award (Sep 92)
Test and Evaluation Master Plan (approved Jan 93).

G. (U) RELATED ACTIVITIES: A low altitude wind measurement device is planned to be developed under the Extended Range-MLRS Program. The IFCS will be capable of accepting information from such a device. There is no unnecessary duplication of effort within the Army or DOD.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603778A
PE Title: MLRS Product Improvement Program
Project Title: Improved Fire Control System (IFCS)

Project Number: D050
Budget Activity: #7

H. (U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Missile Procurement Army							
BUDGET ACT 2:							
MLRS RKT (C65401)	108624	74738	0	0	0	0	0
MLRS LAUNCHER (C65900)	144819	178916	60123	28232	0	0	0
SADARM MLRS RKT (C67900)	0	0	0	0	114877	111602	130293
ER-MLRS (C65402)	0	0	0	0	0	0	16552
BUDGET ACT 3:							
MLRS MODS (C67500)	12146	23197	29496	23146	15285	53681	53171
BUDGET ACT 4:							
MLRS INITIAL SPARES (CA0257)	17431	12411	12066	5251	0	0	0
MLRS MOD SPARES (CA0265)	439	1924	1269	2121	3215	2442	1856
Military Construction	0	0	0	0	0	0	0

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: N/A

J. (U) TEST AND EVALUATION DATA: The IFCS Test and Evaluation program is a logical progression of laboratory and field tests designed to verify the performance of the IFCS hardware and software when integrated with the M270 launcher. The technical test program will be conducted as two separate test phases: (1) The Engineering Design Tests (EDT) shall be the first iteration of hardware and software testing (i.e. test-fix-test-series). The EDT program will demonstrate that the basic design has a high potential to comply with the requirements of MIS 26432C and MIS 46307B when integrated with the M-270 launcher. The Design Qualification Tests will demonstrate that the production prototype IFCS hardware and software meet all requirements of MIS-26432C and MIS 46306B.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603778A
PE Title: MLRS Product Improvement Program
Project Title: Extended Range-MLRS

Project Number: D054
Budget Activity: #7

[PICTURE OR SCHEMATIC DRAWING]

POPULAR NAME: Extended Range-MLRS

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603778A**
PE Title: **MLRS Product Improvement Program**
Project Title: **Extended Range-MLRS**

Project Number: **D054**
Budget Activity: **#7**

A. (U) SCHEDULE/BUDGET INFORMATION: ($ In Thousands)

SCHEDULE	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	To Complete
Program Milestones	MSII IPR 11/92				MSIIIA DEC RVW 2Q			
Engineering Milestones	HDW PDR 7/93	S/W PDR/CDR 3Q	H/W CDR 1Q	SOFTWARE FQT 2Q	HARDWARE PCI 4Q			
T&E Milestones		FLIGHT TESTING 4Q	FLIGHT TESTING 1Q	PPQT START 1Q	PPQT COMPLETE 2Q			
Contract Milestones	EMD KTR AWARD 12/92				CONTRACT COMPLETE 4Q			
BUDGET ($000)	**FY 1993**	**FY 1994**	**FY 1995**	**FY 1996**	**FY 1997**	**FY 1998**	**FY 1999**	**Program Total (To Complete)**
Major Contract	7000	9750	12607	12815	11578			59850 (0)
Support Contract	1146	2423	1413	1613	2788			11357 (0)
In-House Support	1895	1915	2055	2075	1975			11191 (0)
GFE/ Other	2785	3238	4243	1932	939			13787 (0)
Total	12826	17326	20318	18435	17280	0	0	96185* (0)

*10M of this funding is allocated to this project but is shown in FYDP as FY92 funding for Project #D050.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603778A** Project Number: **D054**
PE Title: **MLRS Product Improvement Program** Budget Activity: **#7**
Project Title: **Extended Range-MLRS**

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project provides for the Engineering and Manufacturing Development (EMD) of an Extended Range-MLRS (ER-MLRS) rocket for the Multiple Launch Rocket System (MLRS). The rocket will enhance the capability of the existing MLRS by providing improvements in range, accuracy and effectiveness, and maneuver force safety (improved submunitions with self destruct fuzes).

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments:	Complete	Cost
(U) Self Destruct Fuze (SDF) Development	4Q96	2100
(U) ER-Test Grenades	3Q93	0353
(U) Wind Measurement Device (WMD) Dev.	4Q97	6800
(U) OGA, In House General Support and Support Contracts	4Q93	3573
TOTAL		12826

(U) FY 1994 Planned Program:	Complete	Cost
(U) Early 12 Flight Tests	4Q94	0880
(U) SDF Development	4Q96	1660
(U) WMD Development	4Q97	5000
(U) Motor Qualifications	4Q94	0383
(U) Launcher Pool Maintenance	2Q94	0200
(U) (EMD) Ballistic, V6 and Class Loader Software Designs	3Q95	6728
(U) OGA, In House General Support and Support Contracts	4Q94	2475
TOTAL		17326

(U) FY 1995 Planned Program:	Complete	Cost
(U) Ballistic Flight Testing	1Q96	3883
(U) WMD-Met Sensor SW Code/Test & EDT Units	4Q97	8000
(U) Fuze Qualification	4Q95	0480
(U) Launcher Pool Maintenance	2Q95	0200
(U) SDF Development	4Q96	0960
(U) (EMD) Class Loader SW Code/Test and V6 Software Integrate/Testing	4Q95	4145

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603778A**
PE Title: **MLRS Product Improvement Program**
Project Title: **Extended Range-MLRS**

Project Number: **D054**
Budget Activity: **#7**

(U) OGA, In House General Support and Support Contracts	4Q95	2650
TOTAL		20318

D. (U) WORK PERFORMED BY: LVS is the prime contractor for the rocket and the Wind Measurement Device. Improved submunition fuzes are being developed by Armaments Research Development and Engineering Center (ARDEC) and provided Government Furnished Equipment (GFE). Government technical organization is Research, Development, and Engineering Center at US Army Missile Command (MICOM).

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** NONE
2. **SCHEDULE CHANGES:** NONE
3. **COST CHANGES:** Congress appropriated $12.9 million for FY93 and $17.3 million for FY94.

F. (U) PROGRAM DOCUMENTATION:

Operational Requirement Letter (May 92)
Integrated Program Summary (Nov 92)
EMD Contract Award (DEC 92)
Acquisition Plan (Jul 92)
Acquisition Program Baseline (June 93)
Test & Evaluation Master Plan- DSCOPS has requested extension of TEMP submittal until Jun 94

G. (U) RELATED ACTIVITIES: Zero Launch Detent, a device to hold and release rocket from the launch tube, and XM 451 warhead fuze are being developed under the MLRS SADARM effort and will enhance accuracy of the ER-MLRS. The Wind Measurement Device is being developed under the IFCS contract. There is no unnecessary duplication of effort within the Army or DOD.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603778A
PE Title: MLRS Product Improvement Program
Project Title: Extended Range-MLRS

Project Number: D054
Budget Activity: #7

H. (U) OTHER APPROPRIATION FUNDS:

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
	($ in Thousands)						
Missile Procurement Army							
BUDGET ACT 2:							
MLRS RKT (C65401)	108624	74738	0	0	0	0	0
MLRS LAUNCHER (C65900)	144819	178916	60123	28232	0	0	0
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ER-MLRS (C65402)	0	0	0	0	0	0	16552
BUDGET ACT 3:							
MLRS MODS (C67500)	12146	23197	29496	23146	15285	53681	53171
BUDGET ACT 4:							
MLRS INITIAL SPARES (CA0257)	17431	12411	12066	5251	0	0	0
MLRS MOD SPARES (CA0265)	439	1924	1269	2121	3215	2442	1856
Military Construction	0	0	0	0	0	0	0

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: N/A

J. (U) TEST AND EVALUATION DATA: Testing to date has been limited to prototype demonstration flights which were very successful. Future testing will include Engineering Design Tests (EDT) and Preproduction Qualification Testing (PPQT). EDT will be quite comprehensive including both component testing and flight testing of approximately 150 rockets. During PPQT, 24 rockets will undergo environmental testing prior to flight testing.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603801A
PE Title: Aviation-Advanced Development

Budget Activity: #4

A. (U) RESOURCES: ($ in Thousands)

Project Number Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DB32 Advanced Maintenance Concepts and Equipment	3335	3067	2499	2380	2311	2955	2918	Cont	Cont
DB33 Cargo Handling Equipment	1816	2739	2240	2163	2136	2152	2691	Cont	Cont
DB45 Aviation Life Support Equipment (ALSE) - Advanced Development	11113	9910	4628	3916	4246	2814	2742	Cont	Cont
PE TOTAL	16264	15716	9367	8459	8693	7921	8351	Cont	Cont

B. (U) BRIEF DESCRIPTION OF ELEMENT: This PE provides advanced development aviation support of tactical programs associated with air mobility, advanced maintenance concepts and equipments, and Aviation Life Support Equipment (ALSE).

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:

(U) Project DB32 - Advanced Maintenance Concepts and Equipment: This project enhances utilization of current and future aircraft by improving the efficiency of maintenance (primarily in the area of diagnostics/prognostics) and servicing operations by: replacing obsolete, insupportable ground support equipment with new and standardized multi-output equipment compatible with all Army aircraft models; developing rapid battle repair procedures and tools to speed the return of aircraft to combat ready status; and developing new equipment for aerial recovery of damaged aircraft. Included in the project is the Intelligent Fault Locator (IFL), a program to test artificial intelligence-based troubleshooting software on an AH-64 Apache aircraft.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Finalized the hardware concept for the NDI/NDT capability for composite repair	4Q93	500
• (U) Completed the definition and assembly of the Combat Maintenance/Battle Damage Repair (CM/BDR) kit for fiber optic components	4Q93	396

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603801A
PE Title: Aviation-Advanced Development

Budget Activity: #4

• (U) Completed test stand evaluation of transmission vibration diagnostic system for the CH-47D	4Q93	663
• (U) Completed diagnostic software development for all 20 AH-64 subsystems; completed the initial user evaluation of IFL	4Q93	406
• (U) Initiated detail design of the Unit Maintenance Aerial Recovery kit (UMARK)	2Q93	289
• (U) Completed integration and validation of the prototype Advanced Boresight Equipment (ABE)	4Q93	1031
• (U) Completed design and prototype fabrication and initiated evaluation of the shop equipment, Contact Maintenance Vehicle	3Q93	50
TOTAL		3335

(U) FY 1994 Planned Program:

• (U) Demonstrate NDI/NDT prototype hardware and initiate final design effort	3Q94	286
• (U) Complete development, test and demonstrate CM/BDR kit for fiber optic systems	3Q94	261
• (U) Complete detailed design, fabricate hardware, and conduct development test of UMARK	3Q94	200
• (U) Initiate design, fabrication, and integration of ABE pre-production units	3Q94	1900
• (U) Complete evaluation and finalize design of the SECM	4Q94	20
• (U) Interface electronic Apache TM repair procedures with IFL and investigate active bus interface diagnostic methods	4Q94	400
TOTAL		3067

(U) FY 1995 Planned Program:

• (U) Automate the NDI/NDT inspection methods and repair procedures through application of knowledge based assist software	4Q95	617
• (U) Continue operational test of the UMARK	1Q95	50
• (U) Continue fabrication and integration of ABE pre-production units	4Q95	1832
TOTAL		2499

(U) Project DB33 - Cargo Handling Equipment: Project focuses on the development of equipment and operational improvements in loading and off-loading helicopter cargo in all-weather, around the clock combat scenarios.

(U) FY 1993 Accomplishments:

• (U) Awarded contract for Advanced Material External Cargo Slings	3Q93	200
• (U) Completed detail design and fabricated hardware for improved 30mm Ammo Loader	4Q93	1616
TOTAL		1816

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603801A
PE Title: Aviation-Advanced Development

Budget Activity: #4

(U) FY 1994 Planned Program:

• (U) Contract award and complete design of Helicopter Internal/External (INTEX) Cargo Pallet System	2Q94	765
• (U) Complete design, fabrication, and testing of Advanced Material External Cargo Slings	4Q94	274
• (U) Contract award, complete design, and initiate fabrication of Advanced Aerial Cargo Handling System to enhance cargo helicopter productivity	3Q94	1095
• (U) Conduct functional test and complete documentation for improved 30mm Ammo Loader	2Q94	605
TOTAL		**2739**

(U) FY 1995 Planned Program:

• (U) Fabricate and test hardware for INTEX pallet	4Q95	425
• (U) Complete fabrication and initiate flight demonstration of Advanced Aerial Cargo Handling System	4Q95	1815
TOTAL		**2240**

(U) Project DB45 - Aviation Life Support Equipment (ALSE) - Advanced Development: This project provides advanced development of life support items peculiar and necessary to Army aircrews for survival on the integrated battlefield and related training scenarios. These survivability items will provide: eyesight protection against emerging new threat lasers, nuclear biological, chemical/biological threat; reduction of ingress of NBC agents into cockpit and selected areas on all aircraft to minimize aircraft systems degradation and reduce labor-intensive NBC decontamination; effective crash protection to prevent head and upper torso-strikes to aircrew (currently a major safety issue), and development and integration of the latest technologies into a new protective Air Warrior program (formally Aircrew Integrated Ensemble (AIE)) which does not layer gear and will greatly reduce encumbrance by improving overall functional interface among all equipment and enhancing aviator mission performance and cost efficiencies. The Air Warrior program includes the Aircrew Integrated Common Helmet (AICH) which is compatible with all weapon stations and sighting stations on all aircraft types.

(U) FY 1993 Accomplishments:

• (U) Contracted for air conditioning and prototype NBC air purification system demonstration	4Q93	2358
• (U) Awarded seven contracts for development of the Agile (tunable) laser eye protection visor	3Q93	3180
• (U) Continued development and qualification testing of the Inflatable Body and Head Restraint System (IBAHRS).	3Q93	1937
• (U) Initiated Air Warrior (formally AIE) effort as joint Army/Navy program with tri-service potential	1Q93	626
• (U) Congressional plus-up funds not required due to program immaturity and returned to DA	1Q93	3012
TOTAL		**11113**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603801A
PE Title: Aviation-Advanced Development — Budget Activity: #4

(U) FY 1994 Planned Program:		
• (U) Prepare statement of work and review prior study effort for NBC Contamination Avoidance Program.	2Q94	208
• (U) Continued fabrication and evaluation of advanced laser eye protective visor	3Q94	1200
• (U) Continue development of turbo expander for NBC cockpit filtration; conduct comprehensive chemical stimulant destruction tests	3Q94	2200
• (U) Complete evaluation and testing of IBAHRS (AH-1)	2Q94	1200
• (U) Draft mission need statement and operational requirements documents and Technical Development Plan prepared for Air Warrior (formally AIE)	3Q94	2100
• (U) Initiate development of Cockpit Air Bag System (CABS) with multi-service application	3Q94	1202
• (U) Naval Air Warfare Center support of Aircrew Integrated Common Helmet testing support	3Q94	1800
TOTAL		**9910**
(U) FY 1995 Planned Program:		
• (U) Initiate design development of NBC Contamination Avoidance System	3Q95	200
• (U) Complete Milestone III IPR for IBAHRS	1Q95	350
• (U) Continue development of multi-service Cockpit Air Bag System (CABS)	2Q95	800
• (U) Continue fabrication and evaluation of the Army version of the Agile Laser Protective Visors	2Q95	800
• (U) Conduct live agent destruction testing for NBC cockpit filtration	3Q95	278
• (U) Conduct Air Warrior concept study analysis, technical surveys, and prototype/Non Developmental Item (NDI) hardware evaluation	3Q95	2200
TOTAL		**4628**

(U) Work Performed By: Projects DB32/DB33: Candidate contractors to perform efforts include: Bailey Engineering, Simula Corporation, Sikorsky Aircraft, IBM Corporation, McDonnell Douglas Helicopter Company, Boeing Helicopter Company, AAR Brooks and Perkins Corporation, and Rockwell International, Huntington Beach, CA. ATCOM is the in-house developer with some related activities performed by White Sands Missile Range. Project DB45: Contract work performed by Gentex, Inc. Carbondale, PA; Honeywell, Inc., Minneapolis, MN; Optical Radiation Corporation, Los Angeles, CA; American Optical, Southbridge, MA; Bell Helicopter Textron, Inc., Dallas, TX; Solar Turbines, Inc., San Diego, CA;CAS and Systems Dynamics International (SDI), Huntsville, AL; IITRI, Chicago, IL; Simula, Inc., Phoenix, AZ, and Logistics Management Engineering, Annapolis, MD. In-house work perfomed by: Aviation Applied Technology Directorate, Ft. Eustis, VA; ERDEC, APG, MD; Natick Research and Development Center, Natick, MA; US Air Force Aeronautical Systems Division, Wright-Patterson AFB, OH; US Aeromedical Research Laboratories, Ft. Rucker, AL; Naval Surface Warfare Center, Annaplois, MD; Naval Research Laboratory, Washington, DC; Naval Air Warfare Center, Warminster, PA, and USAATCOM and ALSE PMO (PEO-Aviation), St. Louis, MO.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603801A**
PE Title: **Aviation-Advanced Development**

Budget Activity: **#4**

(U) Related Activities: Projects DB32/DB33: PE #0602211A (Aviation Technology) includes related science and technology work. The ABE program is a tri-service effort with oversight by the Joint Logistics Commanders (JLC)/Joint Aeronautical Commanders Group (JACG). Project DB45, PE #0604801A (Aviation Engineering Development) IBAHRS is a joint Army/Navy progam and the Agile Laser effort is a tri-service program. The AIHS and AIE program have tri-service interest, especially with USN. The CABS program is a multi-servie effort with oversight by the Joint Aeronautical Commanders Group (JACG). There is no unnecessary duplication of effort within Army or DoD.

(U) Other Appropriation Funds: **($ in Thousands)**

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
APA (AZ3110) ALSE		11692	8871	10180	9623	10328	11012

(U) International Cooperative Agreements: Not applicable

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603802A
PE Title: Weapons and Munitions - Advanced Development **Budget Activity: #4**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
XXXB MK-19 Improvements	0	763	663	0	0	0	0	0	1410

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element covers improvements to the MK-19 Automatic Grenade Launcher under project XXXB. This improvement program develops two system specific training devices, the MK-19 Gunnery Trainer and the MK-19 Tactical Engagement Simulator. The MK-19 Gunnery Trainer is a video style classroom trainer. It is an adaption of an existing training device that will provide basic gunnery skills in engaging single and multiple targets with use of the Traverse and Elevation (T&E) Mechanism and free gun engagement. The device will replacate with high accuracy and resolution the aiming, firing, and fire adjustment of the actual weapon to include hits/misses, trajectory, and flight characteristics of the 40mm ammunition. The MK-19 Tactical Engagement Simulator is an adaption of the Multiple Integrated Laser Engagement System (MILES), another existing training device. This device will be used as a means to evaluate the performance of the weapon system and crews in force-on-force training exercises.

C. (U) *JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN 1995:*

(U) XXXB MK-19 Improvements Program: The MK-19 Gunnery Trainer and the MK-19 Tactical Engagement Simulator will comprise an important part of the training subsystem supporting the MK-19 Automatic Grenade Launcher. Without the Gunnery Trainer, effective gunnery training with the MK-19 Automatic Grenade Launcher can only be accomplished with high expenditures of 40mm ammunition. Without the Tactical Engagement Simulator, no effective force-on-force training can be accomplished with the MK-19. These devices will enhance training of the crews and while providing savings associated with reduced ammunition expenditure in qualification and live fire exercises.

(U) FY 1993 Accomplishment:
- **(U)** Not Applicable

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603802A
PE Title: Weapons and Munitions - Advanced Development

Budget Activity: **#4**

(U) FY 1994 Planned Program:

- **(U)** Market Survey/Best Technical Approach for Gunnery Trainer. (2QFY94) ($63K)
- **(U)** Trade-off Analysis/Best Technical Approach for Tactical Engagement Simulator. (2QFY94) ($50K)
- **(U)** Contract award for Gunnery Trainer. (3QFY94) ($293K)
- **(U)** Contract award for Tactical Engagement Simulator (administrative effort). (3QFY94) ($20K)
- **(U)** Gunnery Trainer Technical/Operational Testing. (4QFY94) ($128K)
- **(U)** Tactical Engagement Simulator Prototype Development. (4QFY94) ($188K).
- **(U)** Preparation for Gunnery Trainer Milestone III Decision. (4QFY94) ($10K).

(U) FY 1995 Planned Program:

- **(U)** Fabrication of prototype Tactical Engagement Simulator. (2QFY95) ($443K)
- **(U)** Tactical Engagement Simulator Technical/Operational Testing. (4QFY95) ($205K)
- **(U)** Preparation for Tactical Engagement Simulator Milestone III Decision. (4QFY95) ($10K)

(U) Work Performed By: The prime in-house organization is the Office of the Product Manager Small Arms, Picatinny Arsenal, NJ with other efforts at the U.S. Army Simulation, Training and Instrumentation Command, Orlando, FL., the Office of Project Manager Training Devices, Orlando, FL,.

(U) Related Activities: There is no unnecessary duplication of effort within the Army or Department of Defense.

(U) Other Appropriation Funds: ($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
Procurement									
WTCV - (SSN GL3200)	0	0	270	1900	1625	0	0	0	3795

(U) International Cooperative Agreements: None.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603804A**
PE Title: **Logistics and Engineer Equipment - Advanced Development** Budget Activity: **#4**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DG01 Combat Engineer Equipment Advanced Development	1401	4126	0	0	0	0	0	Cont.	Cont.
DG10 Advanced Tactical Power Sources Advanced Development	1214	189	233	272	268	265	351	Cont.	Cont.
DG11 Advanced Electrical Energy Concepts Advanced Development	2325	1620	823	456	448	443	438	Cont.	Cont.
DG14 Logistics Support Equipment Advanced Development	900	2354	539	97	90	91	90	Cont.	Cont.
DK39 General Support Equipment Advanced Development	787	999	864	1172	1084	1682	1665	Cont.	Cont.
DK41 Petroleum, Oil, and Lubricants (POL) Distribution Equipment Advanced Development	891	811	675	830	851	893	821	Cont.	Cont.
D266 Airdrop Equipment Advanced Development	3833	4412	1241	1500	1503	1510	1514	Cont.	Cont.
D428 Tactical Rigid Wall Shelter Advanced Development	1372	938	817	3597	4109	2695	966	Cont.	Cont.
D526 Marine Oriented Logistic Equipment Advanced Development	94	477	389	0	0	0	0	Cont.	Cont.
PE TOTAL	12817	15926	5581	7924	8353	7579	5845		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program supports advanced development of new and improved combat support and combat service support equipment essential to sustaining combat operations. Improvements in air-drop, rigid wall shelters, marine craft, bridging, electric power generators and batteries, potable water and petroleum equipment will increase the tactical mobility, operational capability and survivability of combat forces while reducing the logistics support burden.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603804A
PE Title: Logistics and Engineer Equipment - Advanced Development
Budget Activity: #4

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:

(U) DG01 - Combat Engineer Equipment Advanced Development: This program supports advanced development of technology necessary to field new and improved combat support and combat support service equipment essential to sustaining combat operations. Bridging development will increase the tactical mobility operational capability and survivability of combat forces while reducing the logistics support burden.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Conducted a Milestone I In-Process Review for the Heavy Dry Support Bridge (HDSB)	4Q93	645
• (U) Prepared and released a draft competitive contract package for the Demonstration and Validation of the HDSB	4Q93	355
• (U) Conducted scenario studies to support HDSB program	4Q93	401
Total		1401

(U) FY 1994 Planned Program:		
• (U) Test and Demonstrate the HDSB Traversing Beam	1Q94	80
• (U) Conduct a milestone review for assault bridging capability in support of armor operaitons	4Q94	222
• (U) Evaluate transportation of the HDSB and Ribbon Bridge on a Heavy Expanded Mobility Tactical Truck (HEMTT) and Trailer combination	4Q94	600
• (U) Design load capability increases for HDSB candidate systems	4Q94	1100
• (U) Conduct Modeling of Heavy Equipment Transporter (HET) crossings of HDSB candidate systems	4Q94	878
• (U) Conduct Congressionally directed research on laser vibration sensing technology for military and civilian bridging structural integrity	2Q95	1246
Total		4126

(U) FY 1995 Planned Program:
- (U) No planned program.

(U) DG10 - Advanced Tactical Power Source Advanced Development: Develop advanced tactical power sources to improve soldier mobility, sustainability and survivability. Program bridges the gap between tech base and full-scale production of new, higher energy density, lower cost, all-weather batteries and battery systems that satisfy the unique tactical and logistical requirements of portable electronic battlefield equipment while maximizing cost effectiveness.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603804A**
PE Title: **Logistics and Engineer Equipment - Advanced Development** Budget Activity: **#4**

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Developed rechargeable Nickel-metal Hydride battery and charger specification for the U.S. Army Communications-Electronics Command (CECOM)	4Q93	200
• (U) Completed development of second generation lithium battery for thermal weapons sight	4Q93	500
• (U) Delivered BA-6590/U Lithium Thionyl Chloride Battery prototypes for Soldier Integrated Protective Ensemble Advanced Technology Demonstration	4Q93	514
Total		**1214**

(U) FY 1994 Planned Program:		
• (U) Develop prototype BA-6699 High Pulse Battery for Laser Counter Measure Systems, Ground Laser Locator Designator, Modular Universal Laser Equipment and Laser Target Designator systems	4Q94	89
• (U) Develop prototype high-rate, low-cost laser training battery	4Q95	50
• (U) Develop pre-production Nickel-metal Hydride analog of BB-590 with 50% performance improvement for Program Executive Officer Communications Systems	4Q95	50
Total		**189**

(U) FY 1995 Planned Program:		
• (U) Develop prototype throw away pouch battery for Program Manager, Milstar (Army) satellite communications devices	4Q95	80
• (U) Develop second generation Smart Battery for on-line indication of battery life status	4Q95	100
• (U) Develop safe lithium rechargeable battery for communications and Special Operations Forces	4Q95	53
Total		**233**

(U) DG11 - Advanced Electrical Energy Concepts Advanced Development: Develop advanced electrical energy concepts and devices to improve soldier mobility, sustainability and survivability. This project is scheduled to produce proof-of-principle prototypes supporting the Other Procurement, Army tactical electric power procurement and to introduce Auxiliary Power Units (APUs) as a higher mobility, lower cost alternative to the present family of Power Units/Power Plants rated at 3, 5, 10, 30 and 60 kilowatts (kW).

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Completed and demonstrated brassboard standardized control and diagnostic system on generator set	4Q93	666
• (U) Prepared solicitation documentation for 3kW Tactical Quiet Generator (TQG) set composite program	4Q93	150
• (U) Completed fabrication of lightweight, high speed 5kW APU	4Q93	583

Program Element: #0603804A
PE Title: **Logistics and Engineer Equipment - Advanced Development** Budget Activity: #4

• (U) Determined optimal direction for dieselization of gasoline powered rotary engine	4Q93	476
• (U) Initiated combined power source and environmental control system effort	4Q93	450
Total		**2325**

(U) FY 1994 Planned Program:

• (U) Identify critical issues as to cost, integrated logistical support (ILS) and user concerns of solid state controls and composites	1Q94	100
• (U) Initiate development of a lightweight, emerging technology 10kW APU module	4Q94	1297
• (U) Evaluate commercial state-of-the-art variable speed, constant frequency systems	1Q94	223
Total		**1620**

(U) FY 1995 Planned Program:

• (U) Continue fabrication and evaluation of emerging technology 10kW APU module	4Q95	723
• (U) Initiate development of a lightweight, emerging technology 5kW APU module	1Q95	50
• (U) Initiate standardized modular component program for fuel systems	1Q95	50
Total		**823**

(U) DG14 - Logistics Support Equipment Advanced Development: Develop advanced material handling equipment.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Conducted Milestone (MS) I/II for the All Terrain Lifting, Articulating System (ATLAS)	1Q93	80
• (U) Transition ATLAS to PE 0604804, project DH01	2Q93	20
• (U) Awarded contracts for prototype Container Cargo Retrievers (CCR)	4Q93	800
Total		**900**

(U) FY 1994 Planned Program:

• (U) Complete fabrication of 40 foot container unstuffing Container Cargo Retrievers (CCR)	2Q94	1607
• (U) Initiate testing of CCR	4Q94	600
• (U) Complete preparation of program management documentation for CCR MSII IPR	4Q94	147
Total		**2354**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603804A
PE Title: Logistics and Engineer Equipment - Advanced Development Budget Activity: **#4**

(U) FY 1995 Planned Program:		
• (U) Complete testing of CCR	2Q95	439
• (U) Conduct CCR MS II in-progress review (IPR)	3Q95	80
• (U) Complete transition of CCR to PE 0604804, project DH01	4Q95	20
Total		**539**

(U) DK39 - General Support Equipment Advanced Development: Develop new water supply and environmental support equipment to improve soldier mobility, sustainability and survivability. Program will develop improved environmental control units (ECUs) with greater capability, commonality and maintainability than present units. Increased mobility and downsizing of the force structure requires ECUs that present less demand on support systems and personnel. Construct prototype units for demonstration use and proof of applied technologies. These systems must be capable of meeting military requirements with performance equal to or better than current units.

	Complete	Cost
(U) FY 1993 Accomplishments:		
• (U) Continued evaluation of high turbidity clarification system for 600 gallons per minute Reverse Osmosis Water Purification Unit (ROWPU)		200
• (U) Conducted evaluation of reverse osmosis elements		250
• (U) Completed evaluation of ocean intake system for 600 GPH ROWPU		337
Total		**787**
(U) FY 1994 Planned Program:		
• (U) Conduct test and evaluation of water treatment technologies including pre-treatment, pumps, intake systems and controls under water purification components	4Q94	754
• (U) Evaluate biocides for preservation of reverse osmosis elements	4Q94	155
• (U) Complete high turbidity clarifier evaluation	4Q94	90
Total		**999**
(U) FY 1995 Planned Program:		
• (U) Complete evaluation of alternative disinfecting agents for water purification components	4Q95	64
• (U) Continue test and evaluation of water treatment technologies including pre-treatment, pumps, intake systems and controls under water purification components	4Q95	730
• (U) Complete technical data package for high turbidity clarifier	4Q95	70
Total		**864**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603804A
PE Title: Logistics and Engineer Equipment - Advanced Development
Budget Activity: #4

(U) DK41 - POL Distribution Equipment Advanced Development: Design new Petroleum, Oil, & Lubricant (POL) transfer surveillance and distribution items to improve soldier mobility and survivability.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Designed and fabricated Standard Army Refueling System (SARS) components for testing		673
• (U) Completed developmental testing of SARS		100
• (U) Evaluated SARS logistic supportability		118
Total		891

(U) FY 1994 Planned Program:		
• (U) Fabricate first SARS prototype and conduct system test	4Q94	600
• (U) Conduct MS I IPR for PQA	4Q94	60
• (U) Prepare solicitation package to demonstrate integration and ruggedization of PQA test components and conduct early evaluation of PQA		151
Total		811

(U) FY 1995 Planned Program:		
• (U) Procure petroleum test equipment prototypes and finalize test requirements for the Petroleum Quality Analysis System (PQA)	4Q95	240
• (U) Test and conduct a MS II IPR forPQA prototypes	4Q95	66
• (U) Test petroleum test equipment and prototypes	4Q95	369
Total		675

(U) D266 - Airdrop Equipment Advanced Development: Develop and test airdrop equipment to improve soldier mobility, sustainability and survivability. Equipment will provide advanced airdrop capabilities from low altitudes (300 ft), ultimately reducing the vulnerability of personnel, supplies, aircraft, and air crews.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Successfully conducted technical testing of electronic equipment for Low Altitude Retrorocket System (LARRS)	4Q93	950
• (U) Completed technical feasibility test (TFT) of a lower weight LARRS prototype system	4Q93	2250
• (U) Completed flight test to evaluate aircraft anti-missile warning system sensitivity to LARRS rocket motors	4Q93	633

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603804A
PE Title: Logistics and Engineer Equipment - Advanced Development — Budget Activity: #4

Total		**3833**
(U) FY 1994 Planned Program:		
• (U) Conduct urgent development of advanced reserve parachute for personnel to significantly improve reliability and performance of airborne operations (addressing a chronic problem with the existing system)	4Q94	468
• (U) Design a bundle system for high priority weapon systems (e.g. Javelin) which cannot be delivered as an accompanying weapon	4Q94	200
• (U) Complete Advanced Development of 300 foot, 30K pound airdrop system designed to significantly reduce aircraft vulnerability and enhance rapid force projection capabilities	4Q94	3744
Total		**4412**
(U) FY 1995 Planned Program:		
• (U) Procure/fabricate prototypes of the advanced reserve parachute; conduct technical and operational testing	2Q95	975
• (U) Design/fabricate prototype weapon bundle system for evaluation in TFT of mission capabilities	3Q95	200
• (U) Conduct technical testing of advanced reserve parachute	4Q95	66
Total		**1241**

(U) D428 - Tactical Rigid Wall Shelter Advanced Development: Develop family of tactical rigid wall shelters to enhance soldier command, control, communications; survivability and sustainability.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Fabricated prototype of the Standard Integrated Command Post System (SICPS) shelter for technical/user testing	4Q93	91
• (U) Awarded dual contract for competitive design and fabrication of cargo bed cover prototypes for the High Mobility Multi-Purpose Wheeled Vehicle (HMMWV), Commercial Utility Cargo Vehicle (CUCV), 2½- and 5-ton truck, and M105 trailer to provide inexpensive, environmentally secure work space for soldiers and their equipment	4Q93	480
• (U) Incorporated a tracked trailer for use with the large SICPS to test the enhanced mobility of Command and Control (C2) systems	3Q93	801
Total		**1372**
(U) FY 1994 Planned Program:		
• (U) Complete design and begin fabrication of HMMWV/CUCV cargo bed cover prototypes	4Q94	600

• (U) Complete fabrication of the 80 decibel (dB) International Standardization Organization (ISO) shelter prototype for mobile strategic C2 systems	4Q94	243
• (U) Conduct test of large SICPS shelter for mobile division and corps C2 systems	2Q94	95
Total		**938**

(U) FY 1995 Planned Program:

• (U) Complete fabrication and conduct testing of M105 and 5 ton truck cargo bed covers	4Q95	550
• (U) Complete technical/user testing of large SICPS shelter for applications in mobile C2 systems for division through corps level	2Q95	93
• (U) Transition large SICPS shelter to engineering development for division through corps command post use	2Q95	0
• (U) Develop concepts for rigid/soft hybrid shelter for enhanced deployment and habitability for soldiers and equipment	4Q95	174
Total		**817**

(U) D526 - Marine Oriented Logistics: Develop the Automated All-weather Cargo Transfer System (AACTS) and enhance Logistics Over The Shore (LOTS) operations in adverse weather.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Identified water craft deficiencies associated with operations in inclement weather		21
• (U) Developed plans for LOTS Research and Development Initiatives		40
• (U) Identified interface deficiencies among various water craft		33
Total		**94**

(U) FY 1994 Planned Program:

• (U) Initiate the design and preliminary testing of the AACTS	2Q94	149
• (U) Complete the design and testing of the Amphibious Cargo Beaching Lighter	3Q94	200
• (U) Conduct sea state stabilization study to determine effect of higher sea states in LOTS mission productivity	3Q94	128
Total		**477**

(U) FY 1995 Planned Program:

• (U) Complete design and testing of AACTS	3Q95	175
• (U) Develop strategies for sea state stabilization systems to improve Army water craft	3Q95	169

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603804A
PE Title: Logistics and Engineer Equipment - Advanced Development **Budget Activity: #4**

• (U) *Initiate inclement weather operation improvement*	3Q95	45
Total		**389**

(U) Work Performed By: In-house efforts will be accomplished by U.S. Army Natick Research Development and Engineering Center, Natick, MA; U.S. Army Belvoir Research, Development and Engineering Center, Fort Belvoir, VA; Yuma Proving Grounds, Yuma, AZ; Airborne & Special Operation Test Board, Fort Bragg, NC; U.S. Army Materials Technology Lab, Watertown, MA; Electronics and Power Source Directorate, Fort Monmouth, NJ. Other supporting government agencies include Sandia National Laboratories, Albuquerque, NM; Oakridge National Laboratories, Oakridge, TN; Aberdeen Proving Ground, MD; White Sands Missile Range, NM; Army Research Laboratory, Adelphi, MD; Army Research Laboratory, MD; Electronics Aid Power Sources Directorate, Fort Monmouth, NJ; and U.S. Naval Civil Engineering Laboratory, Port Hueneme, CA. Major Contractors include AAI Corporation, Hunt Valley, MD; Pioneer Parachute Company, South Windsor, CT; Thiokol, Inc., Elkton, MD; Holometrix, Inc., Cambridge, MA; Teledyne, Inc., Northridge, CA; and Frost Engineering Development Corporation, Englewood, CO; FMC Corporation, Minneapolis, MN; August Design and Development, Philadelphia, PA; Band-Lavis and Associates, Annapolis, MD; Foster-Miller, Inc., Waltham, MA; Science Application International Corporation, Alexandria, VA; Radian Corporation, Alexandria, VA; Advanced Engineering Research Corporation, McLean, VA; Sundstrand Fluid Handling Company, Arvarda, CA; MC, Jonesboros, AR; Wheatly Pump and Valve Company, Tulsa, OK; VSE, Alexandria, VA; Law Environmental, Inc., Springfield, VA; Fluid Systems Division, San Diego, CA; ILMTEC Inc., Minneapolis, MN; and MEMCOR, Inc., Baltimore, MD; Keco Industries, Florence, KY; Allied Signal, V.P. Research, Morriston, NJ; Hughes Aircraft Co., S.A. Gamboa, Radar Systems Group, Los Angeles, CA; Karman Sciences Corp., Colorado Springs, CO; Ballard Battery Systems (Canadian Commercial Corp.), Vancouver, B.C. Canada; Physical Sciences, Waltham, MA; Saft America, Cockeysville, MD; Yardney Technical Products, Pawcatuck, CT; Ultralife Batteries, Inc., Newark, NJ; Power Conversion, Inc., Saddlebrook, NJ; Rayovac Corp., Madison WI; Valchee Technology, San Jose, CA; Catholic University, Washington, DC; BRTRC, Inc., Vienna, VA; IMO Industries, Inc., Wiggins Connectors Division, Los Angeles, CA.

(U) Related Activities: PE #0601102A (Defense Research Sciences); PE #0602705A (Electronics and Electronic Devices); PE #0602786A (Logistics Technology); PE #0603001A (Logistics Advanced Technology); PE #0604804A (Logistics and Engineer Equipment - Engineering Development). Coordination to avoid duplication is accomplished with other services and agencies through the Department of Defense Joint Intermodular Steering Group Joint Committee on Tactical Shelters, Program Advisory Group for Bulk Petroleum Fuels Distribution, DoD Executive Agent for Land Based Water Resources, the Water Resources Management Action Group, Interagency Advance Power Group, and the DoD Project Manager for Mobile Electric Power. Cooperative efforts planned with major firms such as Sanden, Carrier, Modine and defense-specialized firms such as DECO. In addition, university support will be used for specialized research. Full-service Joint Working Group (JWG) reviews draft Mission Needs Statements, Tri-service Panel reviews Environmental Control Units. There is no unnecessary duplication of effort within the Army or DoD.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603804A
PE Title: Logistics and Engineer Equipment - Advanced Development Budget Activity: **#4**

(U) Other Appropriation Funds:
($ in Thousands)

Appropriation	FY93 Actual	FY94 Estimate	FY95 Estimate	FY96 Estimate	FY97 Estimate	FY98 Estimate	FY99 Estimate
Other Procurement, Army Activity 3 (OPA-3):							
SICPS BLIN 126	26966	27000					
Other Procurement, Army Activity 3 (OPA-2):							
SICPS BLIN 93			25085	37700	36900	34247	27100
Generators and Assoc. Equip, BLIN 158	45638	35685	25052	25025	31319	31410	32447

(U) International Cooperative Agreements: None.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603805A
PE Title: Combat Service Support Control System Evaluation and Analysis — Budget Activity: #4

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D091 Combat Service Support Control System	18641	22638	18330	12444	11518	6166	6187	0	139700
D246 Tactical Communications Systems-Advanced Development	1400	1480	454	1573	2102	1958	2004	Cont	Cont
D2GT CSSCS Operational Test	0	0	92	0		0		0	0
PE TOTAL	20041	24118	18876	14017	13620	8124	8191	Cont	Cont

B. (U) BRIEF DESCRIPTION OF ELEMENT: Project D091, the Combat Service Support Control System, is a computer software system designed to assist the Combat Service Support (CSS) Commander and his staff to rapidly collect, store, analyze, and disseminate CSS information to support the functions of command, control and resource management. CSS control centers must provide a rapid decision support capability and supportive information to commanders more quickly than is possible with the present manual systems. This program develops the CSS battlefield functional area (BFA) node of the Army Tactical command and Control System (ATCCS). Project D246, Tactical Communications System - Advanced Development, provides for insertion of proven communications technology from program element 0602782A, project AH92 exploratory development, into advanced development. Examples of these potential programs are the Multiband Multimode Radio, high power solid state amplifiers and couplers, and packet appliques used to increase network efficiency. Project D2GT finances the direct costs of planning and conducting operational testing and evaluation of the CSSCS by the Operational Test and Evaluation Command (OPTEC).

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) Project D246 - Tactical Communications System: A smart, highly efficient, agile antenna coupler and power amplifier is required for the Army's high frequency (HF) communications system to permit the use of state-of-the-art automatic link establishment and electronic counter-countermeasures (ECCM) systems. Current barriers include availability, distortion and efficient linearity. All of the barriers must be overcome while maintaining reasonable size, weight, and cost. The improved coupler/power amplifier will improve communicability and enable the forces to be more mobile. This phase of the frequency agile solid state power amplifier and antenna coupler (FSHPAC) effort is an advanced development follow-on to a previously completed exploratory development effort. The Global Positioning System (GPS)-derived position location information will

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603805A
PE Title: Combat Service Support Control System Evaluation and Analysis Budget Activity: #4

be integrated into ATCCS using Common Hardware/Software and Single Channel Ground Airborne Radio System (SINCGARS) hardware to permit soldier/vehicle position relationships to be determined automatically.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Initiated integration with computer, software and Power Amplifier.	3Q93	578
• (U) Initiated Transportable Prototype (ACTFAST).	2Q93	822
TOTAL		1400

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Deliver Prototype for ACTFAST for US Army and Air Force.	2Q94	700
• (U) Initiate procurement of second unit for performance of testing in FY 95.	3Q94	780
TOTAL		1480

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Complete development of high frequency power amplifier and coupler technology.	2Q95	154
• (U) Initiate advanced development of adaptive high frequency (HF) applique.	2Q95	150
• (U) Incorporate into Transceiver and perform operational testing.	2Q95	150
TOTAL		454

(U) Work performed by: In house effort for the Communications Advanced Development Project is performed by the Communications and Electronics Command (CECOM) command, control and communications (C3) Systems Directorate, Fort Monmouth, NJ. Contractor is American Electronics Laboratory (AEL).

(U) Related Activities:

PE #0602783A (Computer and Software Technology)
PE #0604818A (Army Tactical Command and Control Hardware and Software)
There is no unnecessary duplication of effort within the Army or the Department of Defense.

(U) Other Appropriation Funds: None.

(U) International Cooperative Agreements: Pending per discussion with Canada.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603805A
PE Title: Combat Service Support Control System Evaluation and Analysis Budget Activity: #4

(U) Project D2GT - CSSCS Operational Test: Project D2GT finances the direct costs of planning and conducting operational testing and evaluation of the CSSCS by OPTEC. The CSSCS is an Acquisition Category (ACAT) I system with a dedicated Initial Operational Test and Evaluation (IOTE) in FY94 in support of Milestone III full production decisions. Operational testing is conducted under conditions, as close as possible, to those encountered in actual combat with typical user troops trained to employ the system. Project D2GT is not a new start. It is reprogrammed from PE 0605712, Support of Operational Testing, Project D001, OPTEC IOTE. In FY95, funding for operational testing of Acquisition Category (ACAT) I systems is programed with the PE funding development for each system. Future fiscal years will be reprogrammed when system information becomes available.

(U) FY 1993 Accomplishments: Not Applicable

(U) FY 1994 Planned Program: Not Applicable

(U) FY 1995 Planned Program:	*Complete*	*Cost*
• **(U)** Conduct CSSCS IOTE.	1Q95	92

(U) Work Performed By: A majority of Project D2GT work is performed by Test and Evaluation Directorates of the Operational Test and Evaluation Command (OPTEC) from Alexandria, VA, and Fort Hood, TX. Work is also performed by the Electronic Proving Grounds (EPG), Fort Huachuca, AZ. All organizations are staffed by military and civilian government personnel. Contractors expected to perform work for this project include: BDM International, Inc., McLean, VA; Applied Research Laboratory, Austin, TX; Test and Experimentation Services Company, Albuquerque, NM; Computer Sciences Corporation, San Diego, CA; and Computer Data Systems Inc., Fort Worth, TX.

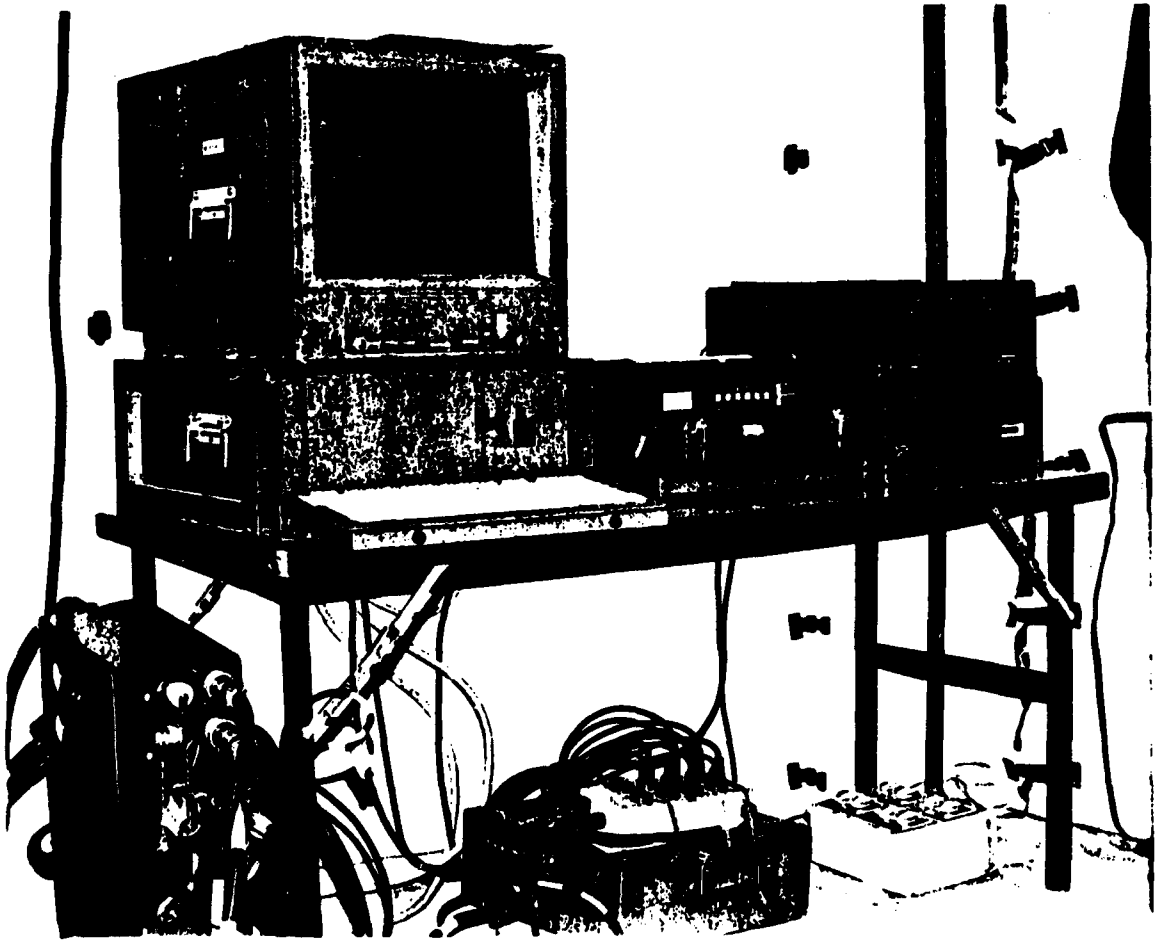
(U) Related Activities: Project D2GT is reprogrammed from PE# 0605712A, Project D001. There is no unnecessary duplication of effort within the Army or DoD. The Army staff monitors all tests for material development and activities to avoid duplication of effort. The Deputy Director of Defense Research and Engineering (Test and Evaluation), and Director of Operational Test and Evaluation, Office of the Secretary of Defense, also review planned testing and development of support equipment to ensure integration of testing by the services and to avoid duplicative testing. High-level staff management of resources for user testing is provided by the U.S. Army Test Schedule and Review Committee which is chaired by OPTEC. Unnecessary duplication of like items is prevented by coordination with Program Manager, Instrumentation, Targets and Threat Simulators (PM-ITTS), the Operational Test and Evaluation Coordinating Council, review by the Army Test and Evaluation Committee and by coordination with the Test Scheduling and Review Committee.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603805A Project #: D091
PE Title: Combat Service Support Control System Evaluation and Analysis Budget Activity: #4
Project Title: Combat Service Support Control System



POPULAR NAME: CSSCS

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603805A
PE Title: Combat Service Support Control System Evaluation and Anal, is
Project Title: Combat Service Support Control System

Project #: D091
Budget Activity: #4

A. (U) SCHEDULE/BUDGET INFORMATION: ($ In Thousands)

SCHEDULE	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	To Complete
Program Milestones			3/ 95 ASARC III 3/ 95 C3I Review 3/ 95 FUE 7/ 95 Ver 3 IOC					
Engineering Milestones			7/95 Ver 4 PDR 9/95 Ver 4 CDR		12/96 Ver 5 PDR 3/97 Ver 5 CDR			
T&E Milestones	9 - 11/ 93 Ver 3 LUT	6 - 9/94 Ver 3 IOT&E		5-6/96 TT Ver 4 7-8/ 96 Ver 4 FOT&E	3-4/ 97 TT Ver 5 6-8/97 Ver 5 FOT&E			
Contract Milestones								
BUDGET ($000)	**FY 1993**	**FY 1994**	**FY 1995**	**FY 1996**	**FY 1997**	**FY 1998**	**FY 1999**	**Program Total (To Complete)**
Major Contract	12000	14000	13452	8695	7720	4480	4500	102440 (0)
Support Contract	768	703	695	647	622	300	299	5164 (0)
In-House Support	3283	1662	1680	1561	1560	785	786	16603 (0)
GFE/ Other	2590	6273	2503	1541	1616	601	602	15493 (0)
Total	18641	22638	18330	12444	11518	6166	6187	139700 (0)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603805A
PE Title: Combat Service Support Control System Evaluation and Analysis
Project Title: Combat Service Support Control System

Project #: D091
Budget Activity: #4

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Combat service support (CSS) functional data required by commanders during combat operations must be automated to accommodate the growing complexity, speed, and lethality of modern warfare. The CSSCS will rapidly collect, analyze, and disseminate critical CSS information to support the functions of command, control and resource management. CSS commanders and staffs are currently participating in the force level planning and decision-making processes through a manual effort of gathering, correlating, and analyzing volumes of technical data from the existing Standard Army Management Information Systems (STAMIS). CSSCS will provide timely situational awareness and force projection to determine capability to support current operations and sustain future operations. The Combat Service Support Control System (CSSCS) will share selected information with the remaining four battlefield functional areas of the Army Tactical Command and Control System (ATCCS) (maneuver control, air defense, fire support and intelligence/electronic warfare).

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Continued full-scale development of Version 3 Software	4Q93	14141
• (U) Continued prototyping to refine user requirements and resolve design issues	4Q93	1000
• (U) Concluded Early User Test & Experimentation (EUT&E) and Force Development Test & Evaluation (FDT&E)	1Q93	2000
• (U) Conducted Limited User Test (LUT)	4Q93	1500
TOTAL		**18641**

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Conclude Limited User Test (LUT)	1Q94	1500
• (U) Continue full-scale development of Version 3 Software	4Q94	16638
• (U) Conduct Initial Operational Test and Evaluation (IOT&E)	4Q94	3000
• (U) Begin development of Version 4 Software	4Q94	1500
TOTAL		**22638**

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Complete development of Version 3 Software	2Q95	4000
• (U) Plan and conduct Army Systems Acquisition Review Council (ASARC) Milestone III and Office of the Secretary of Defense (Command, Control, Communications and Intelligence) (OSD C3I) Review for full-scale production	2Q95	500
• (U) Begin Version 3 Total System Tactical Validation (TSTV)	2Q95	500

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603805A
PE Title: Combat Service Support Control System Evaluation and Analysis
Project Title: Combat Service Support Control System

Project #: D091
Budget Activity: #4

• (U) Begin Fielding of Version 3	2Q95	0
• (U) First UnitEquipped	2Q95	0
• (U) Attain Version 3 Initial Operational Capability (IOC) (cost included in Version 3 development)	4Q95	0
• (U) Continue development of Version 4 Software	4Q95	12300
• (U) Conduct Program Design Review	3Q95	500
• (U) Conduct Critical Design Review	4Q95	500
TOTAL		18330

(U) Program Plan to Completion:

• (U) Conduct Version 4 FOT&E	4Q96
• (U) Begin development of Version 5	4Q96
• (U) Begin fielding Version 4	1Q97
• (U) Conduct Version 5 FOT&E	4Q97
• (U) Begin fielding Version 5	4Q97

D. (U) WORK PERFORMED BY: Contractors are TRW Inc., Carson, CA (Version 3/4 Developer); Engineering and Economic Research (EER) Vienna, VA (Technical Support Services); and Vitro Corporation, Rockville, MD (Acquisition Support Contractor). In-house developing organizations are managed by the PM CSSCS office and include US Army Information Systems Engineering Command, Ft. Huachuca, AZ; US Army Combined Arms Support Command, Ft. Lee, VA; US Army Communications-Electronics Command, Ft Monmouth, NJ; US Army Information Systems Software Development Center-Lee, Ft Lee, VA; and US Army Electronic Proving Grounds, Ft. Huachuca, AZ.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: None

2. (U) SCHEDULE CHANGES: Decisions at the 14 April and 28 June 1993 ATCCS Operational Test Readiness Reviews (OTRRs) for CSSCS to conduct a Limited User Test (LUT) in September-November 1993 and to move the Initial Operational Test and Evaluation (IOT&E) to the May-July 1994 timeframe caused a schedule breach. The breach was reported to HQDA in July 1993, and an Enhanced Program Stability Panel met 23 August to review the baseline breach as well as the overall CSSCS acquisition strategy. The panel concluded that postponement of the IOT&E and introduction of the LUT were justified as prudent management actions. A revised Acquisition Program Baseline (APB) has been staffed at HQDA and is waiting approval of the Army Acquisition Executive.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603805A
PE Title: Combat Service Support Control System Evaluation and Analysis
Project Title: Combat Service Support Control System

Project #: D091
Budget Activity: #4

3. (U) COST CHANGES: The funding increase in FY94 was the result of an Unfunded Requirement (UFR) being funded by HQDA. This provided funding for critical software maintenance fixes needed for the CSSCS Limited User Test (LUT) and post-LUT development period. The increase in FY94 funding was the result of the Enhanced Program Stability Panel decision that 29 test TCU's and supporting hardware and software required to conduct the CSSCS IOT&E in July-September 1994, should be procured from RDT&E funds rather than procurement funds. Based on that decision, FY94 procurement funds were withdrawn and additional RDT&E funds were received to fund the 29 TCU requirement. Projected delivery date is March 1994.

F. (U) PROGRAM DOCUMENTATION:

Mission Element Need Statement (MENS)	06/82
Required Operational Capability (ROC)	09/90
Operational and Organizational Concept	10/90
Test and Evaluation Master Plan (TEMP)	05/91
Acquisition Program Baseline (APB)	10/91

G. (U) RELATED ACTIVITIES:
PE #0602783A (Computer and Software Technology)
PE #0604818A (Army Tactical Command and Control Hardware and Software)
There is no unnecessary duplication of effort within the Army or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Other Procurement, Army							
OPA 2 (W34600)	0	0	6020	5954	6087	6130	6177
OPA 3 (MA9706)	0	0	1412	1369	937	319	204

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603805A
PE Title: Combat Service Support Control System Evaluation and Analysis
Project Title: Combat Service Support Control System

Project #: D091
Budget Activity: #4

J. (U) TEST AND EVALUATION DATA:

• (U) Version 2 Proof of Principle	May 90
• (U) CSSCS TEMP approved by OSD	May 91
• (U) ATCCS Experimentation Site (AES) Experiment 92-06	May 92
• (U) Pre-EUT&E CSSCS Version 3.0	Apr 92
• (U) AES Experiment 92-05, MCS Communications	Jul 92
• (U) Version 3 EUT&E/FDT&E	Sep-Oct 92
• (U) Version 3 LUT -	Sep-Nov 93
• (U) Version 3 IOT&E	Jul-Sep 94
• (U) Version 4 FOT&E	Jul-Aug 96
• (U) Version 5 FOT&E	May-Jul 97

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603806A
PE Title: NBC Defense Systems - Advanced Development

Budget Activity: #4

A. (U) RESOURCES: ($ in Thousands)

Project Number Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DE80 Chemical Biological Individual Protection Concepts	5144	0	0	0	0	0	0	0	5144
DE81 NBC Decontamination Systems	3924	8460	5037	4002	4011	5031	5051	Cont	Cont
D483 Radiac Equipment Advanced Development	1	0	Restructured to PE 0603806A, project D601						
D601 NBC Contamination Avoidance Systems	12987	26026	8741	8929	0	0	0	Cont	Cont
D604 NBC Protection	6369	6417	0	0	0	0	0	Cont	Cont
PE TOTAL	28425	40903	13778	12931	4011	5031	5051		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element supports the Advanced Development (AD) of NBC defensive equipment and addresses various shortcomings identified in Conduct of the Persian Gulf War: Final Report to Congress, April 1992. Projects support development and demonstration testing of radiological and chemical/biological/toxin agent detection and warning systems; individual and collective protection systems; decontamination solutions and equipment. Also included are FY94 Marine and Navy efforts for NBC individual and collective protection for ground troop and ship combat survivability as directed by Congress in the FY 94 Defense Appropriations Bill.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:

(U) Project DE81 - NBC Decontamination Systems: Funding supports the Modular Decontaminating System (MDS), a more transportable, less labor intensive, and more effective system for applying decontaminating solutions to vehicle and equipment surfaces. Lessons learned from Desert Storm validated the need for a deployable and efficient decontamination system. The MDS reduces water usage and equipment processing time with increased water pressure and variable water temperature. The MDS consists of two modules: the XM21 Decontaminant Applicator, and the XM22 High Pressure Washer.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Prototype manufacturing, test and evaluation for XM21	1Q93	2674

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603806A
PE Title: NBC Defense Systems - Advanced Development

Budget Activity: #4

• (U) Initiated market investigation for MDS	1Q93	400
• (U) Approved MDS Operational Requirement Document (ORD)	3Q93	
• (U) Terminated Decontaminating Agent Multipurpose (DAM) program--user withdrew requirement	4Q93	850
Total		3924

(U) FY 1994 Planned Program:

• (U) Approve MDS Acquisition Plan (AP)	1Q94	
• (U) Conduct Critical Design Review for MDS	3Q94	900
• (U) Award Integrated Logistical Support Contract for MDS	4Q94	2853
• (U) Prototype manufacturing and T&E for XM22	4Q94	4707
Total		8460

(U) FY 1995 Planned Program:

• (U) Establish MDS Configuration Baseline	1Q95	
• (U) Fabricate MDS test hardware	1Q95	2274
• (U) Conduct MDS Pre-Production Qualification Test (PPQT)	2Q95	1778
• (U) Systems engineering, planning, development, and combined (XM21 and XM22) systems T&E	4Q95	985
Total		5037

(U) Project D483 - Radiac Equipment AD: Provides for AD of personnel and equipment mounted detection, monitoring, and warning equipment for nuclear battlefield hazards. The Advanced Airborne Radiac System (AARS) will provide rapid, accurate, and safe measurement of radiation from an airborne platform and will correlate airborne readings to ground radiation readings and positions. The system, which will be compatible with maneuver control and automated NBC information systems, will enable field commanders to better plan operations and minimize exposure in a nuclear contaminated environment. The Radiac Training System (RTS) will provide realistic simulation of total dose and dose rate using radio frequency transmissions during training exercises.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Approved RTS Operational Requirement Document (ORD)	4Q93	
• (U) Approved RTS Acquisition Strategy (AS)	4Q93	1
• (U) Transitioned AARS to PE 0604806A (NBC Defense Systems - Engineering and Manufacturing Development), Proj D517 (Radiac Equipment Engineering Development)	1Q93	
• (U) RTS work performed in the this project restructured to Proj D601	4Q93	
Total		1

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603806A
PE Title: NBC Defense Systems - Advanced Development **Budget Activity: #4**

(U) FY 1994 Planned Program: No planned Program

(U) FY 1995 Planned Program: No planned Program

(U) Project D601 - NBC Contamination Avoidance Systems: This project provides Advanced Development (AD) of Reconnaissance, Detection, and Identification (RDI) equipment. Items of equipment included in this project are: (1) Stand-off Chemical Detector (SCD) which provides chemical agent detection, ranging and mapping for chemical agent clouds; (2) Biological Detector (BD), a point detector for threat biological agents which is also a component of the Biological Integrated Detection System (BIDS); (3) Multi-purpose Integrated Chemical Agent Detector (MICAD) which provides automatic transmission of NBC alerts for all fielded detectors to warn soldiers of chemical and biological attacks; (4) Chemical Biological Mass Spectrometer (CBMS) which identifies all chemical and biological agents collected and is a component of the BIDS; and, (5) Radiac Training Set (RTS) which provides realistic simulation of radiation total dose and dose rate using radio frequency transmissions during training exercises. All of these systems increase existing chemical and biological war fighting capabilities by providing more complete, accurate, and current battlefield data. This project also includes FY 94 Marine and Navy efforts for NBC individual and collective protection (PE 0603635M, Marine Corps Ground Combat/Support System, Project C1598 and PE 0603514N, Ship Survivability, Project S2053), as directed in the FY94 Defense Appropriations Bill.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Approved MICAD Operational Requirement Document (ORD)	1Q93	
• (U) Conducted MICAD Milestone I/II In-Process Review (IPR)	2Q93	
• (U) Transitioned MICAD to PE #0604806, Proj D020	4Q93	
• (U) Continued concept feasibility test and evaluation of the Biological Detector	4Q93	11917
• (U) Terminated CADNET Program	2Q93	1070
Total		**12987**

(U) FY 1994 Planned Program:		
• (U) Initiate CBMS Advanced Development	1Q94	5270
• (U) Complete feasibility test and evaluation for Biological Detector	4Q94	5975
• (U) Conduct bio-profile tests on CBMS	4Q94	1400
• (U) Procure CBMS test models	2Q94	2000
• (U) Design CBMS system software modification to implement automatic calibration design BIDS/CBMS interface	4Q94	2600
• (U) Marine - Procure suite of NBC equipment to integrate into the NBC Reconnaissance System (NBCRS)	4Q94	1000
• (U) Marine - Initiate development of software integration unit to link NBC equipment into the NBCRS computer system	4Q94	500
• (U) Marine - Conduct live agent testing of new lightweight NBC gloves, suits and detectors computer system	4Q94	3720

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603806A
PE Title: NBC Defense Systems - Advanced Development
Budget Activity: #4

• (U) Marine - Complete background algorithm package for the M21 Remote Sensing Chemical Agent Alarm product improvement	4Q94	519
• (U) Marine - Complete NBC Information Warning system	4Q94	315
• (U) Navy - (Description of tasks in Navy RDDS PE 0603514N, Proj S2053)	4Q94	2727
Total		**26026**

(U) FY 1995 Planned Program:

• (U) Transition Bio Detector into Joint Program Office (JPO) for Biological Defense Program Element 0208051A Proj BDB1	1Q95	
• (U) Conduct CBMS engineering design testing and fabrication	3Q95	1514
• (U) Complete bio-profile tests on CBMS	2Q95	600
• (U) Generate Integrated Logistics System (ILS) information	4Q95	1000
• (U) Plan and initiate CBMS technical testing	4Q95	627
• (U) Complete CBMS system software modification and BIDS/CBMS interface	4Q95	5000
Total		**8741**

(U) Project D604 - NBC Protection Systems: The project provides for development of the Advanced Integrated Collective Protection System (AICPS). The AICPS will integrate NBC filtration, environmental controls and power source components for combat systems and exploit new filtration technology (regenerable filtration, catalytic oxidation or deep bed chromium-free carbon). The effort extends vehicular collective protection applications providing for reductions in system size, weight, and energy and in filter change logistics burden. The AICPS can be integrated into multiple configurations to provide protection to different tactical systems. Additionally, the effort provides a system solution for countering future threat agents and alleviating the disposal problems associated with hazardous chromium impregnated carbon filters.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Approved AICPS Acquisition Strategy (AS) and Acquisition Plan (AP)	3Q93	
• (U) Conducted AICPS catalytic oxidation and pressure swing absorption studies	4Q93	4800
• (U) Conducted user interface, market surveys, contract development of procurement package for AICPS	4Q93	1569
Total		**6369**

(U) FY 1994 Planned Program:

• (U) Award AICPS developmental contract	2Q94	3000
• (U) Develop AICPS design concepts	4Q94	2317
• (U) Conducted user interface and system integration for AICPS	4Q94	1100
• (U) Transition AICPS to PE #0604806, Proj DO17	4Q94	

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603806A
PE Title: NBC Defense Systems - Advanced Development **Budget Activity: #4**

Total	**6417**

(U) FY 1995 Planned Program: No planned Program

(U) Project DE80 - Chemical Biological Individual Protective Concepts: Provides for AD of the XM45 Aircrew Protective Mask (ACPM). The ACPM will replace the M43 Type II and M43A1 Type II aviators mask and will eliminate air crew dependency on forced air while providing compatibility with aircraft sighting and night vision systems.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Approved ACPM ORD	4Q93	
• (U) Conducted Milestone I IPR for the ACPM	4Q93	2
• (U) Continued ACPM component and tooling design	4Q93	2520
• (U) Assembled, tested, and assessed ACPM prototypes	4Q93	2422
• (U) ACPM program documentation	4Q93	200
• (U) Transition to PE 0604806, Proj DO19	4Q93	
Total		**5144**

(U) FY 1994 Planned Program: No planned Program

(U) FY 1995 Planned Program: No planned Program

(U) Work Performed By: Project Manager for NBC Defense Systems, Aberdeen Proving Ground (APG), MD; U.S. Army Chemical and Biological Defense Command, APG, MD; Edgewood Research, Development and Engineering Center, APG, MD; U.S. Army Tank and Automotive Command, Warren, MI; U.S. Army Communications and Electronics Command, Fort Monmouth, NJ; U.S. Army Test and Evaluation Command, APG, MD; Night Vision Electro-Optics Laboratory, Fort Belvoir, VA; Human Engineering Laboratory, APG, MD; and Electronic Warfare/Reconnaissance, Surveillance and Target Acquisition Center, Fort Monmouth, NJ. Contractors include: Brunswick, Deland, FL; TRW Defense Systems Group, Redondo, CA; Texas Instruments, Dallas, TX; Nuclear Research Corp, Warrington, PA; Numora Enterprises, Inc., Rock Island, IL; Battelle Memorial Institute, Columbus, OH; Booz-Allen, Tyson's Corner, VA; Environmental Technologies Group, Inc., Baltimore, MD; and Technical and Management Service Corp., Long Branch, NJ.

(U) Related Activities: Program Elements #0602622A (Chemical, Smoke, and Equipment Defeating Technology) and #0604806A (NBC Defense Systems - Engineering Development) PE 0603635M-(Marine Corps Ground Combat/Support System) and PE 0603514N-(Ship Combat Survivability). Department of Defense Directive 5160.5 designates the U.S. Army as the executive agent for the Chemical and Biological (CB) Defense Research, Development, and Acquisition (RDA) program to ensure that the services embark on a collective management approach to prioritize, coordinate, and

consolidate CB defense needs. A number of management oversight committees, such as the Joint Service Requirements Group and the Joint Panel on CB Defense, are therefore chaired by the Army to execute this responsibility and periodically review the programs to ensure that essential requirements are being satisfied, and that duplicative efforts are not being pursued by the services. Joint service coordination is also enhanced by the periodic reviews of the Joint-CB Research, Development, Test and Evaluation Program, the Joint Service Coordination Committee, and the Joint Directors of Laboratories' Technology Panel for CB Defense. International coordination and cooperation is fostered through several programs and agreements that include memoranda of understanding (MOU), the Technical Cooperative Program, and data exchange annexes, as well as periodic meetings of the North Atlantic Treaty Organization AC/255 (Panel VII), and Quadripartite Working Groups. There is no unnecessary duplication of effort within the Army or DoD.

(U) Other Appropriation Funds:

	($ in Thousands)						
Appropriation	**FY 1993 Actual**	**FY 1994 Estimate**	**FY 1995 Estimate**	**FY 1996 Estimate**	**FY 1997 Estimate**	**FY 1998 Estimate**	**FY 1999 Estimate**
Procurement - OPA 3							
SSN G47000							
Modular Decon Sys				4866	3995		

(U) International Cooperative Agreements: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603807A
Title: Medical Systems Advance Development **Budget Activity: #4**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D808 DoD Drug and Vaccine - Advanced Development	8299	8182	7878	3973	3990	3938	3906	CONT	CONT
D809 Medical Biological Defense Drug and Vaccine - Advanced Development	4402	3731	0	0	0	0	0	0	22971
D811 Military HIV Vaccine and Drug - Advanced Development	3476	1865	193	3358	3407	2946	2643	CONT	CONT
D836 Combat Medical Materiel - Advanced Development	1689	864	2963	2148	2323	2307	2290	CONT	CONT
D837 Soldier System Protection - Advanced Development	390	0	0	1224	868	861	893	CONT	CONT
D993 Medical Chemical Defense Life Support Materiel - Non Systems - Advanced Development	7040	6986	6461	4911	4994	4885	4917	CONT	CONT
PE TOTAL	25296	21628	17495	15614	15582	14937	14649		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element (PE) addresses joint Service and Army-unique Requirements for advanced development (AD) of medical material necessary to field an effective capability for medical defense against chemical and biological warfare agents. Products developed in the PE will provide for maximum soldier survivability and enhanced sustainability of performance in an environment contaminated with chemical and biological threats. The PE also funds AD of systems for medical protection against naturally occurring diseases and Human Immunodeficiency Virus (HIV). This includes development and initial human testing of vaccines, arthropod vector repellents, prophylactic and therapeutic drugs, rapid identification and diagnostic systems for disease/biological agents. Additionally, the PE supports advanced development of field medical equipment and drugs essential for combat casualty care on a high intensity battlefield while reducing logistical support requirements. The PE also funds advanced development of systems which provide measurement of r protection against physiological and psychological factors affecting cognitive and physical performance imposed by military systems, combat operations or the environment. This includes advanced development of vision corrective devices, environmental health monitoring and medical water quality monitoring equipment. Systems include resuscitators, blood substitutes, field x-ray, and field production of medical grade water and oxygen.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603807A
Title: Medical Systems Advance Development

Budget Activity: #4

C. JUSTIFICATION FOR PROJECTS:

(U) Project D808 - DoD Drug and Vaccine - Advanced Development: This project funds demonstration and validation of candidate medical countermeasures such as vaccines and drugs through safety, immunogenicity, and small-scale efficacy testing in volunteers against naturally occurring infectious diseases of mission aborting potential. Work performed in laboratories and among troop populations is directed to prevention, diagnosis and treatment of viral, bacterial and parasitic diseases, so as to prevent casualties, sustain operational performance and minimize deaths and disability of armed forces during military operations.

(U) FY 1993 Accomplishments:	COMPLETE	COST
• (U) Evaluated safety and efficacy in humans of WR6026 antileishmanial drug	*	894
• (U) Conducted Phase I/II trials of malaria blood stage vaccine	*	1397
• (U) Conducted long term toxicology studies and evaluated human safety for the antimalarial drugs Halofantrine and WR238,605	*	2311
• (U) Completed Phase I trial of Rift Valley Fever live vaccine	2Q93	60
• (U) Screened Insect/Arthropod Repellent candidates	4Q93	583
• (U) Completed Phase I trials on Group B meningococcal vesicle vaccine	4Q93	866
• (U) Conducted Phase II trials of Shigella flexneri 2a-2 vaccine in Israel	*	2188
TOTAL		8299

(U) FY 1994 Program:		
• (U) Conduct Phase I/II trials of malaria blood stage vaccine	*	1481
• (U) Conduct Phase I trial of recombinant hemorrhagic fever with renal syndrome (Hantaan) vaccine	4Q94	453
• (U) Conduct Phase I dosing studies of Rift Valley Fever live vaccine	3Q9	247
• (U) Conduct toxicity testing and field trials with candidate repellents	4Q94	541
• (U) Complete Phase I trial of LT oral adjuvant for use with oral vaccines	3Q94	258
• (U) Complete current studies and trials of enterotoxigenic E. coli vaccines	4Q94	744
• (U) Conduct Phase II trials of Shigella flexneri 2a-2 vaccine in Israel	94	1278
• (U) Evaluate human safety and efficacy for antimalarial drugs Halofantrin and WR238605	*	2279
• (U) Transition to Advanced Development antimalarial drugs Arteether and Azithromycin and conduct human efficacy pilot studies	*	228
• (U) Evaluate human efficacy of antileishmanial drug WR6026	*	673

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603807A
Title: Medical Systems Advance Development **Budget Activity: #4**

TOTAL		**8182**

(U) FY 1995 Planned Program:

• **(U) Complete Phase I trial of Campylobacter vaccine**	4Q95	189
• **(U) Conduct Phase II trials of recombinant hemorrhagic fever with renal syndrome (Hantaan) vaccine**	*	544
• **(U) Submit Investigational New Drug Application for *Shigella sonnei* vaccine**	2Q95	137
• **(U) omplete Phase II trials of Shigella flexneri 2a-2 vaccine**	2Q95	48
* This is continuing research which is reviewed periodically, ensuring quality, relevance, and priority		
• **(U) Conduct Phase I/II trials of malaria vaccines**	*	1608
• **(U) Complete dosing study and conduct Phase I safety trials with Rift Valley Fever Live Vaccine**	4Q95	246
• **(U) Complete small scale field trials; formulate new repellent, and conduct compatibility and efficacy trials**	4Q95	832
• **(U) Conduct Phase III trials with enterotoxigenic E. coli Vaccine**	*	473
• **(U) Evaluate human safety and efficacy of antimalarial drugs Arteether and Azithromycin**	*	1846
• **(U) Evaluate human safety for antileishmanial drug Paromomycin and continue human efficacy study of WR6026**	*	1255
TOTAL		**7878**

(U) Project D809 - Medical Biological Defense Drug and Vaccine - Advanced Development: This project funds USAMRDC as the DoD executive Agent for exploratory research on the development of vaccines and drugs to provide an effective medical defense against Validated biological threat agents including bacteria, toxins, viruses and other agents of biological origin. By employing biotechnology, medical systems will be designed to rapidly identify, diagnose, prevent and treat due to exposure to biological threat agents.

(U) FY 1993 Accomplishments:	**COMPLETE**	**COST**
• **(U) Conducted phase I trials of cell culture derived smallpox vaccine**	*	2220
• **(U) Conduct Phase I trials of Type F botulinum toxoid**	3Q93	1573
• **(U) Completed the Phase I safety trial of Botulism Immune Globulin (Human)**	4Q93	326
• **(U) Conduct non-cGMP Botulinum Toxoid Type G Production**	*	283
TOTAL		**4402**

(U) FY 1994 Planned Program:

• **(U) Complete expanded phase I trials of Q-fever chloroform methanol residue vaccine**	3Q94	110
• **(U) Conduct Phase I trials of vaccinia vaccine**	4Q94	289
• **(U) Conduct Phase I trials of Ricin Toxoid**	*	618

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603807A
Title: Medical Systems Advance Development

Budget Activity: #4

• (U) Development of a rapid biological agent identification system	*	101
• (U) Complete Phase I, start Phase II studies of Botulism Toxoid Type F	4Q94	131
• (U) Conduct Phase I trials of Pentavalent Botulinum Toxoid components	*	44
• (U) Develop purified Botulinum Toxoid Types A and B	3Q94	490
• (U) Develop Botulinum Immune Globulin (F(ab')2) Heptavalent, Equine	4Q94	753
• (U) Development and production of Botulinum Toxoid Type G	*	1195
* This is continuing research which is reviewed periodically, ensuring quality, relevance, and priority		
TOTAL		3731

(U) FY 1995 Planned Program:
(U) This project transitioned to the Joint Program Office under OSD PE/Project 28051.BD2

(U) Project D811 - Military HIV Vaccine and Drug - Advanced Development: This project funds Congressionally-mandated, militarily relevant HIV research for demonstration and validation of candidate vaccines and drugs through safety, immunogenicity and small scale efficacy testing and behavioral intervention in volunteers. Efforts are directed to answer militarily unique needs affecting manning, mobilization and deployment.

	COMPLETE	COST
(U) FY 1993 Accomplishments:		
• (U) Protocol for evaluation of GP160 in HIV negative individuals approved by Thai Ministry of Health	4Q93	1237
• (U) Obtained maximum enrollment for Phase I/II GP120 therapeutic trial	*	2239
TOTAL		3476
(U) FY 1994 Planned Program:		
• (U) Conduct Phase I/II GP160 clinical trial in HIV negative individuals in Thailand	4Q94	468
• (U) Complete Phase I/II GP120 therapeutic vaccine trial	*	1397
TOTAL		1865
(U) FY 1995 Planned Program:		
• (U) Complete Phase I/II GP160 clinical trial in HIV negative individuals in Thailand	4Q95	193
TOTAL		193

(U) Project D836 - Combat Medical Materiel - Advanced Development: The project supports advanced development of new and improved systems for battlefield casualty care, patient transport & evacuation, and return to duty in support of special, contingency, and conventional force operations.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603807A
Title: Medical Systems Advance Development — Budget Activity: #4

(U) FY 1993 Accomplishments:	COMPLETE	COST
• (U) Conducted non-clinical efficacy study of Microencapsulated Antibiotic, Ampicillin	*	304
• (U) Transitioned CT Scanner, Field and Handheld Dental X-ray to Production and Deployment	4Q93	876
• (U) Transitioned to Aviation and Troop Support Command commercial non-development medical items for incorporation into an improved air ambulance	3Q93	246
• (U) Completed market investigations for advanced medical technologies for patient examination, diagnosis and treatment in the field	4Q93	263
TOTAL		1689

* This is continuing research which is reviewed periodically, ensuring quality, relevance, and priority

(U) FY 1994 Planned Program:	COMPLETE	COST
• (U) Conduct non-clinical efficacy studies of Microencapsulated Antibiotic, Ampicillin	*	63
• (U) Fabricate three prototype Armored Ambulance medical interiors incorporating advanced commercial lifesaving equipment	*	418
• (U) Prepare contract for the upgrade of the Field Anesthesia Machine to FDArequirements	4Q94	148
• (U) Evaluate concepts for development of an automated system to reconstitute frozen blood	4Q94	83
• (U) Modify military and commercial medical equipment used for patient examination, diagnosis and treatment in the field	*	152
TOTAL		864

(U) FY 1995 Planned Program:	COMPLETE	COST
• (U) Evaluate Phase I human safety studies of Microencapsulated Antibiotic, Ampicillin	*	225
• (U) Incorporate medical telecommunications and computer-aided medical diagnosis equipment into the Armored Aid Station	*	451
• (U) Manage contract for the upgrade of the Field Anesthesia Machine to meet FDA requirements	4Q95	920
• (U) Contract for development of an automated system to reconstitute frozen blood	2Q95	900
• (U) Modify military and commercial medical equipment used for patient examination, diagnosis and treatment in the field	*	240
• (U) Provide optometry and engineering support in the design, fabrication, and testing of special eyewear incorporated into chemical protective masks and headgear	4Q95	227
TOTAL		2963

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603807A
Title: Medical Systems Advance Development

Budget Activity: #4

(U) Project D837 - Soldier System Protection - Advanced Development: Supports demonstration and validation of preventive medicine materiel, including devices, pharmacologicals and other tools, to provide protection, sustainment, and enhancement of the physiological and psychological capabilities of soldiers in the face of combat operations under all environmental conditions. Focus is on reduction in the incidence of personnel losses due to preventable disease and non-battle injuries through development of environmental and physiological performance monitors and other preventive medical countermeasures.

(U) FY 1993 Accomplishments:	COMPLETE	COST
• (U) Completed advanced development efforts on two systems used by Preventive Medicine teams for evaluating the quality of field water source	3Q93	105
• (U) Provided optometry support for the development of corrective eyewear by other developers responsible for chemical protective masks. * This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.	4Q93	162
• (U) Completed development contract for a hand-held monitor to measure climatic conditions and calculate work/rest periods and water intake for soldiers	4Q93	123
TOTAL		390

(U) FY 1994 Planned Program: None

(U) FY 1995 Planned Program:

- (U) Project designation eliminated. Planning, programming, and execution of this effort will occur through integration with Project D836 under PE #0603807A commencing in FY95.

(U) Project D993 - Medical Chemical Defense Life Support Materiel: This project, which addresses joint service and Army-unique requirements, provides advanced development of countermeasures for chemical agents, including life support equipment, pretreatment and therapeutic drugs, and individual/casualty decontamination compounds. Use of chemical agents by adversaries would have an immense adverse impact on individual survivability and operational capabilities of U.S. Forces on the integrated battlefield. A system of medical defense against chemical agents is required to provide individual soldiers protection, to sustain their performance in a chemical environment, and to provide for self-aid and medical treatment of chemical casualties. The Army has been designated as the Department of Defense (DOD) Executive Agent for chemical defense research and development, and the U.S. Army Medical Research and Development Command (USAMRDC) executes the medical defense portion of this executive agent role.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603807A
Title: Medical Systems Advance Development

Budget Activity: #4

	COMPLETE	COST
(U) FY 1993 Accomplishments:		
• (U) Conducted non-clinical studies to evaluate the efficacy of an improved Nerve Agent Antidote System, HI-6	*	2219
• (U) Completed Concept Exploratory Development for a Topical Skin Protectant barrier cream to protect against chemical warfare agents	4Q93	3392
• (U) Completed contract preparation for final development of a Multichambered autoinjector for nerve agent antidotes	4Q93	1429
TOTAL		**7040**
(U) FY 1994 Planned Program:		
• (U) Conduct pre-clinical studies of the Nerve Agent Antidote System, HI-6	4Q94	3712
• (U) Conduct human safety studies testing of the Topical Skin Protectant	*	1315
* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.		
• (U) Transition to advanced development an anti-cyanide prophylactic drug	*	1343
• (U) Evaluate commercial products for use within the chemical protective patient wrap for improved air circulation	3Q94	616
TOTAL		**6986**
(U) FY 1995 Planned Program:		
• (U) Evaluate human safety studies of the Nerve Agent Antidote HI-6	4Q95	2761
• (U) Evaluate human safety studies of Topical Skin Protectant and prepare a New Drug Application for NDA to submit to the FDA	3Q95	1774
* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.		
• (U) Evaluate human safety studies of Cyanide Pre-treatment	*	572
• (U) Evaluate technical performance of the Multichambered Autoinjector	*	1266
• (U) Test commercial products for use within the chemical protective patient wrap for improved air circulation	1Q95	88
* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.		
TOTAL		**6461**

(U) Work Performed By:
D608: Walter Reed Army Institute of Research, along with field units in Thailand, Korea, Brazil, and Kenya, the U.S. Army Medical Research Institute of Infectious Diseases perform in-house Army research. The remainder is reformed by the Naval Medical Research Institute and the U.S. Navy field units and by extramural non-profit organizations, universities, and industries. The five major contractors are the University of Georgia, Athens, GA; University of Miami School of Medicine, Miami, FL; Kenya Medical Research Institute, Nairobi, Kenya
D609: Walter Reed Army Institute of Research, along with field units in Thailand, Korea, Brazil, and Kenya, the U.S. Army Medical Research

Program Element: #0603807A
Title: Medical Systems Advance Development Budget Activity: #4

Institute of Infectious Diseases, and the U.S. Army Biomedical Research and Development Laboratory perform in-house Army research. The remainder is performed by U.S. Navy field units and by extramural non-profit organizations, universities, and industries. The five major contractors are the University of Georgia, Athens, GA; University of Miami School of Medicine, Miami, FL; Kenya Medical Research Institute, Nairobi, Kenya; University of North Carolina, Chapel Hill, NC; and Korea University, Seoul, Korea.
D811: Walter Reed Army Institute of Research, along with field units in Thailand, Korea, Brazil, and Kenya, the U.S. Army Medical Research Institute of Infectious Diseases perform in-house Army research. The remainder is performed by the Naval Medical Research Institute and the U.S. Navy field units and by extramural non-profit organizations, universities, and industries.
D836: Contractors are Ogden Bioservices Corporation, Gaithersburg, MD; University of Alabama, Birmingham, AL; Harvard University, Cambridge, MA; and The New England Deaconess Hospital, Boston, MA
D836: In-house development and testing by U.S. Army Medical Materiel Development Activity Fort Detrick, MD; U.S. Army Institute of Dental Research, Washington, DC; Project Manager, Medical Digital Imaging System, Fort Detrick, MD; U.S. Army Aeromedical Research Laboratory, Fort Rucker, AL; Lexington-Bluegrass Army Depot Lexington, KY. Primary civilian contractor University of Illinois, Chicago. IL.
D837 Walter Reed Army Institute of Research (WRAIR), Washington, D.C.; Army Medical Research Detachment (Directed Energy Research), WRAIR, Brooks Air Force Base, TX.; Army Medical Research Detachment (Occupational Toxicology Research), WRAIR, Wright-Patterson Air Force Base, OH.; U.S. Army Research Institute of Environmental Medicine, Natick, MA.; U.S. Army Aeromedical Research Laboratory, Ft. Rucker, AL.; U.S. Army Medical Materiel Development Activity, Fort Detrick, MD. Bethesda, MD.
D993: In-house efforts conducted at U.S. Army Medical Material Development Activity, Fort Detrick, MD. Contractors include: Battelle Memorial Institute, Columbus, OH; SRI International, Menlo Park, CA; University of Illinois, Chicago, IL.

(U) Related Activities:

PE #0601102A (Defense Medical Sciences)
PE #0602720A (Environmental Quality Technology) (DA Proj 835 only)
PE #0603002A (Medical Advanced Technology)
PE #0603105A (Military Human Immunodeficiency Virus (HIV) Research)
PE #0603807A (Medical Systems-Advanced Development)
PE #0604807A (Medical Materiel/Medical Defense Equipment-Engineering Development)
PE #0605801A (Program wide Activities, Project MMO2)
PE #0605898A (Management Headquarters R&D, Project MM03)

There is no unnecessary duplication of efforts in the Army or DOD programs. Duplication of effort within the Army is avoided through centralized management at the U.S. Army Medical Research and Development Command. This effort is coordinated annually, or more frequently as required, with Department of Defense, Director for Research and Engineering; Joint Technology Coordinating Groups of the Armed Services Biomedical Research Evaluation Management Committee; Joint Services Container Steering Group; DOD Executive Agent for Land-Based Water Resources;

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603807A
Title: Medical Systems Advance Development

Budget Activity: #4

Program Advisory Group for Bulk Petroleum Fuels Distribution; World and Pan American Health Organizations. Research efforts are also coordinated with Quadripartite, NATO and other cooperative nations through meetings and data exchange agreements.

(U) Other Appropriation Funds: ($ in Thousands) Procurement of completed products is provided for in Other Procurement, Army (OPA), or Operation and Maintenance, Army (OMA) or passed to other procuring agencies of DoD and the Military Departments, as appropriate.

(U) International Cooperative Agreements: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604201A
PE Title: Aircraft Avionics

Project Number: DC97
Budget Activity: #5

A. (U) RESOURCES: ($ in Thousands)
Project Title: Aircraft Avionics

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DC97 Aircraft Avionics	0	16461	14433	6768	1047	576	591	0	39876

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This PE funds the development of avionics systems required to horizontally and vertically integrate the battlefield (commonly referred to as "digitization of the battlefield"). The Global Positioning System (GPS) provides Army aviation with extremely accurate and secure location and velocity information critical to navigation, target acquisition, fire support, assessment of enemy deployments, and logistical support. It also provides Global Time settings for communication systems and assists in situational awareness and prevention of fratricide. The RDT&E efforts address the Army aircraft weight, space and power limitations by embedding a GPS circuit card into existing onboard avionics systems and the Inertial Navigation System (EGI) (Air Force lead) for attack and scout aircraft. The AN/ARC-220 High Frequency (HF) radio provides a long-range (300 kilometers) nap-of-earth (NOE), non-line-of-sight digital and voice communication capability which is reliable, secure, easy to operate, with automatic link establishment and electronic counter-countermeasures. The AN/ARC-220 will be form/fit interchangeable with the AN/ARC-199 HF radio, meet military standards for compatibility with the 1553 data bus, night vision lighting, data transmission, and shipboard operations. The Army Airborne Command and Control System (A2C2S) is a new start in FY94 and funds will be reprogrammed for this effort. The A2C2S functions as a highly mobile airborne command post when mounted in the UH-60 helicopter with auxiliary equipment, providing tactical voice, data, and imagery digitized battlefield communications both in secure and nonsecure modes for corps, division, and brigade commanders. The system provides: battle commanders access to critical situational awareness and off-board national asset intelligence information via satellite communications; digitized battlefield communications links with army team members, joint service and combined force elements; channel scanning and intercommunications facilities for up to six operations and joint interoperability as well as maritime and air traffic control communications.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604201A
PE Title: Aircraft Avionics

Project Number: DC97
Budget Activity #5

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments:
- (U) Project not funded

(U) FY 1994 Planned Program:		Complete	Cost
• (U)	Continue engineering and manufacturing development (EMD) of Embedded Global Positioning System Inertial (EGI)	3QFY95	125
• (U)	Initiate EMD of the AN/ARC-220 NOE Communications	2QFY96	4790
• (U)	Complete Operating and Support Cost Reduction (OSCR) engineering and software programming	4QFY94	146
• (U)	Development of A2C2S	4QFY95	11400
Total			16461

(U) FY 1995 Planned Program:			
• (U)	Conduct Preproduction Qualification Testing of AN/ARC-220 line replaceable units	1QFY96	7861
• (U)	Initiate Government testing of AN/ARC-220 NOE Communications	2QFY96	1688
• (U)	AH-64C/D Engineering Change Proposal EGI Integration	4QFY95	4884
Total			14433

D. (U) WORK PERFORMED BY: In house efforts performed by PM Aviation Electronic Combat, St. Louis, MO; Air Force Common Avionics Directorate, Wright-Patterson AFB, OH; Communications and Electronics Command, Ft. Monmouth, NJ; Aviation and Troop Support Command, St. Louis, MO; Draper Labs, Boston, MA; Naval Research Lab, Wash D.C.; Applied Aviation Technology Directorate (AATD), Ft. Eustis, VA; Assurance Technology Coporation, Concord, MA.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604201A
PE Title: Aircraft Avionics

Project Number: DC97
Budget Activity: #5

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** A2C2S was determined to be a development project and is a new start in FY94. Funds will be reprogrammed to this PE to reflect the change.
2. **SCHEDULE CHANGES:** None
3. **COST CHANGES:** Restructuring of the EGI program allowed funds to be reprogrammed to AN/ARC-220 NOE Communications EMD efforts.

F. (U) PROGRAM DOCUMENTATION:

Navstar-Global Positioning System (GPS) Army User Equipment (AUE) Required Operational Capability (ROC), 6 Apr 79
Revisions to Required Operational Capability (ROC) for the NAVSTAR Global Positioning System (GPS) Army User Equipment, 24 May 91
Required Operational Capability for NOE Communications 7 May 1980
Draft Operational Requirements Document Army Airborne Command and Control System, 18 Jan 94

G. (U) RELATED ACTIVITIES:

There is no unnecessary duplication of effort within the Army or DoD.

H. (U) OTHER APPROPRIATION FUNDS:

$ in Thousands

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Aircraft Procurement, Army							
Airborne Avionics (AA0700)	10567	4780	18986	46578	29909	3535	2752
Airborne Communication (AA0705)	0	3824	5714	5722	31322	31716	32058
Airborne Command and Control (AA0710)	6782	0	0	11385	11374	11311	11361

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604201A
PE Title: Aircraft Avionics

Project Number: DC97
Budget Activity: #5

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. (U) MILESTONE SCHEDULE: Not applicable

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604223A **Budget Activity : #5**
PE Title: Comanche

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DC72 T800 Engine Engineering Development (LH)	41833	68767	81248	57593	57406	60105	59250	232300	1104931
D327 Comanche	352111	297961	443934	316384	441836	462899	456030	1787700	5717486
D397 Longbow-Comanche	289	0	0	0	0	0	0	0	289
PE TOTAL	394233	366728	525182	373977	499242	523004	515280	2020000	6822706

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program provides for the development of the RAH-66 Comanche and the T800 growth engine. The Comanche will replace the current light fleet of tactically obsolescent helicopters (AH-1, OH-6 and OH-58A/C). Based on restructure direction from the Office of the Secretary of Defense, the Longbow system is an integral part of Comanche subsequent to FY 1993; thus, Project D397 will no longer be identified as a separate project. At the request of the Military Deputy to the Army Acquisition Executive, the Comanche Program Manager's Office is conducting a thorough review of the program to determine the best approach to streamlining in order to reduce both funding requirements and development time. The funding supports Comanche within a streamlined acquisition process.

Project DC72 - This project includes tasks to design, develop and qualify an advanced technology engine. The project is for the development of a growth T800 engine, utilizing the technology developed and qualified on the 1200 SHP class baseline T800 engine. The growth engine is for the Army's new RAH-66 Comanche and other applications.

Project D327 - The Comanche helicopter is a highly sustainable and operationally flexible air cavalry system, incorporating significant reductions in personnel and support equipment, capturing the latest combat technologies and capable of accepting upgrades to meet ever-changing threats. It will dominate the battlefield in the close, deep and rear operations; provide a decisive air cavalry capability in day, night, and adverse weather; be operationally tailorable to regional conflicts; and provide an unprecedented level of lethality and operational flexibility for the battle commander.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604223A
PE Title: Comanche

Budget Activity : #5

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:

(U) Project D397: Longbow-Comanche: This project is for provisioning of the Comanche aircraft with the Longbow system. Longbow consists of a mast-mounted millimeter wave Fire Control Radar (FCR) and a radar frequency (RF) autonomous seeker in a Hellfire missile integrated into the RAH-66 Comanche airframe. Longbow will provide the Comanche a fire and forget Hellfire capability. The Longbow weapon system will be employable day or night in adverse weather and in obscurants. Based on restructure direction from the Office of the Secretary of Defense, the Longbow system is an integral part of the Comanche subsequent to FY 1993, therefore, Project D397 is terminated after FY93.

(U) FY 1993 Accomplishments:	Completion	Cost
• (U) Continued Comanche Longbow FCR integration trade studies	4Q93	145
• (U) Continued Comanche Longbow FCR integration design efforts	4Q93	50
• (U) Continue interface with Comanche air vehicle developer	4Q93	50
• (U) Build an antenna FCR mockup	4Q93	44
TOTAL		289

(U) FY 1994 Planned Program:
- (U) Project not funded (D397 efforts included in D327)

(U) FY 1995 Planned Program:
- (U) Project not funded (D397 efforts included in D327)

(U) WORK PERFORMED BY: Boeing Helicopter/Sikorsky Aircraft Co., Joint Program Ofc, Trumbull, CT.

(U) RELATED ACTIVITIES:
PE 0604816A (Longbow - ED)
Joint Integrated Avionics Working Group for coordinating activities with the Navy and Air Force.
There is no unnecessary duplication of effort within the Army or DoD.

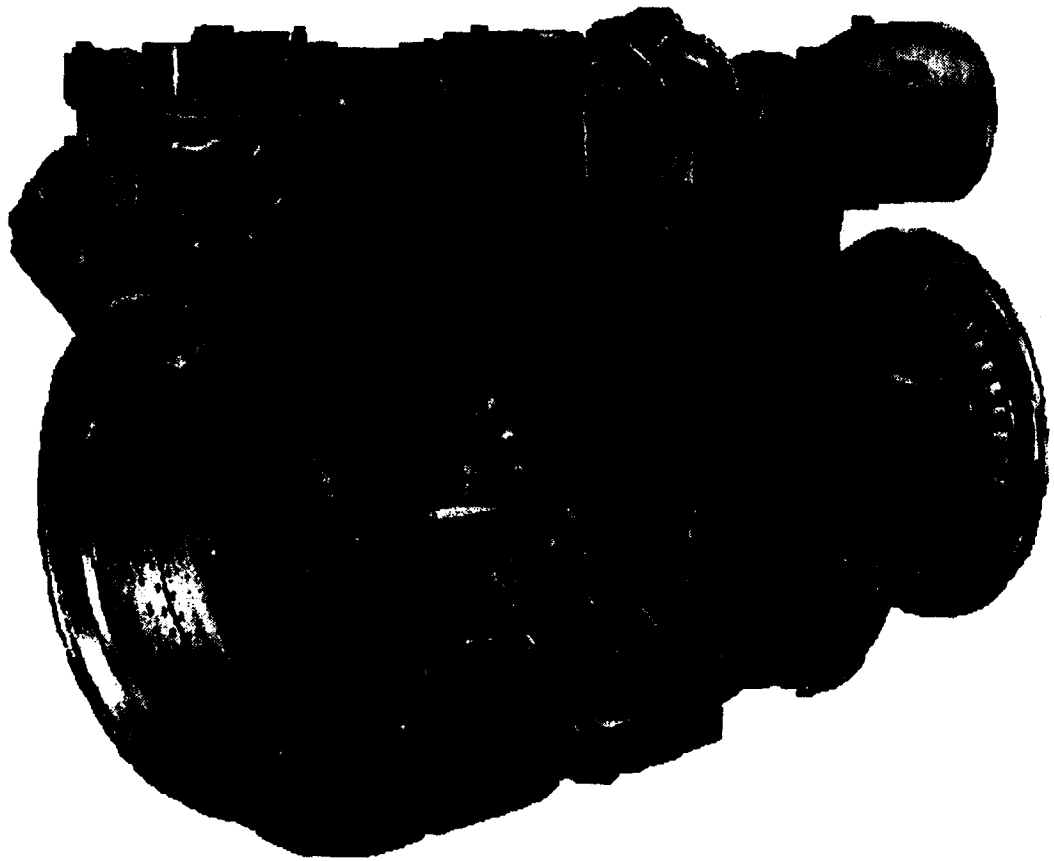
(U) OTHER APPROPRIATION FUNDS: Not applicable

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604223A
PE Title: Comanche
Project Title: T800 Engine Engineering Development (LH)

Project Number: DC72
Budget Activity: # 5



POPULAR NAME: T800 Engine

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604223A
PE Title: Comanche
Project Title: T800 Engine-Engineering Development (LH)

Project Number: DC72
Budget Activity: # 5

A. (U) SCHEDULE/BUDGET INFORMATION: ($ in Thousands)

SCHEDULE* *MS to be revised as Streamlined Plan is refined	FY 1993	FY 1994	FY 1995	FY 1996	FY1997	FY 1998	FY 1999	To Complete
Program Milestones								
Beginning Milestones	Qualify Baseline Engine 05/93 Growth Engine PDR 05/93		Growth Engine CDR 04/95	Begin Delivery of YT Growth Engines 08/96		Complete Air Vehicle Support 12/97		
T&E Milestones	Complete Baseline Qual Test 12/92	First Engine To Test 04/94		Growth Engine Flight Release Testing Complete 07/96				
Contract Milestones	Award Restructure Mod 01/93						Long Lead Contract Award 10/98	
BUDGET ($000)	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	Program Total (To Complete)
Major Contracts	41351	67882	80329	56517	56318	59006	58137	1057838 (228799)
Support Contracts	90	294	319	376	388	399	413	6684 (701)
In House Support	312	475	479	558	554	549	544	25968 (2400)
GFE/ Other	80	116	121	142	146	151	156	14441 (400)
Total	41833	68767	81248	57593	57406	60105	59250	1104931 (232300)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604223A
PE Title: Comanche
Project Title: T800 Engine-Engineering Development (LH)

Project Number: DC72
Budget Activity: # 5

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project includes tasks to design, and qualify an advanced technology engine. The project is designed to provide a reliable, maintainable and fuel efficient engine in the 900 kilowatt (1200 horsepower) class with 50% growth potential required for the Army's new RAH-66 Comanche and other applications. A baseline T800 engine was developed by the Light Helicopter Turbine Engine Company and qualification was successfully completed in 1993. The Army elected to exercise an engine growth program of 12% installed power in FY93. This program utilizes the inherent growth capability of the baseline T800 engine while maintaining the features and strengths of the baseline engine. Qualified baseline engines will be available for the initial flight testing of the Comanche. Preliminary flight test rated growth engines will be available for flight testing on Comanche in FY97.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments:	Completion	Cost
• (U) Start growth engine engineering development	1Q93	30116
- Conduct growth engine Preliminary Design Review (PDR)		
• (U) Delivery of flight test engines	4Q93	11717
• (U) Complete qualification phase	4Q93	0
TOTAL		41833
(U) FY 1994 Planned Program:		
• (U) Continue growth engine engineering development/First engine to test	4Q94	57749
• (U) Complete delivery of basic flight test engines	2Q94	0
• (U) Continue basic engine air vehicle support	4Q94	11018
TOTAL		68767
(U) FY 1995 Planned Program:		
• (U) Continue growth engine development	4Q95	55997
- Conduct growth engine Critical Design Review (CDR)		
• (U) Continue basic engine air vehicle support	4Q95	10176
• (U) Start growth engine air vehicle support	1Q95	15075
TOTAL		81248

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604223A | **Project Number: DC72**
PE Title: Comanche | **Budget Activity: # 5**
Project Title: T800 Engine-Engineering Development (LH)

(U) Program Plan to Completion

• (U) Growth flight release testing complete	07/96
• (U) Begin delivery YT growth engines	08/96
• (U) Complete air vehicle support	12/97
• (U) Award long lead contract for Low Rate Initial Production (LRIP)	10/98

D. (U) WORK PERFORMED BY: The major contractor is Light Helicopter Turbine Engine Co., Indianapolis, IN; and, Phoenix, AZ.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:
NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** None
2. **SCHEDULE CHANGES:** Subject to revision as streamlined program is refined.
3. **COST CHANGES:** Current estimate reflects streamlined progam.

F. (U) PROGRAM DOCUMENTATION: See PE #0604223A, Project D327 (Comanche)

G. (U) RELATED ACTIVITIES: There is no unnecessary duplication of effort within the Army or the Department of Defense.

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

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

J. (U) TEST AND EVALUATION DATA: Baseline QT engines will be used in initial flight testing. Growth T-800 engines will be undergoing preliminary qualification testing for subsequent installation and flight test on Comanche.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604223A
PE Title: Comanche
Project Title: Comanche

Project Number: D327
Budget Activity: # 5



POPULAR NAME: Comanche

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604223A
PE Title: Comanche
Project Title: Comanche

Project Number: D327
Budget Activity: # 5

A. (U) SCHEDULE/BUDGET INFORMATION: ($ in Thousands)

SCHEDULE* **MS to be revised as Streamlined Program is refined	FY 1993	FY 1994	FY 1995	FY 1996	FY1997	FY 1998	FY 1999	To Complete
Program Milestones	Conventional Sys Committee on restructure 12/92						Approval of Advance Procurement Funding 1QTR	Enter Full Rate Production 2Q03
Engineering Milestones		Critical Design Review 12/93		First Flight Prototype # 1 11/95	First Flight Prototype # 2 03/97	First Flight Prototype #3 05/98 First Flight Prototype #4 07/98		IOC 2Q03
T&E Milestones	TEMP Update by PMO 04/93				Complete Initial Flight Tests 09/97			
Contract Milestones	Award contract mod for restructure 01/93							Award Long Lead Contract 1Q99
BUDGET ($000)	**FY 1993**	**FY 1994**	**FY 1995**	**FY 1996**	**FY 1997**	**FY 1998**	**FY 1999**	**Program Total (To Complete)**
Major Contracts	338411	277886	416034	288084	406336	425999	419730	5296440 (1641000)
Support Contracts	2966	9980	10000	11700	13200	13700	13500	149540 (54500)
In House Support	9401	9945	16900	15600	15500	16100	15800	210420 (63900)
GFE/ Other	1333	150	1000	1000	6800	7100	7000	61086 (28300)
Total	352111	297961	443934	316384	441836	462899	456030	5717486 (1787700)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604223A
PE Title: Comanche
Project Title: Comanche

Project Number: D327
Budget Activity: # 5

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project provides for the development of the RAH-66 Comanche. The Army requires an aviation system capable of performing aerial reconnaissance on the modern battlefield. Combat lessons learned and mission analysis have repeatedly supported a critical combat requirement for an aviation reconnaissance system capable of 24 hour combat operations, responsive to the battle commander in night and adverse weather conditions and able to survive on the 21st century battlefield. This air cavalry helicopter system will be self-deployable with highly improved sustainability and availability to support continuous combat operations in any world trouble spot. It will be able to find the enemy with a low probability of self-detection and either engage or hand-off the target based on the battle commander's decision. This air cavalry system will be able to operate effectively in the close, deep or rear battles. Comanche incorporates emerging technologies to provide a leap-ahead air cavalry system; field a world-wide deployable, air cavalry reconnaissance helicopter; operate with minimal logistical burden; serve as the command and control node for the commander on the 21st century battlefield to win the knowledge war. This system will provide three dimensional battlefield situational awareness with greater depth and breadth than currently possible. This picture of the battlefield will be overlaid on digital maps that consolidate all real time data. This system will display friend or foe discrimination and will avoid detection and survive by reducing signature and incorporating low observable technology. The Comanche will be integrated with the Army aviation force structure to complement the AH-64 attack helicopter.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Continue engineering development/Accomplish restructure	4Q93	271649
- Accomplish restructure		
• (U) Continue development tests	4Q93	50953
• (U) Initiate airframe construction	1Q93	29509
TOTAL		**352111**

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Continue engineering development	4Q94	187378
- Conduct core mission equipment package Critical Design Review (CDR)		
- Conduct prototype system CDR		
• (U) Continue contractor development test	4Q94	66937
• (U) Continue airframe construction (tooling/prototype manufacturing)	4Q94	43646
TOTAL		**297961**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604223A
PE Title: Comanche
Project Title: Comanche

Project Number: D327
Budget Activity: # 5

(U) FY 1995 Planned Program:		
• (U) Continue engineering development	4Q95	287469
• (U) Continue contractor development test	4Q95	113775
- Initiate static test article		
- Initiate propulsion system test bed		
- Complete whirl tower test		
• (U) Continue Air Vehicle Construction	4Q95	42690
- Complete prototype #1		
- Continue prototype #2		
TOTAL		443934
(U) Program Plan To Completion		
• (U) First flight, prototype # 1		11/95
• (U) First flight, prototype # 2		03/97
• (U) First flight prototype # 3		05/98
• (U) First flight prototype # 4		07/98
• (U) Complete initial flight tests		09/97
• (U) Approval of Advance Procurement Funding		1Q/99
• (U) Initiate Low Rate Initial Production		1Q00
• (U) Complete streamlined Engineering and Management Development		TBD
• (U) Enter Full Rate Production		2Q03

D. (U) WORK PERFORMED BY: First Team (Boeing Helicopter/Sikorsky Aircraft Co.,) Trumbull, CT.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** None
2. **SCHEDULE CHANGES:** Subject to revision as streamlined program is refined.
3. **COST CHANGES:** Current estimate reflects streamlined program.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604223A
PE Title: Comanche
Project Title: Comanche

Project Number: D327
Budget Activity: # 5

F. (U) PROGRAM DOCUMENTATION:

System Concept Paper	04/88
Common Use Alternative Statement	04/88
Cost & Operation Effective Analysis	04/90
Independent Cost Estimate	01/92
Acquisition Program Baseline	01/93
Acquisition Strategy	01/93

G. (U) RELATED ACTIVITIES:

PE # 0603003 (Aviation Advanced Technology
PE # 0603710 (Night Vision Advanced Technology)
PE # 0604201 (Aircraft Avionics)
PE # 0604270 (EW Development)
PE # 0604816A (Longbow - ED)
PE # AA0700 (Airborne Avionics)
Joint Avionics Working Group for coordinating activities with the Navy and Air Force.

There is no unnecessary duplication of effort within the Army or Department of Defense. However, the open systems architecture of Comanche facilitates the continued insertion of advanced technologies as they mature and requirements for product improvements become more defined. Several ongoing science and technology programs have the potential to reduce development risk, improve operational capabilities and reduce weight for the Comanche and any future Comanche upgrades. These activities include development of color flat panel displays (active matrix liquid crystal), integrated fire and flight controls, sensors, digital mapping, cognitive decision aiding, and other rotorcraft pilot technologies which promote improvements in performance, reliability, and weight reduction.

PE 0603003, Aviation Advanced Technology provides funding for the Rotorcraft Pilot's Associate (RPA) program. RPA is premised on the fact that continuing improvements in cockpit automation, communications systems, and sensors have been and will continue to be applied to DOD/Army rotorcraft. RPA focuses squarely in the cognitive processing issue through the use of expert systems, artificial intelligence, data fusion, and advanced information processing technology. RAH-66 Comanche mission management software developed in EMD will leverage emerging RPA technology. The RPA program contract awarded to McDonnell Helicopter Company, Mesa, AZ including a major sub-contract to IBM, Binghamton, NY in June 1993 is addressing these key technology insertion areas.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604223A
PE Title: Comanche
Project Title: Comanche

Project Number: D327
Budget Activity: # 5

H. (U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
APA (A08300)	0	0	0	0	0	0	145215
RAH-66 Comanche (Advanced Procurement)							

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

J. (U) TEST AND EVALUATION DATA: *Comanche flight testing* will be initiated in 1995. A combined test team (CTT), consisting of both contractor and government testers, will provide the framework to ensure all required testing is accomplished. Aircraft and mission equipment package testing will be performed in a systematic approach to establish flight envelopes, assess system capabilities by conducting surveys and formal demonstrations and, finally, providing data for an initial operational assessment.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604256A
PE Title: Threat Simulator Development

Budget Activity: #6

A. (U) RESOURCES: ($ in Thousands)

Project Number Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D976 Army Threat Simulator Program	22707	18210	20270	14469	15571	20704	15221	Cont	Cont

B. (U) BRIEF DESCRIPTION OF ELEMENT: Funding in this program element was realigned effective FY1994 from PE#0605603A (Army User Test Instrumentation and Threat Simulators), by the Office of the Secretary of Defense (OSD) to improve the visibility and avoid duplication of threat simulator development among services. Program finances development of realistic mobile threat simulators. It provides the capabilities to create realistic simulated tactical environments during conduct of user testing of new weapon systems.

C. (U) JUSTIFICATION FOR PROJECT:

(U) Project D976 - Army Threat Simulator Program: Army Threat Simulator Program (ATSP) is a continuing program which finances development of realistic threat simulators for Army test organizations. These battlefield simulators represent threat systems (e.g. missile systems command and control, communications, electronic warfare systems, helicopters, etc.) that are used to portray a realistic threat environment during testing of U.S. weapon systems. Simulator development is responsive to Office of the Secretary of Defense and General Accounting Office concerns that the Army conduct operational testing in a realistic threat environment. Initially created to develop simulators of Soviet equipment, the changing world order has expanded the scope of this program to address rest of world (ROW) threats. Actual threat equipment is being acquired when appropriate in lieu of development. Total package fielding will still be required (i.e., instrumentation, operations and maintenance, manuals, new equipment training, etc.).

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Completed XM-DEWS directed energy study initiated in FY 1992.	4Q93	997
• (U) Validated and fielded actual threat simulator systems.	4Q93	165
• (U) Initiated development of one XM-HOKS helicopter utilizing KA-32 helicopter.	4Q93	1190
• (U) Initiated procurement of one actual XM-TAR radar system.	4Q93	500
• (U) Completed development, validation and fielding of one XM-TAS radar system.	4Q93	4199
• (U) Continued concept planning for XM15A/S air defense system.	4Q93	3318

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604256A
PE Title: Threat Simulator Development

Budget Activity: #6

• (U) Completed development, validation and fielding of one XM-HKS helicopter.	4Q93	1020
• (U) Completed Program Manager, Instrumentation, Targets and Threat Simulators (PM ITTS) Process Action Team hardware subsystems on XM-43S.	4Q93	2062
• (U) Continued development of XM-C3S Command, Control and Communication (C3) systems.	4Q93	806
• (U) Personnel costs and PM ITTS overhead.	4Q93	3048
• (U) Operations and planning.	4Q93	1722
• (U) Program technical support (contract costs for engineering support, accreditation, configuration management, and logistic management for fielding threat simulator systems.	4Q93	3680
• (U) User tests supported include:		
- APRA (XE-2) Advanced Threat Radar Warning Receiver		
- Joint Tactical Information Distribution System Initial Operational Test and Evaluation (IOTE)		
- 155mm Sense and Destroy Armor (SADARM) IOTE		
- Avenger Non-Cooperative Target Recognition Electronic Support Measures (ESM) Weapons Version Limited User Test and Evaluation (LUTE)		
- Guardrail Common Sensor		
Total		22707

(U) FY 1994 Plans:	Complete	Cost
• (U) Continue contingency concept planning for the XM-15A/S and initiate acquisition of XM-15A air defense system.	4Q94	2093
• (U) Complete development and validate one XM-HOKS helicopter.	3Q94	355
• (U) Baseline, instrument, validate and field one XM-43A AAA gun system.	4Q94	2540
• (U) Complete procurement, instrument, validate and field one XM-TAR radar system.	4Q94	1300
• (U) Initiate development of XM-DEWS directed energy system simulation.	4Q94	1500
• (U) Initiate development of XM-TAS C3 system.	4Q93	1000
• (U) Complete Requirements Definition and Specification Design of XM-17S radar system.	4Q94	100
• (U) Continue development of XM-C3S Command, Control and Communication Systems.	4Q94	515
• (U) Complete development and validation of two threat systems.	4Q94	161
• (U) Personnel costs and PM ITTS overhead.	4Q94	3822
• (U) Operations and planning.	4Q94	1200
• (U) Program technical support (contract costs for engineering support, accreditation, configuration management, and logistic management for fielding threat simulator systems).	4Q94	3624

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604256A
PE Title: Threat Simulator Development

Budget Activity: #6

- (U) Planned user tests requiring threat simulator support include:
  - Aircraft Survivability Equipment (ASE) (AIQ-136) (APR-39) Special Electronics Missions Aircraft (SEMA) ASE Force Development Test and Evaluation (FDTE)
  - Unmanned Aerial Vehicle - Short Range IOTE
  - Block 11A Ground Station Module (GSM) IOTE
  - AN/ALQ-136 (U) 21 Pulse Radar Jammer, SEMA ASE
  - AN/APRA (XE-2) Advanced Threat Radar Warning Receiver, SEMA
  - 155mm and Multiple Launch Rocket System (MLRS) - SADARM
  - Special Operations
  - Forward Area Air Defense Command, Control and Intelligence (FAAD C2I) (Light) FDTE
  - MLRS SADARM IOTE
  - Guardrail Common Sensor
  - OH-58D Kiowa Scout Attack Helicopter

Total **18210**

(U) FY 1995 Plans:	Complete	Cost
• (U) Initiate development of emitter and illuminator for XM-12S missile system using Air Force program design concepts.	4Q95	1718
• (U) Initiate development of XM-HJS helicopter jammer.	4Q95	2000
• (U) Complete development, validate, and field XM-TAS C3 System.	4Q95	1000
• (U) Continue development of XM-DEWS directed energy system simulation.	4Q95	1466
• (U) Continue contingency planning of XM15 and continue acquisition of XM15A air defense system.	4Q95	2819
• (U) Initiate development of XM-17S Air Defense System.	4Q95	2500
• (U) Continue development of XM-C3S Command, Control and Communication Systems.	4Q95	2315
• (U) Personnel costs and PM ITTS overhead.	4Q95	3425
• (U) Operations and planning.	4Q95	1250
• (U) Program technical support (contract costs for engineering support, accreditation, configuration management, and logistic management for fielding threat simulator systems).	4Q95	1777

- (U) Planned user tests requiring threat simulator support include:
  - Longbow Apache IOTE Phase III
  - FAAD C2I Heavy - FDTE
  - Avenger ESM Noncooperative Target Recognition (NCTR - 1)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604256A
PE Title: Threat Simulator Development

Budget Activity: #6

- 155mm and MLRS SADARM FDTE
- Special Operations

(U) WORK PERFORMED BY: *Major contractors are:* Loral Research, Buffalo, NY; Loral Data Communication Corp, Anaheim, CA; Loral Space and Range Systems, Sunnyvale, CA; Loral Electro-Optical Systems, Pasadena, CA; Georgia Technology University, Atlanta, GA; Georgia Technology Research Institute, Marietta, GA; Loral Aeronutronic, Newport Beach, CA; GTE, Sanford CA; Electronic Warfare Associates, Huntsville, AL; and Nichols Research Corp., Huntsville, AL. *In-house organizations include*: elements of the Army Research Institute at Fort Monroe and Fort Eustis, VA; Army Research Laboratory, Aberdeen Proving Ground, MD; Defense Intelligence Agency, Washington, DC; Project Manager for Training Devices (PM TRADE), Orlando, FL; Sacramento Army Depot, CA; Anniston Army Depot, AL; Corpus Christi Army Depot, TX; Vulnerability Lab, Albuquerque, NM; and PM ITTS, Threat Simulator Management Office in Huntsville, AL under U.S. Army Simulation, Training and Instrumentation Command, Orlando, FL.

(U) RELATED ACTIVITIES: There is no unnecessary duplication of effort within the U.S. Army or DoD. CROSSBOW-S (Construction of a Radar to Operationally Simulate Signals believed to Originate Within the Soviet Union) coordinates threat simulator development for the DoD. A lead service is appointed to develop a simulator that has multiple service requirements. Headquarters, Department of the Army provides oversight. Coordination with other Army agencies and services is accomplished through scheduled meetings, resource reviews and planning seminars. This program is related to:

PE #0604256F	Threat Simulator Development
PE #0604256N	Threat Simulator Development
PE #0604940D	Central Test and Evaluation Investment Program (CTEIP)

(U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Other Procurement, Army (OPA)							
MA6700	6131	2520	6805	6876	6335	6255	6220

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604258A
PE Title: Targets Systems Development

Budget Activity: #6

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D238 Aerial Targets	9198	11888	8577	7724	6886	6816	6762	Cont	Cont
D459 Ground Targets	643	7042	5515	8603	8534	9249	9178	Cont	Cont
PE TOTAL	9841	18930	14092	16327	15420	16065	15940		

B. (U) BRIEF DESCRIPTION OF ELEMENT: Funding in this program element (PE) was realigned effective FY1994 from PE #0605602A (Army Technical Test Instrumentation and Targets) by the Office, Secretary of Defense (OSD) to improve the visibility and avoid duplication of target development among the services. Program funds aerial and ground target development, maintenance and upgrade. Targets are developed to support testing and training, are economical and expendable, remotely controlled or stationary, and unlike threat simulators, are often destroyed in tests.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) **Project D238 - Aerial Targets:** Provides for development, acquisition, operation, storage, update, and maintenance of realistic surrogate or acquired threat high performance, multi-spectral aerial targets that can fully stress the latest air defense and air-to-air weapons. Modern weapons require test and evaluation using threat representative aerial targets to assess their effectiveness on the battlefield. This program encompasses a family of rotary and fixed wing, full and sub-scale targets, ancillary devices and remote control systems to stress systems under test. The U.S. Army is the tri-service lead for rotary wing targets for testing. Aerial targets must have flight characteristics, signatures, speed, altitude and other performance factors which emulate modern threat aircraft. Includes long-range planning to determine future target needs and development of coordinated requirement documents. Also includes: management of the target research, development, test and evaluation process; execution of the validation and accreditation process to ensure that surrogate targets adequately represent the threat; development, and acquisition of surrogate and acquired targets; continuing maintenance, storage, and development/enhancement/update engineering services of the developed and acquired threat targets to ensure availability for the test and evaluation customer. Test programs supported are Forward Area Air Defense (FAAD) Missile (Stinger), Patriot, Corps Surface-to-Air (SAM), Non-Line-of-Sight (NLOS), Comanche, and technology programs which demand accurate threat representation in their aerial targets.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604258A
PE Title: Targets Systems Development **Budget Activity: #6**

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Continued Large Scale Rotary Wing Target (HAVOC-X) development.	4Q93	3550
• (U) Continued enhancement of subscale targets and augmentation devices.	4Q93	1039
• (U) Continued participation in Air Force led joint development of Full Scale Fixed Wing Target (QF-4).	4Q93	25
• (U) Contract initiating development of the Universal Drone Control System (UDS) kit awarded.	4Q93	3671
• (U) Performed detailed planning for Full Scale Rotary Wing Target (HOKUM-X).	4Q93	60
• (U) Prepared Statement of Work (SOW) for development of HOKUM-X target and began the acquisition process for contract (with options) award.	4Q93	60
• (U) Continued maintenance, storage and development/enhancement/update engineering services for all RDT&E aerial targets.	4Q93	768
• (U) Began Army participation in development of vector scoring to provide more accuracy and detail about performance relative to the threat aircraft with Navy as lead.	4Q93	10
• (U) Participated in and provided Army funding for Reliance.	4Q93	15
Total		**9198**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Continue development of HOKUM-X.	4Q94	1400
• (U) Continue development and begin testing of HAVOC-X.	4Q94	3000
• (U) Continue engineering development of UDS.	4Q94	3300
• (U) Continue enhancement and maintenance, storage, development/augmentation/update engineering services for all RDT&E aerial targets.	4Q94	842
• (U) Continue participation in Air Force led joint development of Full Scale Fixed Wing Target (QF-4); participation in development of vector scoring to provide more accuracy and detail about missile performance relative to the threat aircraft with Navy as lead; and participation and funding in Reliance.	4Q94	1524
• (U) Exercise intensive management of the MQM-107E as it relates to an Air Force acquisition and investigate aerodynamic shapes and profiles, flight controls, propulsion, software, digital, fiber optic, fluidic gyros, and safety aspects, and adopting Global Positioning System (GPS) for increasing MQM-107E reliability and performance.	4Q94	1127
• (U) Develop Target, Tracking, and Control System (TTCS) mapping via video monitors to replace current plotting boards.	4Q94	400
• (U) Develop infrared towed target and conduct towed target simulation investigations for performance.	4Q94	295
Total		**11888**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604258A
PE Title: Targets Systems Development **Budget Activity: #6**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Continue development of HOKUM-X.	4Q95	3300
• (U) Continue development and testing of HAVOC-X prototypes.	4Q95	1700
• (U) Continue enhancement and maintenance, storage and development/augmentation/update engineering services for all RDT&E aerial targets and augmentation devices.	4Q95	1064
• (U) Continue development of Target, Tracking, and Control System (TTCS) mapping via video monitors to replace current plotting boards; update Drone Formation Control System (DFCS) to include QUH-1.	4Q95	692
• (U) Investigate the safety of MQM-107E development items and test digital, fiber optic and fluidics gyros for the MQM-107E to increase target reliability and performance.	4Q95	300
• (U) Complete development and testing of UDS for CH-3, UH-1 and AH-1 airframes and investigate feasibility of adopting GPS to Universal Drone Control System.	4Q95	325
• (U) Continue participation in Air Force led joint development of Full Scale Fixed Wing Target (QF-4) and continue to participate in and provide Army funding for Reliance.	4Q95	1196
Total		**8577**

(U) Project D459 - Ground Target: This program funds Army efforts to support testing of advanced weapon systems by developing, and/or acquiring surrogate and actual foreign vehicle targets which are required to adequately stress weapons systems. This tasking includes long range planning to determine future target needs and development of coordinated requirement documents. The US Army is the tri-service lead for providing ground targets for testing. This includes: management of the ground target research, development, test and evaluation process; execution of the validation and accreditation process; development, and acquisition of ground target and acquired foreign assets; continuing maintenance, storage, and development/enhancement/update engineering services of the developed and acquired targets to ensure availability for the test and evaluation customer. Test programs supported are Longbow; Tube-Launched, Optically-Tracked, Wire-Guided Missile (TOW) Improved Target Acquisition System (ITAS); Wide Area Mine (WAM); Non-Line of Sight (NLOS); Line-of-Sight Antitank (LOSAT); Brilliant Anti-Armor Submunition (BAT); Kiowa Warrior; Sense and Destroy Armor (SADARM); and Unmanned Aerial Vehicle (UAV)-SR.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Continued support for ground target validation and accreditation processes.	4Q93	30
• (U) Continued consolidation of ground target requirements.	4Q93	15
• (U) Conducted threat target requirements study.	4Q93	15
• (U) Managed use of consolidated target assets.	4Q93	15
• (U) Continued planning of ground target development and consolidation.	4Q93	20
• (U) Continued the management and maintenance of ground targets to include foreign assets.	4Q93	20

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604258A
PE Title: Targets Systems Development **Budget Activity: #6**

• (U) Initiated a Primary Operating Center Network.	4Q93	80
• (U) Reviewed and concurred in each Primary Operating Center's environmental and operational needs.	4Q93	20
• (U) Laid groundwork for spare parts inventory control and distribution.	4Q93	20
• (U) Designated White Sands Missile Range for the location of a central spare parts warehouse.	4Q93	15
• (U) Developed a computer database for inventory of foreign asset spare parts using the German Lieferplan numbering system.	4Q93	20
• (U) Increased the fleet inventory with Kuwait Theater of Operations (KTO) acquisitions.	4Q93	100
• (U) Delivered three (3) T80 surrogates to the test community.	4Q93	58
• (U) Began documentation to support a Milestone 0 decision for two (2) new ground targets.	4Q93	50
• (U) Supported PM test requirements for developmental and operational testing.	4Q93	100
• (U) Developed an asset certification program for the TMO foreign fleet.	4Q93	30
• (U) Began archiving safety information for the TMO foreign fleet.	4Q93	20
• (U) Expanded ground target support to the Navy and Air Force Major Range and Test Facility Bases.	4Q93	15
Total		**643**

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Implement major foreign and surrogate asset management/inventory control program and integrate into the overall DoD Test and Evaluation process.	4Q94	513
• (U) Implement Primary Operating Centers (POC) concept, operation, storage, maintenance and repair of ground target assets.	4Q94	2860
• (U) Acquire additional foreign assets and spare parts to support the ground targets fleet.	4Q94	995
• (U) Support validation, accreditation and certification of ground targets.	4Q94	144
• (U) Begin development of BMP3-S and 2S6-S ground target surrogates.	4Q94	1950
• (U) Conduct threat target requirements study to support DoD ground target needs under Reliance. Develop Ground Targets Five Year Master Plan and DoD Ground Targets Asset Utilization Plan.	4Q94	580
Total		**7042**

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Acquire new foreign materiel assets and manage all ground target foreign assets and surrogates.	4Q95	1501
• (U) Manage and oversee POC operation, storage, maintenance and repair of ground target assets.	4Q95	882
• (U) Acquire additional foreign assets and spare parts to support the ground targets fleet.	4Q95	300

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604258A
PE Title: Targets Systems Development

Budget Activity: #6

• (U) Initiate development of a Main Battle Tank (MBT) threat target surrogate.	4Q95	420
• (U) Continue development of BMP 3-S and 2S6-S.	4Q95	1682
• (U) Support validation, accreditation, and certification of ground targets.	4Q95	150
• (U) Continue threat targets requirements study to support DoD ground target needs under Reliance. Implement Ground Targets Five Year Master Plan and DoD Ground Targets Asset Utilization Plan.	4Q95	580
Total		**5515**

(U) **WORK PERFORMED BY:** ***Major contractors are:*** Beech Aircraft Corp., Wichita, KS; C. Goldberg Models, Chicago, IL; Cartwright Electronics, Fullerton, CA; Consolidated Ind., Huntsville, AL; Continental RPV, Barstow, CA; Dynetics, Inc., Huntsville, AL; General Electric Government Services, Cherry Hill, NJ; Herley Ind., Inc., Lancaster, PA; Honeywell, Inc., Albuquerque, NM; Kaman Aerospace Corp., Bloomfield, CT; MicroSystems, Fort Walton Beach, FL; Microturbo, Inc., Grand Prairie, TX; Nichols Research, Huntsville, AL; Pioneer Aero Corp., South Windsor, CT; Rozendale Associates, El Cajon, CA; Stone Engineering, Huntsville, AL; Southwest Aerospace Corp., Tustin, CA; Teledyne CAE, Toledo, OH; Teledyne Ryan Aerospace, San Diego, CA; Telonics, Inc., Mesa AZ; Tracor Aerospace, Austin TX; and Unisys Corp., McLean, VA. ***Study contracts with:*** CAS, Inc., Huntsville AL; and Tekmasters, Inc., Huntsville, AL. ***In-house organizations include:*** MICOM, Redstone Arsenal, AL; White Sands Missile Range (WSMR), NM; Aviation Technical Test Activity, Fort Rucker, AL; Redstone Technical Test Activity, Huntsville, AL; PM ITTS Targets Management Office at Huntsville, AL and at U.S. Army Simulation, Training, and Instrumentation Command (STRICOM), Orlando, FL; and Foreign Science and Technology Center, Charlottesville, VA.

(U) **RELATED ACTIVITIES:** Tri-services requirements are coordinated and duplication of effort is precluded through Project RELIANCE review. Under Project RELIANCE, the Army is the Department of Defense (DoD) lead for Rotary Wing Aerial Targets and Ground Targets. There is no unnecessary duplication of effort in the Army or DoD This program is related to:

PE #0605601A	Army Test Ranges and Facilities
PE #0604211F	Advanced Aerial Target/Development
PE #0604755F	Improved Capability for Development Test & Evaluation
PE #0604208N	Range Instrumentation Systems Development
PE #0604258N	Targets System Development
PE #0604940D	Central Test and Evaluation Investment Program
PE #0604258F	Targets System Development

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604258A
PE Title: Targets Systems Development

Budget Activity: #6

(U) OTHER APPROPRIATION FUNDS:

Appropriation	($ in Thousands) FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Procurement							
Air Defense Targets (C93000)	11125	14959	8292	6821	6468	6336	6299

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Development of HOKUM-X Rotary Wing Target, between Canada & U. S. A, signed 16 Jul 93.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604270A
PE Title: Electronic Warfare Development

Budget Activity: #5

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DL12 Signals Warfare Development	64713	44460	47338	12847	13575	10195	8349	Cont	Cont
DL15 ARAT-TSS	0	0	4003	4290	4328	5124	4816	4714	27275
DL16 TROJAN Development	0	0	0	548	1340	1417	1491	Cont	Cont
DL18 High Value Asset Defense System	0	2172	5059	7736	0	0	0	0	14967
D611 Tactical Deception Army-Wide	1298	1978	0	0	0	0	0	0	22931
D665 Aircraft Survivability Equipment Development	28886	35215	32722	40045	39951	25751	12004	Cont	Cont
PE TOTAL	94897	83825	89122	65466	59194	42487	26660		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program encompasses advanced and engineering development for tactical electronic warfare (EW), signals warfare (SW), aircraft survivability equipment (ASE), battlefield deception, rapid software reprogramming and protection of personnel and equipment from hostile artillery. EW encompasses the development of tactical EW equipment and systems mounted in both ground and air vehicles. The systems under this program provide the Army with the capability to degrade or deny hostile forces the effective use of their communications, countermortar/counterbattery radars, surveillance radars, infrared/optical battlefield surveillance systems and electronically fused munitions. Existing Army EW systems must be replaced or upgraded to maintain their capability in the face of threat technical advancements. This program element satisfies requirements for brigade, division, corps and higher commanders to conduct electronic and electro-optical countermeasure (ECM) operations. ASE efforts provide for the development and system integration of survivability equipment to meet tactical and Special Electronic Mission Aircraft (SEMA) requirements, attack/scout, and assault/cargo mission requirements. Stingray provides ground combat vehicle protection from hostile optical and electro-optical target acquisition. (Stingray transitioned to Advanced Technology Demonstration (ATD) status and is now funded in PE #0603270A.) Signals Warfare Development provides for an integrated ground-based and heliborne Intelligence and Electronic Warfare Common Sensor (IEWCS) System. Tasks within this Project include: Advanced QUICKFIX which provides for materiel changes to the existing heliborne QUICKFIX communications intercept, collection processing, direction finding, and jamming system; Intelligence and Electronic Warfare (IEW) Ground Based Common Sensor (GBCS)

system, the ground-based equivalent of Advanced QUICKFIX; TACJAM-A Subsystem, which provides for the development of modules and common subsystems to intercept, locate and jam high frequency (HF), very high frequency (VHF) and ultra high frequency (UHF) conventional and Low Probability of Intercept; Host Interface Unit (HIU) Subsystem, which permits a digital message level interface between IEW systems and the Tactical Command and Control (TCAC) system and subsequently the All Source Analysis System (ASAS); Electronic Fighting Vehicle System (EFVS), which provides a tracked carrier for both IEW GBCS and the Army Joint STARS Ground Station Module to meet the mobility and survivability requirements for systems deployed with armored and mechanized infantry units; Communications High Accuracy Location System-Exploitable (CHALS-X) Subsystem for GBCS, Advanced QUICKFIX and retrofit to GUARDRAIL Common Sensor (GR/CS). Tactical battlefield deception encompasses efforts to provide the friendly force commander the ability to hide his forces and to portray false targets to threat weapons, targeting and intelligence systems through a multispectral approach using physical decoys and electro-magnetic signals. The High Value Asset System will provide effective protection of personnel and equipment from electronically fused munitions. TROJAN developments will complete Proof-of-Principle R&D for specific TROJAN applications in advanced threat signals processing and prototype software upgrades; high frequency (HF) algorithms for compact antenna array technology (CAT) configured into small aperture antenna arrays; and search and acquisition capabilities for unattended signal collectors.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:

(U) DL15 - Army Reprogramming and Analysis Team (ARAT): The ARAT project seeks to develop, test and field an Army wide infrastructure capable of rapidly reprogramming Army Target Sensing Systems (ATSS) organic to deploying or deployed combat and combat support forces. ATSS are smart/brilliant munitions, sensors processors and aircraft/vehicle survivability equipment that rely on threat signature parametric data for identification, targeting and crew warning. The project encompasses: automated analysis of Electronic Intelligence (ELINT) and Measurement and Signature Intelligence (MASINT) databases to identify threat signature parametric changes in near realtime; conducting hardware and software engineering impact analysis of the identified change to each ATSS; and developing appropriate reprogramming code transmission media/software loading devices to permit reprogramming the affected weapon system at the unit level. The project focuses on fielded and developing ATSS. It capitalizes on RDT&E conducted by the USN and USAF. The project also supports the ATSS materiel development community by exploring advanced reprogramming technologies applicable to new ATSS or major modification of existing weapon systems. This project was established in response to the requirements of AR 525-15 (S), Software Reprogramming Policy for Target Sensing Systems. This is not a new start. The ARAT program was established out of cycle in 1991 by the DA Staff (DAMO-FDI). Funding of $1500K for each of FY92 and FY93 was provided in PE 064270.DL12 (Signals Warfare Development), pending the establishment of a unique project line for the ARAT. The unique ARAT project line, 064270.DL15, was established to reflect funds starting in FY94. However, during the Bush/Clinton budget drills, "New Starts" in FY94 were postponed one year. Although not technically a "New Start", no funds were programmed for ARAT in FY94. To remedy the funding shortfall in FY94, $1.0M was set aside for ARAT from residual funds in the Tactical Deception Army-Wide line, PE 064270.D611, a program completed in FY94. The ARAT Program Office will continue to draw funds from the Tactical Deception Army-Wide line throughout FY94.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604270A Budget Activity: #5
PE Title: Electronic Warfare Development

(U) FY 1993 Accomplishments: Efforts funded under PE 0604270A, Project DL12

(U) FY 1994 Planned Program: Efforts funded under PE 0604270A, Project D611

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Prepare Rapid Reprogramming Development Plan for Aviation Electronic Combat (AEC) systems.	2Q95	200
• (U) Implement standard operational and technical message formats for the dissemination of time-sensitive rapid reprogramming data.	4Q95	600
• (U) Establish secure Wide Area Network (WAN) for the Army (Target Sensing Systems) Rapid Reprogramming (ATRR) Project infrastructure.	4Q95	800
• (U) Initiate test-bed evaluations of Electronic Intelligence (ELINT) tools and databases.	3Q95	400
• (U) Initiate development of regional threat emitter libraries for Army AEC systems tailored to specific regions.	4Q94	500
• (U) Define requirements (i.e., technical specifications) for flagging for ELINT-based Target Sensing Systems (TSS). Evaluate USAF and USN ELINT flagging approaches and make recommendations for adoption, modification or new development by Army TSS Rapid Reprogramming Project Office (ATRR-PO).	4Q95	800
• (U) Maintain current and newly-developed regional threat libraries and sustain Army's ability to monitor ATSS effect on changing environment.	4Q95	403
• (U) Conclude MASINT/ELINT Memory Loader/Verifier (MLV) Requirements Analysis study, and begin integrating AEC systems.	4Q95	300
TOTAL		4003

(U) Project DL18 - High Value Asset Defense System: This is the continuation of the SHORTSTOP program which was initiated as a Quick Reaction Program (QRP) to a CENTCOM Statement of Need (SON). The SON was developed in the early part of Operation Desert Shield/Desert Storm as a requirement to protect personnel and other high value assets against hostile fuzed munitions. A Mission Needs Statement (MNS) which includes a lightweight version of SHORTSTOP, has been generated by CENTCOM and has been supported by the U.S. Army. Proponency for the system has been assigned to the U.S. Army Infantry School, Fort Benning, GA, and a draft Operational Requirements Document (ORD) has been released for staffing and approval. SHORTSTOP will be used by Infantry, Engineering, Armored, Field Artillery, and Intelligence units to enhance survivability. The QRP SHORTSTOP systems have been designated as contingency stock for national emergencies, until the lightweight versions are available to field to the force. This is not a new start. Efforts previously funded under Project DL12, Signals Warfare Development.

(U) FY 1993 Accomplishments: Efforts funded under PE 0604270A, Project DL12

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604270A Budget Activity: **#5**
PE Title: Electronic Warfare Development

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Operational Requirements Document (ORD) for man-portable system approved.	2Q94	N/A
• (U) Complete upgrade of Limited Procurement Urgent units to multiband configuration.	3Q94	375
• (U) Conduct MS II Review.	3Q94	68
• (U) Award competitive Engineering Manufacturing and Development contract for development of man-portable system.	3Q94	1729
TOTAL		**2172**

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Conduct Critical Design Review (CDR).	2Q95	N/A
• (U) Build prototype hardware of the man-portable system.	4Q95	4409
• (U) Provide continued threat analysis for development of ECM techniques.	4Q95	250
• (U) Begin technical technical testing of prototype by the contractor.	4Q95	400
TOTAL		**5059**

(U) Project Number and Title: Project D611 - Tactical Deception Army-Wide: The battlefield deception program includes development of multispectral physical, communications, and electronics deception devices. Physical devices are decoys that replicate the visual, thermal, and passive radar signatures of military equipment. Communications deception devices replicate tactical radio communications of U.S. Forces. Electronics deception devices replicate active radar signatures of U.S. equipment. This equipment is used to disrupt the enemy's concentration of fires and mislead his intelligence system, forcing the enemy commander to make prejudicial battlefield decisions and lose or fail to regain momentum. The program ends in FY94. Remaining funds close out existing contracts.

Included in this project for FY94, is the Army Reprogramming Analysis Team (ARAT). With the completion of the Tactical Deception program, $1.0M was set aside for use by the ARAT Program Office to finance FY94 unfunded ARAT requirements. The ARAT program was established out of cycle in 1991 by the DA Staff (DAMO-FDI). Funds for each of FY92 and FY93 were provided in PE 064270.DL12 (Signals Warfare Development), pending the establishment of a unique project line for the ARAT. The unique ARAT project line, 064270.DL15, was established to reflect funds starting in FY94. However, during the Bush/Clinton budget drills, "New Starts" in FY94 were postponed one year. Although not technically a "New Start", no funds were programmed for ARAT in FY94. To remedy the funding shortfall in FY94, funds were set aside for ARAT from residual funds in the Tactical Deception Army-Wide line. The ARAT Program Office will continue to draw funds from the Tactical Deception Army-Wide line throughout FY94.

ARAT seeks to correct deficiencies found in Army capabilities to rapidly reprogram software on threat signatures used for targeting, detection, recognition, identification, and warning by Aviation Electronic Combat Systems, Air Defense Artillery (ADA) radars and munitions, Intelligence and Electronic Warfare (IEW) systems, Non-Cooperative Target Recognition (NCTR) Sensors, and Fire Support sensors and munitions. ARAT is currently providing support to 7 Joint Service systems, and will be supporting up 39 systems by FY 1998. The ARAT program provides the Army with capability

to rapidly assess the impact of signature changes on the battlefield. ARAT provides leadership for Joint Service software reprogramming in the areas of signature collection, database management including the Electronic Warfare Integrated Reprogramming Database (EWIRDB) and the Measurement and Signature Intelligence (MASINT) database, tri-service communications, and software tools development.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) P3I SMOKE/FLASH. Continued Engineer Design Tests at Aberdeen Proving Ground and Fort A.P. Hill	4Q93	650
• (U) Countermeasures Transmitting Set, AN/PRT-10 (former Communication Deception System) Awarded production contract for first Article Test and updated the Technical Data Package (TDP).	1Q93	50
• (U) Close Combat Decoys. Completed Pre-production Qualification Test and Initial Operational Test and Evaluation (IOT&E)	2Q93	498
• (U) Completed TDP and transitioned to ATCOM a sustainment package for Stock Fund procurements of components supporting fielded Limited Production-Urgent decoys with active Deception Elements at Corps and Divisions	4Q93	100
TOTAL		1298

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Tactical Deception:		
• (U) Conduct PRT-10 Milestone Decision III In-Process Review for full production release and type classify standard, then place TDP on the shelf until funding becomes available.	4Q94	100
• (U) P3I SMOKE/FLASH. Conduct Milestone I/II In-Process Review	4Q94	441
• (U) Conduct Milestone Decision II for Close Combat Decoys to determine program future since system failed to meet all Required Operational Capabilities (ROC) standards in Pre-Production Qualification Test (PPQT) and IOT&E	3Q94	390
• (U) ARAT:		
• (U) Develop and standardize operational and technical message formats for the dissemination of time-sensitive rapid reprogramming data.	4Q94	200
• (U) Establish the ATRR Project WAN to connect ARAT-TA, the ARAT-SC, and the two ARAT-SE sites.	4Q94	300
• (U) Establish BBS communications between ARAT-TA and ATSS users, and publish a BBS procedural guide for distribution among ATSS users.	2Q94	247
• (U) Maintain current and newly-developed regional threat libraries and sustain Army's ability to monitor ATSS effect on changing environment.	4Q94	300
TOTAL		1978

(U) FY 1995 Planned Program:
- (U) No planned program

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604270A Budget Activity: #5
PE Title: Electronic Warfare Development

(U) Work performed by:

(U) DL15 - ARAT-TSS U.S. Army Communications and Electronics Command, Ft. Monmouth, NJ ILEX Systems, Inc. 170 Patterson Ave., Shewsbury, NJ, 07702; SRI International, 333 Ravenswood Ave., Menlo Park, CA, 94025; Engineering Professional Services, Inc., 78 Apple Street, Tinton Falls, NJ, 07724; TELOS Systems Group, 55 North Gilbert St., Shewsbury, NJ, 07702. SAIC Commsystems, 10770 Wateridge Circle, San Diego, CA; Syracuse Research Corporation, Merrill Lane, Syracuse, NY, 13210.

(U) DL18 - High Value Asset Defense Systems Program Executive Officer, Intelligence and Electronic Warfare, Vint Hill Farms Station, Warrenton, VA; and the Project Manager FIREFINDER, Fort Monmouth, NJ; Night Vision and Electronic System Directorate, U.S. Army Communications-Electronics Command, Fort Monmouth, NJ. Prime contractor for the Limited Procurement Urgent (LPU) program is Whittaker Electronics, Simi Valley, CA. Prime contractor for the Engineering and Manufacturing Development (EMD) effort is To Be Determined (TBD).

(U) D611 - Tactical Deception The Belvoir RD&E Center, Fort Belvoir, VA; the U.S. Army Communications-Electronics Command, Fort Monmouth, NJ; Motorola, Inc., GEC, Scottsdale, AZ; Radian, Inc., Alexandria, VA; and BRTRC Corporation, Vienna, VA.

(U) Related Activities:

(U) DL18 PE #0603743F (Electronic Combat Technology)
PE #0603718F (Electronic Warfare Technology)
PE #0205764N (EW Countermeasures Response)
PE #0603797N (Surface Electromagnetic/Optical System)
PE #0305885G (Tactical Cryptologic Program)
PE #0204575N (EW Readiness Support)
PE #0604738F (Protective Systems)
PE #0604739F (Tactical Protective Systems)
PE #0604710F (Reconnaissance Equipment)
PE #0603270A (Electronic Warfare Technology)

There is no unnecessary duplication of effort within the Army or DoD.

(U) Other Appropriation Funds: None.

(U) International Cooperative Agreements: None

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604270A
PE Title: Electronic Warfare Development

Project Number: DL12
Budget Activity: #5

A. (U) RESOURCES: ($ in Thousands)
Project Title: Signals Warfare Development

Popular Name	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
Signals Warfare Development	64713	44460	47338	12847	13575	10195	8349	Cont	Cont

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

1. (U) This project provides for development and test of the following Intelligence and Electronic Warfare Common Sensor subsystems:
   a. (U) TACJAM-A.

TACJAM-A consists of state-of-the-art modular and scaleable Electronic Support Measures (ESM) and Electronic Counter Measures (ECM) subsystems designed for use on a variety of air and ground prime movers (tracked, wheeled and heliborne). As such, the TACJAM-A subsystems are foremost examples of a horizontally integrated system that is here today and is the right system for Electronic Support or Electronic Attack in the next conflict.

b. (U) CHALS-X (Communications High Accuracy Location Subsystem - Exploitable). CHALS-X is an IEW Common Sensor subsystem which will enhance the commander's ability to locate and kill the enemy by providing for precise location of HVT's. CHALS-X provides the targeting capability required for the Ground Based Common Sensor-Light (GBCS-L), the Ground Based Common Sensor-Heavy (GBCS-H), the Advanced QUICKFIX (AQF), GUARDRAIL/Common Sensor (GR/CS), and the Mobile Electronic Warfare Support System (MEWSS) to support the tactical commander's requirement to locate and kill the enemy by providing for precise location of high value targets. Airborne systems mixed with ground based systems will be capable of precisely locating enemy weapon systems and units (regardless of whether the enemy uses conventional or modern radios) producing target acquisition sufficiently accurate for first round fire for effect by organic artillery. CHALS-X is a continuation of the project which developed the precision location subsystem currently in GUARDRAIL systems 4 and 1.

c. (U) CMES (Common Modular ELINT System). An IEW Common Sensor subsystem which will enhance the Division Commander's ability to outmaneuver and kill the enemy by identifying enemy counter/mortar, counter/battery ground surveillance radars at critical points in the battle; provide electromagnetic overwatch of the entire radar spectrum inclusive of both conventional and modern modulations; and eliminate enemy counterfire by providing precise location of HVT's for targeting.

2. (U) This project also provides for the integration of Common Sensor subsystems into 3 Army Systems, for the development of platform unique items (i.e. antennas), and for the modification of standard Army vehicles to meet intelligence and electronic warfare requirements. The Army systems are:

a. (U) Ground Based Common Sensor-Light (GBCS-L). The GBCS-L provides the Commanders of Light, Airborne, and Air Assault Divisions with an organic capability to listen to, locate for hard-kill targeting or order-of-battle resolution, or render ineffective through jamming opposition command and control and fire control nets and counter/mortar, counter/battery ground surveillance radar emissions. The system is specifically designed to ensure transportability, prime mover maintainability, and over terrain mobility equal to or greater than supported units, while at the same time exploiting or eliminating - at the supported Commander's discretion - the latest, most modern types of hostile modulations and transmission techniques at the key time and place on the battlefield. GBCS-L is configured on High Mobility Multipurpose Wheeled Vehicle (HMMWV).

b. (U) Ground Based Common Sensor-Heavy (GBCS-H). The GBCS-H provides the Commanders of Armored and Mechanized Infantry Divisions and Armored Calvary Regiments (ACR) the same capability as the above GBCS-L. The GBCS-H, however, is the Army's only on-the-move, on-the-ground, all weather, all terrain, self-contained, fully integrated, 24-hour-a-day signals intelligence and electronic warfare asset. The GBCS-H is configured on a derivative of the Bradley Fighting Vehicle, the Electronic Fighting Vehicle System (EFVS) which is being developed in concert with the Command and Control Vehicle (C^2V).

c. (U) Advanced QUICKFIX (AQF). The AQF provides for a materiel change to the existing heliborne QUICKFIX communications intercept, collection, processing, direction finding, and jamming system and will be deployed to Army Divisions and ACR. Configured in a BLACKHAWK Helicopter (EH-60A), it provides the moving platform necessary to invoke Differential Doppler technology to provide for location accuracies sufficient for "steel on target" requirements, as well as for extension of Line of Sight (LOS) for greater range and coverage of signals intercept and C^2 jamming targets. The incorporation of an advanced suite of self protection equipment enables Advanced QUICKFIX to overfly enemy territory and thus provide for electronic overwatch of the commander's entire area of interest.

3. (U) Mobile Electronic Warfare Support System (MEWSS). The United States Marine Corps is utilizing the same subsystems as the GBCS and configuring them in a Light Armored Vehicle as a part of the MEWSS improvement program.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604270A
PE Title: Electronic Warfare Development

Project Number: DL12
Budget Activity: #5

4. (U) This project is joint with the National Security Agency's Tactical Cryptologic Program (TCP), Program Element #030885G, which provides a portion of the funds required for the development of the precision location subsystem and system integration of GBCS-L and GBCS-H.

5. (U) Both the High Value Asset Defense System (SHORTSTOP) and the Army Reprogramming and Analysis Team (ARAT) programs were funded in this project in FY 1993. These programs have been restructured and are currently funded under separate projects in this program element (DL18 and DL15).

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

	Complete	Cost
(U) FY 1993 Accomplishments:		
• (U) Continued GBCS/AQF Integration effort	4Q93	36819
• Exercised RDT&E Option for GBCS-L E&MD systems	1Q93	
• Conducted Critical Design Review (CDR)	1Q93	
• Delivered last two EH-60A Platforms for integration	2Q93	
• Delivered last two EFVS Platforms to integration contractor	3Q93	
• Delivered 3 GBCS-L platforms for integration	3Q93	
• (U) Completed CHALS-X prototype subsystems and delivered for integration	2Q93	6749
• (U) Completed TACJAM-A ESM subsystems and delivered for integration	3Q93	7929
• (U) Conducted Critical Design Review for TACJAM-A ECM E&MD and slow completion of EMD	4Q93	8537
(U) SHORTSTOP Accomplishments:		
• (U) Proponency assigned to US Army Infantry School	1Q93	N/A
• (U) Operation Requirements Document (ORD) released for staffing	4Q93	14
• (U) Cost and Operational Effectiveness Analysis conducted by TRADOC Requirements and Analysis Center-White Sands Missile Range with support from the PM	4Q93	195
• (U) Engineering Change Package (ECP) awarded to incorporate multiband capability	3Q93	2745
• (U) ECP awarded for Mutual Interference and Category 2 Risk Reduction	3Q93	325
(U) ARAT Accomplishments:		
• (U) Established and activated Local Area Network for the ARAT node at Missiles Command (MICOM), Redstone Arsenal, AL.	2Q93	260
• (U) Developed approaches to establishing the Long Term Technology for rapid reprogramming of Army Target Sensing systems.	1Q93	320
• (U) Developed ARAT and Target Sensing Systems (TSS) Software Reprogramming Training course.	4Q93	200
• (U) Researched and identified the reprogramming requirements for ADA, IEW, and Fire Support systems.	4Q93	200

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604270A | **Project Number: DL12**
PE Title: Electronic Warfare Development | **Budget Activity: #5**

• (U) Researched and identified the reprogramming requirements for ADA, IEW, and Fire Support systems.	4Q93	200
• (U) Developed plans for establishing Secure Wide Area Network (WAN) among the critical ARAT nodes.	3Q93	150
• (U) Initiated study of Joint Service communication and transmission path for distribution of threat data.	3Q93	160
• (U) Developed Army requirements for Electronic Warfare Integrated Reprogramming Database (EWIRDB) submission.	3Q94	110
TOTAL		64,713

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Resume TACJAM-A ECM subsystem E&MD program	2Q94	22500
• (U) Continue GBCS/AQF Integration effort	4Q94	16440
◦ Conduct GBCS-L Special In-Process Review (SIPR)	3Q94	
◦ Begin development and operational test (DT/OT) on GBCS-L/H and AQF	4Q94	
• (U)		
• (U) Complete development of TACJAM-A ESM E&MD subsystems	3Q94	2080
TOTAL		44460

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Continue TACJAM-A ECM development	4Q95	22618
• (U) Continue GBCS/AQF Integration effort	4Q95	21638
◦ Conduct E&MD on Block II operational capabilities expansion for GBCS-L/GBCS-H and AQF which could not be accommodated in the baseline system due to funding constraints:	4Q95	
· Additional Embedded Training · Quickfire Correctivity		
· Maintenance/Operator Trainer · Paperless Tech Manuals/CD-ROM		
· Multipath Effects Reduction · Onboard ELINT/COMINT Real time correlation		
· Co-Channel Interference Reduction · Airborne VHF/UHF Single platform target development		
◦ Field RDT&E Models of GBCS-L E&MD Systems to XVIII Airborne Corps	2Q95	
◦ Complete Developmental Test/Operational Test (DT/OT) on GBCS/AQF	2Q95	
◦ Begin integration of TACJAM-A ECM into GBCS/AQF	4Q95	
• (U) Conduct Milestone III	4Q95	87
• (U)		
TOTAL		47338

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604270A
PE Title: Electronic Warfare Development

Project Number: DL12
Budget Activity: #5

D. (U) WORK PERFORMED BY: Program Executive Officer Intelligence and Electronic Warfare and Project Manager Signals Warfare (PM SW), Vint Hill Farms Station, Warrenton, VA. Collocated with PEOIEW and PM SW and providing significant support are two Communication-Electronics Command activities, CECOM Intelligence & Electronics Warfare Directorate (IEWD) providing engineering, technical, and contract management support and CECOM Intelligence Materiel Management Center (CIMMC) providing logistics support. Support contractors are Quest/ERI, McLean, VA and Vitro, Silver Springs, MD. Major contractors are AEL, Lansdale, PA; Sanders, Nashua, NH; Magnavox, Fort Wayne, IN; IBM, Owego, NY; FMC, San Jose, CA; and Electrospace Systems, Inc., Richardson, TX.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. TECHNICAL CHANGES:
- (U) TACJAM-A ECM FOT&E rescheduled for FY96.

2. SCHEDULE CHANGES:
- (U) Resume development of TACJAM-A ECM in FY95 leading to production start in FY97.
- (U) Expedite initiation of Block II IEWCS upgrades from FY97 to FY96:
  - TROJAN interface (remote collection)
  - Training devices (maintenance and operator)
  - Embedded training
  - Reduction of multipath effects
  - Connectivity with AN/PRD-12

3. (U) COST CHANGES: Total cost of Block I and Block II improvements reduced due to resumption of previous program.

F. (U) PROGRAM DOCUMENTATION:

TACJAM-A Required Operational Capabilities (ROC)	07/86
82d Airborne Division Operational Needs Statement (ONS)	07/88
IEW GBCS ROC	10/90
Advanced QUICKFIX Materiel Change	09/91
Advanced QUICKFIX ORD	12/92

G. (U) RELATED ACTIVITIES:

1. (U) Coordination between services is accomplished by the exchange of technical reports, attendance at scientific meetings and conferences, and joint participation in subgroups and working panels of the Technical Co-operation Program of the Joint Logistics Commanders Organization. Coordination of classified programs is accomplished as part of the program reviews conducted by the Joint Requirements Oversight Council. There is no unnecessary duplication of effort within the Army or DoD.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604270A
PE Title: Electronic Warfare Development

Project Number: DL12
Budget Activity: #5

2. (U) This is a multi-service development effort. The United Stated Marine Corps is utilizing the common sensor subsystems and configuring them in their Light Armored Vehicle as a part of their Mobile Electronic Warfare Support System (MEWSS).

- Program Element #0604770A (JOINT STARS)
- Program Element #0603743F (Electronic Combat Technology)
- Program Element #0603718F (Electronic Warfare Technology)
- Program Element #0205764N (Electronic Warfare Countermeasures Response)
- Program Element #06037497N (Surface Electromagnetic and Optical Systems)
- Program Element #0305885G (Tactical Cryptologic Program)

H. (U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Procurement							
APA (SSN AZ2000)	92,542	111,300	26,938	34,680	46,311	35,206	42,985
OPA (SSN BZ7326)	0	0	58,826	59,250	74,893	75,505	29,525
OPA (SSN BZ9752)	14,610	6,629	10,626	14,983	15,345	0	0
APA (SSN AB3000)	391	490	39,164	31,341	41,872	42,384	54,408

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. (U) MILESTONE SCHEDULE:

Milestones	Dates
Started TACJAM-A E&MD ESM prototype effort	07/89
Awarded Integration Contract	09/91
Delivered first EH-60A platform to integration Contractor (AQF)	11/91
Delivered first EFVS to integration Contractor (GBCS-H)	02/92
Exercised Option for EFVS Production Contract	03/92
Delivered first ESM E&MD Prototype to integration Contractor	06/92
Conducted Preliminary Design Review (PDR)	06/92

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604270A
PE Title: Electronic Warfare Development

Project Number: DL12
Budget Activity: #5

Exercised Option for GBCS-L/E&MD	11/92
Conducted Critical Design Review (CDR)	11/92
Delivered first GBCS-L prototype platform to integration Contractor	07/92
Delivered three GBCS-L platforms to integration Contractor	11/92
Delivered CHALS-X prototype subsystem to integration Contractor	03/93
Delivered last two EH-60A platforms to integration Contractor (AQF)	03/93
Began delivery of TACJAM-A ESM subsystems for integration	06/93
Deliver 2nd ESM E&MD Prototype in place	09/93
Continue TACJAM-A ECM subsystem E&MD program	11/93
Conduct Special In-Process Review on GBCS-L	06/94
Begin DT/OT on GBCS/AQF	09/94
Continue TACJAM-A ECM subsystem	10/94
Award contracts for procurement of IEW Common Sensor subsystems for GBCS-L ONS	10/94
Award contract for Advanced QUICKFIX engine upgrade	10/94
Complete DT/OT on GBCS/AQF	03/95
Field RDT&E models of GBCS-L to XVIII Airborne Corps	03/95
Milestone III on GBCS and AQF	07/95
Selection Decision on GBCS/AQF integration contract award	07/95
Award contract for GBCS/AQF system integration	11/95
Initiate E&MD Block I improvements	10/96

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604270A**
PE Title: **Electronic Warfare Development**

Project Number: **#D665**
Budget Activity: **#5**

A. (U) RESOURCES: ($ in Thousands)
Project Title: Aircraft Survivability Equipment

Popular Name	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D665 Aircraft Survivability Equipment (ASE) Development									
	28886	35215	32722	40045	39951	25751	12004	Cont	Cont

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Provides for the development and system integration of Aircraft Survivability Equipment (ASE) to achieve survivability, reduce vulnerability, and enhance combat effectiveness required to fulfill Special Electronic Mission Aircraft (SEMA), attack/scout, and assault/cargo mission requirements. Equipment developed will increase combat effectiveness and potential for mission accomplishment by reducing or eliminating the ability of threat air defense systems to detect, hit, damage, or destroy Army aircraft. Developments respond to the approved requirements documents, test, and type classification for production and fielding of ASE systems to address infrared, radar, laser, and optical/electro-optical directed air defense threats. Projects in development include new or upgraded systems to counter monopulse, millimeter wave, frequency agile, pulse doppler, and continuous wave radars; passive infrared missile seekers; and laser directed weapon systems. Continual adjustments are made to this program to meet the changing and evolutionary nature of technology and threat. This program has Joint Service applications that are coordinated through the Joint Technical Coordinating Group for Aircraft Survivability (JTCG/AS), as well as NATO applications coordinated through OSD. This program element also provides the technical base for electronic equipment for Comanche and Special Operations Aircraft.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Continued engineering and manufacturing development (EMD) of AN/APR-39A(XE-2) Radar Signal Detecting Set (RSDS)	3Q95	394
• (U) Continued EMD of AN/APR-48A Radar Frequency Interferometer (RFI)	1Q94	1759
• (U) Continued DEM/VAL of the Advanced Threat Infrared Countermeasure (ATIRCM)	1Q95	7259
• (U) Continued DEM/VAL of the Advanced Threat Radar Jammer (ATRJ)	3Q94	7530
• (U) Continued DEM/VAL of Tri-Service application IR Expendable Decoy for IR threat missiles	2Q95	3115
• (U) Completed EMD of ASET IV ASE Training Device	4Q93	1242
• (U) Initiated development of Passive IR features for reduction of aircraft signature in all IR bands	3Q96	500

relative to heat seeking missiles		
• (U) Continued integration efforts of ASE systems for most effective use of countermeasures	4Q93	738
• (U) Continued Radar Frequency/Infrared effectiveness updates to ATIRCM and ATRJ	4Q93	2482
• (U) Continued in-house program management administration	4Q93	3867
Total		**28886**
(U) FY 1994 Planned Program:		
• (U) Continue DEM/VAL of ATIRCM and IR Expendables	1Q95	8989
• (U) Continue DEM/VAL of IR Expendables	2Q95	3200
• (U) Complete DEM/VAL and initiate EMD of the ATRJ	4Q97	10000
• (U) Continue EMD of the AN/APR-39A(XE-2) RSDS	3Q95	735
• (U) Complete EMD of AN/APR-48A RFI	1Q94	500
• (U) Continue integration efforts of ASE systems	4Q94	450
• (U) Continue development of Passive IR features for reduction of aircraft signature in all IR bands relative to heat seeking missiles	3Q96	4200
• (U) Continue effectiveness evaluations and rapid software reprogramming	4Q94	3461
• (U) Continue in-house program management administration	4Q94	3680
Total		**35215**
(U) FY 1995 Planned Program:		
• (U) Initiate EMD of ATIRCM	2Q95	7100
• (U) Initiate EMD of the IR Expendables	3Q95	3405
• (U) Initiate EMD of the ATRJ	4Q97	11796
• (U) Complete development of the AN/APR-39A (XE-2) RSDS	3Q95	100
• (U) Continue development of Passive IR features for reduction of aircraft signature in all IR bands relative to heat seeking missiles	3Q96	3285
• (U) Continue effectiveness evaluations and rapid software reprogramming	4Q95	1957
• (U) Continue integration efforts of ASE systems	4Q95	400
• (U) Provide in-house and program management administration	4Q95	4679
Total		**32722**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604270A
PE Title: Electronic Warfare Development

Project Number: #D665
Budget Activity: #5

D. (U) WORK PERFORMED BY: In-house developers are: U.S. Army Aviation and Troop Command (ATCOM), St. Louis, MO; U.S. Army Laboratory Command (LABCOM), Adelphi, MD; Electronic Warfare Reconnaissance Surveillance Target Acquisition (EW/RSTA) Center, Fort Monmouth, NJ; U.S. Army Armament Munitions and Chemical Command (AMCCOM), Dover, NJ; Aviation Applied Technology Laboratory, Fort Eustis, VA; Vulnerability Analysis Laboratory, White Sands Missile Range, NM; U.S. Army Missile Command (MICOM), Huntsville, AL; Contractors are: ITT Avionics Corp., Nutley, NJ; Litton Systems, San Jose, CA; Lockheed Sanders, Nashua, NH; IBM, Owego, NY; Sierra Technologies, Buffalo NY; TRACOR Aerospace, Austin, TX; Thiokol Corp, Brigham City, UT; AEL, Lansdale, PA; SAIC, Albuquerque, NM; CAS, Huntsville, AL.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** None
2. **SCHEDULE CHANGES:** None
3. **COST CHANGES:** None

F. (U) PROGRAM DOCUMENTATION:

Required Operational Capability (ROC), Dec 84
Integrated Infrared Countermeasures Suite Operational and Organizational Plan, Aug 91

G. (U) RELATED ACTIVITIES:

There is no unnecessary duplication of effort within the Army or DoD.

- Program Element #0604270N
- Program Element #0604270F
- Program Element #1160404BB

Directional Infrared Countermeasures (DIRCM) is a USSOCOM program for providing urgent near term protection to C-130 aircraft while reducing technical risk, maximizing competition and minimizing duplication of efforts and expenditures. The major difference between ATIRCM and DIRCM is that ATIRCM is lighter, and requires less space and power than its UK counterpart (DIRCM) and meets all US Army mission requirements.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604270A**
PE Title: **Electronic Warfare Development**

Project Number: **#D665**
Budget Activity: **#5**

H. (U) OTHER APPROPRIATION FUNDS:

	($ in Thousands)						
Appropriation	**FY 1993 Actual**	**FY 1994 Estimate**	**FY 1995 Estimate**	**FY 1996 Estimate**	**FY 1997 Estimate**	**FY 1998 Estimate**	**FY 1999 Estimate**
Aircraft Procurement, Army (AZ3504) ASE	37710	37559	29538	1013	1557	15138	13072
(AA0720) ASE Modifications	4726	4180	8171	5741	5481	4938	2116

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. (U) MILESTONE SCHEDULE: Not Applicable

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604315A
PE Title: Tri-Service Standoff Attack Missile (TSSAM)
Project Title: Tri-Service Standoff Attack Missile

Project Number: DF08
Budget Activity: #5

PICTURE CAN NOT BE RELEASED (CLASSIFIED).

POPULAR NAME: **Tri-Service Standoff Attack Missile (TSSAM)**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604315A
PE Title: Tri-Service Standoff Attack Missile (TSSAM)
Project Title: Tri-Service Standoff Attack Missile

Project Number: DF08
Budget Activity: #5

A. (U) SCHEDULE/BUDGET INFORMATION: ($ In Thousands)

SCHEDULE	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	TO COMPLETE
Program Milestones	TEMP to OSD DAB IPR	Initiate Withdrawal/ Termination Activities	Continue Withdrawal/ Termination Activities	Complete Withdrawal/ Termination Activities				
Engineering Milestones	PDR ESAD CDR MCU Start MPS Activities PDR MDS PDR ECRA							
T&E Milestones	Continued BTV Flt Test Series	Conduct BTV-7 Flight Test						
Contract Milestones		Complete BTV Test Series						
BUDGET ($000)	*FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	Proram Total (To Complete)
Major Contract		27225	76098	1535	0	0	0	712546 (0)
Support Contract								
In-House Support		9267	4274	0	0	0	0	68527 (0)
GFE/ Other		6690	2086	6665	0	0	0	134088 (0)
TOTAL		43182	82458	8200	0	0	0	915161 (0)

* This data remains CLASSIFIED and cannot be provided under this cover.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604315A
PE Title: Tri-Service Standoff Attack Missile (TSSAM)
Project Title: Tri-Service Standoff Attack Missile

Project Number: DF08
Budget Activity: #5

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENTS AND SYSTEM CAPABILITIES: The Army's Modernization Vision for the future, in order to achieve Land Force dominance, requires in part lethal and survivable missile systems that can project and sustain the force, protect the force, and conduct precision strikes.

TSSAM is a joint program with the Air Force as the executive service. The program was congressionally directed for the development of a large cruise missile to meet the requirements of all three services. The program objective is to develop a family of affordable, highly survivable, conventional, stealthy cruise missiles which will satisfy tri-service requirements to effectively engage a variety of high-value land and sea targets. The technical approach is to develop a stealthy modular cruise missile which meets service peculiar requirements and can carry several payloads to engage the required targets. This approach emphasizes commonality and producibility to reduce costs. The Army variant is the Brilliant Antiarmor Submunition (BAT) and will be launched from the MLRS M270 Launcher.

The FY94 Authorization and Appropriation Congressional Language directs the Army to terminate its participation in the Tri-Service Standoff Attack Missile (TSSAM) program. Based on this direction, and limited funding, the Army with OSD concurrence is immediately beginning an orderly program withdrawal at minimum expense. The Army Tactical Missile System (ATACMS) will become the BAT submunition carrier.

The Air Force will issue a partial Termination for Convenience (T for C) to the prime contractor Northrop Aircraft Division, Hawthorne, CA, to terminate the Army effort. The Army will also issue T for Cs to the integration contractor Loral Vought Systems Corporation, Dallas, TX and support contractor CAS, Inc., Huntsville, AL.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

	Complete	Cost
(U) FY 1993 Accomplisments Program:		
• (U) Conduct Boost Flight Test		
BTV-5	2Q93	CLASSIFIED
BTV-6	3Q93	CLASSIFIED
• (U) Completed formal qualification testing on the TSSAM/M270 Launcher Software	4Q93	
• (U) Continued the EMD contract	4Q93	

637.2

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604315A
PE Title: Tri-Service Standoff Attack Missile (TSSAM)
Project Title: Tri-Service Standoff Attack Missile

Project Number: DF08
Budget Activity: #5

	Complete	Cost
(U) FY 1994 Planned Program:		
• (U) Fund EMD activities thru Jan 94 and Conduct Boost Test Vehicle (BTV-7) Flight Test	2Q94	15000
• (U) Begin Withdrawal/Termination Activities	Ongoing	28182
(U) FY 1995 Planned Program:		
• (U) Receive and Review Contracts Termination Proposal	4Q96	82458
• (U) Negotiate Withdrawal/Termination Costs		
• (U) Fund Negotiated Withdrawal/Termination Costs		
(U) Program Plan to Completion:		
• (U) Complete Withdrawal/Termination Activities	4Q96	8200

D. (U) WORK PERFORMED BY: Northrop Aircraft Division is the prime contractor responsible for total system performance. Loral Vought Systems (LVS) Corporation is the Multiple Launch Rocket System (MLRS) M270 launcher integration contractor.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** Not applicable. Program terminated.

2. **(U) SCHEDULE CHANGES:** BTV-7 flight test was delayed until 2Q94 due to actuator problems.

3. **(U) COST CHANGES:** ($ 000) Adjustment to FY94-FY96 dollars reflect Army withdrawal/termination costs.

F. (U) PROGRAM DOCUMENTATION: TAS SOC 3/87; SAC SOC 12/86; TAC SON 307-87 6/87; SAC SON 18-82 1/84, (with Rev. 1 8/87) TACMS Update 6/84; PMD 3/92; Army ROC 12/84, Approved 2/85; APB 11/92; TEMP 10/93 (Pending OSD staffing)

G. (U) RELATED ACTIVITIES: Not applicable. Program terminated.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604315A
PE Title: Tri-Service Standoff Attack Missile (TSSAM)
Project Title: Tri-Service Standoff Attack Missile

Project Number: DF08
Budget Activity: #5

H. (U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation	FY 93 Actual	FY 94 Estimate	FY 95 Estimate	FY 96 Estimate	FY 97 Estimate	FY 98 Estimate	FY 99 Estimate
Procurement	0	0	0	0	0	0	0
Military Construction	0	0	0	0	0	0	0

I.(U)INTERNATIONAL COOPERATIVE AGREEMENTS: None

J.(U)TEST AND EVALUATION DATA:

Not applicable - This program is in termination/withdrawal phase.

637.4

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604321 (TIARA)
PE Title: All Source Analysis System (ASAS) Budget Activity: #5

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DB19 ASAS Evolutionary Acquisition	51355	4471	39895	56978	46421	25376	21118	100800	1397800
D2FT ASAS Operational Test	0	0	2996	0	0	0	0	0	2996
PE TOTAL	51355	4471	42891	56978	46421	25376	21118	100800	1400796

B. (U) BRIEF DESCRIPTION OF ELEMENT: Project DB19 funds the ASAS Block II/III Evolutionary Acquisition. The ASAS is a ground based, mobile, command and control, and intelligence processing system. The ASAS system provides automated support to the combat commander in the areas of intelligence and collection management, all-source target and situation analysis, single and multi-source processing, intelligence reporting, electronic warfare, and operational security, as well as automation support to battlefield commander's command and control. Project D2FT finances the direct costs of planning and conducting operational testing and evaluation of the All Source Analysis System (ASAS) by the Operational Test and Evaluation Command (OPTEC).

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:

(U) Project D2FT - ASAS Operational Test: Project D2FT finances the direct costs of planning and conducting operational testing and evaluation of the All Source Analysis System (ASAS) by the Operational Test and Evaluation Command (OPTEC). The ASAS is an Acquisition Category (ACAT) I system with an Initial Operational Test and Evaluation (IOTE) II in FY94 to support other Army Tactical Command and Control Systems (ATCCS) IOTEs, to include the Advanced Field Artillery Tactical Data System (AFATDS) and the Combat Service Support Control System (CSSCS). The AFATDS and CSSCS IOTEs are in support of Milestone III full production decisions. ASAS Block II has a Limited Users Test (LUT) in FY95 in support of an In-Progress Review (IPR) as part of the system's Evolutionary Acquisition (EA) approach. In FY95, funding for operational testing of Acquisition Category (ACAT) I systems is programed with the PE funding development for each system. Future fiscal years will be reprogrammed when system information becomes available.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Not applicable	N/A	0

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604321 (TIARA)
PE Title: All Source Analysis System (ASAS)

Budget Activity: #5

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Not applicable.	N/A	0

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Conduct ASAS BLOCK I IOTE	1Q95	203
• (U) Conduct ASAS BLOCK II LUT	1Q96	2793
TOTAL		2996

(U) **Work Performed By:** A majority of Project D2FT work is performed by Test and Evaluation Directorates of the Operational Test and Evaluation Command (OPTEC) from Alexandria, VA, Fort Hood, TX, and Fort Huachuca, AZ. Work is also performed by the Electronic Proving Grounds (EPG), Fort Huachuca, AZ. All organizations are staffed by military and civilian government personnel. Contractors expected to perform work for this project include: BDM International Inc., McLean, VA; Applied Research Laboratory, Austin, TX; Test and Experimentation Services Company, Albuquerque, NM; Computer Science Corporation, San Diego, CA; Computer Data Systems Inc., Fort Worth, TX.

(U) **Related Activities:** Project D2FT is reprogrammed from PE 0605712, Project D001. There is no unnecessary duplication of effort within the Army or DoD. The Army staff monitors all tests for material development and activities to avoid duplication of effort. The Deputy Director of Defense Research and Engineering (Test and Evaluation), and Director of Operational Test and Evaluation, Office of the Secretary of Defense, also review planned testing and development of support equipment to ensure integration of testing by the services and to avoid duplicative testing. High-level staff management of resources for user testing is provided by the U.S. Army Test Schedule and Review Committee which is chaired by OPTEC. Unnecessary duplication of like items is prevented by coordination with Program Manager, Instrumentation, Targets and Threat Simulators (PM-ITTS), the Operational Test and Evaluation Coordinating Council, review by the Army Test and Evaluation Committee and by coordination with the Test Scheduling and Review Committee.

(U) **Other Appropriation Funds:** ($ in Thousands) Not applicable.

(U) **International Cooperative Agreements:** Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604321A (TIARA)
PE Title: All Source Analysis System (ASAS)
Project Title: ASAS Evolutionary Acquisition

Project #: DB19
Budget Activity: #5



POPULAR NAME: ASAS

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604321A (TIARA)
PE Title: All Source Analysis System (ASAS)
Project Title: ASAS Evolutionary Acquisition

Project #: DB19
Budget Activity: #5

A. (U) SCHEDULE/BUDGET INFORMATION: ($ In Thousands)

SCHEDULE	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	To Complete
Program Milestones	ASARC BL-I 4Q93	BL-I FUE & Initial Command Release 1Q94 PAPER DAB BL-II 4Q93					Milestone II 3Q99	Continuing
Engineering Milestones	Del V2.1 S/W BL-I (3Q93)			PDR 2Q96; CDR 4Q96				Continuing
T&E Milestones	Tech Test (2Q93) Ops Demo (3Q93)	IOT&E II BL-I 4Q94				PPQT 2Q98 IOT&E 4Q98		Continuing
Contract Milestones	S/W transition to CECOM 3Q93	Contract Award BL-II 1Q94	BL-I Transition to CECOM 2Q95					Continuing
BUDGET ($000)	**FY 1993**	**FY 1994**	**FY 1995**	**FY 1996**	**FY 1997**	**FY 1998**	**FY 1999**	**Program Total (To Complete)**
Major Contract	24032 (includes 17500 C/O)	971*	31000	34974	32902	14676	10216	657000 (47376)
Support Contract	11873	–	6000	5500	5700	4500	4600	307500 (22176)
In-House Support	9235	–	–	5700	6800	5300	4800	321500 (23184)
GFE/ Other	6215	3500	2895	10804	1019	900	1502	111800 (8064)
Total	51355	4471	39895	56978	46421	25376	21118	1397800 (100800)

* $17.5M FY93 carryover (planned and pre-approved) will augment these funds to support FY94 effort.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604321A (TIARA) Project #: DB19
PE Title: All Source Analysis System (ASAS) Budget Activity: #5
Project Title: ASAS Evolutionary Acquisition

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project funds the Army's only tactical intelligence fusion project, the ASAS Block II/III Evolutionary Acquisition. The successful execution of military operations requires a flexible and modular intelligence and targeting system that will provide tactical commanders a common view of the battlefield and a means for gaining a timely and comprehensive understanding of enemy force deployments, capabilities, and potential courses of action. The ASAS is a ground based, mobile, command and control, and intelligence processing system. The ASAS system provides automated support to the combat commander in the areas of intelligence and collection management, all-source target and situation analysis, single and multi-source processing, intelligence reporting, electronic warfare, and operational security, as well as automation support to battlefield commander's command and control. The ASAS Block II development program will build upon and expand the capabilities/functionalities developed and produced in the ASAS Block I System including conversion to the Army Command and Control System (ACCS) Common Hardware/Software Open Architecture. Additional software capabilities include enhanced intelligence and command and control functionality, jump and degraded mode operations, enhanced communications, and improved reliability and supportability. The Block II strategy maximizes the use of Government Furnished Equipment (GFE), government and commercial Non-Developmental Item (NDI) software, reuse of proven Office of Secretary of Defense (OSD) and ACCS Command, Control, Communications and Intelligence (C3I) software, multiple prototype deliveries and continuous user test and evaluation opportunities. This strategy provides early user capabilities and streamlines acquisition. Building upon experience and feedback gained from the field with Block I and other tactical fusion prototypes, the Block II System will undergo a Defense Acquisition Board (DAB) Milestone III review in FY99. The Army's intent is to keep Block I technology as current as possible by initiating value engineering/technology insertion to position ASAS Block I Systems to receive Block II products, and by packaging some of the Block II advances into capability packages and inserting them into Block I. Twenty-eight Block II ASAS systems will be fielded to Army active and reserve armored cavalry regiments, separate brigades, divisions, corps, and echelons-above corps.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Completed Pre-Production prove-out Qualification Testing (PPQT) for Initial Operational Test and Evaluation (IOT&E) system	2Q93	250
• (U) Conducted IOT&E using Version 2.0 software	4Q93	500
• (U) Conducted Phase Zero Prototyping	4Q93	3879
• (U) Completed Block I Army Systemd Acquisition Review Council (ASARC)	4Q93	500
• (U) Continued Development and Transition of V2 Software	3Q93	6532
• (U) Provided Government Furnished Equipment (GFE)/Other	4Q93	6215
• (U) Continued Software Development	4Q93	15979
• (U) Approved Planned Carryover to Fund FY94 Efforts		17500
TOTAL		51355

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604321A (TIARA)
PE Title: All Source Analysis System (ASAS)
Project Title: ASAS Evolutionary Acquisition

Project #: DB19
Budget Activity: #5

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Block II Contract Award and begin Block II Development (13000) (FY93 C/O)	1Q94	
• (U) Provide Phase Zero Prototype to Block II Contractor (225) (FY93 C/O)	2Q94	
• (U) Provide GFE to Block II Contractor (3000) (FY93 C/O)	3Q94	
• (U) Continue Single Source Processor-SIGINT (SSP-S) Effort	4Q94	3500
• (U) Joint Prototyping (2246, FY93 C/0)	4Q94	971
TOTAL		4471

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Continue Block II Engineering & Manufacturing Development	4Q95	36250
• (U) GFE to Block II Contractor	4Q95	2895
• (U) Testing	4Q95	750
TOTAL		39895

(U) Program Plan to Completion:	
• (U) Continue software development to completion	1Q00

D. (U) WORK PERFORMED BY: The Project Manager, ASAS, McLean, VA. Contract awarded to Martin Marietta Corporation.

E. (U) COMPARISON WITH FY 1994 BUDGET REQUEST:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: None.
3. (U) COST CHANGES: Congressional plus up of $3.5M in FY94 is for SSP-S effort.

F. PROGRAM DOCUMENTATION:

Acquisition Strategy Approved	12/91
Block I Acquisition Program Baseline Approved	12/91
ORD Approved by DA	08/93
Block II Acquisition Program Baseline Approved	10/93
Integrated Support Plan Approved	07/93
Test and Evaluation Master Plan (TEMP) Approved	09/93

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604321A (TIARA)
PE Title: All Source Analysis System (ASAS)
Project Title: ASAS Evolutionary Acquisition

Project #: DB19
Budget Activity: #5

G. (U) RELATED ACTIVITIES:

PE #0603745A, Tactical Electronic Support Systems
PE #0604716A, Terrain Information Engineering Development
PE #0604726A, Meteorological Equipment and Systems

There is no unnecessary duplication of effort within Army or DoD.

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Other Procurement Army (OPA 2)							
K28801	51008	29526	28247	6052	3044	5305	40771

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) TEST AND EVALUATION DATA:

All Source Analysis System (ASAS) test and evaluation will be an iterative process to support an evolutionary acquisition strategy. The government is conducting both technical and operational testing on each major development block. Development Test and Evaluation (DT&E) for the Data Processing System (DPS) and the Communication Control System (CCS) as well as operational test and evaluation field trials took place at Ft. Hood in December 1986. Force Development Test and Experimentation (FDTE) of the limited capability configuration (LCC) occurred in early FY 1990. ASAS Block I Preproduction Qualification Test (PPQT) for the Tactical Operation Center Support Element (TSE) was conducted 27 January to 19 April 1992. The PPQT for the Technical Control and Analysis Element (TCAE) was conducted 28 April through 2 July 1992. The purposes of the PPQT were: (1) to reduce performance risk by comprehensively addressing the technical issues necessary to support a materiel release and (2) to validate the exit criteria used to authorize the initiation of operational testing. The PPQT evaluated the functionality provided, logistic supportability, continuity of operations, Safety/Health Hazards, Training and Interoperability. All tests and data collection objectives were met which allowed ASAS Block I to proceed to IOT&E.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604321A (TIARA)
PE Title: All Source Analysis System (ASAS)
Project Title: ASAS Evolutionary Acquisition

Project #: DB19
Budget Activity: #5

An ASAS Block I IOT&E was conducted at Ft. Hood, 8 September through 11 October 1992, to assess the operational suitability and effectiveness of the ASAS Block I system and to support a Materiel Release decision in FY 93. Hardware tested included processors and communications equipment that had been upgraded since FDT&E. All test and data collection objectives were met for IOT&E. However, the test evaluation report released in January 1993 revealed training, and doctrine, tactics, techniques, and procedures (DTT&P) difficulties that must be addressed as the Intelligence and Electronic Warfare (IEW) mission area is automated. To this end, a Technical Test was conducted 1 Mar-2 Apr 1993, with an Operational Demonstration being held 27-30 Apr 93. As a result, the Army Materiel Systems Analysis Agency (AMSAA) stated that an adequate technical baseline now exists to justify both Block I TC-LP and Block II development. Conclusions of the operational evaluation stated that ASAS has demonstrated significant potential to be both operationally effective and suitable. IOT&E II is scheduled for July-September 1994.

The evolutionary acquisition of Block II and conversion to Army Tactical Command and Control System (ATCCS) Common Hardware/Software (CHS) culminates in a Block II IOT&E in FY98. Prior to the Block II IOT&E and its transition, several Early Operational Assessments (EOA) will be made by Operational Test and Evaluation Command (OPTEC) to determine the lessons learned from the Block I fieldings and to assess the status of the Block II development effort. The delivery of phased prototypes and capability packages provides: opportunity for user interaction and feedback; valuable early assessments of the software architecture; and identification of design issues relative to the Block II system.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604604A **Budget Activity: #5**
PE Title: Medium Tactical Vehicles

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DH07 Family of Medium Tactical Vehicles (FMTV)	745	3697	6541	1821	1785	1771	1755	CONT	CONT
DH08 Medium Truck Service Life Extension Program (SLEP)	2774	2851	0	0	0	0	0	0	17568
PE TOTAL	3519	6548	6541	1821	1785	1771	1755	CONT	CONT

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program supports the modernization of the Army's medium truck fleet. The Family of Medium Tactical Vehicles (FMTV) consists of two variants, the Light Medium Tactical Vehicle (LMTV), 2 1/2 ton payload capacity (4x4) vehicle and the Medium Tactical Vehicle (MTV), 5 ton payload capacity (6x6) vehicle. Models currently under development include the expansible van, tanker and companion trailers. The SLEP program upgrades a portion of the Army's overaged and maintenance intensive inventory of medium tactical wheeled vehicles with state-of-the-art components and safety enhancements. The SLEP program is a part of the overall truck modernization strategy to reduce operational and support (O&S) costs and improve the operational capability of the Army's truck fleet.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:

(U) Project DH08 - Service Life Extension Program (SLEP): The SLEP program will upgrade selected medium truck assets through the addition of current technology powertrain components.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Completed prototype testing	4Q93	310
• (U) Developed/Procured TDP	4Q93	2464

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604604A **Budget Activity: #5**
PE Title: Medium Tactical Vehicles

	Complete	Cost
(U) FY 1994 Planned Program:		
• (U) Develop/Procure TDP	4Q94	1351
• (U) Engineering Testing of Technology Insertion	4Q94	1500

(U) FY 1995 Planned Program: Project not funded.

(U) Work Performed By: In-house efforts will be accomplished by Program Executive Officer for Combat Support and the U.S. Army Tank-Automotive Command, both located in Warren, Michigan. The SLEP contractor is AM General, Livonia, Michigan.

(U) Related Activities: There is no unnecessary duplication of effort within the Army or the Department of Defense.

(U) Other Appropriation Funds:

($ in Thousands)

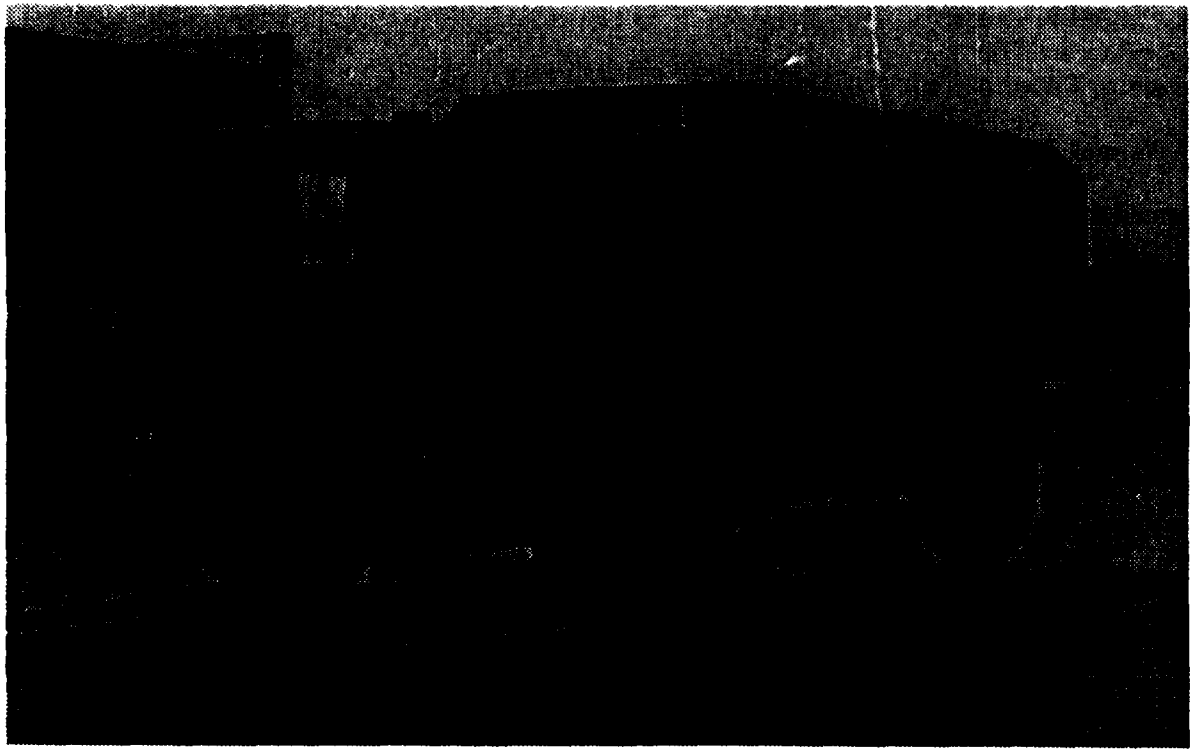
Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Other Procurement, Army (OPA 1)							
ESP (BLIN 9) (DV0008)	0	17615	0	0	0	0	0

(U) International Cooperative Agreements: None

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604604A
PE Title: Medium Tactical Vehicles
Project Title: Family of Medium Tactical Vehicles (FMTV)

Project Number DH07
Budget Activity: #5



POPULAR NAME: FMTV

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604604A
PE Title: Medium Tactical Vehicles
Project Title: Family of Medium Tactical Vehicles (FMTV)

Project Number DH07
Budget Activity: #5

A. (U) SCHEDULE/BUDGET INFORMATION: ($ In Thousands)

SCHEDULE	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	To Complete
Program Milestones								
Engineering Milestones	DESIGN & REVIEW UPDATE	DESIGN & REVIEW UPDATE	DESIGN & REVIEW UPDATE	TDP REVISION	TDP REVISION	TDP REVISION	TDP REVISION	
T&E Milestones		APR - SEP 94 SPECIAL BODY DEV'L TEST						
Contract Milestones		APR 94 FIRST VEHICLE DELIVERY	APR 95 LEVEL III TECH DATA PACKAGE					
BUDGET ($000)	**FY 1993**	**FY 1994**	**FY 1995**	**FY 1996**	**FY 1997**	**FY 1998**	**FY 1999**	**Program Total (To Complete)**
Major Contract	745	3697	4500	1600	1600	500		
Support Contract								CONT
In-House Support			2041	221	185	1271	1755	
GFE/ Other								
Total	745	3697	6541	1821	1785	1771	1755	CONT

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604604A
PE Title: Medium Tactical Vehicles
Project Title: Family of Medium Tactical Vehicles (FMTV)

Project Number DH07
Budget Activity: #5

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The Family of Medium Tactical Vehicles (FMTV) consists of two variants, the Light Medium Tactical Vehicle (LMTV), 2 1/2 ton payload capacity (4x4) vehicle and the Medium Tactical Vehicle (MTV), 5 ton payload capacity (6x6) vehicle, plus companion trailer. The FMTV includes: cargo, van, tanker, wrecker, tractor and dump models. The SLEP program upgrades a portion of the Army's overaged and maintenance intensive inventory of medium tactical wheeled vehicles with state-of-the-art components and safety enhancements. This project supports the development of the FMTV tanker and expansible van models and companion trailers.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

	Complete	Cost
(U) FY 1993 Accomplishments:		
• (U) Designed and built Special Body Variant prototypes	745	4Q93
(U) FY 1994 Planned Program:		
• (U) Conduct prototype testing and develop Technical Data Package (TDP) for Special Body Variants	4Q94	3697
(U) FY 1995 Planned Program:		
• (U) Finalize and Validate TDP for Special Body Variants	2Q95	1000
• (U) Test and Evaluation	4Q95	1500
• (U) Update TDP for development of new/additional requirements and enhancements for second MYP	4Q95	4041

D. (U) WORK PERFORMED BY: In-house efforts will be accomplished by Program Executive Officer for Combat Support and the U.S. Army Tank-Automotive Command, both located in Warren, Michigan. FMTV Prime contractor is Stewart/Stevenson Services, Inc., Houston, Texas.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** None
2. **SCHEDULE CHANGES:** None
3. **COST CHANGES:** None

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604604A**
PE Title: **Medium Tactical Vehicles**
Project Title: **Family of Medium Tactical Vehicles (FMTV)**

Project Number **DH07**
Budget Activity: **#5**

F. (U) PROGRAM DOCUMENTATION:

Operational & Organizational Plan	9/84
Joint Service Operational Requirement	9/87
Acquisition Plan	1/88
Program Baseline	1/88
Decision Coordinating Paper	1/88
Test and Evaluation Master Plan	8/88

G. (U) RELATED ACTIVITIES: There is no unnecessary duplication of effort within the Army or the Department of Defense. Both the Air Force the Navy have purchased FMTV. There is a tri-service working group to ensure coordination among the services.

H. (U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Other Procurement Army (OPA1) FMTV (BLIN 5) (D15500)	255099	19500	382739	382834	309462	275108	397588

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. (U) TEST AND EVALUATION DATA: Special Body prototype testing begins in April 1994.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604609A
PE Title: Smoke, Obscurant and Target Defeating Systems - Engineering Development
Budget Activity: #5

A.(U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D200 Smoke/Obscurant Systems	14072	17096	3754	4001	5013	5031	5051	Cont	Cont

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element supports the conduct of Engineering and Manufacturing Development (EMD) in smoke and obscurant agents, munitions, and devices to improve the survivability of the combined arms force, complement combined weapons systems, and enhance force effectiveness and combat power. Funding supports the Motorized Dual Purpose Mechanical Smoke Generator, XM56, to provide large area visual, infrared (IR), and millimeter wavelength (MMW)-radar obscuration. The XM56, mounted on the High Mobility Multipurpose Wheeled Vehicle (HMMWV), will disseminate smoke on the move and from stationary positions to defeat enemy sensors and smart munitions. The mechanized version of the XM56 will be mounted on a M113A3 carrier and is designated the Generator, Smoke, Mechanized: XM58. The XM58 will equip smoke units in heavy units, providing upgrades in vehicle maneuverability and survivability. This project also supports the Combat Vehicle Defensive Obscuration System (CVDOS) to provide 360 degree multi-salvo IR and MMW screening from smart anti-tank guided missiles (ATGM) and top attack weapons. CVDOS consists of the XM6 Smoke Grenade Discharger and XM81 MMW/IR Smoke Grenades and interfaces with the Vehicle Integrated Defense System. Finally, the program funding will support the XM1101 Mechanized Smoke Obscurant Carrier to provide maneuver commanders a capability to screen larger areas in unfavorable wind conditions or threat locations. The XM1101, formerly the Large Area Mobile Projected Smoke System, will integrate a rocket launching system using XM264 Smoke Rockets with the XM56 smoke generator on a stretched M113A3 chassis.

C.(U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Completed hardware fabrication and initiated Pre-Production Qualification Testing on the XM56	4Q93	9531
• (U) Conducted PPQT for the XM6 Smoke Grenade Discharger	4Q93	820
• (U) Conducted Milestone III/Type Classification (TC) In-Process Review (IPR) of the XM6	4Q93	1654
• (U) Initiated Pre-Production Testing (PPT) of the XM81 MMW/IR Grenade	4Q93	1149
• (U) Systems engineering contract for XM81	4Q93	918

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604609A
PE Title: Smoke, Obscurant and Target Defeating Systems - Engineering Development Budget Activity: **#5**

Total		**14072**
(U) FY 1994 Planned Program:		
• (U) Complete PPQT and conduct Initial Operational Test and Evaluation (IOT&E) of the XM56	4Q94	5216
• (U) Conduct Milestone III/TC IPR for the XM56	4Q94	3220
• (U) Initiate PPQT for the XM81 MMW/IR Grenade	3Q94	2100
• (U) Initiate PPQT for the XM58	4Q94	4900
• (U) XM81 and XM56 systems engineering, XM1101 closure	4Q94	1660
Total		**17096**
(U) FY 1995 Planned Program		
• (U) Conduct Milestone III/TC IPR for the XM81 MMW/IR Grenade	4Q95	2504
• (U) Award XM56 production contract	4Q95	
• (U) Continue limited PPQT for XM58	4Q95	1250
Total		**3754**

(U) WORK PERFORMED BY: The Product Manager for Smoke/Obscurants, Aberdeen Proving Ground (APG), MD; U.S. Army Chemical and Biological Defense Command, APG, MD; Edgewood Research, Development and Engineering Center, APG, MD; U.S. Army Tank and Automotive Command, Warren, MI; U.S. Army Armament Research, Development, and Engineering Center, Picatinny, NJ; U.S. Army Test and Evaluation Command, APG, MD. Contractor: MRC, Inc., Hunt Valley, MD.

(U) RELATED ACTIVITIES: Program Elements #0602622A (Chemical, Smoke, and Equipment Defeating Technology) and #0603627A (Smoke, Obscurant and Target Defeating System-Advanced Development). In order to meet the other services' needs and to prevent unnecessary duplication of effort, coordination is maintained with other services through joint participation in Smoke and Aerosol Working Group of the Joint Technical Coordinating Group; joint participation and attendance at Smoke Weeks and Smoke/Obscurant symposia; personal contacts and joint distribution of relevant project reports. There is no unnecessary duplication of effort within the Army or DoD.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604609A
PE Title: Smoke, Obscurant and Target Defeating Systems - Engineering Development
Budget Activity: #5

(U) OTHER APPROPRIATION FUNDS:

	($ in Thousands)						
Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
OPA-3							
SSN M99103							
Gen Smk Mech/Mtrzd Dual Purpose XM56		4900	12500	12480	13101	13387	
SSN M99107							
Generator, Smoke, Mech. - XM1106				12782	12131	9761	

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604611A
PE Title: JAVELIN (AAWS-M)
Project Title: JAVELIN (AAWS-M)

Project Number: D499
Budget Activity: #5

POPULAR NAME: JAVELIN (AAWS-M)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604611A
PE Title: JAVELIN (AAWS-M)
Project Title: JAVELIN (AAWS-M)

Project Number: D499
Budget Activity: #5

A. (U) SCHEDULE/BUDGET INFORMATION: ($ In Thousands)

SCHEDULE	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	To Complete
Program Milestones	Continued EMD Phase Conducted LLTI IPR	LRIP Decision						
Engineering Milestones	Prototype deliveries	Initiate Tech Support; Initiate EPP	Continue Tech Support/EPP Conduct PCA					
T&E Milestones	Start Preparation for IOT&E Continued PPQT Qual; Conducted FDTE	Conduct IOT&E Complete PPQT Sys Tests	Initiate PQT Conduct LFT					
Contract Milestones	Issued RFP for LLTI/LRIP I	Award LLTI & LRIP I Contracts	Award LRIP II Contract					
BUDGET ($ 000)	**FY 1993**	**FY 1994**	**FY 1995**	**FY 1996**	**FY 1997**	**FY 1998**	**FY 1999**	**Program Total (To Complete)**
Major Contract	75946	31706	17477	0	0	0	0	488450 (0)
Support Contract	1654	1000	1000	0	0	0	0	7560 (0)
In-House Support	11528	12046	7480	0	0	0	0	84747 (0)
GFE/ Other	6900	2685	5380	0	0	0	0	30839 (0)
Total	96028	47437	31337	0	0	0	0	611596 (0)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604611A
PE Title: JAVELIN (AAWS-M)
Project Title: JAVELIN (AAWS-M)

Project Number: D499
Budget Activity: #5

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This program element (PE) provides for the continuation of Engineering and Manufacturing Development (EMD) of a manportable antitank weapon system for the combined arms team employment. The infantry must have the capability to defeat numerically superior armored forces. The present medium infantry antitank weapon is DRAGON. The system developed within this PE will replace the DRAGON to provide enhanced lethality for the early entry force. It will have a high kill rate against all known armor threats at extended ranges under day/night, adverse weather conditions and in the presence of battlefield obscurants. This system will be hardened against countermeasures and will not require extensive training for effective employment.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

	Complete	Cost
(U) FY 1993 Accomplishments:		
• (U) EMD Contract (Includes Enhanced Producibility Program (EPP))	4Q93	75946
• (U) Support Contract	4Q93	1654
• (U) Testing (GFE/Other)		
– Production Proveout Qualification Testing (PPQT) component/subsystem qualification testing	3Q93	2300
– PPQT and Developmental Testing/User Testing Flights	4Q93	2000
– PPQT System Testing	4Q93	900
– Force Development Test and Experimentation (FDTE)	3Q93	1350
– Initial Operational Test and Evaluation (IOTE) Preparation	4Q93	250
– IOTE Hardware to Fort Hunter Liggett	4Q93	100
• (U) In House Support		
– Core	4Q93	2333
– Collocated	4Q93	2903
– MICOM Labs	4Q93	5229
– Other Government Agencies	4Q93	1063
TOTAL		96028
(U) FY 1994 Planned Program:		
• (U) Major Contract	4Q94	31706
– EMD Contract	4Q94	18665
– Enhanced Producibility Program(EPP) Contract	4Q94	4550
– Test Program Set Development	4Q94	400

– Warhead Integration	4Q94	2250
– IDTE Clean-up/Training Device Upgrade	4Q94	5841
• (U) Support Contract	4Q94	1000
• (U) Testing (GFE/Other)	4Q94	2685
– IOTE	1Q94	220
– PPQT System Testing	2Q94	2000
– Technical Support	4Q94	465
• (U) In House Support	4Q94	12046
– Core	4Q94	1765
– Collocated	4Q94	3575
– MICOM Labs	4Q94	4525
– Other Government Agencies	4Q94	1428
– Other (Computer Information Center, hardware and software support)	4Q94	753
TOTAL		47437

(U) FY 1995 Planned Program:

• (U) Major Contract	4Q95	17477
– EMD Contract	4Q95	200
– EPP Contract	4Q95	11500
– Test Program Set	4Q95	1600
– IDTE Clean-up/Training Device Upgrade	4Q95	4177
• (U) Support Contract	4Q95	1000
• (U) Testing (GFE/Other)	4Q95	380
– Technical Support	4Q95	380
• (U) DTOSC Award Fee (GFE/Other)	4Q95	5000
• (U) In House Support	4Q95	7480
– Core	4Q95	1179
– Collocated	4Q95	1039
– MICOM Labs	4Q95	805
– Other Government Agencies	4Q95	4457
TOTAL		31337

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604611A
PE Title: JAVELIN (AAWS-M)
Project Title: JAVELIN (AAWS-M)

Project Number: D499
Budget Activity: #5

D. (U) WORK PERFORMED BY: In-house efforts are being performed by JAVELIN Project Office, Program Executive Officer Tactical Missiles, Redstone Arsenal AL. The prime contractor for the JAVELIN EMD phase is the Texas Instruments Inc./Martin Marietta JAVELIN Joint Venture.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** None
2. **SCHEDULE CHANGES:** LRIP Decision Milestone scheduled for May 1994. Low Rate Initial Production I contract award scheduled for May 1994.
3. **COST CHANGES:** None

F. (U) PROGRAM DOCUMENTATION:

Required Operational Capability (ROC)	07/85
Test and Evaluation Master Plan (TEMP)	09/88
Joint Services Operational Requirement (update)	12/88
Acquisition Decision Memorandum (Milestone Decision Review II (MDR II)	06/89
Restructure Approval via ADM	09/91
Revised Acquisition Program Baseline (OSD Approval)	03/92
Revised TEMP (OSD Approval)	05/92
Cost Analysis Requirements Description (CARD) Approval	03/94
LRIP Decision Milestone	05/94
Milestone III	01/96
FUE	04/96

G. (U) RELATED ACTIVITIES:

PE #0203802A (Improved Target Acquisition System (ITAS))
PE #0603810A (Advanced Missile System - Heavy (AMS-H))
PE #0602303A (Missile Technology)
PE #0603313A (Missile and Rocket Advanced Technology)
PE #0603321A (Target Acquisition Counter/Counter-Countermeasures)
PE #0602120A (Electronic Survivability and Fuzing Technology)
PE #0602624A (Weapons and Munitions Technology)
PE #0602618A (Ballistics Technology)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604611A
PE Title: JAVELIN (AAWS-M)
Project Title: JAVELIN (AAWS-M)

Project Number: D499
Budget Activity: #5

PE #0702807E (Infrared Focal Plane Array (IRFPA))
There is no unnecessary duplication of effort within the Army or DOD.

H. (U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Procurement	18305	207268	131086	171888	168812	159516	153733
(Quantities)	0	703	374	858	942	859	1156
Military Construction	0	0	0	0	0	0	0

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) TEST AND EVALUATION DATA: The JAVELIN EMD test program began in 3QFY89 and concluded in 1QFY94. EMD testing consisted of the following:

(1) Production Proveout Test (contractor component/subsystem/system testing/qualification).
(2) Preproduction Qualification Test (contractor/government system development testing/qualification)
(3) Training Force Development Test and Experimentation II (government training concept testing)
(4) Logistics Demonstration (contractor/government evaluation)
(5) Live Fire Component Test (contractor/government)
(6) Initial Operational Test & Evaluation(government)

EMD test program schedule:
Development Test II (PPT, PPQT) - 4QFY89-1QFY94
User Test II (FDTE, IOT&E) - 1QFY93-1QFY94

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604619A
PE Title: Landmine Warfare

Project Number: D088
Budget Activity: #5

A. (U) RESOURCES: ($ in Thousands)
Project Title: Wide Area Mine Engineering Development

Project Number Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
Wide Area Mine (WAM)	22812	21186	33843	31177	18339	18179	19836	88271	329800

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project provides for Engineering Development and validation of wide area mine system concepts which will enhance the U.S. capability in mine warfare. The program provides for engineering and manufacturing development of Wide Area Mines (WAM) deployed by Hand Emplaced (HE), VOLCANO and Missile delivery systems. WAM will use advanced sensors and warhead technology to extend the range and lethality of present scatterable mines.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Completed Preliminary Design Review.	1Q93	4312
• (U) Procured and fabricated Hand Emplaced version hardware.	4Q93	16000
• (U) Completed Systems Integration Test.	4Q93	2500
TOTAL		22812

(U) FY 1994 Planned Program:		
• (U) Conduct critical design review.	1Q93	4747
• (U) Procure and Fabricate WAM Hand Emplaced Prototype Qualification Hardware.	3Q94	13537
• (U) Complete Systems Demonstration Test.	4Q94	2902
TOTAL		21186

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604619A
PE Title: Landmine Warfare

Project Number: D088
Budget Activity: #5

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Complete Contractor Prototype Qualification Tests.	3Q95	11703
• (U) Conduct HE WAM Milestone III A.	4Q95	1240
• (U) Procure and Fabricate WAM HE Tech Test/User Test (TT/UT) hardware.	4Q95	20900
TOTAL		33843

D. (U) WORK PERFORMED BY: The Project Manager for Mines, Countermine and Demolitions, Picatinny Arsenal, NJ is assigned the responsibility for landmine, countermine and explosive demolition development. The major supporting laboratory is the Armament Research, Development and Engineering Center, Picatinny Arsenal, NJ. The principal contractor is Textron Defense Systems, Wilmington, MA.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** None
2. **SCHEDULE CHANGES:** HE WAM schedule adjusted to reflect a one-year slip of milestone III and the addition of a milestone III A (TC LRIP)
3. **COST CHANGES:** None

F. (U) PROGRAM DOCUMENTATION: Not Applicable

G. (U) RELATED ACTIVITIES: PE #0603619A - Landmine Warfare and Barrier - Advanced Development PE #0603606A - Landmine Warfare and Barrier - Advanced Technology relates to advanced development and component efforts. Mines and Countermine efforts are closely coordinated to incorporate counter-countermeasures as applicable. The Project Manager for Mines, Countermine and Demolitions monitors related programs to ensure there is no unnecessary duplication of effort within the Army or DoD. Development information on mines is coordinated and exchanged among the services by the Tri-Service Joint Technical Coordination Group for Unpowered Weapons. The Department of Defense's Office of Munitions monitors the scatterable mine program to avoid service duplication. No unnecessary duplication exists in the Army or Department of Defense.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604619A | **Project Number: D088**
PE Title: Landmine Warfare | **Budget Activity: #5**

H. (U) OTHER APPROPRIATION FUNDS:

	($ in Thousands)					
Appropriation FY 1993	**FY 1994 Actual**	**FY 1995 Estimate**	**FY 1996 Estimate**	**FY 1997 Estimate**	**FY 1998 Estimate**	**FY 1999 Estimate**
Ammunition Procurement (E78100, E78103)			12269	38201	36396	36732

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

J. (U) MILESTONE SCHEDULE:

	Milestones Dates
EMD Contract Award	4/90
WAM HE Preliminary Design Review	10/92
WAM HE Critical Design Review	4/94
WAM HE Milestone IIIA	9/95
WAM HE Live Fire Report	3/96
WAM HE TT/UT Complete	6/96
WAM HE Milestone III	9/96
WAM VOLCANO Milestone IIIA	9/99
WAM VOLCANO Milestone III	9/02

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604622A
PE Title: Family of Heavy Tactical Vehicles **Budget Activity: #5**

A. (U) RESOURCES: ($ in Thousands)

Project Number Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DE43 Semi-Trailer Van	0	475	0	0	0	0	0	0	475
D659 Family of Heavy Tactical Vehicles (FHTV)	1206	2000	0	0	0	0	0	0	41,882
PE TOTAL	1206	2475	0	0	0	0	0	0	42,357

B. (U) BRIEF DESCRIPTION OF ELEMENT: Project D659 funds the completion of the enhanced flatrack program, as directed by Congress, to provide an intermodal airlift and sealift capability. The enhanced features will be incorporated into production in FY 94. Congress has also directed the Army to design, develop and test prototypes of 3,000-3,500 gallon fuel and water tanker flatracks as initial variants to the Palletized Load System (PLS), as well as flatracks for engineering equipment and a Heavy Repair Vehicle using a PLS Chassis. Project DE43 is a one-time effort for FY94. There is a need for a standardized fleet of semi-trailer vans to support field operations. This project will analyze current semitrailer designs to determine the feasibility of standardizing the 6 and 12 ton fleet of semitrailer chassis having the capability to mount various type of cargo container configurations on a common chassis.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) Project DE43 - Semi-Trailer Van: To explore a standardized fleet of vans to support field operations.

(U) FY 1993 Accomplishments: Project not funded

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Award contracts to procure three prototype semi-trailers and one ISO container and container handling chassis	150	2QFY94
• (U) Conduct government testing of prototypes	325	3QFY94

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604622A
PE Title: Family of Heavy Tactical Vehicles

Budget Activity: #5

(U) FY 1995 Planned Program:
- **(U)** Project not funded

(U) Work Performed By: The in-house effort for project DE43 will be accomplished by PM, Trailer, Warren, MI. Contractor to be determined.

(U) Related Activities: There is no unnecessary duplication of effort within the Army or the Department of Defense. This is an Army effort; no other Services are participating.

(U) Other Appropriation Funds:

($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Other Procurement, Army SEMITRAILER, VAN, CGO 12T (BLIN 3)(D04800) 7331	0	1562	4851	6443	5550	4580	7331

(U) International Cooperative Agreements: Not Applicable

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604622A
PE Title: Family of Heavy Tactical Vehicles
Project Title: Family of Heavy Tactical Vehicles (FHTV)

Project Number #D659
Budget Activity: #5



POPULAR NAME: PLS

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604622A
PE Title: Family of Heavy Tactical Vehicles
Project Title: Family of Heavy Tactical Vehicles (FHTV)

Project Number D659
Budget Activity: #5

A. (U) SCHEDULE/BUDGET INFORMATION: ($ In Thousands)

SCHEDULE	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	To Complete
Program Milestones	FEB 94-EF PRODUCTION DECISION							
Engineering Milestones	DEVELOP EF DEVELOP TF	DEVELOP ENGINEERING FLATRACKS DEVELOP HRV						
T&E Milestones	EF TESTING SEP-NOV 93 TF TESTING MAY-JUL 94	HRV TESTING SEP-NOV 94 ENGR FR TEST APR-JUN 95						
Contract Milestones								
BUDGET ($000)	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	Program Total (To Complete)
Major Contract								
Support Cor'								
In-House Support	1206	2000						
GFE/ Other								
Total	1206	2000	0	0	0	0	0	41,882

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604622A
PE Title: Family of Heavy Tactical Vehicles
Project Title: Family of Heavy Tactical Vehicles (FHTV)

Project Number D659
Budget Activity: #5

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Completion of the enhanced flatrack development effort initiated to provide intermodal airlift and sealift capability for transition to production. Completion of the tanker flatrack effort directed by Congress in FY 93 to develop and test prototypes of 3,000 - 3,500 gallon fuel and water tanker flatracks as initial variants of the Palletized Load System (PLS). Develop, fabricate and test a series of PLS flatracks adapted for engineering equipment uses, e.g., dump truck, bituminous spreader, and concrete mixer as directed by FY 94 Congressional language. The fabrication and test of a Heavy Repair Vehicle (HRV) using the PLS chassis with armored cab and a redesigned storage work area to demonstrate and determine feasibility, also directed by FY 94 Congressional language.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

	Complete	Cost
(U) FY 1993 Accomplishments:		
• (U) Began development of enhanced flatrack (EF)	327	1QFY94
• (U) Began testing of enhanced flatrack (EF)	55	1QFY94
• (U) Developed statement of work specification for water and fuel tanker flatrack	37	1QFY94
• (U) Complete testing of EF; purchase TDP and transition to production	614	3QFY94
• (U) Continue water and fuel tanker flatrack fabrication and design	173	4QFY94
(U) FY 1994 Planned Program:		
• (U) Develop, fabricate and test a series of PLS flatracks for engineering equipment, e.g., dump flatrack, bituminous spreader flatrack and concrete mixer flatrack	1000	4QFY94
• (U) Fabricate and test a 3 person Heavy Repair Vehicle (HRV) using the PLS chassis with armored cab and a redesigned storage work area to demonstrate and determine feasibility	1000	4QFY94

(U) FY 1995 Planned Program: Project not funded

D. (U) WORK PERFORMED BY: In-house effort for Project D659 will be managed by Program Executive Officer for Combat Support and accomplished by the Tank-Automotive R&D Center located in Warren, Michigan. The contractor for the development of the enhanced flatrack is Oshkosh Truck Corporation, Oshkosh, WI with work subcontracted to Steeltech, Incorporated, Milwaukee, WI.

Program Element: **#0604622A**
PE Title: **Family of Heavy Tactical Vehicles**
Project Title: **Family of Heavy Tactical Vehicles (FHTV)**

Project Number **#D659**
Budget Activity: **#5**

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** Not applicable
2. **SCHEDULE CHANGES:** Testing and production cut-in of enhanced flatrack slipped to FY 94.
3. **COST CHANGES:** Not applicable

F. (U) PROGRAM DOCUMENTATION: Not Applicable.

G. (U) RELATED ACTIVITIES: There is no unnecessary duplication of effort within the Army or the Department of Defense. This is an Army effort; no other Services are participating.

H. (U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Other Procurement, Army Family of Heavy Tactical Vehicles (BLIN 8) (DA0500)	309492	402958	16459	577	555	554	541

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Currently, there is an Interoperability Agreement among the US/UK/GE to assure the interoperability of US, British and German load-handling systems.

J. (U) TEST AND EVALUATION DATA: Both the EF and TF will undergo performance testing in FY94.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604633A **Budget Activity: #5**
PE Title: Air Traffic Control

A. (U) RESOURCES: ($ Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D586 Air Traffic Control	1753	5600	7873	1821	1846	1888	1930	Cont	Cont

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element funds continuously evolving efforts for the development of ATC systems for both tactical and fixed base applications. It funds the integration and qualification of an Air Traffic Navigation, Integration, and Coordination System (ATNAVICS) and Tactical Airspace Integration System (TAIS). These systems provide urgently needed communications and precision/non-precision approach and flight following capability in support of Army tactical airfields, remote landing zones, drop zones, pickup zones and temporary helicopter operating areas worldwide. These are non-developmental item (NDI) programs. Fixed base ATC efforts funded by this line include Precision Approach Radar (PAR), Navigation Air Systems Modernization (NAVAID), Communication Systems Modernization, and digitization of the ATC structure.

C. (U) JUSTIFICATION FOR PROJECT LESS THAN $10.0 MILLION IN FY 1995:

(U) Project D586 - Air Traffic Control:

(U) FY 1993 Accomplishments:

(U) Air Traffic Navigation, Integration, Coordination Systems (ATNAVICS)/Precision Approach Radar (PAR)	**Complete**	**Cost**
• (U) Market analysis for state-of-the-art system	2Q93	240
• (U) Evaluation and suitability study and cost saving data	2Q93	540
• (U) Procurement data package completed for state-of-the-art system	3Q93	753
(U) Tactical Airspace Integration System (TAIS)		
• (U) Pre-market analysis for state-of-the-art system solution	4Q93	220
TOTAL		**1753**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604633A
PE Title: Air Traffic Control

Budget Activity: #5

(U) FY 1994 Planned Program:		
(U) ATNAVICS/PAR		
• (U) Evaluation and suitability study and cost saving data	4Q94	567
• (U) Prototype selection and procurement	4Q95	3683
• (U) Plan developmental test and operational testing	4Q95	100
(U) Tactical Airspace Integration System (TAIS)		
• (U) Market analysis for state-of-the-art system	3Q95	300
• (U) Design definition/integration analysis	4Q95	950
TOTAL		**5600**
(U) FY 1995 Planned Program:		
(U) ATNAVICS/PAR		
• (U) Procure prototype system for Developmental Testing/Initial Operational Test Evaluation (IOTE)	4Q95	240
• (U) Conduct Initial Operational Test Evaluation (IOTE)	4Q95	200
• (U) Design, fabricate, test prototype system	4Q95	6800
• (U) Plan test under operational conditions	4Q95	100
(U) Tactical Airspace Integration System (TAIS)		
• (U) Design/system integration with Army communication hardware/software digitization integration analysis	4Q96	250
• (U) Hardware/software demonstration	4Q95	83
• (U) Evaluation and suitability study and cost saving data	4Q95	200
TOTAL		**7873**

(U) Work performed by: The lead for Army in-house efforts will be the Air Traffic Control Product Manager at the U.S. Army Aviation and Troop Command (ATCOM), St. Louis, MO and the U.S. Army Research, Development and Engineering Center, Ft. Monmouth, NJ.

FY 1995 RDTE DESCRIPTIVE SUMMARY

Program Element: #0604633A **Budget Activity: #5**
PE Title: Air Traffic Control

(U) Related Activities: The Army participated in the tri-service Air Traffic Control Approach and Landing Aids (ATCALS) Joint Working Group to share technical information and developmental programs being conducted by each service. There is no unnecessary duplication of effort within the Army or DoD.

(U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

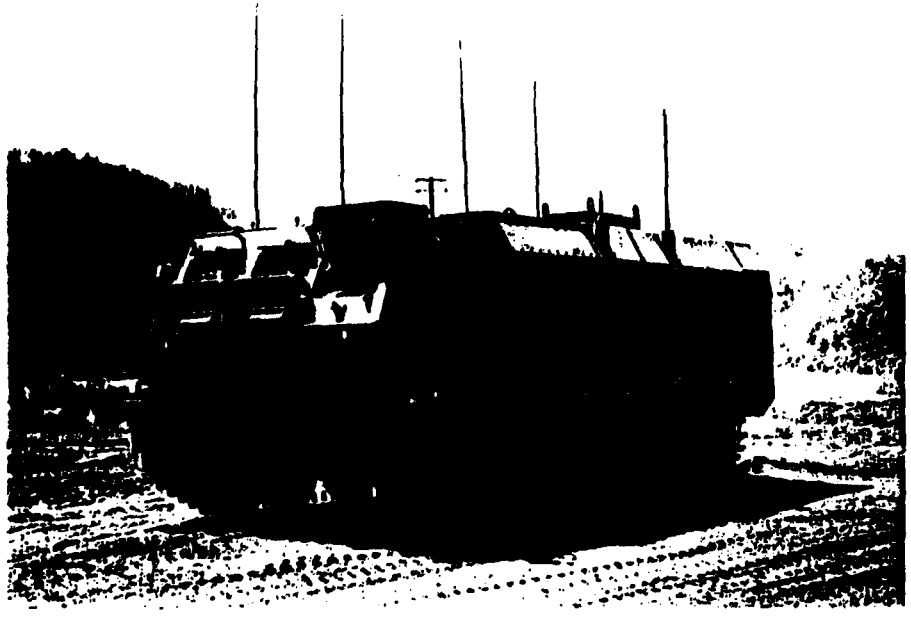
Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
APA (AA0050)							
Air Traffic Control (ATC)							
	330	8261	8769	8227	6480	6200	6300

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604640A
PE Title: Advanced Command and Control Vehicle
Project Title: Advanced Command and Control Vehicle (C2V)

Project Number: DG27
Budget Activity: #5



POPULAR NAME: Command and Control Vehicle (C2V)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604640A
PE Title: Advanced Command and Control Vehicle
Project Title: Advanced Command and Control Vehicle (C2V)

Project Number: DG27
Budget Activity: #5

A. (U) SCHEDULE/BUDGET INFORMATION: ($ In Thousands)

SCHEDULE	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	To Complete
Program Milestones		MS I/II ASARC	LRIP Long Lead Items IPR	LRIP IPR				
Engineering Milestones		Complete design effort. Initiate fabrication of prototypes	Complete fabrication of prototypes. Conduct brassboard upgrades.					
T&E Milestones		Continue Brassboard testing	Begin Technical Tests & Operational Experiments	Complete Development Tests; Continue Operational Experiments	Continue Operational Experiments; Conduct PQT			
Contract Milestones		Award NDI, Qualification & Integration Contract		Award LRIP Long Lead Items Contract	Award LRIP Contract			
BUDGET ($000)	**FY 1993**	**FY 1994**	**FY 1995**	**FY 1996**	**FY 1997**	**FY 1998**	**FY 1999**	**Program Total (To Complete)**
Major Contract		7100	21279	11463	6022			45864 (0)
Support Contract								0 (0)
In-House Support		1650	3800	2000	1600			9050 (0)
GFE/ Other		1904	7080	4052	1500			14536 (0)
Total		10654	32159	17515	9122			69450 (0)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604640A
PE Title: Advanced Command and Control Vehicle
Project Title: Advanced Command and Control Vehicle (C2V)

Project Number: DG27
Budget Activity: #5

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The Command and Control Vehicle (C2V) will provide a fully tracked, armored vehicle that will ensure a mobile, responsive and survivable command and control capability for the heavy force. The C2V will be capable of command and control during mobile operations and will be capable of incorporating communications and electronic systems compatible with Army Tactical Command and Control Systems. This program is a Desert Storm Initiative. In FY 1994, this program transitions from PE 0603053 Project DG23.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments:

- (U) Funded under PE#0603053 in FY 93

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Complete Design Effort	4Q94	$ 1650
• (U) Mission Module System Integration	2Q97	$ 1500
• (U) Fabrication of Prototypes	2Q96	$ 3200
• (U) Brassboard Testing	3Q95	$ 650
• (U) Logistics Effort	2Q00	$ 100
• (U) Project Management	4Q94	$ 3554

(U) FY 1995 Planned Program:		
• (U) Complete Fabrication of Prototypes	2Q96	$14959
• (U) Logistics Effort	2Q00	$ 3700
• (U) Upgrade Brassboard Vehicles	3Q96	$ 1300
• (U) Begin Development Tests and Operational Experiments	4Q98	$ 5100
• (U) Mission Module System Integration	2Q97	$ 1700
• (U) Project Management	4Q95	$ 5400

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604640A
PE Title: Advanced Command and Control Vehicle
Project Title: Advanced Command and Control Vehicle (C2V)

Project Number: DG27
Budget Activity: #5

(U) Program Plan to Completion:

• (U)	Award LRIP Long Lead Contract	1Q96
• (U)	Complete Logistics Effort	2Q00
• (U)	Complete Development Tests	1Q97
• (U)	Complete Operational Experiments	4Q98
• (U)	Award LRIP Contracts	1Q97
• (U)	Conduct PQT	2Q98

D. (U) WORK PERFORMED BY: PM Bradley is the material developer. FMC Corp., San Jose, CA is the prime contractor. The Mission Module System contractor will be determined as a result of a competitive source selection process in FY94.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: FUE Accelerated from FY99 to FY98
3. COST CHANGES: Congress appropriated an additional $2.0M above the FY94 President's Budget request to support integration of an improved intercom system.

F. (U) PROGRAM DOCUMENTATION:

Mission Need Statement	2/93
Operational Requirements Document	8/93
Integrated Program Summary & Assessment	12/93
Test and Evaluation Master Plan	9/93

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604640A
PE Title: Advanced Command and Control Vehicle
Project Title: Advanced Command and Control Vehicle (C2V)

Project Number: DG27
Budget Activity: #5

Cost and Operational Effectiveness Analysis 12/93

G. (U) RELATED ACTIVITIES: The Future Electronic Fighting System will use the same chassis and enclosure as the C2V, but will purchase this equipment separately. The C2V program will provide chassis for the J-STARS (PE 0604770 Proj:D202) Common Ground Station. The C2V is designed to accommodate Army Tactical Command and Control Systems (PE: 0604818, Proj: C34) and Common Hardware/Software (PE: 0604818, Proj: 323). There is no unnecessary duplication of effort within the Army or Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Procurement (G84200)	0	0	0	23664	47115	71359	112787
Military Construction	0	0	0	0	0	0	0

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: NATO cooperative test. US/GE Combat Vehicle Command & Control (CVC2) MOU 12 Sep 88, to define symbology, develop a bilateral concept, conduct joint simulation experiments, maximize interoperability and possibly develop common hardware.

J. (U) TEST AND EVALUATION DATA: The Test and Evaluation Master Plan is being revised to as a result of guidance provided by the Army Systems Acquisition Review Council

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604642A
PE Title: Light Tactical Wheeled Vehicles

Budget Activity: #5

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DE41 Armored Security Vehicles (Combat Support)	0	0	3479	910	0	0	0	0	4389

B. (U) BRIEF DESCRIPTION OF ELEMENT: Project DE41 funds the Armored Security Vehicle (ASV). The Military Police (MP) currently use the High Mobility Multipurpose Wheeled Vehicle. The ASV is required to provide improved ballistics protection, increased payload and NBC protection to the MP three man team.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:

(U) Project DE41 - Armored Security Vehicles (Combat Support): Evaluate the commercially available Armored Security Vehicles (ASV) for use by the Military Police.

(U) FY 1993 Accomplishments:
- (U) Project not funded

(U) FY 1994 Planned Program:
- (U) Project not funded
- (U) Based upon Congressional direction, the Army is working with Office of the Secretary of Defense and the other services to identfy joint and unique requirements through a joint Memorandum of Understanding and Working Group.

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Release Request for Proposal (RFP)	176	2Q95
• (U) Initiate Source Selection Evaluation Board (SSEB)	210	3Q95
• (U) Award contracts for hardware demonstration vehicles to support Pre-Production Qualification Test/Early User Test (PPQT/EUT)	3093	4Q95

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604642A
PE Title: Light Tactical Wheeled Vehicles Budget Activity: **#5**

(U) Work Performed By: In-house efforts will be accomplished by the Program Executive Officer for Combat Support and the U.S. Army Tank-Automotive Command both located in Warren, MI. Major contractors are to be determined.

(U) Related Activities: There is no unnecessary duplication of effort within the Army or the Department of Defense.

(U) Other Appropriation Funds:

	($ in Thousands)						
Appropriation	**FY 1993 Actual**	**FY 1994 Estimate**	**FY 1995 Estimate**	**FY 1996 Estimate**	**FY 1997 Estimate**	**FY 1998 Estimate**	**FY 1999 Estimate**
Other Procurement, Army (D02800)	0	0	0	10354	9673	9582	7097

(U) International Cooperative Agreements: None

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604645A
PE Title: Armored Systems Modernization (ASM) - Engineering Development
Budget Activity: #5

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D175 Advanced Field Artillery System (AFAS) Multi-Option Fuze for Artillery (MOFA)	4669	7735	6325	5420	0	0	0	0	29238
D2AT AGS Operational Test	0	0	2949	0	0	0	0	0	2949
D413 Armored Gun System (AGS)	67178	81769	41823	15528	23069	432	0	0	271961
PE TOTAL	71847	89504	51097	20948	23069	432	0	0	304148

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element supports AGS Operational testing to support a low rate initial production decision and Engineering and Manufacturing Development (EMD) phase for both the Armored Gun System (AGS) and Advanced Field Artillery System (AFAS) Muti-Option Fuze for Artillery (MOFA).

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:

(U) Project D175 - AFAS MOFA EMD: The Advanced Field Artillery System (AFAS) is the Army's next generation 155mm self-propelled howitzer system providing high-payoff technology capabilities in support of the maneuver force. This project finances the Engineering and Manufacturing Development phase of MOFA. MOFA will provide proximity, time delay and point detonation functions for 105mm, 155mm, and 8 inch bursting projectiles. MOFA will be inductively (or manually) set contributing to AFAS's critical automated ammunition handling capability, allowing AFAS to meet extended range (40-50KM), rate-of-fire (12 rounds per minute), and autonomous operations requirements.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Product Development	4Q93	3794
• (U) Support & Management	4Q93	780
• (U) Test & Evaluation	4Q93	95

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604645A
PE Title: Armored Systems Modernization (ASM) - Engineering Development
Budget Activity: #5

(U) FY 1994 Planned Program:		
• (U) Continue Product Development	4Q94	6176
• (U) Continue Support & Management	4Q94	959
• (U) Continue Test & Evaluation	4Q94	600
(U) FY 95 Planned Program:		
• (U) Continue Product Development	4Q95	4035
• (U) Continue Support & Management	4Q95	860
• (U) Continue Test & Evaluation	4Q95	1430

(U) Project D2AT - AGS Operational Testing: The AGS program is an Acquisition Category (ACAT) II system with a dedicated Early User Test and Experimentation (EUTE) to support an LRIP decision in FY95. This project finances the direct costs of planning and conducting operational testing and evaluation of the AGS by the Operational Test and Evaluation Command (OPTEC). Operational testing is conducted under conditions, as close as possible, to those encountered in actual combat with typical user troops trained to employ the system. OPTEC provides Army leadership with an independent test and evaluation of the effectiveness and suitability of the system. Project D2AT is not a new start. It is restructured from PE 0605712, Support of Operational Resting, Project D001, OPTEC Initial Operational Test and Evaluation (IOTE).

	Complete	Cost
(U) FY 1993 Accomplishments:		
• (U) Not applicable	N/A	N/A
(U) FY 1994 Planned Program:		
• (U) Not applicable	N/A	N/A
(U) FY 1995 Planned Program:		
• (U) AGS EUTE	4Q95	2949

(U) Work Performed By: Management is accomplished by the Project Manager for the Advanced Field Artillery System with primary engineering support provided by the U.S. Army Armament, Research, Development, and Engineering Center, both of which are located at Picatinny Arsenal, New Jersey. Significant other government agency support is provided by Army Research Laboratory, MD, Aberdeen Proving Grounds, MD, Yuma Proving Grounds, AZ, and Communications Electronics Command, NJ. The EMD contractor is Alliant Techsystems, Minneapolis, MN. Other major contractual efforts are provided by Integrated Circuit Systems Corporation, San Jose, CA, Hittite Microwave Corporation, Woburn, MA, and

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604645A
PE Title: Armored Systems Modernization (ASM) -
Engineering Development **Budget Activity: #5**

Polytronix, Incorporated, Richardson, TX. A majority of Project D2AT work is performed by Test and Evaluation Directorates of OPTEC located in Alexandria, VA, Fort Hood, TX, and Fort Bragg, NC. All organizations are staffed by military and civilian government personnel. Contractors expected to perform work for this project include: Vreuls Research Corporation, Thousand Oaks, CA; Testing Experimentation Services Company, Albuquerque, NM.

(U) Related Activities: PE #0603645 (Armored System Modernization - Advanced Development). Project D2AT is reprogrammed from PE 0605712, Project D001. There is no unnecessary duplication of effort within the Army or DoD. The Army staff monitors all tests for materiel development and activities to avoid duplication of effort. The Deputy Director of Defense Research and Engineering (Test and Evaluation), and Director of Operational Test and Evaluation, Office of the Secretary of Defense, also review planned testing and development of support equipment to insure integration of testing by the services and to avoid duplicative testing. High-level staff management of resources for user testing is provided by the U.S. Army Test Schedule and Review Committee which is chaired by OPTEC. Unnecessary duplication of like items is prevented by coordination with Program Manager, Instrumentation, Targets and Threat Simulators (PM-ITTS), the Operational Test and Evaluation Coordinating Council, review by the Army Test and Evaluation Committee and by coordination with the Test Scheduling and Review Committee.

(U) International Cooperative Agreements: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604645A
PE Title: Armored Systems Modernization (ASM) - Engineering Development
Project Title: Armored Gun System

Project Number: # D413
Budget Activity: #5

POPULAR NAME: Armored Gun System

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604645A
PE Title: Armored Systems Modernization (ASM) - Engineering Development
Project Title: Armored Gun System

Project Number: # D413
Budget Activity: #5

A. (U) SCHEDULE/BUDGET INFORMATION: ($ In Thousands)

SCHEDULE *	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	To Completion (Total)
Program Milestones			LRIP IPR AUG 95				MS III APR 99	
Engineering Milestones	Critical Design Review SEP 93							
T&E Milestones	BSS Testing AUG 93	TT MAY 94 EUTE AUG 94				LFT FEB 98 PQT APR 98 IOTE JUN 98		
Contract Milestones	BSS DEL JUL BTS DEL JUN	PPROTO DEL MAR		LRIP Award OCT 95	Awd Option OCT 96	Awd Option OCT 97	Full Rate Prod Contr APR 99	
BUDGET* ($000)	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	
Major Contract	54782	68124	28466	10365	13720	0	0	0 (205624)
Support Contract	0	0	0	0	0	0	0	0 (140)
In-House Support	5142	6008	6361	2363	2759	0	0	0 (27904)
GFE/ Other	7254	7637	6996	2800	6590	432	0	0 (38293)
Total	67178	81769	41823	15528	23069	432	0	0 (271961)

* Due to recent program and budget decisions, the AGS program is currently being evaluated for restructure with accompanying schedule and funding changes.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604645A
PE Title: Armored Systems Modernization (ASM) - Engineering Development
Project Title: Armored Gun System

Project Number: # D413
Budget Activity: #5

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The Armored Gun System (AGS) is a strategically deployable, tactically transportable, lightly armored, highly mobile, direct fire weapon system. The AGS will support light infantry forces in offensive and defensive operations, low and mid intensity conflicts. The AGS will be employed during contingency force operations; therefore, it must be capable of insertion via low velocity air drop (LVAD) and execute forced entry operations. Its role is to support infantry units in direct fire mode for point fire target destruction, generally against bunkers, threat medium armor systems, buildings, and in Military Operations in Urban Terrain (MOUT). System capabilities include C-130 LVAD (Level I armor), Roll-on/Roll-off C130/C141 (Level II armor), Roll-on/Roll-off C-17 (Level III armor), 105mm main gun (XM35) with autoloader, 3-man crew, fire control roughly equivalent to M1, and mobility greater than M551 Sheridan with Level III armor.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:	COMPLETE	COST
(U) FY 1993 Accomplishments:		
• (U) Continue Engineering and Manufacturing Development (EMD)	4QFY93	60717
• (U) Initiate First Phase of Government Testing	4QFY93	1399
• (U) Continue Project Management		
(U) FY 1994 Planned Program:		
• (U) Continue Engineering and Manufacturing Development (EMD)	4QFY94	70292
• (U) Continue First Phase of Government Testing	4QFY94	6463
• (U) Continue Project Management	4QFY94	5014
(U) FY 1995 Planned Program:		
• (U) Continue Engineering and Manufacturing Development (EMD)	4QFY95	31644
• (U) Complete First Phase of Government Testing	4QFY95	5862
• (U) Continue Project Management	4QFY95	4317

D. (U) WORK PERFORMED BY: The Program Executive Officer for Armored Systems Modernization, Warren, MI, is assigned the responsibility for armored systems development. The major supporting government technical organizations are the Armament Research, Development, and

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604645A
PE Title: Armored Systems Modernization (ASM) - Engineering Development
Project Title: Armored Gun System

Project Number: # D413
Budget Activity: #5

Engineering Center, Picatinny, NJ; US Tank-Automotive Command, Warren, MI; Benet Laboratory and Watervliet Arsenal, Watervliet, NY. The contractor for the EMD is FMC Corp, Ground Systems Division, Santa Clara, CA.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. TECHNICAL CHANGES: None

2. SCHEDULE CHANGES: Due to recent program and budget decisions, the AGS program is currently being evaluated for restructure with an accompanying schedule change.

3. COST CHANGES: Due to recent program and budget decisions, the AGS program is currently being evaluated for restructure with an accompanying cost change.

F. (U) PROGRAM DOCUMENTATION:

Acquisition Plan	5/91
Acquisition Strategy	5/91
Required Operational Capability (ROC)	10/91
Cost and Operational Effectiveness Analysis (COEA)	1/92
System Manprint Management Plan (SMMP)	3/92
Army Cost Position	3/92
System Threat Assessment Report (STAR)	5/92
Integrated Program Summary	5/92
Test and Evaluation Master Plan (TEMP)	9/92

G. (U) RELATED ACTIVITIES: There is no unnecessary duplication of effort within the Army or Department of Defense.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604645A
PE Title: Armored Systems Modernization (ASM) - Engineering Development
Project Title: Armored Gun System

Project Number: # D413
Budget Activity: #5

H. (U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation / WCTV	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Armored Gun System (Total)	4732	8218	0	107667	124706	133851	221554
Quantities				(18)	(22)	(19)	(55)

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. (U) TEST AND EVALUATION DATA:

Milestones	Dates
Armor Sample Test	4/93 - 6/93
Autoloader Certification Test	6/93 - 1/94
Ballistic Hull and Turret Test	7/93 - 6/94
Technical Test	5/94 - 9/95
Vulnerability Test	9/94 - 9/95
Early User Test and Experimentation	8/94 - 12/94
Live Fire Test	2/98 - 9/98
Production Qualification Test	4/98 - 1/99
Initial Operational Test and Evaluation	6/98 - 1/99

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604649A **Budget Activity: #5**
PE Title: Engineer Mobility Equipment Development

A. (U) RESOURCES: ($ in Thousands)

Project Number Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DG25 Breacher									
	0	0	4594	14716	100141	1990	4447	0	35678
DG26 Heavy Assult Bridge									
	2111	16404	12271	10523	903	1794	0	0	48727
PE TOTAL	2111	16404	16865	25239	10944	3784	4447	0	84405

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program supports development of new, advanced combat engineer mobility vehicles that will have mobility characteristics equal to the maneuver forces they support. Two projects are included in the PE. Both are OPERATION DESERT STORM initiatives. The two projects are the Breacher and the Heavy Assault Bridge (HAB). The base for both vehicles will be an Abrams Tank chassis. The Breacher will integrate on the chassis, a versatile/survivable Mine Clearing Blade with Automatic Depth Control, a Power Driven Arm, and an armored Commander's Control Station. This is not a new start. The HAB will integrate a bridge capable of supporting 70 ton loads and a launching mechanism.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10 MILLION IN FY 1995:

(U) Project DG25- Breacher Development: The Breacher will provide the maneuver forces the capability to conduct in-stride breaches of complex obstacles using its full-width mine clearing blade and power driven excavating arm. This program completes the development of the Breacher begun under PE 0603649A, DG24. It supports further design changes to the prototype vehicles to finalize vehicle configuration prior to Low Rate Initial Production of the system.

FY 1994/1995 BIENNIAL RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604649A **Budget Activity: #4**
PE Title: Engineer Mobility Equipment

(U) FY 1993 Accomplishments: Breacher Funded under PE 63649

(U) FY 1994 Planned Program: Breacher Funded under PE 63649

(U) FY 1995 Planned Program:	**COMPLETE**	**COST**
• (U) Delivery of 2 prototypes, conduct of technical testing	2QFY95	$4.536
• (U) Design refinement, Conduct validation of logistics functions and apply changes to prototypes identified during test and conduct of MSII.	3QFY95	$3.062
• (U) Vehicle refurbishment and prepare for continued testing (PPQT I)	4QFY95	$3.650

(U) Work Performed By: As an Acquisition Category III project-managed system, management of the Breacher program is provided by the Office of the Project Manager, Combat Mobility Vehicles, within the overall management structure of the Program Executive Officer, Armored Systems Modernization. The program management effort includes engineering, logistics and maintenance support planning, reliability predictions and assessments, configuration management, quality assurance, procurement and production planning, and cost and schedule management. The program management office receives matrix support from the U.S. Army Tank-Automotive Command (TACOM) and other subordinate commands (Belvoir Research, Development and Engineering Center, Waterways Experimental Station, and the Test and Evaluation Command). The prime contractor is BMY Combat Systems, a Division of Harsco Corporation, York, Pennsylvania.

(U) Related Activities: PE #0603645A, Armored Systems Modernization Advanced Development Project DB86, Combat Mobility Vehicle, provides preliminary development work for the Breacher prior to FY 1993. PE #0603649A, Project DG24, Breacher Advanced Development, is the advanced development RDT&E project supporting the Breacher program FY 1993 through FY 1995; work in this PE will support the design and development of prototype vehicles for technical feasibility and early user testing. There is no unnecessary duplication of effort within the Army or DoD.

(U) Other Appropriation Funds:

Appropriation	**FY 1993 Actual**	**FY 1994 Estimate**	**FY 1995 Estimate**	**FY 1996 Estimate**	**FY 1997 Estimate**	**FY 1998 Estimate**	**FY 1999 Estimate**
Breacher System Mod GZ3200	0	0	0	5643	75174	153699	149452
Initial Spares GAO178						1019	1222

(U) International Cooperative Agreements: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604649A | **Project Number: DG26**
PE Title: Engineer Mobility Equipment Development | **Budget Activity: #5**

A. (U) RESOURCES: ($ in Thousands)
Project Title: Heavy Assault Bridge

Popular Name	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
Heavy Assault Bridge	2111	16404	12271	10523	903	1794	0	0	44006

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The Heavy Assault Bridge (HAB) will provide Military Load Class 70 (MLC 70) vehicles the capability to cross 24-meter gaps (26-meter bridge). The HAB will have mobility characteristics comparable to the maneuver forces it will support. The launch time for the bridge will be five minutes; the retrieve time will be five minutes to engage plus five minutes to place the vehicle in a travel mode. The base for the HAB will be an Abrams Tank chassis. Proposals from three contractors are currently being evaluated for award of an equipment development/integration contract.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS.

(U) FY 1993 Accomplishments:	COMPLETE	COST
• (U) Completion of Developmental Test	1QFY93	$ 100K
• (U) Program Management (prepare RFP, receive proposals, conduct source selection, Service Support Contract, matrix support)	4QFY93	$1661M
o (U) Chassis Refurbishment	4QFY93	$ 350K

Program Element: #0604649A **Project Number: DG26**
PE Title: Engineer Mobility Equipment Development **Budget Activity: #5**

	COMPLETE	COST
(U) FY 1994 Planned Program:		
• (U) Engineering & Manufacturing Development (EMD) Phase II contract award	2QFY94.	$13566M
• (U) Program Management (complete source selection, conduct SRR and PDR, matrix support)	4QFY94	$ 2638M
o (U) Complete Chassis Refurbishment	1QFY94	$ 200K
(U) FY 1995 Planned Program:		
• (U) EMD Phase II contract (integration and prototype build, contractor testing)	4QFY95	$10867M
• (U) Program Management (Conduct CDR, Program Review, matrix support,)	4QFY95	$ 1404M

D. (U) WORK PERFORMED BY: As an Acquisition Catagory III project managed system, management of the Heavy Assault Bridge Program is provided by the Office of the Project Manager , Combat Mobility Systems, within the overall management structure of the Program Executive Officer, Armor Systems Modernization. The program management effort includes engineering, logistics, testing, production planning and cost and schedule control. The major supporting organizations are the Belvoir Research, Development and Engineering Center, the Tank-Automotive Command, the US Army Engineer School (USAES), the Aviation and Troop Support Command, and the Test and Evaluation Command. Principal contractors and subcontractors are: GDLS, Warren, MI, as prime contractor, and MANN-GHH Corporation, Germany, as the subcontractor; BMY, a Harsco Corp Division, York, PA, as prime contractor, and Israel Military Industries, Israel, as subcontractor; and, Southwest Mobile Systems, St. Louis, MO, as prime contractor and Thompson Defense Projects, United Kingdom as subcontractor for the bridge.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

TECHNICAL CHANGES: No changes from previous submission

SCHEDULE CHANGES: Schedule slip is attributed to the additional effort required for contractor development testing, systems integration and development of a logistical support package.

COST CHANGES: Cost of the EMD phase has been increased by $9.7 million. This provides for logistical development and robust contractor and government testing.

Program Element: #0604649A
PE Title: *Engineer Mobility Equipment Development*

Project Number: DG26
Budget Activity: *#5*

F. (U) PROGRAM DOCUMENTATION:

(U) Operational Requirements Document (ORD) (Formally - Required Operational Capability (ROC))	Approved January 1990 (Reliability, Availability and Maintainability Report under revision)
(U) Acquisition Strategy	Approved October 1990 (Revised Jun 92)
(U) Test Evaluation Master Plan	Approved July 1990 (Revised Jun 92)
(U) Integrated Logistics Support Package	Approved March 1992 (Revised Jun 92)

G. (U) RELATED ACTIVITIES: There is no unnecessary duplication of effort within the Army or Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Heavy Assault Bridge Mod GZ3250	0	0	0	19164	47239	58281	51246
Initial Spares GAO178						1019	1026

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. (U) MILESTONE SCHEDULE:

Milestones	Dates
Milestone I/II Review	Completed 1QFY91
Development and Early Operational Tests	Completed 3QFY92-1QFY93
Contract selection IPR	2QFY94
EMD Contract Award	2QFY94
Testing PPQT/EUTE	1QFY96-1QFY97

Program Element: #0604649A
PE Title: Engineer Mobility Equipment Development

Project Number: DG26
Budget Activity: #5

Low Rate Initial Production contract AWARD	1QFY97
Low Rate Initial Production deliveries	2QFY98-4QFY99
Production Qualification Test (PQT)	2QFY98-4QFY98
Initial Operational Test & Evaluation	2QFY98-3QFY98
Milestone III Review	4QFY98
Production contract award	1QFY99
First Unit Equipped (FUE)	1QFY99
Initial Operational Capability (IOC)	2QFY99
Production Contract Option award	1QFY00

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604710A
PE Title: Night Vision Systems Engineering Development
Budget Activity: #5

A. (U) RESOURCES: ($ in Thousands)

Project Number Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
Horizontal Technology Integration Second Generation FLIR (HTI SGF)									
DL69	0	14199	25265	24507	20749	6137	0	0	90857
Night Vision Systems - Engineering Development									
DL70	20296	27162	18114	15444	19328	17472	25341	Cont	Cont
PE TOTAL	20296	41361	43379	39951	40077	23609	25241		

B. (U) BRIEF DESCRIPTION ELEMENT: US defense forces are required to engage enemy forces twenty four hours a day, frequently in conditions of degraded visibility due to darkness, adverse weather and battlefield obscurants. Developments and improvements to high performance night vision electro-optic, thermal and laser systems and systems integration of related multi sensor suites will enable near to long range target acquisition and engagement as well as improve battlefield command and control in "around the clock" combat operations. These projects provide the equipment required to meet stated deficiencies across US Army mission areas to include preventing fratricide. Current equipment being developed includes the Thermal Weapon Sight (TWS) which uses forward looking infrared (FLIR), the non-developmental item (NDI) Laser Countermeasure System (LCMS), the Compass/Vertical Angle Measure (C/VAM) for the Mini Eyesafe Laser Observation Set (MELIOS), the Thermal Identification Device (TID), which is an anti-fratricide device, the Drivers Vision Enhancer (DVE), which is a FLIR used for driving Combat, Combat Support, and Combat Service Support vehicles, the Lightweight Laser Designator/Rangefinder (LLD/R), the Objective Laser Countermeasure System (LCMS), and the GEN II FLIR Horizontal Integration program which will enable the Army to insert key technology into the highest priority forces. In addition, this program element supports the night vision electro optics portion of Land Warrior Program which will develop helmet mounted sensors.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN 1995: N/A

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604710A
PE Title: Night Vision Systems Engineering Development

Project Number: DL69
Budget Activity: #5

A. (U) RESOURCES: ($ in Thousands)
Project Title: Night Vision Systems Engineering Development

Popular Name	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
HTI 2nd GEN FLIR - Engineering Development									
	0	14199	25265	24507	20749	6137	0	0	90857

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: US defense forces are required to engage enemy forces twenty four hours a day frequently in conditions of degraded visibility due to darkness, adverse weather and battlefield obscurants. This program significantly enhances the capability of the total combat force through the integration of second generation thermal sights. The Horizontal Technology Integration Second Generation Forward Looking Infra Red (HTI 2ND FLIR) project is dedicated to integrating key advanced thermal night vision technology in the highest priority forces across numerous critical combat systems on the battlefield. The initial systems selected to receive the 2ND GEN FLIR capability are the M2A3 Bradley, M1A2 Abrams, and the M-8 Armored Gun System. The HTI 2ND GEN FLIR is a continuation of efforts previously funded under PE #0603774A, Project D131 (Night Vision Advanced Development). The resulting synergy significantly enhances the capability and effectiveness of the entire force.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

	Complete	Cost
(U) FY 1993 Accomplishments:		
• (U) HQDA Special Task Force Chartered	2Q93	
• (U) Specification finalized	1Q93	
(U) FY 1994 Planned Program:		
• (U) Prepare and conduct Source Selection for HTI SGF	1Q94-3Q94	700
• (U) Award of Producibility Contracts for key components and critical technologies.	2Q94-4Q94	5900
• (U) Award ED contracts for platform integration	3Q94-4Q94	2199
• (U) Milestone I/II ASARC	3Q94	400
• (U) Award ED contract for FLIR systems	3Q94 - 4Q94	5000
Total		14199

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604710A
PE Title: Night Vision Systems Engineering Development

Project Number: DL69
Budget Activity: #5

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Develop and fabricate ED prototypes for HTI 2nd GEN FLIR	1Q95 - 4Q95	12748
• (U) Accept and test prototypes from Producibility Contracts	1Q95 - 4Q95	5327
• (U) Initiate Integration of 2ND GEN FLIR into Candidate Vehicles Sights	2Q95 - 4Q95	7061
Total		25265

D. (U) WORK PERFORMED BY: In-house efforts accomplished by Communications and Electronics Command (CECOM), Ft. Monmouth, NJ and the Night Vision Electronic Sensors Directorate (NVESD), Ft. Belvoir, VA. Government management responsibility is the Program Executive Office for Intelligence and Electronics Warfare (PEO-IEW), Vint Hill Farm Station, Warrenton, VA, Product Manager, Forward Looking Infrared (PM-FLIR), and the Project Manager for Night Vision Electro Optics (PM-NVEO), Ft. Belvoir, VA in close coordination with the Program Executive Officers for Armored Systems Modernization and Tactical Missiles. Contractors are to be determined.

E. (U) COMPARISON WITH FY 1994 AMENDED DESCRIPTIVE SUMMARY:
NARRATIVE DESCRIPTION OF CHANGES

1. TECHNICAL CHANGES: N/A
2. SCHEDULE CHANGES: N/A
3. COST CHANGES: N/A

F. (U) PROGRAM DOCUMENTATION:

GEN II FLIR Horizontal Integration

Operational Requirement Document (ORD)	- 12/93
Acquisition Plan (AP)	- 12/93
Milestone I/II Approval	- 6/94

G. (U) RELATED ACTIVITIES: Program element #0603710A Night Vision Advanced Technology, and program element #0603774A Night Vision Systems Advanced Development support this program element. There is no unnecessary duplication of effort within the US Army or Department of Defense.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604710A
PE Title: Night Vision Systems Engineering Development

Project Number: DL69
Budget Activity: #5

H. (U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Other Procurement Army-2 Horizontal Technology Integration 2nd Gen FLIR K30400 (Production funded to begin in FY97)							
	None	None	None	None	5594	36341	67243

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. (U) MILESTONE SCHEDULE:

Milestones	Dates
GEN II FLIR HTI ED contract	FY 1994-96
GEN II FLIR HTI technical and user test	FY 1996-97
GEN II FLIR LRIP Decision	FY 1997
GEN II FLIR HTI Milestone III production decision	FY 1998
GEN II FLIR HTI production award	FY 1998
GEN II FLIR HTI First Unit Equipped (FUE)	FY 1999

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604710A
PE Title: Night Vision Systems Engineering Development

Project Number: DL70
Budget Activity: #5

A. (U) RESOURCES: ($ in Thousands)
Project Title: Night Vision Engineering Development

Popular Name	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DL70 Night Vision Systems - Engineering Development									
	20296	27162	18114	15444	19328	17472	25241	Cont	Cont

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: US defense forces are required to engage enemy forces twenty four hours a day, frequently in conditions of degraded visibility due to darkness, adverse weather and battlefield obscurants. Developments and improvements to high performance night vision electro-optic, thermal and laser systems and systems integration of related multi sensor suites will enable near to long range target acquisition and engagement as well as improve battlefield command and control in "around the clock" combat operations. This project provides the equipment required to meet stated deficiencies across US Army mission areas to include reducing fratricide. Current equipment being developed includes the Thermal Weapon Sight (TWS) which uses forward looking infrared (FLIR), the non-developmental item (NDI) Laser Countermeasure System (LCMS), the Compass/Vertical Angel Measure (C/VAM) for the Mini Eyesafe Laser Observation Set (MELIOS), the Thermal Identification Device (TID) which is an anti-fratricide device, and the Drivers Vision Enhancer (DVE) which is for driving Combat, Combat Support, and Combat Service Support vehicles. The Lightweight Laser Designator/Rangefinder (LLD/R), and the Objective Laser Countermeasure System (LCMS), are planned for future development. In addition, this project supports the night vision electro optics portion of Land Warrior Program which will develop helmet mounted sensors.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Develop and fabricate ED prototypes for TWS	1Q93 - 4Q93	9600
• (U) Develop and fabricate ED prototypes for NDI LCMS	1Q93 - 4Q93	6737
• (U) Award ED contract for DVE	4Q93	2134
• (U) Test C/VAM for MELIOS	1Q93 - 2Q94	1825
Total		20296

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604710A
PE Title: Night Vision Systems Engineering Development

Project Number: DL70
Budget Activity: #5

	Complete	Cost
(U) FY 1994 Planned Program:		
• (U) Begin and complete testing of TWS	2Q94 - 4Q94	6795
• (U) Begin and complete testing of NDI LCMS	2Q94 - 4Q94	7274
• (U) Develop ED prototypes for DVE	1Q94 - 4Q94	11608
• (U) Complete C/VAM Testing	1Q94 - 2Q94	50
• (U) Initiate Support of the NVEO portion of the Land Warrior Program	2Q94 - 4Q94	1435
Total		27162
(U) FY 1995 Planned Program:		
• (U) Complete development and fabricate ED prototypes for DVE	1Q94 - 4Q95	6337
• (U) Award ED for LLD/R	2Q95 - 4Q95	5241
• (U) Award ED Contract for Objective LCMS	2Q95 - 4Q95	5174
• (U) Provide support to the NVEO portion of the Land Warrior Program	1Q95 - 4Q95	1362
Total		18114

D. (U) WORK PERFORMED BY: In-house efforts accomplished by Communications and Electronics Command (CECOM), Ft. Monmouth, NJ and the Night Vision Electronic Sensors Directorate (NVESD), Ft. Belvor, VA. In addition, work is performed by Tobyhanna Army Depot, PA. Government management responsibility is the Program Executive Office for Intelligence and Electronics Warfare (PEO-IEW), Vint Hill Farm Station, Warrenton, VA and the Project Manager for Night Vision Electro Optics (PM-NVEO), Ft. Belvoir, VA. Contractors include Hughes Aircraft Corporation, El Segundo, CA, Lockheed Sanders, Nashua, NH, IMO OSD, Garland, TX, Magnavox, Mahwah, NJ and Texas Instruments, Richardson, TX.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. TECHNICAL CHANGES: No impact
2. SCHEDULE CHANGES: The LLD/R ED award moved from FY94 to FY95
3. COST CHANGES: Reduction of -$ 3.7M in FY93 to accomodate higher DoD priority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604710A
PE Title: Night Vision Systems Engineering Development

Project Number: DL70
Budget Activity: #5

F. (U) PROGRAM DOCUMENTATION:

Thermal Weapon Sight (TWS)	
Required Operational Capability (ROC)	- 08/90
Acquisition Plan (AP)	- 02/90
Milestone I/II In-Process Review (IPR)	- 12/90
Laser Countermeasure System (LCMS)	
Required Operational Capability (ROC)	- 09/91
Acquisition Plan (AP)	- 08/91
Milestone I/II In-Process Review (IPR)	- 12/91
Drivers Vision Enhancer (DVE)	
Operational Requirement Document (ORD)	- 3/93
Acquisition Plan (AP)	- 2/93
Milestone I/II In-Process Review (IPR)	- 4/93

G. (U) RELATED ACTIVITIES: Program element #0603710A Night Vision Advanced Technology and program element #0603774A Night Vision Systems Advanced Development support this program element. There is no unnecessary duplication of effort within the US Army or Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Other Procurement Army-2 Night Vision Devices KA3500 (Excludes funding for HTI SGF K30400, See project DL69)	72663	86126	78362	76383	82298	51891	64679

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604710A
PE Title: Night Vision Systems Engineering Development

Project Number: DL70
Budget Activity: #5

J. (U) MILESTONE SCHEDULE:

Milestones	Dates
TWS ED Contract	FY 1991-94
TWS technical and user test	FY 1994
TWS Milestone III production decision	FY 1995
TWS production award	FY 1995
TWS First Unit Equipped (FUE)	FY 1996
NDI LCMS ED contract	FY 1992-94
NDI LCMS technical and user test	FY 1994
NDI LCMS Milestone III production decision	FY 1995
NDI LCMS production award	FY 1995
NDI LCMS First Unit Equipped (FUE)	FY 1996
Special IPR C/VAM for MELIOS	FY 1994
DVE ED contract	FY 1993-95
DVE prototype selection and consolidation	FY 1996-97
DVE technical and user tests	FY 1998
DVE Milestone III production decision	FY 1999
DVE production award	FY 2000
DVE First Unit Equipped (FUE)	FY 2001
Objective LCMS MS II E&MD Decision	FY 1995
Objective LCMS ED Contract	FY 1995-97
Objective LCMS technical and user test	FY 1997
Objective LCMS MS III production decision	FY 1998
Objective LCMS FUE	FY 1999

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604713A
PE Title: Combat Feeding, Clothing and Equipment **Budget Activity: #5**

A.(U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DC40 Unit/Organizational Equipment	1156	1590	1441	2482	1705	1996	2064	Cont.	Cont.
DL40 Clothing and Equipment	3176	5594	6132	7015	2850	4711	5082	Cont.	Cont.
D548 Military Subsistence System	1388	1439	875	848	841	974	1447	Cont.	Cont.
D667 Enhanced Land Warrior	0	0	503	1099	4441	6038	2021	Cont.	Cont.
D668 Soldier Enhancement Program	18001	19766	16107	16022	16113	16604	16670	Cont.	Cont.
PE TOTAL	23721	28389	25058	27466	25950	30323	27284		

B.(U) BRIEF DESCRIPTION OF ELEMENT: Engineering and Manufacturing Development (EMD) and Non-Developmental Item (NDI) evaluation of items of unit/organizational equipment, weapons/munitions, clothing and individual equipment, fabric shelters, field service equipment, food and food service equipment enhance soldier efficiency and survivability. New food items and food service equipment will be developed to and reduce food service logistics requirements for all four services. This program provides EMD of individual soldier protective items and systems to provide protection from existing and emerging enemy threats including ballistic, chemical/biological/nuclear, and directed energy, as well as environmental conditions. Items are developed for the total force, including the specialized requirements of aviators, combat vehicle crews, light infantry, and ordnance specialists. This program supports development of a new generation of field service support items; small, large and collective protective shelters; decontamination items; and improved space heaters to shelter and sustain the soldier in the field and improve quality of life. It will integrate equipment from ongoing programs into a first generation fighting system for combat soldiers.

C.(U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:

(U) Project DC40 - Unit/Organizational Equipment: Develop new unit/organizational equipment and tentage to improve soldier mobility, sustainability and survivability.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604713A
PE Title: Combat Feeding, Clothing and Equipment
Budget Activity: #5

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Conducted Engineering and Manufacturing Development (EMD) and awarded contract for the lighter weight, more easily erected, more flexible Modular General Purpose Tent System (MGPTS)	4Q93	273
• (U) Performed user evaluation of the Tactical Air Shelter (TAS)	4Q93	125
• (U) Designed and fabricated low water and waterless field latrine systems	4Q93	164
• (U) Procured power distribution systems for Force Provider (FP) test complex	3Q93	204
• (U) Procured air/sea shipping containers for FP test	3Q93	390
Total		**1156**

(U) FY 1994 Planned Program:		
• (U) Conduct EMD of a safer and more fuel efficient 35K British Thermal Unit (BTU) Convection Space Heater	4Q94	376
• (U) Conduct use assessments of third generation TAS to validate design enhancements	3Q94	200
• (U) Fabricate and test air beam concepts for the Transportable Helicopter Enclosure (THE); down select to best technology	2Q94	454
• (U) Redesign MGPTS; fabricate prototypes and perform test and evaluation with users	4Q94	560
Total		**1590**

(U) FY 1995 Planned Program:		
• (U) Complete Pre-Production Qualification Test (PPQT) of the 35K BTU Convection Space Heater	2Q95	301
• (U) Conduct EMD of a safer and more fuel efficient 10K BTU Soldier Crew Tent Heater and Arctic Tent Heater	4Q95	300
• (U) Fabricate final design prototypes of the THE and conduct Production Prove-out Testing (PPT)	4Q95	200
• (U) Complete PPT of the TAS	4Q95	170
• (U) Complete development and test of the MGPTS for type classification	4Q95	470
Total		**1441**

(U) **Project DL40 - Clothing and Equipment:** Develop new clothing and equipment items to improve soldier mobility, efficiency (lighten the soldier's load), and survivability.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Conducted test and evaluation on the anti-mine protective suit for combat engineers and improved chemical and environmental protective boots	4Q93	815
• (U) Completed Technical Test/User Test (TT/UT) of ballistic/laser eyewear and aviation cold weather clothing	4Q93	593

• (U) Conducted Engineering and Manufacturing development efforts (EMD) for multiple chemical protective clothing in support of the Joint Service Lightweight Suit Technology (JSLIST) program	4Q93	666
• (U) Type Classified the Auxiliary Aviation Lighting Devices for limited procurement	4Q93	55
• (U) Fabricated prototypes for TT/UT of the cold/wet weather glove P3I	4Q93	441
• (U) Conducted evaluations and design reviews on various programs to include sleeping bags and combat vehicle crew coverall programs and women's' shirt programs	4Q93	606
Total		**3176**

(U) FY 1994 Planned Program:

• (U) Down select chemical suit materials and designs and finalize Test and Evaluation Master Plan (TEMP) for Joint Service Lightweight Suit Technology (JSLIST)	1Q94	250
• (U) Award integrated acquisition contract for manufacturing test prototypes and first unit equipped optional buys for JSLIST	3Q94	1100
• (U) Initiate procurement of candidates under Integrated Acquisition Program for the Advanced Sun, Wind, and Dust Goggle	3Q94	680
• (U) Type Classify ballistic/laser eye protection, aviation cold weather clothing. and Body Armor Set, Individual, Countermine (BASIC)	2Q94	235
• (U) Conduct TT/UT of P3I on the Intermediate Cold/Wet Glove, and type classify	4Q94	317
• (U) Complete design/evaluation of the Personal Ice Cooling System (PICS)	2Q94	113
• (U) Integrate Chemical Protective (CP) Handwear and CP Footwear programs with the JSLIST CP Garment program to field a Joint Service Chemical Protective System	4Q94	450
• (U) Conduct evaluations on innovative design concepts using lightweight, more producible materials for the Toxicological Agent Protective (TAP) Suit Redesign	4Q94	403
• (U) Integrate lightweight, chemical protective materials into the current Firefighters Ensemble and conduct testing	4Q94	369
• (U) Initiate development of a helmet mounted radio into the Advanced Combat Vehicle crewman (CVC) helmet	4Q94	860
• (U) Conduct TT/UT of the Combat Soldiers' Sleeping System (CSSS) P3I and type classify	3Q94	120
• (U) Conduct various engineering development tasks for multiple projects and in-house support to the PM	4Q94	497
• (U) Conduct evaluations of several womens dress items for standardization among services (ie.,slacks, skirt, necktab, all weather coat)	4Q94	200
Total		**5594**

(U) FY 1995 Planned Program:

• (U) Receive test suits and initiate operational and developmental testing of full JSLIST ensemble	2Q95	1800

• (U) Conduct TT/UT of the Personal Ice Cooling System (PICS) and Firefighters Chemical Protective (CP) Ensemble	3Q95	730
• (U) Procure test items and initiate Joint Service TT/UT on the TAP Suit Redesign	2Q95	1000
• (U) Procure test items to conduct TT/UT on the helmet mounted radio for the Advanced Combat Vehicle crewman (CVC) helmet, individual soldier microclimate cooling system, and advanced sun/wind/dust goggle	4Q95	2500
• (U) Type classify Firefighters' CP Ensemble	1Q95	60
• (U) Type classify a P3I for the body Armor Set, Individual Countermine and Multipurpose Overboot (MULO)	4Q95	42
Total		**6132**

(U) Project D548 - Military Subsistence Systems: Develop, produce and field improved subsistence and subsistence preparation items to enhance fighter mobility, efficiency, sustainment and survivability and quality of life in all four services as part of an integrated DoD Food Research, Development, Test, Evaluation and Engineering (RDT&E) program.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Completed development of product improvements to the Navy Communication Zone (COMMZ) Hospital Food Service System	4Q93	388
• (U) Conducted a field evaluation of the Navy COMMZ Hospital Food Service System for Army applications	4Q93	400
• (U) Contracted for design/fabrication of prototype Air Force Initial Deployment Kitchen for initial deployments to bare base conditions	3Q93	400
• (U) Completed final tests of hospital ward insulated food container	3Q93	200
Total		**1388**

(U) FY 1994 Planned Program:		
• (U) Conduct field test of prototype Air Force Initial Deployment Kitchen	4Q94	354
• (U) Complete final design(s) and procure test prototype(s) of more efficient containerized kitchen(s)	4Q94	700
• (U) Develop potable water heater and sanitation unit for Marine Corps field feeding system	4Q94	385
Total		**1439**

(U) FY 1995 Planned Program:		
• (U) Conduct Initial Operational Test and Evaluation of the Containerized Kitchen	3Q95	100
• (U) Produce Technical Data Package (TDP) for Air Force Initial Deployment Kitchen and transition for procurement	3Q95	182

• (U) Conduct developmental/operational testing of potable water heater and sanitation unit for Marine Corps field feeding system	3Q95	360
• (U) Conduct tests with Powered Multifuel Burner that provides Operation and Support Cost Reduction (OSCR)	3Q95	233
Total		**875**

(U) Project D667 - Enhanced Land Warrior: This program includes all soldier system modernization: Land Warrior (LW); Mounted Warrior (MW); and Air Warrior (AW). LW is a first generation, integrated fighting system for dismounted combat soldiers, that encompasses anything the soldier wears or carries. The backbone of LW will be a radio/computer/Global Positioning System (GPS) and head mounted display. LW will incorporate/integrate equipment from other programs when appropriate. MW will be a similar system for the mounted crewman, and the AW will support air crew soldiers.

	Complete	Cost
(U) FY 1993 Accomplishments: Not applicable. Project established beginning in FY95.		

(U) FY 1994 Planned Program: Not applicable. Project established beginning in FY95.

(U) FY 1995 Planned Program:

• (U) Contract a helmet-mounted radio (HMR) and vehicle system interface usable by combat vehicle crewmen while mounted or dismounted	3Q95	150
• (U) Procure prototypes of the HMR	4Q95	353
• (U) Conduct user evaluation of HMR	4Q95	43
Total		**546**

(U) Work Performed By: In-house efforts will be accomplished by U.S. Army Natick Research, Development and Engineering Center, Natick, MA; Project Manager Soldier, Woodbridge, VA. Other supporting government agencies include U.S. Army Test and Evaluation Command, Aberdeen Proving Ground (APG), MD; Yuma Proving Ground, AZ; Dugway Proving Ground, Dugway, UT; U.S. Army Belvoir Research, Development and Engineering Center, Fort Belvoir, VA; USMC Project Manager Combat Soldier Support, Quantico, VA; U.S. Navy Clothing and Textile Facility, Natick, MA; U.S. Army Chemical and Biological Defense Agency, APG, MD; and U.S. Army Research Institute of Environmental Medicine, Natick, MA; U.S. Army Aviation Research Laboratory, Fort Rucker, AL; Oak Ridge National Laboratories, Oak Ridge, TN; U.S. Army Tank Automotive Command, Warren, MI; U.S. Army Cold Regions Test Center, Fort Greeley, AK; and U.S. Army Quartermaster Center and School, Fort Lee, VA. Contractors include: Foster-Miller, Inc., Waltham, MA; Air Lock Inc., New Haven, CT; Analytics Inc., Willow Grove, PA; Metrick, Inc., Elverson, PA; East/West Industries, Inc., Hauppauge, NY; Battelle Corporation, Columbus, OH; Uvex Winter Optics, Southfield, RI; KPM-Tek, Inc., Inwood, PA; American Optical Corp., South Bridge, MA; Research Inc., Waynesville, NC; Teledyne Inc., Northridge, CA; Environmental Technologies Group Inc., Towson, MD; Gentex Corporation, Carbondale, PA; Mine Safety Appliance, Murrayville, PA; Bose,

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604713A
PE Title: Combat Feeding, Clothing and Equipment **Budget Activity: #5**

Framingham, MA; Safetech, Newton, PA; and GEOMET Technologies, Germantown, MD.

(U) Related Activities: PE #0603747A (Enhanced Land Warrior) established by DoD 3235.2-R. The Army is the executive agent for management of this fully coordinated joint services effort. To prevent duplication of clothing and individual equipment item development, close coordination is maintained through joint working groups, joint service agreements and circulation of requirements documents. There is no unnecessary duplication of effort within the Army or DoD.

(U) Other Appropriation Funds:

	($ in Thousands)						
Appropriation	**FY 1993 Actual**	**FY 1994 Estimate**	**FY 1995 Estimate**	**FY 1996 Estimate**	**FY 1997 Estimate**	**FY 1998 Estimate**	**FY 1999 Estimate**
Operation and Maintenance, Army (OMA):	47911	41415	74500	61226	65996	64724	63573
Other Procurement, Army Activity 3: Force Provider (MA6810),	0	0	10741	18712	18417	18399	0
Enhanced Land Warrior (MA6801)	0	0	0	0	0	0	10229

(U) International Cooperative Agreements: None.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604713A**
PE Title: **Combat Feeding, Clothing and Equipment**

Project Number: **#D668**
Budget Activity: **#5**

A. (U) RESOURCES: ($ in Thousands)
Project Title: Soldier Enhancement Program

Popular Name Program	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
SEP	18001	19766	16107	16022	16113	16604	16670	Cont.	Cont.

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The Soldier Enhancement Program (SEP) consists of multiple projects to identify, test and evaluate equipment for the individual soldier, focusing on non-developmental items whenever possible to expedite the research and development process. SEP products are intended to improve soldier lethality, survivability and combat effectiveness. The focus of SEP is in four general areas: weapons and munitions, combat clothing, communications and navigation aids, and food/water/shelter.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Type classified and initiated production contracts for the 50 caliber Sabot Launched Armor Penetrator (SLAP) ammunition, M24 sniper laser hardening protection, and assault pack for M249	4Q93	150
• (U) Initiated development of dual and vehicle mounts for M249 machine gun, small arms commercial lubricants, stabilized binoculars, 5.56mm dim tracer, stun grenade, 40mm tracer ammunition, and MK19 extended range sight	1Q93	11435
• (U) Conducted field evaluation of new/improved Meal, Ready-to-Eat (MRE) items	2Q93	596
• (U) Type classified the Mounted Water/Ration Heater (MWRH)	3Q93	277
• (U) Conducted technical tests of insulated food container and down selected field test prototype	4Q93	135
• (U) Procured/assembled initial small unit health and comfort pack test items and test quantities of multi-faith rations	4Q93	340
• (U) Conducted test and evaluation of Organizational Clothing and Individual Equipment (OCIE) including lightweight rain suit, gloves, hot weather Battle Dress Uniform (BDU) cap, kneepads and boots	4Q93	1342
• (U) Initiated work on lightweight chemical protective overgarment, improved chemical biological glove, improved mechanics' coveralls and tropical load bearing vest	2Q93	1737
• (U) Type classified neck gaiter, knife sheath, improved ballistic CVC helmet and hot weather BDU cap	4Q93	265

• (U) Conducted technical test on the soldier fighting cover	3Q93	359
• (U) Continued work on the Lightweight Video Reconnaissance System	1Q93	1000
• (U) Continued work on the launched grapnel hook	4Q93	265
• (U) Begin operational testing of the individual water purification system (joint program with U.S. Marine Corps)	3Q93	100
Total		**18001**

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Type classify/program completion for the AT4 night sight bracket, universal boresight device, 5.56mm armor piercing, M249 collapsible buttstock, XM144 telescope, M249 blank firing adapter	3Q94	808
• (U) Continue work on the modular weapon system (supports Enhanced Land Warrior), M4/M16 multiple magazine holder, 40mm IR illumination round, portable periscope, M203 for M4 carbine, and close combat optics	4Q94	8692
• (U) Complete multi-faith ration field test/transition Technical Data Package (TDP) to the Defense Logistics Agency (DLA)	2Q94	20
• (U) Complete insulated food container TDP and transition to DLA for procurement	2Q94	25
• (U) Complete evaluation of small unit health and comfort pack	4Q94	15
• (U) Evaluate air activated catalytic heating for subsistence	3Q94	225
• (U) Terminate programs for the small arms alternate commercial lubricants, the MK19 extended range sight and the alternate color tracer	1Q94	25
• (U) Conduct technical test on lightweight chemical protective overgarment, improved chemical/biological glove, improved mechanics overalls, tropical load bearing vest, improved lightweight cold weather underwear, and improved trigger finger mitten	4Q94	1116
• (U) Type classify rainsuit, hot weather boot, ghillie suit accessory kit, improved socks, improved shelter half, mounted crewmen cold wet gloves	4Q94	526
• (U) Procure test items and conduct technical testing of the lightweight video reconnaissance system	3Q94	336
• (U) Conduct technical test of the 40mm smoke/flame projectile	4Q94	861
• (U) Procure test hardware and software and begin technical testing of the lightweight leader's computer	3Q94	847
• (U) Conduct user testing and type classify the performance specification for the soldier fighting cover	2Q94	350
• (U) Initiate evaluation of remaining 31 SEP projects on various clothing and equipment items for the dismounted soldier to include monocular night vision device, .50 caliber multi-purpose round, PASGT liner, and 2nd generation extreme Cold Weather Clothing System (ECWCS)	4Q94	2790

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604713A
PE Title: Combat Feeding, Clothing and Equipment

Project Number: #D668
Budget Activity: #5

• (U) Conduct technical/user testing for the launched grapnel hook (the following Force Provider (FP) tasks will be restructured to DC40 during FY94)	4Q94	530
• (U) Type classify standard the Force Provider objective system	3Q94	300
• (U) Develop winterization kit	4Q94	600
• (U) Develop prototype latrines	4Q94	400
• (U) Develop waste water treatment systems	4Q94	800
• (U) Develop commercial prototype laundry	4Q94	500
Total		**19766**

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Type classify XM192 lightweight tripod, 7.62mm Small Arms Light Armor Penetration (SALAP), portable periscope, close combat optics, M249 vehicle mount, dual mount, stun grenade, M24 night sight, mini-binoculars, M4/M16 multiple magazine holder, and M24 flash/blast suppresser and attenuator	4Q95	3294
• (U) Complete TDP for air activated catalytic heater	4Q95	150
• (U) Type classify load bearing equipment clasps and improved butt pack	4Q95	155
• (U) Conduct test and evaluation on cold weather parka/trouser, improved chemical biological glove and inconspicuous body armor	4Q95	975
• (U) Complete user testing and type classify lightweight video reconnaissance system	2Q95	76
• (U) Type classify hardware and begin production contract for soldier fighting cover (SFC)	1Q95	25
• (U) Type classify launched grapnel hook	4Q95	350
• (U) Complete user/technical testing for fighting position revetment	4Q95	100
• (U) Type classify lightweight leader's computer	4Q95	300
• (U) Complete user/technical testing for fighting position excavator	2Q95	1290
• (U) Conduct design review and field testing for individual enhanced ration	3Q95	140
• (U) Continuation of various SEP projects on individual equipment, small arms and clothing to include 2nd generation ECWCS, .50 caliber multi-purpose round, modular weapon system, 40mm canister round, improved trigger finger mitten, and the surveillance damage assessment device	4Q95	5907

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604713A
PE Title: Combat Feeding, Clothing and Equipment

Project Number: #D668
Budget Activity: #5

• (U) Initiate FY95 new starts from approximately 175 programs submitted in the areas of survivability, lethality, communications, and mobility including the improved flotation device, one man sandbagging device, night vision goggle, power lenses, face paint, camouflage head net, pocket survival tool, fingerless glove, phoenix infrared beacon and M9 slide buffer	1Q95	3345
Total		**16107**

D. (U) WORK PERFORMED BY: In-house work performed by U.S. Army Natick Research and Development Centers, Natick, MA; PM Soldier, Woodbridge, VA; PM Small Arms, Dover, NJ; Belvoir Research, Development and Engineering Center, Fort Belvoir, VA; U.S. Army Aviation Research Laboratory, Fort Rucker, AL; Ballistic Research Laboratories, Aberdeen Proving Ground, (APG) MD; U.S. Army Test and Evaluation Command, APG, MD; US Army Chemical and Biological Defense Agency, APG, MD; Picatinny Arsenal, Dover, NJ; U.S. Armament, Munitions and Chemical Command, Rock Island Arsenal, IL; U.S. Army Communications and Electronics Command, Fort Monmouth, NJ; Oak Ridge National Laboratories, Oak Ridge, TN; Contractors are: Kem-Tek Inc., Linwood, PA; Americal Optical Corp, South Bridge, MA; Research Inc., Waynesville, NC; Teledyne Inc., Northridge, CA; Environmental Technologies Group, Inc., Towson, MD; Alliant Technologies, Brooklyn Park, MN, Colt Firearms, Hartford, CT; Saco Defense, Inc., Saco, ME; FN Manufacturing Inc., Columbia, SC; Litten, Tempe, AZ; Olin, St. Petersburg, FL; Normura Industries, Rock Island, IL; Hughes, El Segundo, CA; A.R.M.S., Inc., Bridgewater, MA; IMO/Varo, Garland, TX; IMO/OEC, Dallas, TX; ITT Corp, Roanoke, VA, Gentex Corporation, Carbondale, PA; Mine Safety Appliance, Murrayville, PA; Bose, Framingham, MA; and GEOMET Technologies, Germantown, MD.

E.(U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:
NARRATIVE DESCRIPTION OF CHANGES

1. TECHNICAL CHANGES: None.

2. SCHEDULE CHANGES: 33 new items added

3. COST CHANGES:

F.(U) PROGRAM DOCUMENTATION: Each of the 67 separate projects currently within SEP have individual program documentation

G.(U) RELATED ACTIVITIES: There is no unnecessary duplication of effort within the Army or DoD.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604713A
PE Title: **Combat Feeding, Clothing and Equipment**

Project Number: #D668
Budget Activity: #5

H.(U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Operations and Maintenance, Army (OMA):	0	0	2525	0	0	0	0
Weapons and Tracked Combat Vehicles (WTCV):							
GZ1290	0	0	1943	0	0	0	0
GC0925	0	0	352	709	1198	1436	0
Other Procurement, Army Activity 2 (OPA-2): Lightweight Video Reconnaissance System (K30800)	0	0	2210	2370	2714	4180	4245
Other Procurement, Army Activity 3 (OPA-3): Soldier Enhancement Program (MA6800)	10942	11000	0	0	0	0	0

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS:

J. (U) MILESTONE SCHEDULE: Each of the 67 separate projects currently within SEP has an individual milestone schedule.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604715A (TIARA)**
PE Title: **Non-System Training Devices - Engineering Development** Budget Activity: **#5**

A.(U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DC82 Louisiana Maneuvers	0	0	5929	6003	5012	4025	4041	Cont	Cont
DC91 Distributive Interactive Simulations	0	0	3492	3950	3884	3856	3826	Cont	Cont
D241 Non-System Training Devices Combined Arms	13661	42834	25765	33130	26130	15045	11151	Cont	Cont
D396 Tactical Simulation (TIARA)	2541	5255	3495	2093	893	0	3331	Cont	Cont
D573 STRICOM and Naval Training System Center Support	8896	9099	9648	9884	10272	10670	11990	Cont	Cont
D574 Combined Arms Tactical Trainer (CATT)	14580	(Beginning in FY94, CATT funding is in PE 0604780A D571)							
PE TOTAL	39678	57188	48329	55060	46191	33596	34339		

B.(U) BRIEF DESCRIPTION OF ELEMENT:
Engineering Development of Non-System Training Devices to support force-on-force training at the Combat Training Centers (CTC), general military training and training on more than one item/system, as compared with system devices which are developed in support of a specific item/weapon system. Training devices and training simulations provide force multipliers that improve combat effectiveness by providing realistic training while helping to control rapidly escalating costs. Training devices maximize the transfer of knowledge, skills and experience from the training situation to a combat situation. Force-on-force training at the National Training Center (NTC), Ft. Irwin, CA, Joint Readiness Training Center (JRTC), Ft. Chaffee, AR, and Combat Maneuver Training Center (CMTC), Hohenfels, Germany, will provide increased combat readiness through realistic collective training in low, mid, and high intensity scenarios. Project DC82 Louisiana Maneuvers is a new Project intended to energize and guide the restructuring of the Army while simultaneously keeping it combat-ready for any contingency. Project DC91, Distributive Interactive Simulations (DIS), includes engineering development of techniques and technology for DIS and related simulations and simulator efforts. Project D241, Non-System Training Devices-Combined Arms, develops simulation training devices for Army-wide use, including the CTCs. Project D396, Tactical

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604715A (TIARA)
PE Title: Non-System Training Devices - Engineering Development

Budget Activity: #5

Simulations, is an intelligence simulation/driver for both training (intelligence driver for Corps Battle Simulation (CBS)) and testing (test driver for All Source Analysis System (ASAS)). Project D573, STRICOM/NAWCTSD Support, funds in-house costs of project support by STRICOM and Naval Air Warfare Center Training Systems Division (NAWCTSD).

C.(U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN 1995:

(U) Project DC82- Louisiana Maneuvers (LAM): LAM will serve as a laboratory for the Army to practice its roles and missions, to develop and explore options, to assess and direct progress, to provide a framework for decisions by senior leaders, and to facilitate the Army's transformation. LAM will consist of a series of related exercises forming a campaign to assess the army of the 21st century in areas of policy, doctrine, organization, training, materiel, leader development, and soldier issues shaping the force. As an evolving process, LAM will exploit the results and outcomes of each exercise by incorporating lessons learned in order to enhance the value of follow-on exercises. Overall, LAM will focus the Army's self-assessment of institutional effectiveness, provide direction for change, and orient the Army's leadership to accomplish the national military strategy with available resources. This is a new project in FY95 (formerly funded under project D241).

	Complete	Cost
(U) FY 1993 Accomplishments:		
• (U) Funded under project D241		
(U) FY 1994 Planned Program:		
• (U) Funded under project D241		
(U) FY 1995 Planned Program:		
• (U) Continue development of database tools for theater-level exercises	4Q95	2500
• (U) Initiate development of simulaiton linkages	4Q95	1500
• (U) Conduct issue investigation by AMC, TRADOC, FORSCOM, & SSDC	4Q95	1929
Total		5929

(U) Project DC91 - Distributive Interactive Simulations (DIS): DIS technology provides wide area simulation networking in support of modeling and prototyping, doctrinal development, training, and operations. DIS utilizes live, virtual and constructive simulations. This project was established and funding moved from D241 to allow better tracking of DIS efforts.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604715A (TIARA)**
PE Title: **Non-System Training Devices - Engineering Development** Budget Activity: **#5**

	Complete	Cost
(U) FY 1993 Accomplishments:		
• (U) Not funded		
(U) FY 1994 Planned Program:		
• (U) Funded under project D241		
(U) FY 1995 Planned Program:		
• (U) Establish replacement to Advanced Distributed Simulation Technology (ADST) contract	3Q95	500
• (U) Supports DIS site operations	3Q95	1500
• (U) Support Systems Engineering and Integration Contract	2Q95	1492
Total		**3492**

(U) Project D396 - Tactical Simulation (TACSIM): TACSIM is a TIARA program. Funds development and testing support of TACSIM

	Complete	Cost
(U) FY 1993 Accomplishments:		
• (U) Initiated TACSIM Version 2.1.5 for compatibility with CBS 1.5	3Q94	2000
• (U) Initiated development of Aggregate Level Simulation Protocol (ALSP) interface to CBS	3Q95	291
• (U) Provided limited support to Army Tactical Command and Control System (ATCCS) testing	4Q93	250
Total		**2541**
(U) FY 1994 Planned Program:		
• (U) Complete TACSIM Version 2.1.5 development	3Q94	3000
• (U) Initiate TACSIM 2.1.6 development	3Q95	2030
• (U) Enhancement TACSIM to include Unmanned Aerial Vehicle Ground Support	4Q94	225
Total		**5255**
(U) FY 1995 Planned Program:		
• (U) Complete TACSIM 2.1.6 development	3Q95	1495
• (U) Initiate TACSIM 2.1.7 development	3Q96	1000
• (U) Initiate development of Warfighters' Simulation (WARSIM) intel capability	1Q99	1000
Total		**3495**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604715A (TIARA)**
PE Title: **Non-System Training Devices - Engineering Development** Budget Activity: **#5**

(U) Project D573 - Simulation, Training and Instrumentation Command (STRICOM) and Naval Air Warfare Center Training Systems Division (NAWCTSD) Support: This project funds STRICOM personnel and proportionate Army share of the operating costs of the NAWCTSD through an inter-service support agreement which is reviewed annually.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Funded STRICOM personnel	4Q93	6300
• (U) Funded NAWCTSD support	4Q93	1550
• (U) Funded concept formulation	4Q93	1046
Total		**8896**
(U) FY 1994 Planned Program:		
• (U) Funds STRICOM personnel	4Q94	6505
• (U) Funds NAWCTSD support	4Q94	1500
• (U) Funds concept formulation	4Q94	1094
Total		**9099**
(U) FY 1995 Planned Program:		
• (U) Funds STRICOM personnel	4Q95	6750
• (U) Funds NAWCTSD support	4Q95	1600
• (U) Funds concept formulation	4Q95	1298
Total		**9648**

(U) Project D574 - Combined Arms Tactical Trainer (CATT): This project provides for Engineering and Manufacturing Development and pre-planned product improvements for the Close Combat Tactical Trainer (CCTT) to enhance readiness of both active and reserve component forces.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Completed Definition of System Requirements	4Q93	9680
• (U) Collected and Archived Performance data	4Q93	1900
• (U) Initiated Test & Evaluation, Independent Verification and Validation and Subject Matter Expert programs	4Q93	3000
Total		**3495**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604715A (TIARA)
PE Title: Non-System Training Devices - Engineering Development **Budget Activity: #5**

(U) FY1994 Planned Program: See PE #0604780A, Project D571

(U) Work Performed By: In-house activities are performed by STRICOM, various Army commands and agencies, the Naval Air Warfare Center Training Systems Division (NAWCTSD), Orlando, FL, and other DoD agencies. Contract efforts are performed by various contractors contracted by the Army through NAWCTSD.

(U) Related Activities: PE #0602727A (Non-System Training Device Technology); PE #0604780A (Combined Arms Tactical Trainer). To preclude duplication of effort, this project is closely coordinated with other services through Training and Personnel Technology conferences, a Joint Service Technical Coordinating Group, worldwide staffing of Training Device Requirements, and collocation of STRICOM with the Naval Air Warfare Center Training Systems Division in Orlando, FL. There is no unnecessary duplication of effort within the Army or DoD.

H. (U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Procurement OPA3							
CTC Support	31297	12975	20138	26006	10638	0	0
NSTD	78711	84650	99339	93614	124736	79003	114873

(U) International Cooperative Agreements: Not Applicable

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604715A**
PE Title: **Non-System Training Devices - Engineering Development**

Project Number: **#D241**
Budget Activity: **#5**

A. (U) RESOURCES: ($ in Thousands)
Project Title: Non-System Training Devices Combined Arms

Popular Name	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
NSTD Combined Arms	13661	42834	25765	33130	26130	15045	11151	Cont	Cont

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project is used to develop prototype training devices to support combined arms (Infantry, Armor, Aviation, Air Defense, Artillery, Engineer, Chemical, and Support troops) training and multi-system training within the Army, to include the Reserve Components. Corps Battle Simulation (CBS) is the Army's standard command and staff training simulation at the corps/division level. Combat Service Support Training Simulation System (CSSTSS) is a training simulation which supports training at battalions through echelons-above-corps levels to provide the level of detail required to train logistics commanders and staffs. CSSTSS will be linked to CBS to provide integrated maneuver and logistics training. Distributed Interactive Simulation (DIS) will allow training simulations representing different weapons systems and command levels at geographically dispersed locations to interact with one another in real time to provide more realistic combined arms training. Warfighters' Simulation (WARSIM) will be the next generation battle simulation to replace CBS and Brigade/Battalion Battle Simulation (BBS). WARSIM will utilize current technology to efficiently provide training support and linkage to other simulations and simulators. WARSIM will comply with DIS standards and open architecture to meet the Army's training requirements into the next century. Multiple Integrated Laser Engagement Simulation II (MILES II) will provide additional weapon system capabilities during tactical engagement exercises. Additionally, this project provides for the development of maintenance simulators. This project funds the development of training devices, simulators, simulations and instrumentation for the Combat Training Centers (CTC), including the MILES Claymore/Grenade, and instrumentation upgrades and the Battle Command Training Program (BCTP). The Air Ground Engagement System II (AGES II) will permit the inclusion of aviation assets in MILES tactical engagement exercises. Devices developed will enable the Army to train units collectively to obtain the synergistic results through the employment of weapons and support systems in their respective battlefield roles. The Fire Support Combined Arms Tactical Trainer (FSCATT), formerly called the Closed Loop Artillery Simulation System (CLASS). FSCATT Phase I will operate in stand alone mode for initial and sustainment gunnery training; Phase II can be linked as part of the CATT family.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604715A | **Project Number: #D241**
PE Title: Non-System Training Devices - Engineering Development | **Budget Activity: #5**

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Initiated development of AGES II upgrades	4Q95	800
• (U) Initiated development of JRTC Objective Instrumentation System	4Q94	5950
• (U) Initiated development of After Action Review (AAR) system to support BCTP and CBS/BBS sites	3Q95	550
• (U) Initiated development of M113 OPFOR Surrogate Vehicle (OSV)	4Q95	150
• (U) Initiated development of NTC AH-64 Instrumentation	4Q96	50
• (U) Initiated development of CBS 1.5	3Q94	102
• (U) Continued development of the CSSTSS	4Q01	2908
• (U) Continued enhancements of Brigade/Battalion Battle Simulation	3Q99	750
• (U) Continued development of devices, simulators and simulations to support training at the NTC, JRTC, CMTC, and BCTP	4Q93	1148
• (U) Continued testing of Simulated Area Effects-Radio Frequency (SAWE-RF)	4Q94	948
• (U) Completed development of CBS 1.4	4Q93	305
• (U) Completed development of Range Data Measurement Subsystem (RDMS) upgrade for NTC	3Q93	0
Total		**13661**

(U) FY 1994 Planned Program:		
• (U) Initiate development of MILES II for crew served and individual weapons	4Q94	1950
• (U) Initiate development of FSCATT Phase I	4Q96	2245
• (U) Initiate architecture and test bed development for WARSIM 2000	3Q01	2796
• (U) Initiate development of Trainer Distributed Interactive Simulation (restructure to DC91 in FY95)	4Q94	2159
• (U) Initiate development of CBS 1.6	3Q95	1771
• (U) Initiate enhancement of BCTP AAR for Armywide CBS use	2Q96	728
• (U) Continue development of AGES II upgrades	4Q95	4342
• (U) Continue development of M113 OSV	4Q95	984
• (U) Continue development of the CSSTSS	4Q01	7906
• (U) Continue limited BBS enhancement	4Q98	737
• (U) Continue development of After Action Review system for BCTP	2Q96	536
• (U) Continue development of devices, simulators and simulations to support training at the NTC, JRTC, CMTC, and BCTP	4Q94	5376
• (U) Complete development of CBS 1.5	3Q94	4060

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604715A | **Project Number: #D241**
PE Title: Non-System Training Devices - Engineering Development | **Budget Activity: #5**

• (U) Complete development of AH-64 instrumentation	4Q96	
• (U) Complete testing of SAWE-RF	4Q94	3815
• (U) Provide support of Louisiana Maneuvers exercises and CINC training initiatives	4Q94	3429
Total		**42834**

(U) FY 1995 Planned Program:

• (U) Initiate CBS 1.7 enhancement	3Q96	1431
• (U) Continue development of AGES II upgrades	4Q95	1670
• (U) Continue architecture development for WARSIM 2000	3Q01	5086
• (U) Continue development of CSSTSS	4Q01	6599
• (U) Continue limited BBS enhancement	3Q99	600
• (U) Continue development of FSCATT Phase I	4Q96	5954
• (U) Continue development of M113 OSV	4Q95	500
• (U) Continue development of devices, simulators and simulations to support training at the NTC, JRTC, CMTC, and BCTP	4Q95	1650
• (U) Complete CBS 1.6 enhancement	3Q95	2275
Total		**25765**

D. (U) WORK PERFORMED BY: In-house STRICOM activities are performed by the Naval Air Warfare CenterTraining System Division, Orlando, FL. Contractors include Jet Propulsion Laboratories, Pasadena, CA, Loral Electro-Optics, Pasadena, CA, software supported by Communication-Electronics Command (CECOM).

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** None.
2. **SCHEDULE CHANGES:** CSSTSS contract award protest has delayed development.
3. **COST CHANGES:** None

F. (U) PROGRAM DOCUMENTATION: Each separate project has individual documentation.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604715A**
PE Title: **Non-System Training Devices - Engineering Development**

Project Number: **#D241**
Budget Activity: **#5**

G. (U) RELATED ACTIVITIES: PE #0602727A (Non-System Training Device Technology); To preclude duplication of effort, this project is closely coordinated with other services through Training and Personnel Technology Conferences, a Joint Service Technical Coordinating Group, worldwide staffing of Training Device Requirements, and collocation of STRICOM with the Naval Air Warfare Center Training Systems Division (NAWCTSD) in Orlando, FL. There is no unnecessary duplication of effort within the Army or DOD.

H. (U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Procurement OPA3 CTC Support	31297	12975	20138	26006	10638	0	0
NSTD	78711	84650	99339	93614	124736	79003	114873

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

J. (U) MILESTONE SCHEDULE:

Milestones	Dates
FSCATT Contract Award	3QFY94
NTC AH-64 Instrumentation Contract Award	3QFY94
WARSIM Contract Award	2QFY95
CSSTSS Tech/OP Test	3QFY95
MILES Testing	2QFY95
FSCATT Testing	2QFY96
FSCATT Milestone III	4QFY96

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604716A (TIARA) Project Number: #D579
PE Title: Terrain Information - Engineering Development Budget Activity: #5

A. (U) RESOURCES: ($ in Thousands)
Project Title: Field Army Mapping Systems - Engineering Development

Popular Name	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DTSS/QRMP	13478	9523	10547	8527	6580	5582	5146	Cont.	Cont.

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
This program element funds development of two systems: The Digital Topographic Support System (DTSS) and the Quick Response Multicolor Printer (QRMP). The current terrain analysis, topographic support and reproduction support, provided by Army Engineer Terrain Teams, are slow, labor intensive processes. The current processes do not and cannot meet the needs of the battlefield commander for rapid terrain information and graphic product generation. DTSS will automate the updating and processing of terrain information into terrain analysis products and disseminate them rapidly within the Command and Control System. Three blocks of Pre-Planned Product Improvements (P3I) are authorized for DTSS including: downsizing for light divisions, terrain visualization, multi-spectral imagery, higher security accreditation, increased throughput and others. The QRMP will provide rapid reproduction of low volume, up-to-date, large format, full color imagery maps, situation overlays, special maps (e.g., captured enemy maps), and other topographic and terrain products. The QRMP program is being executed in two phases including: (1) fielding a QRMP prototype printer system to engineer battalions for assessment and Early Field Prototype (EFP) capability; and (2) developing the objective QRMP based on best available technology that will comply with most user requirements.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Completed DTSS Milestone III In Process Review (IPR) (Type Classification Standard Approved)	3Q93	278
• (U) Initiated DTSS Low Rate Initial Production (LRIP) Production Qualification Test	4Q93	750
• (U) Completed DTSS Baseline development configuration	4Q93	4500
• (U) Initiated DTSS Block I Pre-Planned Product Improvement (P3I)	4Q95	2300
• (U) Awarded QRMP System Engineering and Integration (SE&I) Engineering & Manufacturing Development (EMD) contract	2Q93	350
• (U) Delivered Enhancements to QRMP garrison field prototype	3Q93	700
• (U) Initiated QRMP Block I System Task 1 for the SE&I contract	4Q95	2600
• (U) Initiated DA directed Terrain Imagery Integrated Prototype (TIIP) contract	4Q95	2000
TOTAL		13478

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604716A (TIARA)** Project Number: **#D579**
PE Title: **Terrain Information - Engineering Development** Budget Activity: **#5**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Complete DTSS LRIP Productior Qualification Test	1Q94	150
• (U) Continue DTSS Block I P3I development	4Q95	4520
• (U) Complete DTSS Material Release	2Q94	500
• (U) Achieve DTSS First Unit Equipped (FUE)	2Q94	200
• (U) Continue QRMP Block I Developments	4Q95	3700
• (U) Deploy & Upgrade QRMP Garrison Prototypes	3Q94	453
TOTAL		9523

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Complete DTSS Block I P3I development	4Q95	4500
• (U) Conduct test/evaluation of DTSS Block I P3I	4Q95	847
• (U) Continue support of QRMP Garrison Prototypes	4Q95	550
• (U) Complete QRMP Block I Systems	4Q95	3900
• (U) Conduct QRMP technical and operational tests	4Q95	750
TOTAL		10547

D. (U) WORK PERFORMED BY:

In-house work for the DTSS and the QRMP is accomplished at the U.S. Army Topographic Engineering Center, Fort Belvoir, Virginia. The DTSS development contractor is Loral Defense Systems Division, Akron, Ohio, with Initial Production at Loral Horsham, Horsham, Pennsylvania. The QRMP Development Contractor is Martin Marietta Corporation, Fort Washington, Pennsylvania.

E. (U) COMPARISON WITH FY 1994 AMENDED DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. **(U) TECHNICAL CHANGES:** QRMP Block I configuration changed to incorporate latest available digital printing technology.
2. **(U) SCHEDULE CHANGES:** New QRMP Block I configuration will serve as baseline system for fielding. This approach accelerates the fielding by approximately one year (FUE FY96)
3. **(U) COST CHANGES:** Increase of $2,000,000 in FY93 funding to start the DA directed Terrain Imagery Integrated Prototype (TIIP) contract.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604716A (TIARA)
PE Title: Terrain Information - Engineering Development

Project Number: #D579
Budget Activity: #5

F. (U) PROGRAM DOCUMENTATION:

DTSS	Date
Letter of Agreement (LOA)	01/82
Operational & Organizational (O&O) Plan	08/85
Acquisition Strategy (initial)	12/85
Decision Coordinating Package (DCP)	10/86
Required Operational Capability (ROC)	10/86
Test & Evaluation Master Plan (TEMP)	02/93
Integrated Logistic Support Plan (ILSP)	03/93
MS III In Process Review (IPR)	04/93
ADM Approving Type Classification (TC) Standard & Full Rate Production (FRP)	04/93

QRMP	Date
Letter of Agreement (LOA)	08/79
Operational & Organizational (O&O) Plan	07/85
Required Operational Capability (ROC)	12/86
Integrated Logistic Support Plan (ILSP)	02/87
Test & Evaluation Master Plan (TEMP)	09/87
Decision Coordinating Package (DCP)	09/87
Acquisition Strategy & Plan (revised)	03/92

G. (U) RELATED ACTIVITIES:
PE#0604321A (All Source Analysis System).
There is no unnecessary duplication of effort within the Army or DoD. Extended coordination is conducted with other services and agencies to avoid duplication of effort within DoD.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Project Number: #D579
Budget Activity: #5

Program Element: #0604716A (TIARA)
PE Title: Terrain Information - Engineering Development

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Other Procurement Army							
KA2550	9677	12779	12835	12994	10679	10642	8233
KA2551	0	0	0	4140	12351	11560	0

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

J. (U) MILESTONE SCHEDULE:

Milestones	Date
DTSS	
System Delivery (EMD)	01/91
Pre Production Qualification Test (Completion)	05/92
LRIP Contract Award (EMD Option)	05/92
Initial Operational Test and Evaluation (IOT&E)	07/92
Milestone III Decision Review (Type Classification)	04/93
Production Qualification Test (LRIP)	08/93
First Unit Equipped	03/94
Production Contract	03/94
ORMP	
Award Development Contract	01/93
Block I CDR	10/94
Block I Technical Test	05/95
Block I Operational Test	08/95
Milestone III Decision Review	12/95

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604726A (TIARA)
PE Title: Integrated Meteorological Support System — Budget Activity: #5

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DD85 Integrated Meteorological Support System	4303	949	0	0	0	0	0	0	9663

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Project #DD85, the Integrated Meteorological System (IMETS) is a shelter-contained operations and control system. IMETS is a mobile tactical automated weather data receiving, processing and dissemination system designed to provide timely weather and environmental effects, forecasts, observations, and decision aid information to multiple command elements where weather support is provided to the Army. IMETS includes the near real-time processing and memory needed to provide automated weather products to the All-Source Analysis System (ASAS), the Digital Topographic Support System (DTSS) and other automated Army systems through the Army Tactical Command and Control System (ATCCS).

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:

(U) Project #DD85, Integrated Meteorological Support System (IMETS): Army commanders need the best available knowledge of future weather in the area of operations to take advantage of friendly strengths and enemy weaknesses provided by weather effects on weapon systems and units. The IMETS will provide such weather information. The system will utilize existing Army Common Hardware/Software (CHS), Standard Integrated Command Post Shelter (SICPS), tactical vehicles and communications, and U.S. Air Force developed software and weather products to provide a total weather system. IMETS is deployed in a single shelter configuration to Echelons Above Corps (EAC), Corps, Divisions, Separate Brigades, Armored Cavalry Regiments, and Special Operations Forces where United States Air Force (USAF) Weather Teams provide support to the Army. Operational and Organizational (O&O) plan was approved in Dec 86 and the Required Operational Capability (ROC) was approved in Mar 92.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604726A (TIARA)
PE Title: Integrated Meteorological Support System Budget Activity: #5

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Completed AF Software Rehost to Army Common Hardware	3Q93	1000
• (U) Completed Integration 3 Systems for Development/Operational Test	4Q93	2100
• (U) Conducted contractor integration component tests	4Q93	80
• (U) Updated Test and Evaluation Master Plan	4Q93	20
• (U) Conducted Operator Personnel Training	4Q93	370
• (U) Conducted Formal Qualification Tests	4Q93	418
• (U) Conducted Preliminary Development Tests	4Q93	250
• (U) Revised Integrated Logistics Support Plan	4Q93	40
• (U) Prepared Integrated Program Summary for MS III-A	4Q93	25
TOTAL		**4303**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Complete Early User Test and Evaluation (EUTE)	1Q94	10
• (U) Conduct Milestone III-A Decision Review	1Q94	10
• (U) Integrate System for Initial Operational Test	2Q94	349
• (U) Conduct follow-on Development Tests	3Q94	470
• (U) Conduct operator personnel refresher training	2Q94	70
• (U) Test Unit Equipped (CONUS)	4Q94	15
• (U) Prepare Integrated Program Summary for MS III	4Q94	25
TOTAL		**949**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) No planned activities	N/A	0

(U) Work Performed By: IMETS In-House developing organizations are: U.S. Army Research Laboratory, White Sands Missile Range, NM (Tech Base and Software Development); Program Executive Office - Command and Control Systems, Project Director - IMETS, Fort Monmouth, NJ (Material Developer); U.S. Army Intelligence Center, Fort Huachuca, AZ (Preparation of Requirements Documents & Combat Developer); and U.S. Army Communications Electronics Command, Fort Monmouth, NJ (Matrix Support). IMETS contractors are: GTE, Westlake Village, CA (Air Force Software) and RDA/Logicon, Tacoma, WA (System Integrator).

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604726A (TIARA)
PE Title: Integrated Meteorological Support System

Budget Activity: #5

(U) Related Activities:
PE #0604321A (All Source Analysis System)
PE #0604716A (Terrain Information - Engineering Development)
PE #0603811A (Meteorological Data System)
Extensive coordination is conducted with other services (Air Force/Navy/Marines) and Agencies. There is no unnecessary duplication of effort within the Army or DoD.

(U) Other Appropriation Funds: ($ in Thousands)

Appropriation	Actual	FY 1993 Estimate	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999
Other Procurement Army (OPA 2)								
BW0021	916	1452	7004	6452	3292	0	0	
MA9726	0	0	667	624	0	0	0	

(U) International Cooperative Agreements: NONE

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604740A (TIARA)
PE Title: Tactical Surveillance System - Engineering Development

Budget Activity: #5

A. (U) RESOURCES: ($ in Thousands)

Project Number Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D662 Tactical Surveillance System - Engineering Development	18897	38734	2121	1158	1086	4513	6262	Cont	Cont

B. (U) BRIEF DESCRIPTION OF ELEMENT: In FY94 and prior this project supported engineering development work directed at meeting the deep intelligence and targeting needs of tactical commanders, as stated in Field Manual 100-5 and under airland battle tactics, to fight out-numbered and win. Specific tactical imagery exploitation studies and developments are under the Army's Tactical Exploitation of National Capabilities (TENCAP). This PE includes efforts to maintain sensor interfaces, modernize the existing Imagery Exploitation Systems (IES), and perform engineering development of the hardware of the Enhanced Tactical Radar Correlator (ETRAC) and DoD's Common Synthetic Aperture Radar Processor (CSARP). The IES and Imagery Processing and Dissemination System (IPDS), the Army portion to the Joint Service Imagery Processing System (JSIPS), receive and process imagery from National and tactical sources to present intelligence reports and exploited imagery products to the field commander. The CSARP processes the signals from synthetic aperture radars. The ETRAC contains the DoD CSARP and is a C-130 drive on/off system that receives inputs from various platforms, converts the SAR to a visual image, and is capable of stand alone contingency operations. These tasks will provide direct operational access to national and theater imagery in near-real-time to provide critical, deep target intelligence support to tactical commanders and to support contingency missions and low intensity conflicts. This Program Element also provides technical and engineering support efforts to IPDS, IES, and ETRAC from the Topographic Engineering Center (TEC), Federally Funded Research And Deveopment Centers (FFRDC), and Scientific Engineering and Technology Assistance (SETA) activity. In FY95, all funds directly related to the development of IES/MIES, IPDS/JSIPS and ETRAC are moved to PE #0305154D, Defense Airborne Reconnaissance Program. Even though the funds have moved, the Department of Army will continue these development efforts on behalf of the Defense Airborne Reconnaissance Office (DARO). Therefore, the support cost for TEC, FFRDC, and SETA in this PE are required for FY95 and beyond. Further details may be found at the Top Secret Special Access Level in the Tactical Intelligence and Related Activities (TIARA) Congressional Justification Book, Volume III, and the TENCAP Master Plan.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604740A (TIARA)
PE Title: Tactical Surveillance System - Engineering Development

Budget Activity: #5

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:

(U) Project D662:

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Integrated the Modernized IES (MIES) into existing IES at XVIII Corps.	1Q93	601
• (U) Developed Forward Area Support Terminal (FAST) system. Effort transferred to PE 0604766 Project D909 for integration and fielding in FY94.	4Q93	2712
• (U) Continued development of MIES for U.S. Army Europe (USAREUR)	1Q94	2400
• (U) Continued development of ETRAC and DoD CSARP. (Effort funded under PE 0305154D in FY95)		11715
• (U) Continued scientific and engineering technology support to TENCAP program from Federally Funded Research and Development Center (FFRDC) (Aerospace).	4Q93	455
• (U) Continued scientific and engineering technology support to TENCAP program from U.S. Topographic Engineering Center (TEC).	4Q93	492
• (U) Continued scientific and engineering technology support to TENCAP program from Scientific Engineering and Technology Assistance (SETA).	4Q93	522
Total		**18897**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Complete second MIES and integrate into existing IES at USAREUR.	1Q94	4915
• (U) Initiate Requirement Management System (RMS) and ETRAC interfaces into MIES.	4Q95	2000
• (U) Continue joint support within Joint Services Imagery Processing System (JSIPS) program. (Effort funded under PE 0305154D in FY95.)		7996
• (U) Continue development of ETRAC and DoD CSARP. (Effort funded under PE 030154D in FY95.)		16331
• (U) Initiate development of Receive Element (RE) to replace National Input Segment (NIS) (Effort funded under PE0305154D in FY95.)		5500
• (U) Continued scientific and engineering technology support to TENCAP program from Federally Funded Research and Development Center (FFRDC) (Aerospace).	4Q94	490

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604740A (TIARA)
PE Title: Tactical Surveillance System - Engineering Development

Budget Activity: #5

	Complete	Cost
• (U) Continued scientific and engineering technology support to TENCAP program from U.S. Topographic Engineering Center (TEC).	4Q94	600
• (U) Continued scientific and engineering technology support to TENCAP program from Scientific Engineering and Technology Assistance (SETA).	4Q93	902
Total		38734

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Continued scientific and engineering technology support to TENCAP program from Federally Funded Research and Development Center (FFRDC) (Aerospace).	4Q95	500
• (U) Continued scientific and engineering technology support to TENCAP program from U.S. Topographic Engineering Center (TEC).	4Q95	621
• (U) Continued scientific and engineering technology support to TENCAP program from Scientific Engineering and Technology Assistance (SETA).	4Q93	1000
Total		2121

(U) Work Performed By:
In-house efforts accomplished by US Army Topographic Engineering Center (TEC), Ft Belvoir, VA. Contractors: E-Systems, Garland, TX; Aerospace Corp, El Segundo, CA; DBA, Inc., Melbourne, FL; and SAIC, Dayton, OH; Westinghouse, Baltimore, MD; Paramax, Salt Lake City, UT.

(U) Related Activities:
In FY94 and prior PE #0603730A (Tactical Surveillance System--Advanced Development) provides the initial development efforts for timely and accurate tactical receipt, exploitation and dissemination of digital imagery. In FY95, development and engineering efforts for IPDS/JSIPS, ETRAC, and MIES/IES transferred to PE 0305154D (Defense Airborne Reconnaissance Program (DARP). In FY 95 this PE continues to provide scientific and engineering technology support to the developmental efforts being conducted under PE0305154D. To ensure no duplication of effort, this work is coordinated with the Defense Airborne Reconnaissance Office (DARO), Office Secretary of Defense, Navy, and Air Force TENCAP offices, the National Security Agency, Defense Intelligence Agency, Army Materiel Command, and other classified agencies. Coordination is also accomplished as part of the program reviews conducted by the Office of the Secretary of Defense (Director for Research and Engineering).

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604740A (TIARA)
PE Title: Tactical Surveillance System - Engineering Development

Budget Activity: #5

(U) Other Appropriation Funds: ($ in Thousands)

Appropriation	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999
Other Procurement Army (OPA 2) BA0329	1444	1927	2428	2507	2578	2659	2835

(U) International Cooperative Agreements: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604741A**
PE Title: **Foward Area Air Defense Command, Control and Intelligence System (FAAD C2I)** Budget Activity: **#5**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D126 FAAD Command and Control Engineering Development	38258	15410	26358	22056	21139	15349	0	Cont	Cont
D2JT FAAD C2 Operational Test	0	0	136	0	0	0	0	0	136
PE TOTAL	38258	15410	26494	22056	21139	15349	0		

B. (U) BRIEF DESCRIPTION OF ELEMENT: Project D126, Forward Area Air Defense Command and Control and Intelligence (FAAD C2I), is an automated system deployed with FAAD weapons to provide accurate and timely command, control and targeting information for the weapon systems. The system utilizes non-developmental item sensors, computers, displays and interface hardware integrated with data communication equipment. It automates mission related functions and uses the Single Channel Ground and Airborne Radio Systems (SINCGARS) for voice and the Army Data Distribution System (ADDS) for data. The First Unit Equipped (FUE) was the 101st Airborne Division (Air Assault) in September 1993. Project D2JT supports the operational testing and evaluation of the FAAD C2 by the Operational Test and Evaluation Command (OPTEC).

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:

(U) Project D2JT - FAAD C2 Operational Test: Project D2JT finances the direct costs of planning and conducting operational testing and evaluation of the Foward Area Air Defense Command, Control and Intelligence System (FAAD C2I) by the Operational Test and Evaluation Command (OPTEC). The FAAD C2I is an Acquistion Category (ACAT) I system with a dedicated Initial Operational Test and Evaluation (IOTE) in FY94 in support of Milestone III full production decisions. Operational testing is conducted under conditions, as close as possible, to those encountered in actual combat with typical user troops trained to employ the system. OPTEC provides Army leadership with an independent test and evaluation of effectiveness and suitablity of the system. Project D2JT is not a new start. It is reprogrammed from PE 0605712, Support of Operational Testing, Project D001, OPTEC Initial Operational Test and Evaluation (IOTE). In FY95, funding for operational testing of Acquisition Category (ACAT) I systems is programed with the PE funding development for each system. Future fiscal years will be reprogrammed when system information becomes available.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604741A
PE Title: Foward Area Air Defense Command, Control and Intelligence System (FAAD C2I) Budget Activity: #5

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Not applicable	N/A	0

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Not applicable	N/A	0

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Conduct FAAD C2I IOTE	1Q95	136

(U) **Work Performed By:** A majority of Project D2JT work is performed by Test and Evaluation Directorates of the Operational Test and Evaluation Command (OPTEC) from Alexandria, VA, Fort Hood, TX, and Fort Bliss, TX. Work is also performed by the Electronic Proving Grounds (EPG), Fort Huachuca, AZ. All organizations are staffed by military and civilian government personnel. Contractors expected to perform work for this project include: BDM International Inc., McLean, VA; United International Engineering, Fort Bliss, TX; Test and Experimentation Services Company, Albuquerque, NM; Computer Science Corporation, San Diego, CA; and Computer Data Systems Inc., Fort Worth, TX.

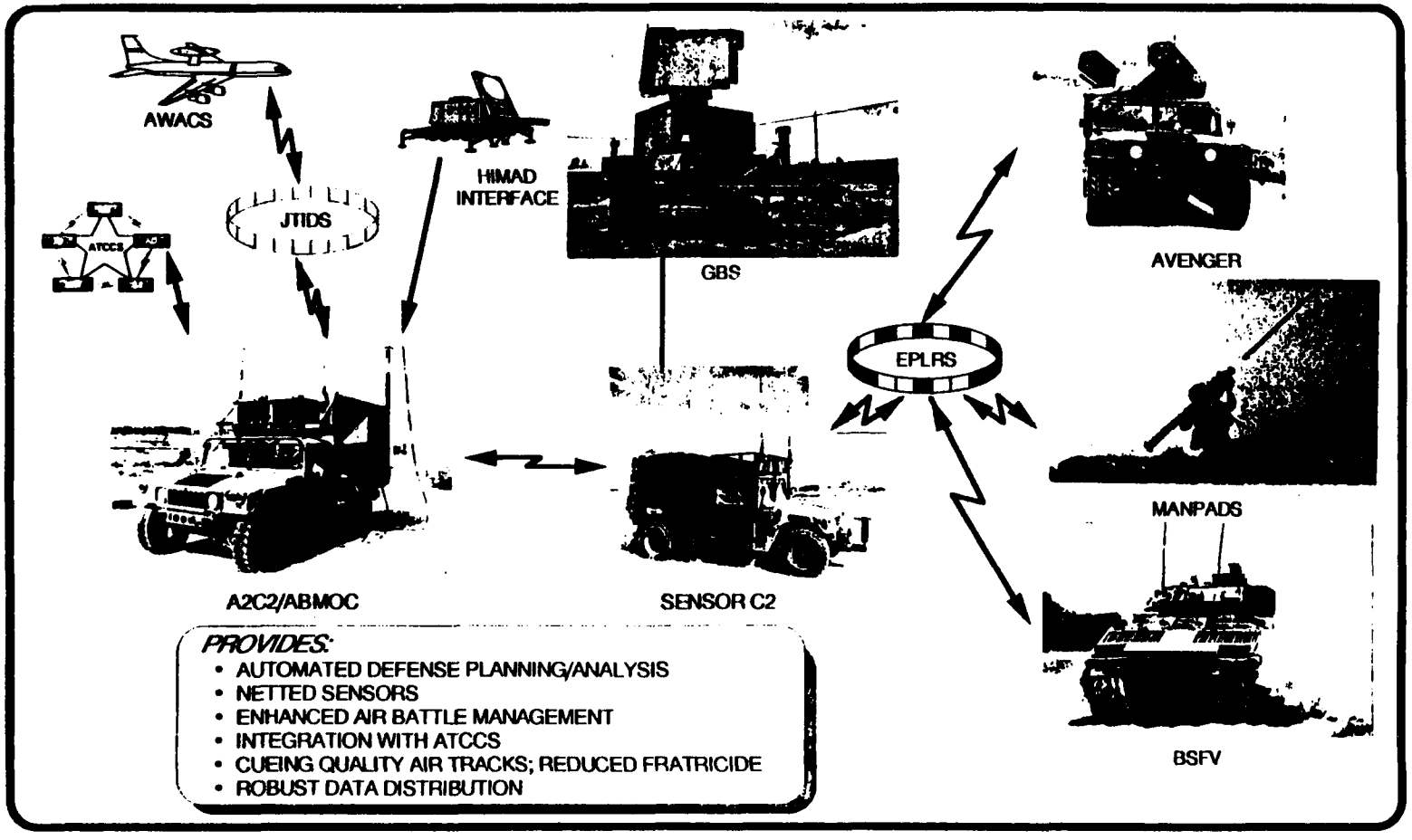
(U) **Related Activities:** Project D2JT is reprogrammed from PE 0605712, Project D001. There is no unnecessary duplication of effort within the Army or DoD. The Army staff monitors all tests for material development and activities to avoid duplication of effort. The Deputy Director of Defense Research and Engineering (Test and Evaluation), and Director of Operational Test and Evaluation, Office of the Secretary of Defense, also review planned testing and development of support equipment to ensure integration of testing by the services and to avoid duplicative testing. High-level staff management of resources for user testing is provided by the U.S. Army Test Schedule and Review Committee which is chaired by OPTEC. Unnecessary duplication of like items is prevented by coordination with Program Manager, Instrumentation, Targets and Threat Simulators (PM-ITTS), the Operational Test and Evaluation Coordinating Council, review by the Army Test and Evaluation Committee and by coordination with the Test Scheduling and Review Committee.

(U) **Other Appropriation Funds:** ($ in Thousands) Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604741A
PE Title: Air Defense Command, Control and Intelligence Engineering Development
Project Title: FAAD Command and Control Engineering Development

Project Number: D126
Budget Activity: #5



POPULAR NAME: FAAD C2

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604741A
PE Title: Air Defense Command, Control and Intelligence Engineering Development
Project Title: FAAD Command and Control Engineering Development

Project Number: D126
Budget Activity: #5

A. (U) SCHEDULE/BUDGET INFORMATION: ($ In Thousands)

SCHEDULE	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	To Complete
Program Milestones	MDR III 5/93 LT FUE 9/93		C2 Hvy Division MDR III (FSP) 2Q95		OSD C2 IPR 2Q97 FUE Objective System 4Q97			
Engineering Milestones	CDR V4 5/93							
T&E Milestones	Block I DT 11/92 LUT 2/93	Block II DT 4Q94	Block II IOTE 1Q95		Block III DT 1Q97 Block III FOT&E 3Q97			
Contract Milestones			Award Contract V4.1 (2Q95)		Award Contract V5 (1Q97)			
BUDGET	**FY 1993**	**FY 1994**	**FY 1995**	**FY 1996**	**FY 1997**	**FY 1998**	**FY 1999**	**Program Total**
Major Contract	21639	9540	13300	12000	11000	8000	0	281300 (36621)
Support Contract	2579	880	1380	1380	1400	900	0	54720 (16981)
In-House Support	6491	4610	7478	6576	7158	5301	0	247280 (64294)
GFE/ Other	7549	380	4,200	2100	1581	1148	0	71800 (9306)
Total	38258	15410	26358	22056	21139	15349	0	655100 (127202)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604741A
PE Title: Air Defense Command, Control and Intelligence Engineering Development
Project Title: FAAD Command and Control Engineering Development

Project Number: D126
Budget Activity: #5

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

The Forward Area Air Defense Command, Control and Communication (FAAD C3) System is an automated system deployed with FAAD weapons to provide accurate and timely command, control and targeting information for the weapon systems. The system utilizes non-developmental item sensors, computers, displays and interface hardware integrated with data communication equipment. It automates mission related functions and uses the Single Channel Ground and Airborne Radio Systems (SINCGARS) for voice and the Army Data Distribution System (ADDS) for data. Limited production of the system was authorized in May 1993 and the first unit equipped was the 101st Airborne Division (Air Assault) in September 1993. Since this fielding occurred prior to the availability of the Enhanced Position Location Reporting System (EPLRS) portion of ADDS, additional SINCGARS radios will be added to transmit data.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Completed Block I software development	4Q93	9000
• (U) Continued Block II software development	4Q94	21139
• (U) Completed Block I Development Test (DT) and Limited User Test (LUT)	2Q93	2617
• (U) Received Low Rate Initial Production (LRIP) authorization for fielding to light divisions	3Q93	0
• (U) Completed Critical Design Review (CDR) (V4) for heavy division software development	3Q93	0
• (U) Completed First Unit Equiped (FUE), (101st Airborne Division)	4Q93	5502
TOTAL		**38258**

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Continue Block II Software Development	4Q94	11500
• (U) Conduct Block II Development Test (DT)	4Q94	3910
• (U) Prepare for Block II Initial Operational Test & Evaluation (IOTE)	4Q94	0
TOTAL		**15410**

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Conduct Block II IOTE	1Q95	4158
• (U) Request Full Scale Production (FSP) decision for heavy divisions	2Q95	0
• (U) Award contract for software (V4.1) development	2Q95	7000
• (U) Continue Block II software development	4Q95	15200
TOTAL		**26358**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604741A
PE Title: **Air Defense Command, Control and Intelligence Engineering Development** — Project Number: **D126**
Project Title: **FAAD Command and Control Engineering Development** — Budget Activity: **#5**

(U) Program to Complete:	Complete
• (U) Conduct Block III Development Test (DT)	1Q97
• (U) Conduct Block III FOTE	3Q97
• (U) Office of the Secretary of Defense (OSD) Command & Control (C2) In Process Review (IPR)	
• (U) FUE for objective system	FY97
• (U) This is a continuing program.	

D. (U) WORK PERFORMED BY: Program Management is performed by the Project Manager, Air Defense Command and Control Systems, Redstone Arsenal, Alabama, assigned to the Program Executive Officer, Command and Control Systems, Fort Monmouth, New Jersey. The FAAD C2 systems integration and software development contractor is TRW, Dominquez Hills, California.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. (U) **TECHNICAL CHANGES:** None
2. (U) **SCHEDULE CHANGES:** None
3. (U) **COST CHANGES:** None

F. (U) PROGRAM DOCUMENTATION:

FAAD C2I Required Operational Capability (ROC)	10/85; revised 7/92
Decision Coordinating Paper (DCP)	7/86
Secretary of Defense Decision Memorandum (SDDM)	8/86
Acquisition Decision Memorandum (ADM) Restructuring Program	3/89
Acquisition Decision Memorandum (ADM) Restructuring Program	6/90
Acquisition Decision Memorandum (ADM) for Low Rate Initial Production Decision (C2 Light Div)	6/93
Acquisition Decision Memorandum (ADM) for Full Scale Production (C2 Heavy Div)	2Q95

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604741A
PE Title: Air Defense Command, Control and Intelligence Engineering Development
Project Title: FAAD Command and Control Engineering Development

Project Number: D126
Budget Activity: #5

G. (U) RELATED ACTIVITIES:

PE #0604820A (Radar Development)
PE #0603740A (Air Defense C2I - Advanced Development)
PE #0604817 (Non-Cooperative Target Recognition-Engineering Development)
PE #0603706A (IFF - Advanced Development)
PE #0604709A (IFF - Engineering Development)
PE #0203739A (Air Defense C2I Modifications)
PE #0604818A (Army Tactical Command & Control Hardware/Software)
PE #0603713A (Army Data Distribution System - ADDS)
There is no unnecessary duplication of effort within the Army or DoD.

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Other Procurement, Army							
AD5050	0	10800	14252	18711	21442	5109	0
BA9702	0	1473	0	0	0	0	0
MA9702	0	0	1457	1528	1435	1686	938

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Development of Low Level Air Picture Interface (LLAPI) with Germany

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604741A**
PE Title: **Air Defense Command, Control and Intelligence Engineering Development**
Project Title: **FAAD Command and Control Engineering Development**

Project Number: **D126**
Budget Activity: **#5**

J. (U) TEST AND EVALUATION DATA:

Conducted FY 90 Block I Software Demonstration (V1)	3Q90
Conducted FY 91 Block I Software Demonstration (V2)	3Q91
Conducted FY 92 Early User Innovative Test (EUIT) and LSDIS Demonstration	4Q92
Conducted FY 93 Block I Development Test (DT), and Limited User Test (LUT) (operational test)	2Q93
Conduct FY 94 Block II Development Test (DT)	3Q94
Conduct FY 95 Initial Operational Test & Evaluation (IOTE)	1Q95
Conduct Block III Developmental Test (DT)	4Q98

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604746A
PE Title: Automatic Test Equipment Development

Budget Activity: #5

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Progra
DL10 Electro-Optic Test Equipment	5683	7179	4789	2289	1532	1516	1499	CONT	CONT
DL59 Diagnostic/Expert System Development	10698	12707	0	6274	1917	1898	1882	CONT	CONT
D537 Integrated Family of Test Equipment (IFTE)	100	3567	2412	2331	2290	2270	2248	CONT	CONT
PE TOTAL	16481	23453	7201	10894	5739	5684	5629		

B. (U) BRIEF DESCRIPTION OF ELEMENT: State-of-the-art weapon and support system electronic and electro-optical technology has rapidly out paced the capability of the Army's present test, measurement, and diagnostic equipment (TMDE) to adequately test and fault isolate weapon systems and their components and assemblies. This program element provides for development of modular, reconfigurable automatic test equipment (ATE) to satisfy test requirements across equipment commodities and to meet the operational readiness needs of sophisticated systems and state-of-the-art technologies. An urgent requirement exists at all levels of maintenance for ATE to support complex communications and electronics-intensive commodities such as missiles, aircraft, and combat vehicles. The Integrated Family of Test Equipment (IFTE) meets these mission requirements during the 1990's. This program element further provides for identification and evaluation of nondevelopmental items (NDI) to satisfy requirements for manual and semi-automatic general purpose test equipment at the division level. Expert systems and artificial intelligence applications are also being developed to provide paperless maintenance, manuals and procedures, and battlefield electronic displays which will reduce the Army's investment in test program sets (TPSs) and in maintenance publications and procedures.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604746A**
PE Title: **Automatic Test Equipment Development** Budget Activity: **#5**

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:

(U) Project DL10 - Electro-Optic (EO) Test Equipment: Provides for development of state-of-the-art, technologically superior general purpose test equipment capable of performing fault isolation and failure diagnosis on the Army's major weapon systems. The IFTE Electro-Optics Program employs a two-phased approach consisting of an off-system EO test facility and an on-system EO Augmentation (EOA) device which will be driven by an IFTE Contact Test Set (CTS). Currently, EO testing requirements in the forward areas are met with a multitude of non-standard, semi-automatic or manual testers which vary greatly in capability, reliability, weight, and cost, and require very highly skilled operators and maintainers. Serious deficiencies in EO testing capabilities exist in the field. There is no automatic EO testing capability at organizational and direct support levels for certain weapon systems and critical parameters of other systems cannot be measured at the organizational levels because EO test equipment is not available. The new test equipment will fill these voids in the field and replace outmoded, deficient and difficult to maintain equipment such as the Land Combat Support System (LCSS). This new equipment will alleviate the existing EO test and diagnostic shortfalls and is in concert with Army policy on standard ATE.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Continued development of the CTS-EOA.	4Q96	4126
• (U) Procured preproduction hardware units for testing.	4Q94	1322
• (U) Completed study of EOA capabilities versus Army weapon systems requirements.	3Q93	235
TOTAL		**5683**

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Conduct technical and environmental tests on the CTS-EOA.	3Q94	707
• (U) Commence development of EO test capability for the Base Shop Test Facility (BSTF).	4Q96	2154
• (U) Convert Land Combat Support System EO TPSs for use on the BSTF.	4Q94	4203
• (U) Procure interactive electronic technical manual for CTS-EOA.	4Q94	115
TOTAL		**7179**

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Continue development of the CTS-EOA.	4Q96	500
• (U) Continue development of EO test capability for the BSTF.	4Q96	2289
• (U) Initial fabrication of prototype EO Test Facility and repair bench.	4Q97	2000
TOTAL		**4789**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **604746A**
PE Title: **Automatic Test Equipment Development** Budget Activity: **#5**

(U) Project DL59 - Diagnostic/Expert System Development: Supports full-scale development and NDI equipment for expert/diagnostic systems and general purpose test equipment. Included in this program are market surveys of commercially available general purpose test equipment; evaluations/validations of test equipment performance and requirement envelopes; development of diagnostic hardware and software with system-specific databases and tools interface/host software on targeted hardware; and evaluation of TPSs for conversion to new standard ATE. State-of-the-art technologies in expert systems and artificial intelligence, paperless maintenance and troubleshooting manuals, battlefield use of electro-optics displays, and soldier-friendly equipment will be developed to meet identified requirements. This program includes the development of new diagnostic technologies to support weapon systems.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Developed electronic technical manuals for Palletized Load System.	4Q93	352
• (U) Completed test of expert system for the Heavy Equipment Transporter.	4Q93	159
• (U) Tested nondevelopmental instruments in the Contact Test Set (CTS).	4Q93	340
• (U) Completed and tested a CTS with *STE/ICE-R functionality.*	4Q93	80
• (U) Completed transition of general support diagnostic software programs to standard ATE.	4Q93	1932
• (U) Developed diagnostic software for the M915 and M916 Trucks.	4Q93	175
• (U) Commenced development of TPSs for Kiowa Warrior.	4Q95	2900
• (U) Developed TPSs for Abrams Tank and Ground Based Sensor.	4Q94	2960
• (U) Converted Land Combat Support System electronic TPSs for use on IFTE Base Shop Test Facility.	4Q94	1800
TOTAL		**10698**

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Develop artificial intelligence (AI) software tools to support weapon system diagnostics.	3Q95	714
• (U) Commence development of software tools to reduce TPS and Interactive Electronic Technical Manual (IETM) development costs.	4Q95	391
• (U) Develop software to electronically link IFTE with the Unit Level Logistics Systems (ULLS), Standard Army Maintenance System (SAMS),and other logistics systems.	4Q94	523
• (U) Develop, test, and implement additional diagnostic data capability.	4Q94	1377
• (U) Develop test capability to meet new air quality standards.	4Q94	702
• (U) Complete development of TPSs for the Kiowa Warrior mast mounted sight and control display system.	4Q94	2000
• (U) Develop Depot and factory level TPSs and on-system diagnostic enhancement for the Longbow Apache.	4Q94	7000
TOTAL		**12707**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604746A**
PE Title: **Automatic Test Equipment Development**

Budget Activity: **#5**

(U) FY 1995 Planned Program:

- (U) *No planned program.*

(U) Project D537 - Integrated Family of Test Equipment (IFTE): Supports the development and improvement of ATE that provides automated testing of electronic-intensive weapons systems at all maintenance levels. IFTE will automatically test and verify the operation of line replaceable units and screen shop replaceable units. Its pre-planned product improvement (P3I) program upgrades the software to the new Department of Defense (DoD) standard, A Broad-Based Environment for Test (ABBET), and upgrades the hardware. The hardware upgrade will be for inclusion of the latest commercially available technology Virtual Memory Extension (VME) buss for Instrumentation (VXI) as well as upgrades in the digital and radio frequency areas to support new weapon systems.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Investigated and proved feasibility of adding verify probe capability to the BSTF.	2Q94	100
TOTAL		**100**

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Commence computer system upgrade for the BSTF.	3Q95	1285
• (U) Commence development of display replacement for the BSTF.	3Q95	642
• (U) Commence software tool development.	4Q95	385
• (U) Evaluate Continuous Acquisition and Life Cycle Support (CALS)/audio/video implementation.	4Q94	695
• (U) Modify Navy Consolidated Automated Support System (CASS) costing model for use with IFTE.	3Q94	390
• (U) Compare CASS and IFTE Abbreviated Test Language for All Systems (ATLAS).	4Q94	170
TOTAL		**3567**

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Perform VXI evaluation and commence development of VXI implementation in the BSTF.	4Q96	1112
• (U) Complete development and test computer system upgrade for the BSTF.	3Q95	300
• (U) Complete development and test display replacement for the BSTF.	3Q95	220
• (U) Complete development of and implement new software tools.	4Q95	780
TOTAL		**2412**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element; **#0604746A**
PE Title: **Automatic Test Equipment Development** Budget Activity: #5

(U) Work Performed By:
DL10 - Electro-Optic Test Equipment: In-house efforts are performed by the U.S. Army TMDE Activity and the U.S. Army Missile Command, Redstone Arsenal, AL. Major contractors include Pentastar Electronics, Inc., Huntsville, AL; and SUMMA Technology, Inc., Huntsville, AL.
DL59 - Diagnostic/Expert System Development: In-house efforts are performed by the U.S. Army TMDE Activity and U.S. Army Missile Command, Redstone Arsenal, AL; Armament Research, Development, and Engineering Center, Picatinny Arsenal, NJ; and Tobyhanna Army Depot, Tobyhanna, PA. Major contractors include Science Applications International Corporation, San Diego, CA; SUMMA Technology, Inc., Huntsville, AL; and Honeywell, Albuquerque, NM.
D537 - Integrated Family of Test Equipment: In-house efforts are performed by the U.S. Army TMDE Activity and the U.S. Army Missile Command, Redstone Arsenal, AL; the Armament Research, Development, and Engineering Center, Picatinny Arsenal, NJ; and Tobyhanna Army Depot, Tobyhanna, PA. Major contractor is Grumman Aerospace Corp., Bethpage, NY.

(U) Related Activities:
DL10 - Electro-Optic Test Equipment: None. There is no unnecessary duplication of effort within the Department of the Army or DoD.
DL59 - Diagnostic/Expert System Development: P.E. #063001A (Logistics Advanced Technology). There is no unnecessary duplication of effort within the Department of the Army or DoD.
D537 - Integrated Family of Test Equipment: None. There is no unnecessary duplication of effort within the Department of the Army or DoD.

(U) Other Appropriation Funds:

($ in thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Integrated Family Of Test Equip (IFTE) (KA4000)	49565	57835	58216	57304	61425	62388	61897

(U) International Cooperative Agreements: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604759A
PE Title: **Major Test and Evaluation Investments**

Budget Activity: #6

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DC55 Distributed Development Simulation Technology	3710	2892	2859	2787	2740	2717	3928	Cont	Cont
D983 Major Test and Evaluation Investment - USAKA	0	0	2109	0	0	0	0	Cont	Cont
D984 Major Technical Test Instrumentation *	35387	2098	29894	27420	24432	24590	27466	Cont	Cont
D986 Major User Test Instrumentation	20976	23866	20674	19198	3109	2640	2619	Cont	Cont
PE TOTAL	60073	28856	55536	49405	30281	29947	34013		

*** OSD established this program element (PE) in FY 1994 to consolidate all Major T&E Investment programs into a single PE for oversight and management. Resources in projects D983, D984, and D986 were realigned from PE's #0605301A, #0605602A, and #0605603A, respectively. FY 1993 funding does not match the R-1, but represents the actual costs expended for major test and evaluation investments and are displayed for comparability between fiscal years.**

B. (U) BRIEF DESCRIPTION OF ELEMENT: Program funds development and acquisition of major developmental test instrumentation for the US Army's Major Ranges and Test Facility Bases (MRTFB): Dugway Proving Ground (DPG), UT; White Sands Missile Range (WSMR), NM; Electronic Proving Ground (EPG), AZ; Yuma Proving Ground (YPG), AZ; Combat Systems Test Activity (CSTA), MD and U.S. Army Kwajalein Atoll (USAKA), in the Marshall Islands; as well as the Aviation Technical Test Center (ATTC), AL; and Redstone Technical Test Center (RTTC), AL. Program also funds development of major field instrumentation for US Army Operational Test and Evaluation Command (OPTEC) test organizations. It provides the capabilities to create simulated tactical environments during conduct of user testing of new weapon systems and provides development and upgrade of other range instrumentation in support of training. **The increase between FY 1994 and FY 1995 in this PE does not reflect growth, but a one-time "skip-year" reduction in FY 1994 to meet higher priority requirements. As reflected in projects D983 and D984, all funding for development and acquisition of major test instrumentation for all U.S. Army test ranges, USAKA and Test and Evaluation Command (TECOM), was zeroed in FY 1994, except for $2 million required for salaries, and other in-house support. For**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604759A
PE Title: Major Test and Evaluation Investments

Budget Activity: #6

FY 1995 - FY 1999, funding in this PE is restored to the minimum level required to develop the new testing capabilities required to evaluate advanced weapon system technologies and gain the planned efficiencies through manpower reductions at U.S. Army test ranges.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project DC55 - Distributed Developmental Simulation Technology: Supports the operation and maintenance of the Battlefield Distributed Simulation - Developmental (BDS-D) sites at Ft Knox, KY and Ft Rucker, AL, which provide virtual combined arms battlefield with the warfighter-in-the-loop to evaluate weapon system concepts, tactics, doctrine and test plans.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Continued sustainment of Advanced Distributed Simulation Technology support which enables combat, materiel and training developers and testers to perform experiments to test tactics, doctrine and weapon design.	4Q93	3710

(U) FY 1994 Plans:	Complete	Cost
• (U) Continues sustainment of Advanced Distributed Simulation Technology support which enables combat, materiel, and training developers and testers to perform experiments to test tactics, doctrine and weapon design.	4Q94	2892

(U) FY 1995 Plans:	Complete	Cost
• (U) Continues sustainment of Advanced Distributed Simulation Technology support which enables combat, materiel, and training developers and testers to perform experiments to test tactics, doctrine and weapon design.	4Q94	2859

(U) Project D983 - Major Test and Evaluation (T&E) Investment - USAKA: Funds the purchase of major Improvement and Modernization (I&M) equipment at the US Army Kwajalein Atoll (USAKA) in the Marshall Islands. USAKA is a national test range supporting Army, Ballistic Missile Defense Organization (BMDO), US Air Force, National Aeronautics and Space Administration (NASA), and other customers. Major T&E investment items are defined as costing $2 million in a single year or items costing $10 million total acquisition. Approximately $10 million of range improvements and upgrades to radars, telemetry equipment, optics and other equipment are required annually to maintain USAKA as a national test range in support of projected workload. A major study of USAKA requirements is underway and funding for future T&E investments will be readdressed in the next budget submission.

(U) FY 1993 Accomplishments:
- (U) There were no major instrumentation projects for USAKA funded in FY 1993.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Budget Activity: #6

Program Element: #0604759A
PE Title: **Major Test and Evaluation Investments**

(U) FY 1994 Plans:

- (U) There are no major instrumentation projects for USAKA funded in FY 1994.

	Complete	Cost
(U) FY 1995 Plans:		
• (U) Upgrade the Technical Control Facility (TCF) and relocate into the Kwajalein Missile Control Center.	4Q95	2109

(U) Project D984 - Major Technical Test Instrumentation: This project develops and acquires major developmental test technology/instrumentation to perform developmental testing of weapon systems at U.S. Army TECOM activities. Major instrumentation is defined by having one or more of the following attributes: joint service requirements, used by multiple commands, high visibility, large dollar value, produces a new capability or requires intensive management during acquisition. This project funds major instrumentation that exceeds $2 million per year or $10 million acquisition cost in RDT&E funding. This project responds to the rapid advances in weapons systems technology and diversity of systems being developed to assure adequate testing.

	Complete	Cost
(U) FY 1993 Accomplishments:		
• (U) Completed the first Combat Systems Test Activity (CSTA) vehicle test course as part of the Combat Vehicle Measurement System (CVMS) project; continued second course and contract development for final phase in FY 1994. Second course will be completed in FY 1994 due to late delivery of hardware.	4Q93	4700
• (U) Acquired high-speed data acquisition system and secured data and video transmission instrumentation as part of the Combat Vehicle Productivity (CVP) project at CSTA.	4Q93	1000
• (U) Completed the acquisition of the Radar Electromagnetic Environment Simulation (REES) project at Redstone Technical Test Center (RTTC) which includes microwave and millimeter wave test and measurement system and low power microwave sources. Project will be completed in FY 1994 based on delivery of key hardware.	4Q93	3050
• (U) Continued installation of Phase I (100 - 500 Mhz) of Electromagnetic Radiation Effects (EMRE) Transmitters program at White Sands Missile Range (WSMR); awarded first contract option for Phase II (of three) to provide 30 - 100 Mhz frequency radiation. The program has been restructured into three phases with phase I and II finishing in FY 1994.	4Q93	4200
• (U) Completed Phase I of Frequency Surveillance System (FSS) modernization program, partially automating five sites capable of monitoring frequencies from 20 Mhz to 40 Ghz.	4Q93	2699
• (U) Continued development of acquisition strategy and technical design for the WSMR Test Support Network (TSN). Completed interim telemetry microwave link.	4Q93	2267
• (U) Conducted instrumentation requirement studies.	4Q93	200
• (U) Initiated concept exploration for a High Powered Microwave (HPM) instrumentation suite at WSMR for determining the effects of radio frequency directed energy environments on US Army weapon systems.	3Q93	150

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604759A Budget Activity: #6
PE Title: Major Test and Evaluation Investments

• (U) Continued acquisition of Low Rate Initial Production (LRIP) of the Army's component of the DoD Global Positioning System (GPS) program which provides test centers with precise Time, Space, Positioning, Information (TSPI) data using Congressionally mandated Range Application Joint Project Office (RAJPO) developed hardware and support.	4Q93	14793
• (U) Provided in-house support (engineering analysis, salaries, travel, etc.) to ongoing projects.	4Q93	2328
Total		**35387**

(U) FY 1994 Plans:

	Complete	Cost
• (U) Provide in-house support (engineering analysis, salaries, travel, etc. and completion of limited on-going FY 1993 projects.	4Q94	2098

- Prepare the WSMR TSN procurement package and seek a Milestone Decision Authority approval for milestone I/II to allow contract award in FY 1995.
- Conduct instrumentation requirement studies.

(U) FY 1995 Plans:

	Complete	Cost
• (U) Continue from FY 1992 development of the Fiber Optic Network (FON) at CSTA.	4Q95	600
• (U) Continue from FY 1993 development of the Combat Vehicle Measurement System (CVMS).	2Q95	5000
• (U) Develop acquisition documentation for the FSS project, Phase II of FSS project.	4Q95	50
• (U) Award basic WSMR TSN contract for completion of phase I of the project.	4Q95	6750
• (U) Continue from FY 1993 execution of the Army's portion of the GPS full rate production contract, acquiring and fielding hardware and software at all test centers.	4Q95	13300
• (U) Coordinate technical/operational requirements for Battlefield Management Interoperability Command Control Communications System (BMIC3S), Combat Automotive Test, and High Power Microwave (HPM).	4Q95	100
• (U) Conduct instrumentation requirement studies.	4Q95	100
• (U) Continue from FY 1993 development of the Combat Vehicle Productivity (CVP) project.	4Q95	1500
• (U) Provide in-house support (engineering analysis, salaries, travel, etc.) to on-going projects.	4Q95	2494
Total		**29894**

(U) <u>Project D986 - Major User Test Instrumentation:</u> Finances the development of major field instrumentation for Operational Testing (OT) and Force Development Testing and Experimentation (FDTE). The Mobile Automated Instrumentation Suite (MAIS) will provide users the capability to measure the performance of hardware and personnel under realistic tactical conditions for large scale operations (up to 1830 players). The MAIS will instrument combat systems in the operational forces to provide Real Time Casualty Assessment (RTCA) and Time, Space, and Positioning Information (TSPI) data. MAIS will provide protocol data unit (PDU) transformation to link with Distributed Interactive Simulation

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604759A
PE Title: Major Test and Evaluation Investments

Budget Activity: #6

(DIS). This data will provide objective assessment for new materiel acquisition, force structuring, doctrine and tactics modification, and, through the Advanced Research Projects Agency (ARPA) PDU format, part of the DIS, provide data with which to validate the future DoD warfighting models and simulations. The MAIS, a non-major system acquisition, achieved Milestone I/II in FY 90. Current program reflects revised Initial Operational Capability (IOC) from FY 1996 to FY 1997.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Conducted engineering effort which culminated in the MAIS Encryption Preliminary Design Review (PDR) and Critical Design Review (CDR).	2Q93	3800
• (U) Conducted engineering effort which culminated in the MAIS System CDR for hardware and software.	3Q93	15500
• (U) Acquired MAIS encryption models.	4Q93	300
• (U) Initiated MAIS system integration.	4Q93	1376
Total		20976

(U) FY 1994 Plans:	Complete	Cost
• (U) Conduct and complete MAIS formal qualification tests. - Software test to be witnessed by the government - System has eight computer software configuration items (CSCIs) - Tests are to verify allocation requirements are being met	3Q94	2600
• (U) Initiate manufacturing of initial MAIS system requirements. - Initiate parts procurement to assemble player unit engineering development prototypes - Start assembly of player units (e.g. ground vehicle, rotary wing, fixed wing, dismounted troop, and crew served weapons)	3Q94	3300
• (U) Conduct MAIS system software Independent Validation and Verification (IV&V).	4Q94	1100
• (U) Complete equipment installation and integration in Central Information Facility/Test Control (CIF/TC) shelters. - Install equipment racks - Install computational equipment - Install transceivers	3Q94	2900
• (U) Complete all software coding and integration testing. - Develop software for eight system CSCIs - Integrate and test software components	3Q94	12770
• (U) Demonstrate functionality of key hardware/software MAIS components for defined exit criteria.	4Q94	1196
Total		23866

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604759A
PE Title: Major Test and Evaluation Investments

Budget Activity: #6

(U) FY 1995 Plans:	Complete	Cost
• (U) Complete MAIS system integration and conduct subsystem and system level test.	4Q95	4847
- Hardware/software integration and test at subsystem level		
- Conduct subsystem integration and test of player units/C3 center		
- Conduct qualification tests		
• (U) Demonstrate critical functionality of the MAIS data communications network for defined milestone III exit criteria.	1Q95	5500
- Conduct engineering systems test to validate the communication systems design		
- Demonstrate C3 functionality		
• (U) Complete brassboard integration and test for all player units.	3Q95	3800
- Provide player unit brassboards required for system integration and tests		
• (U) Release all player unit drawings for assembly.	3Q95	200
• (U) Verify Time Division Multiple Access (TMDA) network for data latency, link margins and error rates.	1Q95	1577
• (U) Complete Formal Operational Verification Tests validating that the system meets security requirements.	1Q95	1200
• (U) Validate Command Control and Communication (C3) player unit hardware and software functionality.	1Q95	100
• (U) Complete C3 center assembly and test.	4Q95	3450
- Procure Software Development Support Facility and logistics shelters		
- Procure equipment for shelter development (e.g. computational, battery chargers)		
- Assemble racks and install equipment into the shelters		
Total		**20674**

(U) WORK PERFORMED BY: ***Major contractors:*** Andrew Corp, Richardson, TX; BDM, Albuquerque, NM; CSC Corp., Falls Church, VA; Dynaspan, Las Cruces, NM; Environmental Research Institute of Michigan, Detroit, MI; Frederick Manufacturing Div, Frederick, MD; Hewlett Packard, Huntsville, AL; Honeywell, Inc., Defense Avionics Systems Division, Albuquerque, NM; Interstate Electronics Corp, Anaheim, CA; Jet Propulsion Lab, Pasadena, CA; LESC, WSMR, NM; Lockheed, Los Angeles, CA; Loral (Western Development Lab), San Jose, CA; Loral (Technical Training Services), Norfolk, VA; Loral Space and Range Systems, Sunnyvale, CA; Loral Systems, Akron, Ohio; Physical Sciences Lab, New Mexico State Univ, Las Cruces, NM; Science and Technology Corp, Hampton, VA; Sperry Corporation, Reston, VA; SRI, WSMR, NM; Syndetix, Las Cruces, NM; TVI Corporation, Beltsville, MD; Westinghouse, Baltimore, MD; Aeromet Inc, Tulsa, OK; Johnson Controls World Services, Cape Canaveral, FL; Massachusetts Institute of Technology, Lexington, MA; and Range Services Engineering, Burlington, MA. ***Study contracts with:*** Aircraft Armaments International Corp, Baltimore, MD; Colsa Inc., Huntsville, AL; Georgia Tech Research Institute, Atlanta, GA; Illinois Institute of Technology Research Center, Chicago, IL; MITRE Corp., Vienna, VA; Physical Science Lab, New Mexico State University, Las Cruces, NM; SAIC, Sierra Vista, AZ; ServAir, Lexington, KY; and SRS Technologies, Huntsville, AL. ***In-house:*** National Institute of Standard

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604759A Budget Activity: #6
PE Title: Major Test and Evaluation Investments

and Technology, Boulder, CO; US Army TECOM, Aberdeen Proving Ground (APG), MD; Missile Command (MICOM), Redstone Arsenal, AL; CSTA, APG, MD; YPG, AZ; DPG, UT; WSMR, NM; Army Research Lab, WSMR, NM and APG, MD; EPG, Fort Huachuca, AZ; CRTC, Fort Greeley, AK; ATTC, Fort Rucker, AL; Edwards Air Force Base, CA; RTTC, Huntsville, AL; Fort Knox, KY; TACOM, Detroit, MI; US Army Operational Test and Evaluation Command, Alexandria, VA; Test and Experimentation Command, Fort Hood, TX; TEXCOM Experimentation Command, Fort Hunter-Liggett, CA; Product Manager for LOSAT, Huntsville, AL; Project Manager for LOSAT, Huntsville, AL; Project Manager for Instrumentation, Targets and Threat Simulators at U.S. Army Simulation, Training and Instrumentation Command, Orlando, FL; Project Manager for Defense Communications and Transmissions Systems, Fort Monmouth, NJ; Combat Electronics Intelligence Warfare Directorate, Vint Hill Farms Station, VA; and U.S. Army Kwajalein Atoll, U.S. Army Space and Strategic Defense Command, Huntsville, AL.

(U) RELATED ACTIVITIES: Tri-services requirements are coordinated and duplication of effort is precluded through the DOD sponsored RELIANCE process. There is no unnecessary duplication of effort in the Army or DoD. This program is related to:

PE #0605601A	Army Test Ranges and Facilities
PE #0605602A	Army Technical Test Instrumentation
PE #0604759F	Major Test and Evaluation Investments
PE #0604759N	Major Test and Evaluation Investments
PE #0604940D	Central Test and Evaluation Investment Program
PE #0605301A	USAKA
PE #0605712A	Support of Operational Testing

(U) OTHER APPROPRIATION FUNDS: Not applicable.

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604760A** Budget Activity: **#5**
PE Title: **Distributive Interactive Simulations - Engineering & Manufacturing Development**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
Battle Lab Reconfigurable Simulators									
DC81	0	0	8041	0	0	0	0	cont	cont
PE TOTAL	0	0	8041	0	0	0	0		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This is a new Program Element. Includes Engineering Development of techniques and equipment for Distributed Interactive Simulation (DIS) and related simulations efforts. DIS technology provides wide area simulation networking in support of modeling and prototyping, doctrinal development, training, and operations, utilizing live, virtual, and constructive simulations. Includes development of reconfigurable simulators. Includes linking of dissimilar simulators. Includes development of terrain, semi-automated force (SAFOR), weapon systems, and environmental databases for shared used in a DIS environment.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN 1995:

(U) DC81 Battle Lab Reconfigurable Simulators: This program provides resources for the engineering development of both software and hardware for reconfigurable simulators for use in TRADOC Battle Labs. Simulators developed in this program are not system specific, but will represent generic equipment (tanks, aircraft, etc.). Reconfigurable simulators will be used to simulate existing and developmental equipment to explore new concepts and systems for technology insertion, and for the development of doctrine necessary to mesh new equipment items into training and battle situations. FY95 efforts will include development of a first-generation rotary wing aircraft simulator, an armored vehicle simulator based on the M2 Bradley chassis but reconfigurable to any weapons and performance criteria, a fire support module reconfigurable to both artillery and air defense systems, and a combat service support console.

	Complete	Cost
(U) FY 1993 Accomplishments:		
• (U) N/A		

(U) FY 1994 Planned Program:
- **(U) N/A**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604760A Budget Activity: **#5**
PE Title: Distributive Interactive Simulations - Engineering & Manufacturing Development

(U) FY 1995 Planned Program:

• (U) Engineer prototypes of reconfigurable simulators	4Q95	1500
• (U) Build prototype reconfigurable simulators	1Q96	6000
• (U) Conduct Verification, Validation, and Accreditation (VVA) of Battle Lab Reconfigurable Simulators	4Q95	541
Total		**8041**

(U) Work Performed By: To be Determined

(U) Related Activities: PE #0604715A Non-System Training Devices - Engineering Development Project DC91 Distributive Interactive Simulations. There is no unnecessary duplication of effort within the Army or DoD.

(U) Other Appropriation Funds:

	($ in Thousands)						
Appropriation	**FY 1993 Actual**	**FY 1994 Estimate**	**FY 1995 Estimate**	**FY 1996 Estimate**	**FY 1997 Estimate**	**FY 1998 Estimate**	**FY 1999 Estimate**
NONE							

(U) International Cooperative Agreements: N/A

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Project Element: #0604766A (TIARA)
PE Title: Tactical Electronic Surveillance Systems - Engineering Development

Budget Activity: #5

A. (U) RESOURCES: ($ in Thousands)

Project Number Title	FY1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D113 Joint Tactical Ground Station	0	21345	8998	0	0	0	0	0	30343
D909 Tactical Electronic Surveillance System - Engineering Development	32194	30934	19477	23664	14291	10595	20860	Cont	Cont
PE Total	32194	52279	28475	23664	14291	10595	20860		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element supports the engineering development directed at meeting the tactical commanders intelligence mission requirements for contingency force deployment and deep battle surveillance and targeting - as stated in Field Manual 100-5. Specific signals intelligence (SIGINT) and multi-spectral developments are managed within the Army's Tactical Exploitation of National Capabilities (TENCAP) program. The scope of the program is directed towards advanced techniques and capabilities to exploit National and selected theater capabilities that uniquely meet stated Army tactical intelligence and targeting needs and deficiencies, for near-real-time receipt, analysis, and dissemination into the appropriate tactical echelon. Project #D113 is not a FY 1994 new start, it is a follow-on to the Strategic Defense Initiative Organization (SDIO), now Ballistic Missile Defense Organization (BMDO), funded Tactical Surveillance Demonstration (TSD). Initial development of the Tactical Surveillance Demonstration Enhancement (TSDE) was funded in FY 1993 under Project #D909. Project #D113 develops the Joint Tactical Ground Station (JTAGS), designed for in-theater receipt, processing and dissemination of warning and alerting data from space based sensors to existing in-theater communications nets. Specific details are provided at the Top Secret Special Access Level in the Tactical Intelligence and Related Activities (TIARA) Congressional Justification Book (CJB). Volume III, and in the Army TENCAP Master Plan.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:

(U) Project D113 - Joint Tactical Ground Station (JTAGS): This project develops two EMD JTAGS units designed for in-theater receipt, processing and dissemination of warning and alerting data from space based sensors of major tactical events such as missile launches, and Slow Walkers. JTAGS supports active defense, attack operations and passive defense. Initial development of the TSDE was funded in FY93 under Project #D909. By being located in-theater, the system improves the warning and alerting response time and eliminates several single-point-failure susceptible communications relay nodes. The warning and cueing information will be disseminated via Tactical Information Broadcast System

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Project Element: #0604766A (TIARA)
PE Title: Tactical Electronic Surveillance Systems - Engineering Development

Budget Activity: #5

(TIBS), Tactical Related Application (TRAP) and other existing in-theater communications nets. This is not a new start. This project is a follow-on to the Strategic Defense Initiative Organization (SDIO), now Ballistic Missile Defense Organization (BMDO), funded Tactical Surveillance Demonstration (TSD).

(U) **FY 1993 Accomplishments:** Efforts funded in Project D909.

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Complete developmental and phase I operational testing of transportable TSDE unit.	2Q94	470
• (U) Support preparations for Milestone II decision review.	2Q94	720
• (U) Develop Engineering and Manufacturing Development (EMD) JTAGS ruggedization specifications.	2Q94	1331
• (U) Award Engineering and Manufacturing Development Contract for two JTAGS EMD units.	3Q94	18824
Total		21345

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Develop and deliver two JTAGS EMD units.	2Q95	6897
• (U) Conduct developmental and operational testing of JTAGS EMD units.	4Q95	1081
• (U) Prepare for MS III decision review.	4Q95	1020
Total		8998

(U) **Work Performed By:** The JTAGS Product Office, an element of the Program Executive Office (PEO) Missile Defense, Redstone Arsenal, AL, is assigned responsibility for JTAGS development. The U.S. Navy Space and Naval Warfare Systems Command (SPAWAR) is participating in the development. The contractor for the TSD program is Aerojet Electronic System Division, Azusa, CA. The EMD contractor is to be determined.

(U) **Related Activities:**
This is a joint interest program with the Navy. The Army will develop JTAGS to incorporate both Army and Navy requirements. BMDO and the Air Force have a complementary program in the BMDO budget. The two programs form the elements of the U.S. Space Command Tactical Event System (TES) architecture. Both receive oversight from an Executive Committee consisting of the PEO Missile Defense from each service.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Project Element: #0604766A (TIARA) Budget Activity: #5
PE Title: Tactical Electronic Surveillance
Systems - Engineering Development

JTAGS and Talon Shield/Centralized Tactical Processing Program (CTPP), which also evolved from the Army's Tactical Surveillance Demonstration (TSD), form an architecture wherein Talon Shield/CTPP provides worldwide coverage, while JTAGS provides responsive in-theater coverage. There is no unnecessary duplication of effort within the Army or DoD.

(U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Other Procurement Army 2:							
BZ8410	0	0	0	31120	0	0	0

(U) International Cooperative Agreements: Not Applicable

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604766A (TIARA)
PE Title: Tactical Electronic Surveilance Systems - Engineering Development

Project Number: D909
Budget Activity: #5

A. (U) RESOURCES: ($ in Thousands)
Project Title: Tactical Electronic Surveillance System - Engineering Development

Popular Name	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
Tactical Electronic Surveillance System - Engineering Development	32194	30934	19477	23664	14291	10595	20860	Cont	Cont

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project supports the engineering development directed at meeting the tactical commanders intelligence mission requirements for contingency force deployment and deep battle surveillance and targeting - as stated in Field Manual 100-5. Specific signals intelligence (SIGINT) and multi-spectral developments are managed within the Army's Tactical Exploitation of National Capabilities (TENCAP) program. The scope of the program is directed towards advanced techniques and capabilities to exploit National and selected theater capabilities that uniquely meet stated Army tactical intelligence and targeting needs and deficiencies, for near-real-time receipt, analysis, and dissemination into the appropriate tactical echelon. This project supports the engineering development/enhancement of the Electronic Tactical User Terminal (ETUT), Mobile Integrated Tactical Terminal (MITT), Forward Area Support Terminal (FAST), Electronic Processing and Dissemination System (EPDS), Tactical High Mobility Terminal (THMT). It also supports initial development of the Tactical Surveillance Demonstration Enhancement (TSDE) in FY93. In FY94 the Joint Tactical Ground Station (JTAGS) effort transfers to Project #D113. Specific details are provided at the Top Secret Special Access Level in the Tactical Intelligence and Related Activities (TIARA) Congressional Justification Book, Volume III, and in the Army TENCAP Master Plan.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Continued software upgrades and enhancements for the refinement of the TENCAP Common Baseline (which includes work on Demand Assigned Multiple Access (DAMA), modifications to communications system processors, and other efforts common to EPDS, THMTs, MITT, FAST and ETUTs to fully exploit the national capabilities to meet the changing threat environment.	4Q93	16929
• (U) Completed engineering development and support fielding and testing of the initial MITT and FAST systems based on the commercial "open architecture" baseline.	4Q93	1000

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604766A (TIARA)
PE Title: Tactical Electronic Surveilance Systems - Engineering Development

Project Number: D909
Budget Activity: #5

• (U) Continued development of TSDE unit to permit capability to receive and process data from more than two space based sensors; improve communications connectivity; and incorporate hardware and software upgrades. (Effort funded under Project D113 in FY94.)	7,242	
• (U) Engineered, developed and delivered for testing a transportable TSDE unit which incorporates the enhancements described above.	4Q93	3914
• (U) Began developmental testing of transportable TSDE unit. (Effort funded under Project D113 in FY94.)		2496
• (U) Continued support to TENCAP program management and administrative activities (e.g. Federally Funded Research and Development Center (FFDRC) (Aerospace), Army Research Laboratory (ARL) support, U.S. Army Space Program Office (ASPO) support and Scientific Engineering and Technology Assistance (SETA) support.	4Q93	613
Total		**32194**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Continue software upgrades and enhancements for the refinement of the TENCAP Common Baseline (including work done to modify Synthesized UHF Computer Controled Electronic Sub-System (SUCCESS) Radios to DAMA) to fully exploit national capabilities to meet changing threat environment.	4Q94	14159
• (U) Complete the fielding of initial six Mobile Integrated Tactical Terminals (MITT) and initiate the Engineering development of five additional MITTs to replace the existing THMTs.	4Q95	9500
• (U) Complete and field FAST terminals which put TENCAP capability in a transit case sized system for echelon below corps maneuver units.	2Q94	400
• (U) Continue the retrofit of ETUTs with MITT hardware and software (based on an open architecture baseline).	3Q95	5149
• (U) Continue support to TENCAP program management and administrative activities (e.g. FFRDC (Aerospace), Army Research Laboratory (ARL) support, U.S. Army Space Program Office (ASPO) support and Scientific Engineering and Technology Assistance (SETA) support.	4Q94	1726
Total		**30934**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604766A (TIARA)
PE Title: Tactical Electronic Surveilance Systems - Engineering Development

Project Number: D909
Budget Activity: #5

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Continue software upgrades and enhancements for the refinement of the TENCAP Common Baseline to fully exploit national capabilities to meet changing threat environment.	4Q95	9407
• (U) Initiate design study for the retrofit or replacement of EPDS processing van and major upgrade to communications component, SUCCESS radio.	4Q95	1500
• (U) Complete development of five additional MITTs to replace existing Tactical High Mobility Terminals (THMT).	2Q95	5000
• (U) Complete the retrofit of Enhanced Tactical User's Terminals (ETUT) with enhanced MITT hardware and software.	4Q95	1770
• (U) Continue support to TENCAP program management and administrative activities (e.g. FFRDC (Aerospace), Army Research Laboratory (ARL) support, U.S. Army Space Program Office (ASPO) support and Scientific Engineering and Technology Assistance (SETA) support.	4Q95	1800
Total		**19477**

D. (U) WORK PERFORMED BY:
In-house development agencies: U.S. Army Space Program Office (ASPO); the JTAGS Product Office, an element of PEO Missile Defense Redstone Arsenal; Communications and Electronics Command (CECOM), Ft. Monmouth, NJ; Army Research Laboratories, Adelphi, MD; Contractor; Gen Corp AEROJET Space Systems Division, Azusa, CA; Aerospace Corporation, El Segundo, CA.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:
NARRATIVE DESCRIPTION OF CHANGES

1. (U) **TECHNICAL CHANGES:** None.
2. (U) **SCHEDULE CHANGES:** None.
3. (U) **COST CHANGES:** None.

F. (U) PROGRAM DOCUMENTATION:
Technological Objective, Army Tactical Application of SIGINT Special (ATASS), 7/81 Appendix I, Technological Objective, ATASS, 1/89.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604766A (TIARA)
PE Title: Tactical Electronic Surveilance Systems - Engineering Development

Project Number: D909
Budget Activity: #5

G. (U) RELATED ACTIVITIES:

The initial efforts to provide the technical basis for the procedures, prototypes and processing and dissemination capabilities are addressed within PE #0603766A (Tactical Electronic Surveillance Systems - Advanced Development). To avoid duplication of effort, coordination is made with the National Security Agency, Defense Intelligence Agency, Navy and USAF TENCAP offices, Army Materiel Command, and other classified agencies at the national level.

H. (U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
OTHER PROCUREMENT, ARMY 2:							
BZ7315	5175	7229	4669	4641	1841	1835	1829

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE:

Milestones	Milestones Dates
Deliver JTAGS Transportable Prototype	4Q93
MITT #1-6 Fielding	3Q93-2Q94
FAST Development/Fielding	2Q94
Initiate ETUT Retrofit	4Q93
Complete ETUT Retrofit	4Q95
Complete and Field MITT #7-11	4Q94-4Q95

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604768A
PE Title: BAT

Budget Activity: #5

A. (U) RESOURCES: ($ in Thousands)

Project Number Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D641 BAT	114548	119727	93528	99180	71880	62581	0	0	962099
D687 BAT P3I	0	0	15483	37321	34914	59645	41312	Cont	Cont
PE TOTAL	114548	119727	109011	136501	106794	122226	41312	Cont	Cont

B. (U) BRIEF DESCRIPTION OF ELEMENT: The BAT System fills a void that currently exists in the fire support structure of the Army to attack moving targets at ranges in excess of 100 kilometers. The only option in the past has been to engage these targets with Army attack helicopters. While effective, this option places critical resources and their air crews at risk. The BAT System provides this capability to significantly reduce this risk using its autonomous guidance to attack well defended armor columns. Destruction of the reinforcement armor columns will also reduce the threat forces faced by our maneuver forces. This equates to a decrease in the number of casualties sustained in battle and an increase in the combat effectiveness of the U.S. forces involved. The BAT system includes the BAT submunition, a later Improved BAT (IBAT) submunition, the BAT Carrier which is the Army Tactical Missile System (TACMS) Block II, and the Extended Range (ER) BAT Carrier which is the ER Army TACMS. BAT is a dual-sensor (acoustic and infrared), referred to as "brilliant" because, once deployed, it can autonomously seek and destroy armored targets without human interaction. The BAT submunition is an unpowered aerodynamically stable vehicle approximately 36 inches long, 5.5 inches in diameter and weighs 44 pounds. BAT submunitions can be carried deep into enemy territory by a variety of delivery vehicles, then dispersed over numerous targets to selectively attack and destroy individual targets. The IBAT will be the product of the BAT Pre-Planned Product Improvement (P3I) Program. Through sensor, warhead, and microprocessor modifications, the BAT P3I program will increase lethality and allow attack of new target arrays to include cold stationary targets, dug-in targets, Surface-to-Surface Missile (SSM) Transporter Erector Launchers (TEL) and others.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995: None.

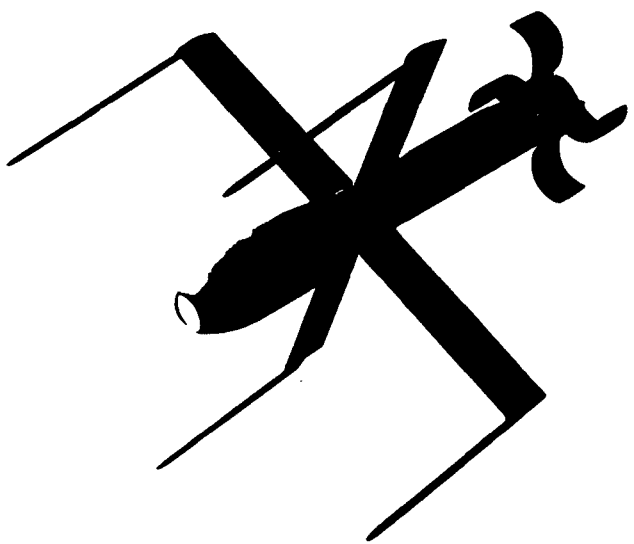
FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604768A
PE Title: BAT
Project Title: BAT

Project Number: D641
Budget Activity: #5

BAT

PEO Fire Support



Brilliant Anti-Armor Submunition

POPULAR NAME: BAT

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604768A**
PE Title: **BAT**
Project Title: **BAT**

Project Number: **D641**
Budget Activity: **#5**

A. (U) SCHEDULE/BUDGET INFORMATION: ($ In Thousands)

SCHEDULE	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	To Complete
Program Milestones						PEO Rvw/CSC- 1st Qtr		MS III- 3d Qtr 00
Engineering Milestones	Initiate prototype mfg- 3d Qtr	1st prototype unit del- 3d Qtr	Compl subsys qual II-4th Qtr	Compl system qual- 2d Qtr				SRD- 1st Qtr 00
T&E Milestones	Compl DVT 1, CFT 2, SPT 2	Cmpl DVT,CFT3, SPT3	Cmpl WT/Sled tests- 3d Qtr Cmpl CDT I - 4th Qtr	Cmpl DVT II- 1st Qtr Initiate CDT II- 2d Qtr	Compl CDT II- 2d Qtr			
Contract Milestones		EMD restructure CA-2d Qtr				LRIP I CA- 2d Qtr	LRIP II CA- 2d Qtr	Prod CA- 3d Qtr 00
BUDGET ($000)	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	Program Total (To Complete)
Major Contract	92731	93018	70001	74344	48935	60744	0	724398
Support Contract	3294	5499	3803	3900	4023	596	0	63407
In-House Support	18523	21210	19724	20936	18922	1241	0	174294
Total	114548	119727	93528	99180	71880	62581	0	962099 (0)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604768A**
PE Title: **BAT**
Project Title: **BAT**

Project Number: **D641**
Budget Activity: **#5**

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The BAT submunition is an unpowered aerodynamically stable vehicle approximately 36 inches long, 5.5 inches in diameter, and weighs 44 lbs. The BAT is an acoustic and infrared terminally guided submunition that searches for, tracks, and destroys armored, mobile targets. BAT submunitions can be carried deep into enemy territory by a variety of delivery vehicles, then dispersed over numerous high-payoff targets to selectively attack and destroy individual targets. Being a certified round, the BAT submunition has a low sustainment cost. By utilizing acoustic technology, BAT has the advantage of a large footprint which allows it to compensate for target location errors.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• Conducted FY 1993 Engineering and Manufacturing Development (EMD) Program	4th Qtr 93	105383
• Completed Captive Flight Test (CFT) # 2	2d Qtr 93	
• Completed Suspended Platform Test (SPT) # 2	2d Qtr 93	
• Completed Low Speed Wind Tunnel Test # 2	2d Qtr 93	
• Completed Deployable Wind Tunnel Test: Phase I	3d Qtr 93	
• Completed Design Verification Test (DVT) I	3d Qtr 93	
• Initiated prototype production	3d Qtr 93	
• Performed integration activities with Alternate Carrier(s)	4th Qtr 93	
• Operated and maintained Test Range for Submunition Flight Tests	3d Qtr 93	6675
• Initiated Pre-Planned Product Improvement (P3I) Program Dem/Val Phase I	3d Qtr 94	2490
TOTAL		114548
(U) FY 1994 Planned Program:		
• Conduct FY 1994 EMD program	4th Qtr 94	91452
• Completed DVT 2a	1st Qtr 94	

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604768A
PE Title: BAT
Project Title: BAT

Project Number: D641
Budget Activity: #5

• Completed CFT #3	1st Qtr 94	
• Perform CFT #4	2d Qtr 94	
• First prototype unit delivery	3d Qtr 94	
• Complete BAT Design Modification	3d Qtr 94	
• Complete DVT testing	4th Qtr 94	
• Initiate subsystem Qualification: Phase I	4th Qtr 94	
• Begin fabrication and testing of High Speed Stabilizer	2d Qtr 95	
• Initiate Wind Tunnel and Sled testing: Phase II	4th Qtr 95	
• Perform prototype production	4th Qtr 94	
• Build integration test hardware for BAT Carrier test program	4th Qtr 94	
• Perform integration activities with BAT Carrier	4th Qtr 94	
• Begin preliminary design support with BAT Carrier	3d Qtr 95	
• Perform Carrier wind tunnel testing	3d Qtr 94	
• Initiate static eject sled testing	3d Qtr 95	
• Conduct BAT integration activities	4th Qtr 94	
• Conduct test range and target maintenance/improvements	4th Qtr 94	4875
• Conduct BAT/MLRS Integration Study (Congressionally Directed)	1st Qtr 96	10000
• Complete P3I Dem/Val Phase I and Initiate Phase II	4th Qtr 94	13400
TOTAL		119727

(U) FY 1995 Planned Program:

• Conduct EMD program	4th Qtr 95	81497
• Complete Wind Tunnel and Sled testing- Phase II	3d Qtr 95	
• Start Contractor Development Test (CDT): Phase I	3rd Qtr 95	
• Conduct prototype production	4th Qtr 95	
• Complete CDT: Phase I	4th Qtr 95	

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604768A**
PE Title: **BAT**
Project Title: **BAT**

Project Number: **D641**
Budget Activity: **#5**

• Conduct System Environmental Qualification Test	2d Qtr 96	
• Perform prototype production	4th Qtr 95	
• Build integration test hardware for BAT carrier test program	4th Qtr 95	5000
• Conduct test range and target maintenance/improvements	4th Qtr 95	7031
TOTAL		93528

D. (U) WORK PERFORMED BY: This program will be managed by the Army BAT Project Manager. Northrop Corporation of Los Angeles, CA is the prime contractor responsible for total system performance. Raytheon Company of Bedford, MA is the Infrared Seeker (IR) subsystem subcontractor.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. TECHNICAL CHANGES: The BAT submunition will be modified to accommodate the new BAT Carrier (Army TACMS Block II)

2. SCHEDULE CHANGES: The BAT program has realigned itself with a new carrier. Realignment has forced BAT to extend its EMD program 25 months and delay procurement for 2 years.

3. COST CHANGES: The BAT project (D641) funds have been reduced due to reallocation of funds to the BAT P3I project(D687). Previously, BAT and BAT P3I funds were combined under this project.

F. (U) PROGRAM DOCUMENTATION:

Test and Evaluation Master Plan (TEMP)	11/90	
System Threat Assessment Report (STAR)	03/93	
Required Operational Capability (ROC)	01/93	(TRADOC update of 03/91 DA approved document)
Integrated Program Summary (IPS)	04/91	

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604768A**
PE Title: **BAT**
Project Title: **BAT**

Project Number: **D641**
Budget Activity: **#5**

G. (U) RELATED ACTIVITIES: The BAT Submunition integrates with the following Weapon Systems:

- Program Element/Project #0604768A/D687, BAT P3I
- Program Element/Project #0203802A/D685, BAT Carrier
- Program Element/Project #0203802A/D686, Extended Range BAT Carrier
- Program Element/Project #0203802A/D304, Army TACMS P3I
- Program Element/Project #0603778A/D050, Multiple Launch Rocket System (MLRS)
- There is no unnecessary duplication of effort within the Army or DOD

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Missile Procurement, Army							
Budget Activity 2							
BAT CA6100	None	None	None	None	None	128000	138600

Military Construction (None)

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. (U) TEST AND EVALUATION DATA: Through simulations and testing during Extended Proof Of Principle (EPOP), BAT demonstrated that it can meet the ROC specified requirement for kills per launcher load. BAT conducted 8 successful Acoustic and Design Verification flight tests, 2 end-to-end flight tests (Oct 90 and Jan 91), and over 200 captive flight tests prior to EMD. In EMD, BAT plans to conduct final Design Verification Tests (DVTs) in FY 95/96 and Contractor Developmental Tests (CDTs) in FY 96/97. BAT successfully conducted its first three EMD DVTs in Jun 93, Nov 93, and Jan 94.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604768A
PE Title: BAT
Project Title: Brilliant Anti-Armor Submunition Pre-Planned Product Improvement (BAT P3I)

Project Number: D687
Budget Activity: #5

POPULAR NAME: Improved BAT (IBAT)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604768A**
PE Title: **BAT**
Project Title: **BAT P3I**

Project Number: **D687**
Budget Activity: **#5**

A. (U) SCHEDULE/BUDGET INFORMATION: ($ In Thousands)

SCHEDULE	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	To Complete
Program Milestones		P3I CSC - 4th Qtr			P3I MS II 2d Qtr			P3I MS III- 3d Qtr FY 02
Engineering Milestones			IPR - 3d Qtr		SSR, SVR, Final IPR - 3d Qtr			P3I PROD FY 02
T&E Milestones			CFTs -3/4 Qtr	CFTs - 1/2 Qtr	Drop Test - 1st Qtr			
Contract Milestones		P3I Phase I/II CA - 1/4 Qtrs			EMD CA- 3d Qtr			LRIP CA- 1st Qtr 01
BUDGET ($000)	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	Program Total (To Complete)
Major Contract	0	0	9846	29188	28102	53499	32742	Cont
Support Contract	0	0	784	962	983	1005	1027	Cont
In-House Support	0	0	4853	7171	5829	5141	7543	Cont
Total	0	0	15483	37321	34914	59645	41312	Cont

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604768A**
PE Title: **BAT**
Project Title: **BAT P3I**

Project Number: **D687**
Budget Activity: **#5**

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The IBAT submunition is an unpowered aerodynamically stable vehicle approximately 36 inches long, 5.5 inches in diameter, and weighs 44 lbs. The IBAT is an multi-sensored terminally guided submunition that searches for, tracks, and destroys armored, mobile, and cold stationary targets. IBAT submunitions can be carried deep into enemy territory by a variety of delivery vehicles, then dispersed over numerous high-payoff targets to selectively attack and destroy individual targets. Being a certified round, the IBAT submunition has a low sustainment cost. By utilizing acoustic technology, BAT has the advantage of a large footprint which allows it to compensate for target location errors. IBAT is an Army approved Pre-Planned Product Improvement (P3I) program intended to increase submunition lethality and allow attack of new target arrays to include cold stationary targets, dug-in targets, Surface-to-Surface Missile (SSM) Transporter Erector Launchers (TELs) and others. This program will incorporate new seeker, warhead, and microprocessor technologies into the current BAT configuration.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments: FY 1993 activities were funded in BAT PE #0604768A, Project # D641

(U) FY 1994 Planned Program: FY 1994 activities are funded in BAT PE #0604768A, Project # D641

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• Conduct Test Range operation, maintenance and improvements	2d Qtr 97	2400
• Conduct P3I DEM/VAL Phase II program	4th Qtr 94	9400
• Conduct P3I warhead development	4th Qtr 94	1200
• Upgrade Hardware-In-The-Loop simulation	4th Qtr 97	2483
TOTAL		**15483**

D. (U) WORK PERFORMED BY: This program will be managed by the Army BAT Project Manager. Northrop Corporation of Los Angeles, CA is the prime contractor responsible for total system performance.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY: This is the initial submittal for the BAT P3I program.

F. (U) PROGRAM DOCUMENTATION: No specific P3I documentation exists for this project.
Test and Evaluation Master Plan (TEMP) 11/90 (Revision at HQDA)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604768A
PE Title: BAT
Project Title: BAT P3I

Project Number: D687
Budget Activity: #5

System Threat Assessment Report (STAR)	03/93	
Required Operational Capability (ROC)	01/93	(TRADOC update of 03/91 DA approved document)
Integrated Program Summary (IPS)	04/91	

G. (U) RELATED ACTIVITIES: The IBAT Submunition integrates with the following Weapon Systems:

- Program Element/Project #0604768A/D461, BAT
- Program Element/Project #0203802A/D686, Extended Range BAT Carrier
- Program Element/Project #0203802A/D685, BAT Carrier
- Program Element/Project #0203802A/D304, Army TACMS P3I
- Program Element/Project #0603778A/D050, Multiple Launch Rocket System (MLRS)
- There is no unnecessary duplication of effort within the Army or DOD

H. (U) OTHER APPROPRIATION FUNDS: None.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. (U) TEST AND EVALUATION DATA: Through simulations and testing during Extended Proof Of Principle (EPOP), BAT demonstrated that it can meet the ROC specified requirement for kills per launcher load. BAT conducted 8 successful Acoustic and Design Verification flight tests, 2 end-to-end flight tests (Oct 90 and Jan 91), and over 200 captive flight tests prior to EMD. In EMD, BAT plans to conduct final Design Verification Tests (DVTs) in FY 93/94, Contractor Developmental Tests (CDTs) in FY 94/95 and Production verification Tests (PVTs) in FY97/99. BAT successfully conducted its first three EMD DVTs in Jun 93, Nov 93, and Jan 94. There is no test data on the IBAT to date.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604770A (TIARA) Budget Activity: #5
PE Title: **Joint Surveillance Target Attack Radar System**

A. (U) RESOURCES: ($ in Thousands)

Project Number Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D2CT JSTARS Operational Test	0	0	6013	0	0	0	0	0	6013
D202 Army Joint STARS	62471	25955	34173	21849	25904	27445	26291	0	621034
PE TOTAL	62471	25995	40186	21849	25904	27445	26921	0	627047

B. (U) BRIEF DESCRIPTION OF ELEMENT: This is a TIARA program. US Forces have an urgent need for wide-area surveillance and target attack radar system capable of continuous coverage out to a depth in excess of 100 km beyond their Forward Line of Troops. Commanders must have the capability to detect, locate, classify and track moving and stationary targets for situation assessment to avoid surprise and attack targets out to the range of existing and developing weapons. The Joint Surveillance and Target Attack Radar System (JSTARS) provides battle management and targeting of enemy units at critical times and places so commanders can employ their organic forces and firepower in support of deep, close and rear operations. The joint Army/Air Force program objective is to develop a radar, datalink, ground station, and airframe that will provide the capability to locate, track and classify tracked and wheeled vehicles beyond ground line-of-sight during the day and night, and under most weather conditions. Radar data is distributed to ground station modules via a secure surveillance and control data link. The Army will develop the ground components of the JSTARS under this PE, Project D202. Also included in this PE is project D2CT with FY95 funding for the Multi-Service Operational Test and Evaluation (MOTE).

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:

(U) Project D2CT - JSTARS Operational Test: D2CT provides for the Army's costs associated with the MOTE during April - September 95. This Joint Service Initial Operational Test and Evaluation (IOT&E) will support both the US Army and US Air Force for their FY96 Joint STARS Full Scale Production Decisions. Project D2CT is not a new start. It is transfer of effort from PE 0605712, Support of Operational Testing, Project D001, Operational Test and Evaluation Command (OPTEC) IOTE. (In FY95, funding for operational testing of Acquisition Category (ACAT) I systems is programmed with the PE funding development for each system. Future fiscal years will be reprogrammed when system information becomes available.)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604770A (TIARA) Budget Activity: #5

PE Title: Joint Surveillance Target Attack Radar System

	Complete	Cost
(U) FY 1993 Accomplishments:	N/A	N/A
(U) FY 1994 Planned Program:	N/A	N/A
(U) FY 1995 Planned Program:	Complete	Cost
• (U) Conduct MOTE Pre Test Planning and Training	2Q95	1133
• (U) Develop Instrumentation of Test Hardware, Simulators and Facilities	2Q95	906
• (U) Conduct MOTE	4Q95	3363
• (U) Complete Test Analysis and Reports	1Q96	611
Total		6013

(U) Work Performed By: The Project Manager for JSTARS, Ft Monmouth, NJ under the Program Executive Officer for Intelligence and Electronic Warfare, Vint Hill Farms Station, Warrenton, VA is assigned the responsibility for development and acquisition of the JSTARS GSM. Principal contractor employed at this time is Motorola Inc., Scottsdale, AZ. The Air Force prime mission equipment is being developed by Grumman Melbourne Systems, Melbourne, FL, Norden Systems Division of United Technologies CT, and Cubic Corporation, San Diego, CA.

(U) Related Activities:

- The Joint STARS Airborne hardware is funded under Program Element #0604770F (Joint Surveillance Target Attack Radar System).
- There is no unnecessary duplication of effort within the Army or DoD.

(U) Other Appropriation Funds: ($ in Thousands)

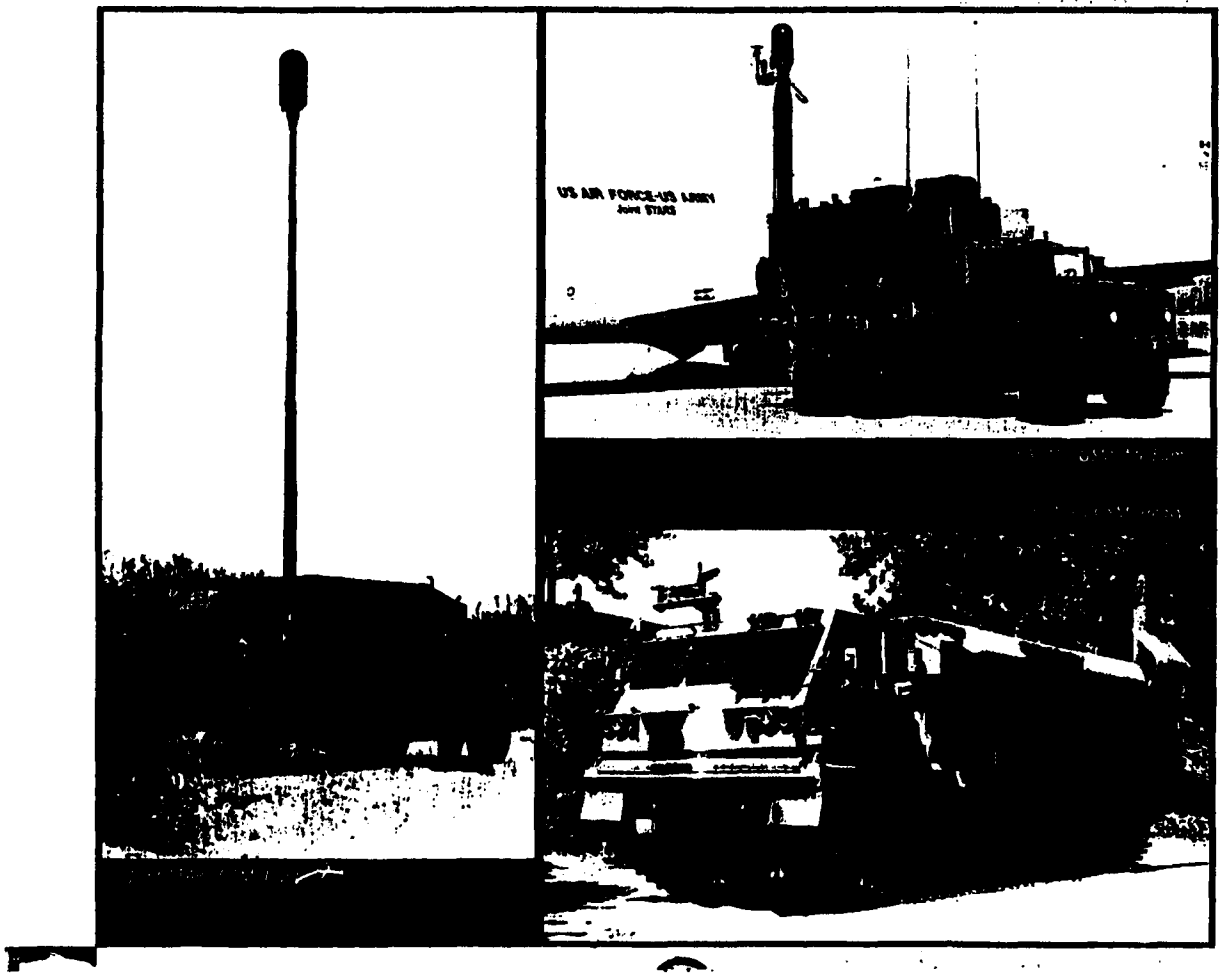
Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Communications & Electronic Equipment							
BA1080 Joint STARS Army TIARA	35220	57796	55638	80536	70457	74874	33069

(U) International Cooperative Agreements: N/A

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604770A (TIARA)
PE Title: Joint Surveillance Target Attack Radar System
Project Title: Army Joint STARS

Project Number: D202
Budget Activity: #5



FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604770A (TIARA)**
PE Title: **Joint Surveillance Target Attack Radar System**
Project Title: **Army Joint STARS**

Project Number: **D202**
Budget Activity: **#5**

A. (U) SCHEDULE/BUDGET INFORMATION: ($ In Thousands)

SCHEDULE	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	To Complete
Program Milestones	Block I Medium LRIP 7/93		Block I Light LRIP 3/95	Milestone III/IV 6/96			Complete EMD Program 9/99	Complete FPI Fielding 9/02
Engineering Milestones	Block I Light CDR 8/93			Block II CGS CDR I 8/96		Block II CGS CDR II 10/97		
T&E Milestones	Block I Medium LUT 1/93	Blk I Lt TT 4/94 Blk I Light FDTE 7/94	Multi Service Operational Test & Eval (MOTE) 7/95		Block II CGS Follow-On Test & Eval (FOTE) 1/97		Block II CGS FOTE II 1/99	
Contract Milestones	Block I Medium LRIP Award 9/93		Block I Light LRIP Award 4/95	Block I GSM Full Scale Product Award 7/96	Block I LGSM LRIP 1ST Del 3/97			Complete Block II CGS Product 12/03
BUDGET ($000)	**FY 1993**	**FY 1994**	**FY 1995**	**FY 1996**	**FY 1997**	**FY 1998**	**FY 1999**	**Program Total (To Complete)**
Major Contract	54558	20870	29611	18431	22687	24173	22971	451847 (0)
Support Contract	483	450	500	515	515	565	665	40558 (0)
In-House Support	4793	3410	3157	2230	2029	2075	2065	68355 (0)
GFE/ Other	2637	1225	905	673	673	632	590	60274 (0)
Total	62471	25955	34173	21849	25904	27445	26291	621034 (0)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604770A (TIARA) Project Number: D202
PE Title: Joint Surveillance Target Attack Radar System Budget Activity: #5
Project Title: Army Joint STARS

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This is a TIARA program. US Forces have an urgent need for wide-area surveillance and target attack radar system capable of continuous coverage out to a depth in excess of 100 km beyond their Forward Line of Troops. Commanders must have the capability to detect, locate, classify and track moving and stationary targets for situation assessment to avoid surprise and attack targets out to the range of existing and developing weapons. The Joint Surveillance and Target Attack Radar System (JSTARS) provides battle management and targeting of enemy units at critical times and places so commanders can employ their organic forces and firepower in support of deep, close and rear operations. The joint Army/Air Force program objective is to develop a radar, datalink, ground station, and airframe that will provide the capability to locate, track and classify tracked and wheeled vehicles beyond ground line-of-sight during the day and night, and under most weather conditions. Radar data is distributed to ground station modules via a secure surveillance and control data link. The Army will develop the ground components of the JSTARS under this PE/Project. The Ground Station Module (GSM) is being developed in a Block approach. Block I Medium, Light and Heavy GSMs utilize the same prime mission equipment and will be developed/deployed on different platforms. The Block I Medium GSM (MGSM) is housed in a Standard S280 shelter and mounted on a 5 Ton Truck. The Light Weight Block I Light GSM (LGSM) is housed in a Standard Integrated Command Post Shelter (SICPS) and mounted on a High Mobility Multi Purpose Wheeled Vehicle (HMMWV). The Block I Heavy GSM involves integrating the mission equipment into a Command and Control Vehicle (C2V) (a Bradley variant). Also included in this project is the development of the Block II GSM or Common Ground Station (CGS). The CGS will integrate signal, imagery, and other intelligence processing into a single ground station, resulting in enhanced battle management as well as significant cost savings.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Conducted Block I Medium Limited Users Test (LUT)	2Q93	347
• (U) Completed Low Rate Initial Production (LRIP) Defense Acquisition Board (DAB) and contract award for Block I Medium (OPA)	4Q93	0
• (U) Conducted Block I Light Critical Design Review (CDR)	4Q93	0
• (U) Complete LGSM Hardware Design, Assembly and Technical Test	3Q94	54575
• (U) Perform MOTE software development and integration	4Q94	7549
TOTAL		**62471**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604770A (TIARA) Project Number: D202
PE Title: Joint Surveillance Target Attack Radar System Budget Activity: #5
Project Title: Army Joint STARS

	Complete	Cost
(U) FY 1994 Planned Program:		
• (U) Conduct Block I Light Technical Test (TT)	3Q94	2743
• (U) Complete Block I Light Force Development Test & Evaluation (FDTE)	4Q94	150
• (U) Complete GSM Trainer development and delivery	3Q94	7750
• (U) Complete LGSM Engineering and Manufacturing Development Model Delivery	3Q94	11084
• (U) Complete LGSM software/data development	4Q94	4228
TOTAL		**25955**
(U) FY 1995 Planned Program:		
• (U) Obtain Block I Light LRIP Decision	2Q95	306
• (U) Perform Multi-service Operational Test & Evaluation (Block I Medium & Light)	4Q95	0
• (U) Complete Data Link Mast Head redesign	1Q95	2313
• (U) Release Full Scale production competitive data package	2Q95	11878
• (U) Complete LGSM Engineering and Manufacturing Development (EMD) Program	2Q96	19676
TOTAL		**34173**
(U) Program Plan to Completion		
• (U) Complete Block I Medium LRIP first delivery and fielding	1Q96	
• (U) Obtain Block I Milestone III/IV Decision	3Q96	
• (U) Complete Block I Full Scale Production Award(OPA)	4Q96	
• (U) Complete LGSM EMD Program	2Q96	
• (U) Initiate Phase I CGS design/system enhancements	2Q97	
• (U) Complete Block II CGS Phase 1 design, integration and Tech Test	2Q97	
• (U) Conduct Block II CGS Follow-on Test & Evaluation (FOTE)I	2Q97	
• (U) Complete Block I Heavy design, integration and Tech Test	1Q98	
• (U) Complete Block II Phase II design, integration and test	2Q99	
TOTAL		

D. (U) WORK PERFORMED BY: The Project Manager for JSTARS, Ft Monmouth, NJ under the Program Executive Officer for Intelligence and Electronic Warfare, Vint Hill Farms Station, Warrenton, VA is assigned the responsibility for development and acquisition of the JSTARS

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604770A (TIARA) Project Number: D202
PE Title: Joint Surveillance Target Attack Radar System Budget Activity: #5
Project Title: Army Joint STARS

GSM. Principal contractor employed at this time is Motorola Inc., Scottsdale, AZ. The Air Force prime mission equipment is being developed by Grumman Melbourne Systems, Melbourne, FL, Norden Systems Division of United Technologies CT, and Cubic Corporation, San Diego, CA.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. TECHNICAL CHANGES: No Impact

2. SCHEDULE CHANGES: Due to schedule delays in LUT start and subsequent DAB approval/contract, the Block I Medium first production delivery will slip to FY96 from FY95. The MGSM Fielding schedules are also delayed approximately 9 months. Fielding of Block II CGS capable LGSMs has been accelerated to FY98 by the initiation of a Preplanned product Improvement (P3I) program following the 6/96 Milestone III/IV decision. Block I Heavy Production has been delayed from FY96 to FY98 due to a delay in availability of the C2V carrier. Total quantities per year are unaffected as additional LGSMs will be procured in FY96-97.

3. COST CHANGES:

Annual Research, Development and Acquisition funding requirements were adjusted to reflect the April 93 Army Cost Position (ACP). Total program RDA funding requirements as delineated in the ACP were $1492.1M.

F. (U) PROGRAM DOCUMENTATION:

Operational and Organizational Plan (O&O)	10/88
Acquisition Decision Memorandum (ADM) Milestone II	3/89
Joint Services Operational Requirements Document (JSORD)	2/92
Army Required Operational Capability (ROC) (revision)	11/92
Baseline Cost Estimate (BCE)	4/93
Acquisition Decision Memorandum (ADM) (LRIP)	8/93
Test & Evaluation Master Plan (TEMP)	8/93

G. (U) RELATED ACTIVITIES:

- The Joint STARS Airborne hardware is funded under Program Element #0604770F (Joint Surveillance Target Attack Radar System).

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604770A (TIARA)
PE Title: Joint Surveillance Target Attack Radar System
Project Title: Army Joint STARS

Project Number: D202
Budget Activity: #5

- There is no unnecessary duplication of effort within the Army or DoD.

H.(U) OTHER APPROPRIATION FUNDS:($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Communications & Electronic Equipment							
BA1080 Joint STARS Army TIARA							
	35220	57796	55638	80536	70457	74874	33069

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS:
None Current. Airborne Radar Demonstration System (ARDS) NATO (US, UK, France) program completed FY91.

J. (U) TEST AND EVALUATION DATA:

(U) Development Test and Evaluation (DT&E) has been conducted to verify that the GSMs satisfy specification requirements. DT&E was conducted in accordance with the US Army Materiel Systems Analysis Agency (AMSAA) Independent Evaluation Plan. The IGSM and Block I MGSM have completed DT&E.

(U) Operational Test and Evaluation (OT&E). The Block I Medium Limited User Test (LUT) was conducted in FY93. LUT included seven live missions with the Joint STARS E-8 and the OV-1D aircrafts and ten missions with simulated radar data. The MGSM LRIP approval was in part based on LUT results.

(U) PLANNED DT&E: The planned DT&E will qualify new GSM functions. All Block I GSM DT&E will be completed prior to the FY96 Milestone III decision.

(U) PLANNED OT&E: The OT&E for the Block I GSMs will be the Joint STARS, system level Multi-service Operational Test and Evaluation (MOT&E). Production representative Block I GSM configurations will participate in MOT&E. MOT&E will be completed prior to the 1996 Milestone III decision.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604778A**
PE Title: **Positioning System Development** Budget Activity: **#5**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D163 Modular Azimuth and Positioning System (MAPS) Hybrid Product Improvement Program (PIP)	5313	4414	3375	0	0	0	0	0	15927
D168 NAVSTAR Global Positioning System (GPS) Equipment	0	474	471	462	451	452	442	CONT	CONT
PE TOTAL	5313	4888	3846	462	451	452	442	CONT	CONT

B. (U) BRIEF DESCRIPTION OF ELEMENT: Project D163 provides for Engineering and Manufacturing Development (EMD) of a Hybrid Modular Azimuth and Positioning System (MAPS) into one host system, the Paladin (M109A6 155mm Self-Propelled Howitzer). The MAPS will be integrated with a Global Positioning System (GPS) receiver to provide rapid initialization and frequent updates of the inertial positioning and orientation system without the need of local survey control and will limit inertial Position/ Navigation (POS/NAV) errors. Project D168 provides for Army participation in the research and development phases of Army weapon systems requiring POS/NAV capabilities. It provides for the engineering development of several alternatives for integration of GPS receivers into selected systems. These alternatives include, but are not limited to, Embedded/Integrated GPS, Advanced GPS Receivers (AGR), Tactical GPS Anti-Jam Technology (TGAT) and Differential GPS. Project D168 (NAVSTAR GPS) is a new start in FY 1994.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:

(U) Project D163 - MAPS Hybrid PIP: MAPS Hybrid PIP is a product improvement of MAPS. The project is intended to improve the autonomous capability of Paladin and other potential users by decreasing their reliance on externally provided survey control points and, thus, increasing system effectiveness and survivability on the battlefield.

	Complete	Cost
(U) FY 1993 Accomplishments:		
• (U) Development/Design of MAPS Dynamic Reference Unit for use with Precision Lightweight GPS Receiver	4Q94	4900
• (U) Coordinated development with Paladin Automatic Fire Control System and Firefinder Radar	4Q93	213
• (U) PLGR contract awarded by PM GPS and prototype PLGR hardware obtained for integration.	1Q93	200
TOTAL		**5313**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604778A**
PE Title: **Positioning System Development** Budget Activity: **#5**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Research and develop alternatives related to system integration and application technology	4Q94	2067
• (U) Review documentation and interface with host systems	4Q94	790
• (U) Participate in studies, prototyping and integration of candidate systems	4Q94	835
• (U) Support test and evaluation of GPS integrations	4Q94	722
TOTAL		**4414**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Continued Test and Evaluation	4Q95	1536
• (U) Production and Field Retrofit Planning	4Q95	670
• (U) Type Classification of MAPS Hybrid Unit	4Q95	1169
TOTAL		**3375**

(U) D168 - NAVSTAR GPS Equipment: GPS sets were used in Operation Desert Storm and proved to be a significant force multiplier. GPS assures greater command and control and significantly reduces the likelihood of fratricide. New uses for GPS are being developed. These new uses require an analysis of the overall host vehicle operational POS/NAV system to support development of alternative GPS applications. This Project was a new start in FY1994.

(U) FY 1993 Accomplishments:
- **(U) Project not funded**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Research and develop alternatives related to system integration of GPS in selected weapons systems	2Q94	200
• (U) Review documentation and interface with host systems		80
• (U) Develop and test GPS anti jam, differential and embedded applications.	FY95	194
TOTAL		**474**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604778A
PE Title: **Positioning System Development**

Budget Activity: #5

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Continue development/testing of GPS anti-jam, differential and embedded technologies.	1Q95	150
• (U) Incorporation of new GPS technology into next generation. User equipment through insertion of P31.	3Q95	221
• (U) Testing of prototype equipment.	4Q96	100
TOTAL		471

(U) Work Performed By: D163 - MAPS Hybrid PIP: The major supporting laboratory is the Armament Research, Development and Engineering Center, Picatinny Arsenal, NJ; supplemental support provided by Topographic Engineering Center, Ft Belvior, VA. Principle contractors are Honeywell Inc., Clearwater, FL and Alliant Techsystems, Minneapolis, MN.

D168 - NAVSTAR GPS Equipment: Draper Laboratory, Boston, MA; Mayflower Communications, Boston, MA; Raytheon Corporation, Melborne, FL; Harris Corporation, Melborne, FL. Arinc Research Corp, San Diego, CA.

(U) Related Activities: D163 - MAPS Hybrid PIP: Operational Requirements Document (ORD) for the Paladin and Advanced Firefinder include a requirement for initialization and update of their inertial positioning and orientation systems without the need of local survey control. This effort answers that requirement and will be applied to the host systems via product improvement programs. This is a joint program with participation by all Armed Services. There is no unnecessary duplication of effort within the Army or DOD.

D168 - NAVSTAR GPS Equipment: PE #0603746A relates to advanced development of the Block I improvements to the Single Channel Ground and Airborne Radio System (SINCGARS) which includes GPS. There is no unnecessary duplication of effort within the ARMY or DOD.

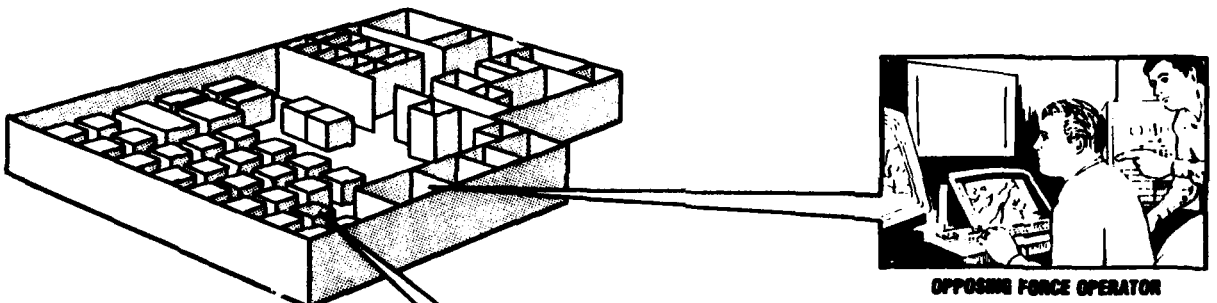
(U) Other Appropriation Funds: Not Applicable

(U) International Cooperative Agreements: A Memorandum of Understanding with ten NATO nations was signed on 6 June 1984 and amended on 14 April 1987. This memorandum provides for the exchange of information, coordination of developments and joint test and evaluation activities.

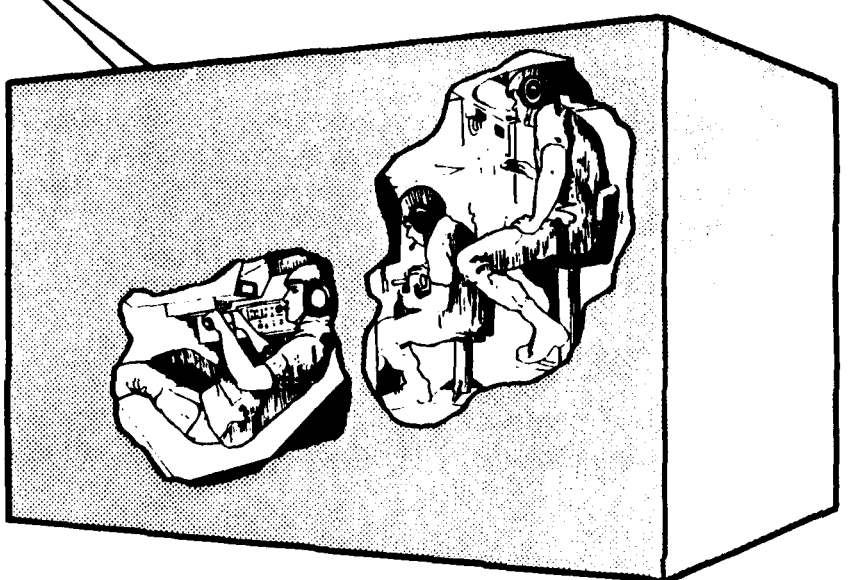
FY 1995 RDT&E DESCRIPTIVE SUMMARY

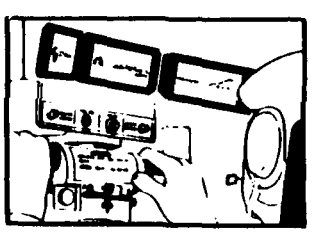
Program Element: **#0604780A**
PE Title: **Combined Arms Tactical Trainer**
Project Title: **Close Combat Tactical Trainer**

Project Number: **# D571**
Budget Activity: **#5**



OPPOSING FORCE OPERATOR





TYPICAL CREW STATION VIEW

M1A1 TANK MANNED MODULE

POPULAR NAME: **CCTT**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604780A**
PE Title: **Combined Arms Tactical Trainer**
Project Title: **Close Combat Tactical Trainer**

Project Number: **# D571**
Budget Activity: **#5**

A. (U) SCHEDULE/BUDGET INFORMATION: ($ In Thousands)

SCHEDULE	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	To Complete
Program Milestones				DA REVIEW OF QS TEST 2Q96	MS IIIA 3Q97	MS III 1Q98	IOC 1Q99	
Engineering Milestones		SPIRAL DEV. BUILDS BEGIN 1Q94	SPIRAL DEV. BUILDS END 3Q95					
T&E Milestones			CSCI 4Q95	PPQT 4Q96	IOTE 3Q97			
Contract Milestones			QUICKSTART AWARD 1Q95					
BUDGET ($000)	**FY 1993**	**FY 1994**	**FY 1995**	**FY 1996**	**FY 1997**	**FY 1998**	**FY 1999**	**Program Total (To Complete)**
Major Contract	0	42820	42395	31586	6941	2652	2728	Cont
Support Contract	0	2842	4548	4295	1725			Cont
In-House Support	0	7259	5217	5890	2106	500	500	Cont
GFE/ Other	0							
Total	0	52921	52160	41771	10772	3152	3228	Cont

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604780A**
PE Title: **Combined Arms Tactical Trainer**
Project Title: **Close Combat Tactical Trainer**

Project Number: **# D571**
Budget Activity: **#5**

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
This project provides for Engineering and Manufacturing Development (EMD) and pre-planned product improvements for the Close Combat Tactical Trainer (CCTT) which will enhance readiness of both active and reserve component forces. The program will develop a networked system of interactive computer driven simulators, emulators and semi-automated forces that replicate combat vehicles and weapon system, combat support, combat service support, and command and control to create a fully integrated real-time collective task training environment. This trainer will allow soldiers to practice, repetitively, techniques which, if performed on real equipment, would be too hazardous, time-consuming and expensive. These trainers enhance realism and allow soldiers and units to learn tactical combat lessons on maneuver, command and control, and improved teamwork for increased survivability. This project is not a new start. It was restructured from PE 0604715 D574 in order to separate a major Army program from the non-system training device program in FY94.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) See PE #0604715A, Project D574		

NOTE - Costs for individual tasks are not identifiable because tasks are not separately costed in the development contract for CCTT.

(U) FY 1994 Planned Program:

		Cost
• (U) Perform hardware/software preliminary design review	1Q95	
• (U) Perform hardware/software critical design review	2Q95	
• (U) Complete software requirement specification	2Q95	
Total		**52160**

(U) FY 1995 Planned Program:

		Cost
• (U) Perform hardware/software test readiness review	3Q95	
• (U) Perform software physical configuration audit	2Q96	
• (U) Initiate Computer Software Configuration Item (CSCI) testing	3Q95	
Total		**41771**

D. (U) WORK PERFORMED BY: In-house activities by the U.S. Army Simulation, Training and Instrumentation Command (STRICOM) and the Naval Air Warfare Center Training Systems Division (NAWCTSD), Orlando, FL. Development contractor is IBM Corporation, Manassas, VA.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604780A**
PE Title: **Combined Arms Tactical Trainer**
Project Title: **Close Combat Tactical Trainer**

Project Number: **# D571**
Budget Activity: **#5**

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY: NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** None
2. **SCHEDULE CHANGES:** None
3. **COST CHANGES:** None

F. (U) PROGRAM DOCUMENTATION:

Requirement Document (TDR)	4/91
Computer Resources Management Plan	4/91
Integrated Logistics Support Plan	4/91
Acquisition Plan	7/91
Test and Evaluation Master Plan	10/91
Acquisition Decision Memorandum	10/91

G. (U) RELATED ACTIVITIES: PE #0602727A (Non-System Training Device Technology); PE 0604715A (Non-System Training Devices - Engineering Development). To preclude duplication of effort, this project is closely coordinated with other services through Training and Personnel Technology Conferences, a Joint Service Technical Coordinating Group, worldwide staffing of Training Device Requirements, and collocation of STRICOM with the Naval Air Warfare Center Training Systems Division in Orlando, FL. There is no unnecessary duplication of effort within the Army or DoD.

H. (U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Procurement							
OPA3	0	0	32038	66858	99113	99086	153483

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604780A
PE Title: Combined Arms Tactical Trainer
Project Title: Close Combat Tactical Trainer

Project Number: # D571
Budget Activity: #5

J. (U) TEST AND EVALUATION DATA:

Milestones	Dates
Pre-Production Qualification Test	2Q96-4Q96
Initial Operational Test and Evaluation	1Q97-3Q97

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604801A
PE Title: Aviation - Engineering Development

Budget Activity: #5

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DC45 Aviation Life Support Equipment (ALSE) - Engineering Development	6643	8569	4672	5098	6844	7786	7113	Cont	Cont
DE70 Aviation Non-System Training Devices	0	0	0	0	0	0	0	0	35381
D275 Synthetic Flight Training Systems	6285	0	0	0	0	0	0	0	116527
PE TOTAL	12928	8569	4672	5098	6844	7786	7113	Cont	Cont

B. (U) BRIEF DESCRIPTION OF ELEMENT: Provides engineering development to programs associated with air mobility support: Aviation Life Support Equipment (ALSE), Synthetic Flight Training Systems (SFTS), and Aviation Non-Systems Training Devices (NSTD). ALSE (Project DC45) makes battlefield survivability possible and enhances the aircrew's ability to return to fight again through new protective clothing ensembles, aviator protective masks, laser protective visors, survival kits, restraint systems, integrated flight helmets, and microclimate cooling devices. The SFTS and Aviation NSTD projects provide for engineering development of new aircraft training aids, devices, and simulators to support aircrew, maintenance, and classroom training.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:

(U) Project DC45 - ALSE: This project provides for aviation engineering development of support items peculiar and necessary to Army aircrews for survival on the integrated battlefield and related training scenarios. These survivability items provide: a follow-on Lightweight Blower for the M43A1 Chemical Protective Mask; advanced laser protection against emerging new threat lasers; greatly improved lightweight helmet technology; cooling for aircrew encumbered in the nuclear, biological, and chemical (NBC) ensemble during desert or tropic operations to prevent incapacitating heat stress; a Cockpit Air Bag System (CABS) for the AH-64; improved survival kit packaging with recent materials technology to include an overwater kit for self-deployment, and Helicopter Emergency Escape Device (HEED) to provide breathing air for aircrew use in escaping from submerging helicopters; and Pre-Planned Product Improvement (P3I) to the Aircrew Integrated Helmet System (AIHS) for the AH-64.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604801A
PE Title: **Aviation - Engineering Development** Budget Activity: #5

	Complete	Cost
(U) FY 1993 Accomplishments:		
• (U) Awarded Low Rate Initial Production (LRIP) contract for the AIHS integrated with laser protective devices, improved crash protection and vision protective devices.	2Q93	2400
• (U) Fabricated and evaluated prototypes of the Electro-Optic Helmet Sight System (EOHSS) which is a module to the AIHS to incorporate Apache Sighting Systems (P3I).	4Q93	1262
• (U) Continued engineering and manufacturing development (EMD) of Aircrew Microclimate Conditioning System (AMCS), designed and fabricated prototypes; prepared for conducting development and user testing.	3Q93	1776
• (U) Initiated procurement of non-developmental Lightweight Blower units for acceptance testing.	2Q93	1205
TOTAL		**6643**
(U) FY 1994 Planned Program:		
• (U) Perform follow-on operational testing of the AIHS and begin *fielding LRIP deliverables.*	3Q94	1314
• (U) Continue AIHS to evaluate Apache EOHSS (P3I).	3Q94	2000
• (U) Test and evaluate AMCS prototypes and complete manufacturing technical data package for procurement.	2Q94	3199
• (U) Initiate production contract planning for Lightweight Blower for M43A1E1.	2Q94	1556
• (U) Initiate CABS EMD effort for the AH-64.	3Q94	500
TOTAL		**8569**
(U) FY 1995 Planned Program:		
• (U) Continue EMD of advanced laser protective visor.	1Q95	700
• (U) Field the Apache EOHSS (P3I).	2Q95	1200
• (U) Conduct operational test and complete AMCS development for milestone III production decision.	3Q95	600
• (U) Initiate planning for Aircraft Modular Survival System (AMSS) P3I items.	3Q95	672
• (U) Continue CABS EMD for the AH-64.	2Q95	1500
TOTAL		**4672**

(U) Project D275 - Synthetic Flight Training Systems (SFTS): Initiates development of a family of transportable sustainment flight simulators for the AH-64, OH-58D Kiowa Warrior, and UH-60. This family of transportable sustainment flight simulators will be network compatible, provide mission rehearsal capabilities when deployed with operational forces, train 100% of aircraft critical aircrew sustainment tasks, and be based on maximizing hardware and software commonality among all aviation collective training systems. Also supports development of simulations for aircraft system system enhancements to maintain concurrency of fielded flight simulators and the aircraft.

Progran
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Enginee Mileston
T&E Mileston
Contract Mileston
BUDC ($00
Major Contract
Support Contract
In-Hous Support
GFE/ Other
Total

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604801A
PE Title: **Aviation - Engineering Development** Budget Activity: #5

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Initiated development of an SFTS Defense Simulation Internet (DSI).	4Q94	2206
• (U) Initiated Studies and demonstrations to determine fidelity requirements for motion system cues and vibration system cues to satisfy critical training tasks.	4Q94	141
• (U) Initiated technical study of helmet mounted displays for "out of window" image viewing.	4Q94	736
• (U) Initiated Phase One of the Advanced Rotary Wing Aircraft (ARWA) Program.	2Q94	3070
• (U) Conducted a task and skills analysis on Family of Aircrew Sustainment Trainer (FAST) vs. AVCATT.	4Q93	75
• (U) Initiated a task and skills analysis on UH-60 FAST.	4Q94	57
TOTAL		6285

(U) FY 1994 Planned Program:
- (U) Project not funded.

(U) FY 1995 Planned Program:
- (U) Project not funded.

(U) Work Performed By: Project DC45: Major contractors include: Gentex Inc., Carbondale, PA; Simula Inc., Phoenix, AZ; American Optical, Southbridge, MA; Midwest Research Institute, Kansas City, MO; Logistics Management Engineering (LME), Annapolis, MD; Systems Dynamics International (SDI) and CAS, Huntsville, AL. In-house work performed by: USAATCOM - Aviation Applied Technology Directorate (AVRDEC), Ft. Eustis, VA and NRDEC, Natick, MA; ERDEC, Aberdeen Proving Ground, MD; USAARL, Ft. Rucker, AL; US Army Aviation and Troop Command and ALSE PMO (PEO-AV), St. Louis, MO; Naval Aerospace Medical Research Lab (NAMRC), Pensacola, FL; and Naval Air Warfare Center (NAWC), Warminster, PA. Project D275: Major contractors include: CAE Link, Binghamton, NY; Reflectone Corp., Tampa, FL; GA Tech Research Corp., Atlanta, GA; and LORAL, Orlando, FL. In-house work performed by the Program Manager for Training Devices (USASTRICOM), Orlando, FL

(U) Related Activities: Project DC45: ALSE programs are coordinated through several tri-service and allied working groups and steering committees, appropriate Army, Air Force, and Navy development commands, and aircraft Project Managers (PM's) in order to prevent duplication of effort and ensure proper prioritization of efforts. PE #0602211A (Aviation Technology), PE #0603801A (Aviation-Advanced Development) perform technology and advanced development efforts that transition to this project. Project D275: Coordination of training device technology is accomplished with the Air Force and Navy. The Army Project Manager for Training Devices, is located at the Navy Training Systems Center and has an Air Force liaison officer. Program Element #0603003A (Aviation Advanced Technology) and #0602727A (Non-System Training Device Technology) perform flight simulation component and simulation component technology research and development. Many joint projects are effected between the services to prevent duplication of in-flight simulator development efforts. There is no unnecessary duplication of effort within the Army or Department of Defense.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604801A
PE Title: Aviation - Engineering Development **Budget Activity: #5**

(U) Other Appropriation Funds: **($ in Thousands)**

Number Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Aviation Life Support Equipment							
APA (AZ3110)		11692	8871	10180	9623	10328	11012

(U) International Cooperative Agreements: Not Applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604802A
PE Title: Weapons and Munitions - Engineering Development
Budget Activity: #5

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D134 Obj Ind Cbt Wpn Eng De	0	0	0	0	1862	4960	7012	0	13834
D290 Bunker Defeat Munition	0	6295	2642	0	0	0	0	0	8937
D531 105MM Howitzer Ammunition Improvement	5272	4856	3171	1837	0	0	0	0	25842
D613 Mortar Systems	0	9195	3317	0	0	0	0	0	64691
PE TOTAL	5272	20346	9130	1837	1862	4960	7012	0	113304

B. (U) BRIEF DESCRIPTION OF ELEMENT: Provides for engineering development of weapons and munitions systems. The Bunker Defeat Munition will provide a much needed capability for the individual soldier to destroy field fortifications from a standoff position. The howitzer ammunition effort supports development of ammunition for the M119A1 Howitzer. The program element also supports qualification of an Improved Mortar Ballistic Computer.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:

(U) Project D290 - Bunker Defeat Munition: This project provides for the development and type classification of a throwaway munition for neutralizing earth and timber bunker field fortifications. Program transitions from PE #0603004A in FY94.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604802A
PE Title: Weapons and Munitions - Engineering Development
Budget Activity: #5

(U) FY 1993 Accomplishments: Not applicable.

	Complete	Cost
(U) FY 1994 Planned Program:		
• (U) Complete side-by-side tests of candidate systems.	FY94	2100
• (U) Down-select to "best value" system.	FY94	500
• (U) Initiate Technical Test/Operational Test to support type classification standard and material release.	FY95	3695
Total		6295
(U) FY 1995 Planned Program:		
• (U) Complete type classification.	FY95	2642

(U) Project D531 - 105MM Howitzer Ammunition Improvement: This project provides for the fielding of an extended range 105MM artillery projectile for the M119A1 Howitzer; development of a dual purpose improved conventional munition (DPICM) for the M119A1 Howitzer; and development of self-destruct fuzing technology for submunitions.

	Complete	Cost
• (U) FY 1993 Accomplishments:		
• (U) Evaluated all design concepts; follow up on contracts and testing.	FY93	723
• (U) Grenade performance testing.	FY94	80
• (U) Initiated Engineering and Manufacturing Development (EMD) Testing of 105MM DPICM.	FY95	170
• (U) Contract for XM234 Self Destruct Fuze hardware and initiation of Producibility Engineering and Planning (PEP) to develop high volume manufacturing methods.	FY96	2083
• (U) Awarded contracts for Developmental Testing and Engineering (DT&E) hardware.	FY95	1765
• (U) Certification testing and type classification of XM927 105mm High Explosive Rocket Assisted (HERA) projectile.	FY94	451
Total		5272
(U) FY 1994 Planned Program:		
• (U) Evaluate all design concepts; follow up on contracts and testing.	FY94	1131
• (U) Hardware contract increments to provide DT&E hardware.	FY95	707
• (U) Performance testing and envelope studies on XM80 grenade and XM915 projectile.	FY94	118
• (U) Load, Assemble, Pack of test cartridges at Lone Star AAP.	FY94	140
• (U) EMD Phase II testing of 105MM DPICM.	FY95	417

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604802A
PE Title: Weapons and Munitions - Engineering Development
Budget Activity: #5

• (U) Continue design effort and PEP on XM234 Self Destruct Fuze.	FY96	2293
• (U) AFATDS Fire Control Software Support Program.	FY95	50
Total		4856

(U) FY 1995 Planned Program:

• (U) Evaluate all design concepts; follow up on contracts and testing.	FY95	1181
• (U) Hardware contract increments.	FY95	140
• (U) Load, Assemble, Pack of test cartridges at Lone Star AAP.	FY95	320
• (U) Continue design effort and PEP on XM234 Self Destruct Fuze.	FY96	768
• (U) Conduct DT&E performance and safety testing of 105MM DPICM.	FY95	762
Total		3171

(U) Project D613 - Mortar Systems: This program provides funds to develop existing and emerging technology to enhance the effectiveness, lethality, versatility of use, mobility and accuracy of mortar systems. Current mortar systems include conventional ammunition with a variety of fuzing and applications, weapons that range from man-portable 60MM to vehicle-mounted 120MM mortars, and related equipment such as fire control, mortar ballistic computer and training devices and ammunition. This project provides for the qualification of a new Mortar Ballistic Computer to replace and ensure continued maintainability of the nearly obsolescent current M23 version.

(U) FY 1993 Accomplishments: Program not funded.

	Complete	Cost

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Develop software to provide ballistic data for all existing and planned mortar munitions.	4QFY95	3175
• (U) Evaluate and select hardware platform for Improved Mortar Ballistic Computer (IMBC).	4QFY94	125
• (U) Evaluate and analyze materiel requirements to achieve mortar systems mobility and accuracy requirements. Develop a program plan for a mortar fire control system.	4QFY94	895
• (U) Develop, test and type classify a 120mm mortar Full Range Training Cartridge.	4QFY95	5000
Total		9195

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604802A
PE Title: Weapons and Munitions - Engineering Development

Budget Activity: #5

(U) FY 1995 Planned Program:

• (U) Complete development of IMBC software.	4QFY95	1877
• (U) Conduct Technical Test/Operational Test of IMBC.	4QFY95	600
• (U) Type classify the Improved Mortar Ballistic Computer.	1QFY96	800
Total		3317

(U) Work Performed By:
In-house efforts by the Armaments Research, Development and Engineering Center, Picatinny Arsenal, NJ; Harry Diamond Laboratories, Adelphi, MD; Aberdeen Proving Ground, Aberdeen, MD, and Product Manager, Mortar Systems, Picatinny Arsenal, NJ.. Major contractors are Dayron, Orlando, FL; KDI Electronics, Cincinnati, OH; Motorola, Scottsdale, AZ; and Tally Defense Systems, Mesa, AZ. Major contractor for the IMBC to be selected. Pocal Industries, Moscow, PA., will be the prime developer and initial producer of the 120mm mortar Full Range Training Round, including the necessary modification of the M751 practice fuze to be used on the cartridge.

(U) Related Activities:
PE #0603004A (Weapons and Munitions Advanced Technology). No unnecessary duplication of effort exists in the Army or Department of Defense. The IMBC effort is coordinated with the Marine Corps and Communications-Electronics Command, FT Monmouth, NJ and the Field Artillery School, FT Sill, OK.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604802A
PE Title: Weapons and Munitions - Engineering Development

Budget Activity: #5

(U) Other Appropriation Funds:

Appropriation	($ in Thousands) FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Procurement (Ammunition)							
SSN E88401 (BDM)	0	0	7149	11054	11899	11931	0
SSN E88402 (BDM)	0	0	384	352	0	264	0
SSN E88403 (BDM)	0	0	228	247	0	343	0
SSN E53500 (DPICM)	0	0	0	0	20661	20833	52032
SSN E53700 (HERA)	16074	0	0	0	0	0	0
SSN E25504 (XM929)	0	4784	21698	1062	1660	1114	2811

(U) International Cooperative Agreements: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604804A**
PE Title: **Logistics and Engineer Equipment - Engineering Development** Budget Activity: **#5**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DH01 Combat Engineer Equipment Engineering Development	4381	4898	1407	0	0	0	0	Cont.	Cont.
DH14 Logistics Support Equipment Engineering Development	700	4476	6705	1369	90	91	91	Cont.	Cont.
DL39 General Support Equipment Engineering Development	1058	2743	1607	1745	1918	2390	2627	Cont.	Cont.
DL41 Fuels Handling Equipment Engineering Development	1800	1426	1475	1447	1145	1390	1447	Cont.	Cont.
DL42 Camouflage System Engineering Development	0	0	0	1821	1785	1771	1755	Cont.	Cont.
D194 Engine Driven Generators Engineering Development	2600	1523	2008	1652	575	516	552	Cont.	Cont.
D279 Airdrop Equipment Engineering Development	4407	4745	1507	1500	1503	1510	1514	Cont.	Cont.
D429 Tactical Rigid Wall Shelters Engineering Development	3746	5708	3630	2884	3394	2480	1140	Cont.	Cont.
D461 Marine Oriented Logistical Equipment Engineering Development	0	0	2832	0	0	0	0	Cont.	Cont.
PE TOTAL	18692	25519	21171	12418	10410	10148	9126		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program supports engineering development (ED) of new and advanced combat support and combat service support equipment. DH01, tactical bridging, provides dry and wet bridging for heavy forces, such as the Heavy Assault Bridge (HAB) and the Military Load Class (MLC) 70 version of the Armored Vehicle Launched Bridge (AVLB). DH14 supports development of material and container handling equipment, including the All Terrain Lifter, Articulated System (ATLAS) forklift, water and petroleum distribution systems, containers, and marine craft. Project DL39 includes improved water purification capabilities with an ability to desalinate sea water to meet critical operational requirements in arid environments. Project DL41 supports development of petroleum distribution systems. DL42, Camouflage System Engineering Development, is a new project in FY96 which rfor increased emphasis on state-of-the-art camouflage systems to defeat optical, thermal, radar and other threat observation equipment. It is aestructure from DH01. D194, Engine Driven Generators, will provide generators with reduced

noise and thermal signatures, increased fuel efficiency, improved reliability and will support the single fuel on the battlefield concept. Project D279 supports advanced development of airdrop equipment and techniques to reduce aircraft vulnerability, improve operational capability to conduct airborne assault, and airdrop resupply for airborne and conventional forces. D429 supports development of tactical rigid wall shelters to increase the efficiency of shelter systems and provide protection for personnel and equipment to sustain operations in nuclear, biological, and chemical (NBC) environments. D461 - Lighter, Amphibian Resupply Cargo, 60 Ton (LARC-60) upgrade, dredge and causeway enhancements effort will greatly improve Logistics Over The Shore (LOTS) operations.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:

(U) Project DH01 - Combat Engineer Equipment Engineering Development: Develop and transition to procurement military bridging for dry and wet bridging requirements such as the Heavy Assault Bridge (HAB) and Improved Ribbon Bridge (IRB) transporter. Development of Low Cost Low Observable systems for suppression of visual, near-infrared, thermal, radar and acoustic signatures of high mobile and semi-mobile weapon assets. Support the non-developmental item acquisition of the Deployable Universal Combat Earthmover (DEUCE).

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Completed HAB technical testing in support of EMD Phase II source selection	4Q93	875
• (U) Completed AVLB 70 prototypes and initiated testing for production decision	4Q93	1085
• (U) Prepared and released Improved Ribbon Bridge Transporter solicitation package	2Q93	2111
• (U) Improved Ribbon Bridge Transporter contract awarded	3Q93	310
Total		**4381**

(U) FY 1994 Planned Program:		
• (U) Conduct P3I for general purpose camouflage with enhanced thermal radar and visual signature reduction	4Q94	474
• (U) Complete testing of the AVLB 70	1Q94	685
• (U) Type classify the AVLB 70 and award a production contract	2Q94	424
• (U) Test the Medium Girder Bridge (MGB) for load class 96 capability	4Q94	350
• (U) Conduct PQT/OT and Milestone III Review for Aviation and General Purpose Ultra lightweight Camouflage Net System (ULCANS) and PPQT/OT/Milestone Review for High Mobility Camouflage (HMC) for M1 and M2 assets	4Q94	480
• (U) Delivery of four upgraded prototype IRB transporters and complete PQT and IOT&E testing	4Q94	850
• Conduct Milestone I/II review and preaward contract activities for the DEUCE	4Q94	1635
Total		**4898**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604804A**
PE Title: **Logistics and Engineer Equipment - Engineering Development** Budget Activity: **#5**

(U) FY 1995 Planned Program:		
• (U) Conduct Milestone III review for the DEUCE	1Q95	200
• (U) Procure preproduction prototypes for DEUCE	1Q95	900
• (U) Conduct preproduction qualification test for DEUCE	4Q95	307
Total		**1407**

(U) Project DH14 - Logistics Support Equipment Engineering Development: Develop and transition to procurement a series of material handling equipment (MHE) items.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Conducted Milestone I/II Review of All Terrain Lifting, Articulating System (ATLAS)	1Q93	200
• (U) Completed specifications for ATLAS	2Q93	300
• (U) Released Draft Request for Proposal for ATLAS to industry	4Q93	200
Total		**700**
(U) FY 1994 Planned Program:		
• (U) Conduct Milestone III Review for ATLAS	1Q94	434
• (U) Release Request for Proposal for ATLAS	2Q94	1200
• (U) Conduct Source Selection Board for ATLAS	4Q94	642
• (U) Support delivery of Improved Ribbon Bridge transporters in DH01 for testing	4Q94	2200
Total		**4476**
(U) FY 1995 Planned Program:		
• (U) Award preproduction prototype contract for ATLAS	1Q95	3050
• (U) Test ATLAS Prototypes	4Q95	2805
• (U) Develop ATLAS Logistics	4Q95	850
Total		**6705**

(U) Project DL39 - General Support Equipment Engineering Development: Develop water purification and environmental control equipment and transition to procurement.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Continued Reverse Osmosis Water Purification Unit (ROWPU) P3I to investigate NBC agent removal by reverse osmosis (RO) and continued investigation into ROWPU chemicals, and lightweight pump	4Q93	358

• (U) Evaluated design concepts for NBC resistant collective protective ensemble for 3000 GPH ROWPU	4Q93	328
• (U) Evaluated Extreme Environment Water System (EEWS) tactical transport protection system for 600 Gallon Per Hour (GPH) ROWPU	4Q93	297
• (U) Initiated development of cold weather kit for 3000 GPH ROWPU	4Q93	75
Total		**1058**

(U) FY 1994 Planned Program:

• (U) Design, fabricate and test Modular Collective Protective Equipment (MCPE) for 3000 GPH ROWPU	4Q94	605
• (U) Initiate evaluation of commercial light weight water purifiers	4Q94	651
• (U) Complete TDPs and implementation procedures for cold weather kit for 600 GPH ROWPU and continue development of kits for 3000 Gallon Per Hour ROWPU	4Q94	607
• (U) Complete evaluation of NBC agent removal and standardization of ROWPU chemicals and prepare LOI for the field on the Preplanned Product Improvement (P3I) ROWPU	4Q94	880
Total		**2743**

(U) FY 1995 Planned Program:

• (U) Complete testing of MCPE for 3000 GPH ROWPU kit and hold special IPR to approve equipment	4Q95	150
• (U) Complete TDP and implementation procedures for 3000 GPH ROWPU kit, and evaluate storage and distribution equipment	4Q95	300
• (U) Initiate development of a high capacity purifier and hold MS I/II IPR	4Q95	357
• (U) Conduct market investigation and trade-off analysis to identify candidate packaged water systems	4Q95	400
• (U) Continue evaluation of candidate lightweight water purifiers and initiate user test of selected systems	4Q95	400
Total		**1607**

(U) Project DL41 - Fuels Handling Equipment Engineering Development: Develop and transition to procurement petroleum distribution systems.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Conducted component and system testing of initial prototypes for Lightweight Arctic Forward Area Refueling Equipment (LAFARE)	4Q93	757
• (U) Conducted exposure tests in desert environment to define seam joining, ultraviolet (UV) resistance, and coated fabric materials for Tank Life Extension Program	4Q93	101
• (U) Fabricated components of initial LAFARE	4Q93	942
Total		**1800**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604804A**
PE Title: **Logistics and Engineer Equipment - Engineering Development** Budget Activity: **#5**

(U) FY 1994 Planned Program:		
• (U) Fabricate first LAFARE prototype	4Q94	676
• (U) Conduct system test of LAFARE prototype	4Q94	500
• (U) Conduct logistics demonstration (Part I) of LAFARE	4Q94	200
• (U) Continue long term exposure testing/evaluation of tank fabric	4Q94	50
Total		**1426**
(U) FY 1995 Planned Program:		
• (U) Develop statement of work for development of four (4) prototype Tactical Fuel Distribution and Storage Systems (TFDSS)	4Q95	170
• (U) Conduct TT/IOT&E, logistics demonstration, and Physical Configuration Audit (PCA) for LAFARE	4Q95	1088
• (U) Prepare contract documentation for prototype Petroleum Quality Analysis System (PQA)	4Q95	217
Total		**1475**

(U) Project D194 - Engine Driven Generators Engineering Development: Develop and transition to procurement a series of diesel engine driven generator sets/auxiliary power units and provide continual modernization of fielded sets in order to meet federally mandated environmental statutes and competition mandates.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Prepared and issued solicitation package for 5 kW 28VDC auxiliary power unit (APU) for the Standardized Integrated Command Power System (SICPS) on XM1068 tracked vehicle	4Q93	2169
• (U) Developed an acquisition strategy for the Less Than 3 kW (LT3kW) program which exploits Foreign Comparative Testing (FCT)	4Q93	427
• (U) Continued cold weather starting kit program to satisfy Commercial Generator Sets and Assemblages (CGSA) Required Operational Capability (ROC) Preplanned Product Improvement (P3I) requirements	4Q93	4
Total		**2600**
(U) FY 1994 Planned Program:		
• (U) Award multiple development contracts for fabrication/testing for a 5 kW 28VDC auxiliary power unit	4Q94	1463
• (U) Complete the test phase of Foreign Comparative Test program for LT3kW program	3Q94	10
• (U) Complete cold weather starting kit program for Tactical Quiet Generator (TQG) sets	1Q94	50
Total		**1523**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604804A**
PE Title: **Logistics and Engineer Equipment - Engineering Development** Budget Activity: **#5**

(U) FY 1995 Planned Program:		
• (U) Complete testing and down-select 5 kW 28VDC auxiliary power unit	1-4Q95	1625
• (U) Prepare Materiel Change Management (MCM) program for low emission engines for inclusion into 5-60 kW TQG Technical Data Packages	1Q95	75
• (U) Evaluate foreign comparative test results of LT3kW and conduct Type Classification In-Process Review (TC IPR). Finalize Technical Data Package (TDP) for competitive procurement	1Q95	150
• (U) Initiate development program for solid state controls for TQG sets	1Q95	158
Total		**2008**

(U) Project D279 - Airdrop Equipment Engineering Development: Develop and transition to procurement cargo parachutes, airdrop containers and associated equipment. Air delivery equipment will enhance mission capabilities by fully using the airdrop capacity of C-5 and C-17 aircraft for resupply and cargo air delivery.

	Complete	Cost
(U) FY 1993 Accomplishments:		
• (U) Completed operational testing of All Purpose Weapons and Equipment Container (AIRPAC)	4Q93	409
• (U) Conducted technical testing of the single unit 60K Low Velocity Air Drop System (LVADS) with U.S. Air Force C-5 and C-17 aircraft	2Q93	1729
• (U) Verified the capability of conducting personnel, container resupply and platform airdrop using USAF C-17 aircraft	4Q93	2269
Total		**4407**
(U) FY 1994 Planned Program:		
• (U) Complete development of the single unit 60K LVADS	4Q94	1150
• (U) Complete design of high speed/low altitude Container Delivery System	4Q94	451
• (U) Procure items and conduct technical testing of 60K Low Altitude Parachute Extraction System (LAPES)	4Q94	800
• (U) Hold type classification review panel and type classify as standard the AIRPAC	2Q94	150
• (U) Continue support to the airdrop capability portion of the ongoing C-17 flight test program	4Q94	2194
Total		**4745**
(U) FY 1995 Planned Program:		
• (U) Demonstrate operationally the airdrop capabilities of the C-17 aircraft and certify it for air delivery	4Q95	807
• (U) Procure/fabricate prototype high speed low altitude container delivery systems for technical and operational testing of the system	4Q95	200
• (U) Conduct operational testing of the 60K LAPES to validate mission capabilities	3Q95	400

• (U) Complete design of the enhanced small-weapons container for use in Airborne operations	3Q95	100
Total		**1507**

(U) Project D429 - Tactical Rigid Wall Shelters Engineering Development: Develop and transition to procurement a series of nuclear, biological, and chemical (NBC) hardened rigid wall shelters.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Began technical testing of the Standardized Integrated Command Post System (SICPS) 5-ton Expando-Van (E-Van) installation kit for mobile division Command and Control (C2)	2Q93	709
• (U) Conducted technical testing of SICPS Rigid Wall Shelter (RWS) for the U.S. Army Tactical Command and Control System	4Q93	1067
• (U) Completed testing of SICPS RWS Pre-Planned Product Improvement (P3I) components for enhanced mobile power generation and environmental control	4Q93	375
• (U) Completed Production Prove-Out Testing (PPT) and prepared Technical Data Package (TDP) for the intermediate hardened shelter for enhanced blast protection for C2 systems	3Q93	51
• (U) Conducted PPT for Modular Extendible Rigid Wall Shelter (MERWS) for Corps level medical applications and disaster relief	4Q93	238
• (U) Completed fabrication of test prototypes for Chemical Biological Protective Shelter (CBS) for Battalion level medical aid	2Q93	820
• (U) Completed front end analysis of CBPS integration into tracked and wheeled vehicles for highly mobile Battalion level medical aid	4Q93	30
• (U) Completed testing of SICPS tent P3I for mobile C2 applications	4Q93	456
Total		**3746**

(U) FY 1994 Planned Program:		
• (U) Conduct PPT of non-expandable Electro-Magnetic Interference (EMI) shelter prototypes for enhanced EMI security for Division C2 systems	4Q94	275
• (U) Complete testing of SICPS 5-ton E-van	4Q94	300
• (U) Type classify as standard the lightweight multipurpose shelter	2Q94	50
• (U) Type classify as standard the intermediate hardened shelter to provide enhanced blast protection for C2 systems	3Q94	100
• (U) Prepare TDPs for MERWS for Corps level medical applications and disaster relief	4Q94	521
• (U) Fabricate integrated CBPS/tracked or wheeled vehicle prototypes and conduct technical testing to provide mobile chemically protected Battalion Aid Station	4Q94	1992
• (U) Complete development of 5-ton E-Van SICPS installation kit for Division level C2 systems	4Q94	450

• (U) Complete P3I efforts on SICPS tent for mobile C2 applications and enhanced mobile power generation and environmental control	4Q94	400
• (U) Complete technical testing of SICPS RWS for the Army Tactical Command and Control System (ATCCS)	4Q94	1120
• (U) Complete testing of SICPS RWS P3I components for enhanced mobile power generation and environmental control	4Q94	500
Total		**5708**

(U) FY 1995 Planned Program:

• (U) Prepare TDP for the non-expandable EMI rigid wall shelter to provide enhanced EMI security for C2 systems	2Q95	50
• (U) Type classify SICPS rigid wall shelter for the U.S. Army Tactical Command and Control System	4Q95	500
• (U) Complete systems testing of Turbine Integrated Power and Environmental Control Systems (TIPECS) to provide enhanced climatic and operational capability	4Q95	416
• (U) Test and redesign five cargo bed cover variants	4Q95	568
• (U) Fabricate improved 80dB EMI International Standardization Organization (ISO) shelters for engineer development tests	4Q95	578
• (U) Conduct technical testing of large SICPS shelter	4Q95	1518
Total		**3630**

(U) Project D461 - Marine Oriented Logistical Equipment Engineering Development: Upgrade the Lighter Amphibious Resupply Cargo-LX (LARC-LX), design Causeway Enhancements to prevent damage during rough weather.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) None.		

(U) FY 1994 Planned Program:

• (U) None.		

(U) FY 1995 Planned Program:

• (U) Develop and prepare documentation necessary for implementation of Causeway Enhancement and Causeway Emplacement initiatives	4Q95	611
• (U) Develop and prepare documentation necessary for implementation of improvements to Causeway assemblies	4Q95	450
• (U) Develop and prepare documentation necessary for implementation of improvements to Causeway Pier	4Q95	560
• (U) Develop and prepare documentation necessary for implementation of improvements to LARC-LX	4Q95	1211
Total		**2832**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604804A**
PE Title: **Logistics and Engineer Equipment - Engineering Development** Budget Activity: **#5**

(U) Work Performed By: In-house efforts will be accomplished by the U.S. Army Belvoir Research, Development and Engineering Center, Fort Belvoir, VA and U.S. Army Natick Research, Development and Engineering Center, MA. Other supporting government agencies will include Sandia National Laboratories, Albuquerque, NM; Oakridge National Laboratories, Oakridge, TN; Chemical RD&E Center, Edgewood, MD; Army Research Laboratory, Adelphi, MD; Tank and Automotive Command, Warren, MI; Aberdeen Proving Ground, MD; White Sands Missile Range, NM; Army Research Laboratory, Adelphi, MD; Yuma Proving Ground, AZ; U.S. Naval Civil Engineering Laboratory, Port Hueneme, CA; U.S. Army Cold Regions Research and Engineering Laboratory, Hanover, NH. Major Contractors include AAI Corporation, Hunt Valley, MD: BMY Corp., York, PA; General Dynamics Land System, Sterling Heights, MI; Pioneer Parachute Company, South Windsor, CT; Thiokol Inc., Elkton, MD; GDLS, Warren, MI; Holometrix, Inc., Cambridge, MA; Teledyne, Inc., Northridge, CA; Frost Engineering Development Corporation, Englewood, CO; Chemfab Corp., Buffalo, NY; Gichner Corp., Dallastown, PA; VSE Corporation, Alexandria, VA; Foster-Miller Inc., Waltham, MA; Mechanical Equipment Company, New Orleans, LA; Engineered Air Systems Inc., St. Louis, MO; Aqua Chem, Inc., Milwaukee, WI; Recovery Engineering Inc., Minneapolis, MN. In-house efforts on Project D461 - Project Manager for Army Water Craft (PMAWC); U.S. Army Material Technology Lab, Watertown, MA; Development Science Corporation, Ontario, CA.

(U) Related Activities: PE #0603804A (Logistics and Engineer Equipment - Advanced Development); PE #0602705A (Electronics and Electronic Devices); PE #0602786A (Logistics Technology); PE #0603001A (Logistics Advanced Technology). Coordination of effort with other services and agencies is accomplished through the DOD Joint Intermodular Steering Group Joint Committee on Tactical Shelters, Program Advisory Group for Bulk Petroleum Fuels Distribution, DOD Executive Agent for Land Based Water Resources, the Water Resources Management Action Group, Interagency Advance Power Group, and the DOD Project Manager for Mobile Electric Power. There is no unnecessary duplication of effort within the Army or DoD.

(U) Other Appropriation Funds:

			($ in Thousands)				
Appropriation	**FY 1993 Actual**	**FY 1994 Estimate**	**FY 1995 Estimate**	**FY 1996 Estimate**	**FY 1997 Estimate**	**FY 1998 Estimate**	**FY 1999 Estimate**
Other Procurement, Army Activity 3 (OPA-3):							
DEUCE							
BLIN 151	0	0	1600	8740	7980	0	0
ATLAS							
BLIN 160	0	0	9749	25100	0	0	0

(U) International Cooperative Agreements: None.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604805A Budget Activity: **#5**

PE Title: Command, Control and Communications Systems - Engineering Development

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D097 C3I Interoperability Network Activity	0	1763	1875	1791	1785	1771	1755	Cont	Cont
D098 Tactical Radio Accessories	2261	1238	0	196	0	0	0	0	3795
D282 SINCGARS-V Engineering Development	0	1855	4597	7230	3658	0	0	0	17340
D485 C4I Interoperability Standardization and Certification	0	0	79	1800	1340	886	438	Cont	Cont
D488 Tactical Net Radio Communications	5480	4050	4835	3575	3701	3964	4065	Cont	Cont
PE TOTAL	7741	8906	11386	14592	10484	6621	6258	Cont	Cont

NOTE: For FY94 $2079K of D488 is being allocated to D485 work.

B. (U) BRIEF DESCRIPTION OF ELEMENT: In support of the Army Enterprise Strategy to achieve interoperability within the Army and with the Joint/Combined forces, this program includes Engineering and Manufacturing Development (EMD), interoperability evaluation of Army command, control, communications and intelligence (C3I) systems and equipment, and the supporting interoperability facilities. Included is a life-cycle capability to develop, test, and maintain interoperability, and support an interoperability development and evaluation process consisting of an Army interoperability board and technical management to ensure maximum horizontal and vertical integration. Also included is the Single Channel Ground and Airborne Radio System (SINCGARS) product improvements identified in the SINCGARS System Improvement Plan. Also included is the Frequency Hopping Multiplexer (FH MUX) which allows multiple radios to operate on one antenna for reduced visual signature and rapid transportability and set-up.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604805A
Budget Activity: #5
PE Title: Command, Control and Communications Systems - Engineering Development

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:

(U) Project D097 - C3I Interoperability Network Activity: A suite of distributed communications, sites, and services (Army Interoperability Network - AIN) supporting Army C3I systems throughout their life-cycle, which provides the capability to develop, test, and maintain interoperability, and support a continuous life-cycle interoperability development and evaluation process through remote access to the actual C3I systems and test evaluation facilities. Enables engineering solutions that replicate battlefield configurations by networking dispersed C3I systems, creating the environments needed to identify, isolate and resolve interoperability problems, evolve interoperability standards & protocols, and support testing required to meet the DoD interoperability objectives. As a multi-use technology, provide the connectivity for achieving horizontal and vertical integration, and initiatives such as Command, Control, Communications, Computers and Intelligence (C4I) for the Warrior, Louisiana Maneuvers, Battle Labs Process, Digitizing the Battlefield, and Life-Cycle Software Engineering. This is not a FY 1994 new start. Efforts were funded under PE# 0604805A, Project D488 in FY 1992. Block O development under PE# 0604818A, Project DC36 in FY93 with additional FY93 funding support, provided by customer funds.

(U) FY 1993 Accomplishments: Efforts funded under PE# 0604818A, Project DC36.

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Begin AIN Block-1 development (supports emerging C4I interoperability test evaluation requirements)	4Q94	$988
• (U) Install six remote field sites and two national command and control (C2) sites	4Q94	$550
• (U) Support PEO, PM, & Army systems interoperability development	4Q94	$75
• (U) Support JCS phase-1 C4I for the Warrior and interservice tactical switch interoperability	4Q95	$75
• (U) Supports interoperability development, testing and sustainment of Army's C4I systems (PEOs, PMs, CECOM and fielded systems)	4Q95	$75
Total		$1763

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Integrate AIN Block-1 capabilities and new sites	4Q95	$1067
• (U) Develop rapid deployment AIN communications interfaces	2Q95	$658
• (U) Support PEOs, PMs and CECOM in achieving systems Army/Joint interoperability, C4I certification testing and DoD policy objectives	4Q95	$75
• (U) Continue to support Joint Chiefs of Staff (JCS) C4I for the Warrior, and interservice tactical switching, and other Army interoperability programs	4Q95	$75
Total		$1875

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604805A
Budget Activity: #5
PE Title: Command, Control and Communications Systems - Engineering Development

(U) Project D098 - Tactical Radio Accessories: This project funds development of radio improvements resulting from emerging technologies. This was a new start in FY 1993. This includes the SINCGARS Forward Error Correction design improvements, part of the SINCGARS System Improvement Plan (SIP)which reduces bit error rate data messages throughout the battlefield, while providing the necessary traffic isolation between SINCGARS data nets needed to maximize the available throughput. It will provide both a voice and data Gateway to the Area Common User System (ACUS).

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Completed design feasibility analysis including packet data design requirements	4Q93	$200
• (U) Initiated Forward Error Correction (data transmission design improvements)	4Q94	$1775
• (U) In-House support of System Improvement Plan efforts	4Q93	$286
Total		$2261

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Initiate design plans for airborne SIP development	4Q94	$850
• (U) Initiate fabrication of Generation I prototypes units	4Q94	$338
• (U) Conduct aircraft integration & verification testing of prototype models	1Q95	$50
Total		$1238

(U) FY 1995 Planned Program: No planned program.

(U) Project D282 - SINCGARS-V ENG DEV: Program provides for analysis and implementation of overall product improvements to the SINCGARS Combat Net Radio. Priorities for the product improvement program are Global Positioning System (GPS) interfaces and Forward Error Correction (FEC)(data transmission enhancement techniques) (Phase I improvement), improved data capability, weight reduction, MANPRINT (ease of operations), vehicular system re-engineering, improved electronic counter- counter measure (ECCM) performance and switched system dial up interfacing. Program provides simplified operations, improved performance of existing capabilities, new operational capabilities and reduced life cycle costs. This is not a new start; project was restructured. Efforts were previously funded under PE# 0603746A, Project D555.

(U) FY 1993 Accomplishments: Efforts funded under PE# 0603746A, Project D555

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604805A** Budget Activity: **#5**

PE Title: **Command, Control and Communications Systems - Engineering Development**

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Continue development of SINCGARS GPS interface and FEC hardware/development for ITT	4Q94	$1155
• (U) Conduct design verification testing for FEC for ITT	4Q94	$670
• (U) Conduct field demonstration of GPS/FEC prototype models	3Q94	$30
Total		**$1855**

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Continue Airborne Design Improvements for Generation II pilot units	2Q96	$3000
• (U) Fabrication/modification of Generation II pilot units	2Q96	$1497
• (U) Continue hardware and software compatibility testing with aircraft integrators	1Q96	$100
Total		**$4597**

(U) Project D485 - C4I Interoperability Standardization and Certification: The Army Enterprise Strategy, DODD 4630.5, DODI 4630.8, C4I for the Warrior, and CJCSI 6212.01, mandate the establishment and sustainment of interoperability between Army C4I systems and within the Army and Joint/Allied C4I communities. This includes operation of the Army board to synergize and integrate the Army's interoperability certification testing and analysis, and configuration management functions. Provide the Army focal point for the review, staffing, coordination, and development of Army positions for interface and interoperability standards and specifications. Direct the integration of the Army systems' requirements and operational concepts documents with the joint standards and interface documents. Included is the Army's participation in Joint/Allied and intra-Army interoperability certification testing and the Army's representation in the Joint/Allied Configuration Management Process. This is a restructure of project D488, and not a new start.

(U) FY 1993 Accomplishments: Efforts funded under PE# 0604805A, Project D488

(U) FY 1994 Planned Program: Efforts funded under PE# 0604805A, Project D488

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Continue to implement an Army FYIAP to manage Army interoperability testing requirements	2Q95	$79
Total		**$79**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604805A **Budget Activity: #5**
PE Title: Command, Control and Communications Systems - Engineering Development

(U) Project D488 - Tactical Net Radio Communications: Develops the Frequency Hopping Multiplexer which allows multiple radios to operate on one antenna for reduced visual signature and rapid transportability and set-up. Performs procedural interoperability testing and provides the Army's gateway to interoperability test network for certification of Army C3I systems.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Continue development effort on the FH MUX	4Q94	$1174
• (U) Initiate fabrication of 16 FH MUX development model units	4Q94	$2760
• (U) Conducted study of Army spectrum needs for the near future	1Q94	$300
• (U) Developed tactical Army Communications-Electronics (CE) data base of new electromagnetic emitters and initiated necessary Electromagnetic Compatibility (EMC) Analysis	1Q94	$500
• (U) Participated in 18 Interoperability Certification tests	4Q93	$328
• (U) Represented the Army in 16 Joint forums	4Q93	$112
• (U) Continued to direct/manage the Army Configuration Control Boards (CCB) (three meetings) to develop and coordinate Army positions on Army C4I systems procedural interface requirements. Managed development and provided Army principal of two messages for Army Fir[illegible]upport interface with Marines	4Q93	$306
Total		**$5480**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Complete development effort on the FH MUX	4Q94	$1450
• (U) Conduct design verification test using development models	3Q94	$296
• (U) Initiate pilot (pre-production) model fabrication	4Q95	$225
• (U) Prepare, coordinate, process, and approve 340 Interface Change Proposals (ICPs); Convene 4 Army Configuration Control Boards(CCBs); Provide Army voting Principal at 26 Joint/Combined review panels	4Q94	$1083
• (U) Conduct 4 Army interoperability tests; Participate in 28 Army/Joint interoperability test and provide Army voting principal at joint certification forums	4Q94	$727
• (U) Develop simulation/stimulation, message drivers, analyzers and data reduction tolls for testing interoperability	4Q94	$269
Total		**$4050**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604805A
PE Title: Command, Control and Communications Systems - Engineering Development

Budget Activity: #5

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Complete pilot (pre-production) model fabrication	4Q95	$4035
• (U) Conduct operational test and evaluation on the FH MUX	2Q95	$600
• (U) Conduct Design Verification Testing	4Q95	$200
Total		$4835

(U) Work Performed By: Program management is provided by Project Manager, SINCGARS reporting to the Program Executive Officer for Communications Systems at Fort Monmouth, New Jersey (NJ) with support from US Army Communications-Electronic Command at Fort Monmouth, New Jersey. The contractor for the Frequency Hopping Multiplexer is Xetron Corp, Cincinnati, Ohio. The contractors for the SINCGARS System Improvement Program are ITT Aerospace/Communications, Fort Wayne, Indiana and General Dynamics, Tallahassee, Florida. Contractors for AIN and C4I Interoperability/Standardization are ARINC, Annapolis, Maryland and TELOS, Shrewsbury, New Jersey. Spectrum Analysis associated with tactical radio utilization is being performed by ECAC, Annapolis, Maryland.

(U) Related Activities:

PE 0603746A supplements the FY94 System Improvement Program effort to the SINCGARS Combat Net Radio. There is no unnecessary duplication of effort within the Army or Department of Defense.

(U) Other Appropriation Funds:

($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Other Procurement, Army (OPA2)							
B00500	184056	314121	332597	326876	275928	235846	185064
J30500	30320	20616	20968	664	687	687	0
BA1205	0	0	0	19968	33105	23494	0

(U) International Cooperative Agreements: None

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604806A**
PE Title: **NBC Defense Systems - Engineering Development** Budget Activity: **#5**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DF97 NBC Decontamination Systems	60	0	1005	6501	6616	5031	5051	Cont	Cont
D017 NBC Protection Systems	0	5781	9174	10196	9222	7083	0	Cont	Cont
D019 Chemical Biological Individual Protection Materiel	53	Restructure to project D017 in FY94						Cont	Cont
D020 NBC Contamination Avoidance Systems	35342	37058	3295	2073	19747	19523	14144	Cont	Cont
D517 Radiac Equipment Engineering Development	2840	Restructure to project D020 in FY94						Cont	Cont
PE TOTAL	38295	42839	13474	18770	35585	31637	19195		

B. (U) BRIEF DESCRIPTION OF ELEMENT: U.S. Forces must survive and sustain combat operations on the Nuclear, Biological and Chemical (NBC) contaminated battlefield. This program element supports the Engineering and Manufacturing Development (EMD) of NBC defensive equipment and addresses various shortcomings identified in Conduct of the Persian Gulf War: Final Report to Congress, April 1992. Projects provide for development and demonstration testing of individual and collective protection equipment such of the XM45 Aircrew Protective Mask (ACPM); radiological detection and monitoring equipment such as the Advanced Airborne Radiac System (AARS); an array of chemical/biological/toxin detection and warning systems to include the Multi-Purpose Integrated Chemical Agent Detector (MICAD) and the XM93E1 Fox NBC Reconnaissance System (NBCRS); and, finally, decontamination solutions and equipment to replace currently logistically burdensome and time consuming decon methods.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY1995:

(U) Project D017 - NBC Protection Systems: Provides EMD of equipment to protect soldiers on NBC contaminated battlefields. The project resources development of the XM45 Aircrew Protective Mask (ACPM) which provides rotary-wing air crewmen with a less burdensome respiratory protection system. The ACPM eliminates the air crew dependence on forced air and is compatible with helicopter weapon sights and night vision

system. This projects also supports the Advanced Integrated Collective Protection System (AICPS) which integrates NBC filtration environmental controls and power source components for combat systems and exploits new filtration technology. The AICPS can be integrated into multiple configurations to provide protection to several different tactical systems.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) None		

(U) FY 1994 Planned Program:		
• (U) Transition ACPM from PE #0604806, Proj DO19	1Q94	
• (U) Initiate/complete ACPM Engineer Design Test (EDT)	4Q94	1050
• (U) Conduct ACPM Critical Design Review	4Q94	385
• (U) Manufacture ACPM Pre-Production Qualification Test (PPQT) hardware	4Q94	1550
• (U) Continue ACPM components and tooling design	4Q94	2796
Total		**5781**

(U) FY 1995 Planned Program:		
• (U) Complete ACPM technical data package and tooling	4Q95	2225
• (U) Conduct ACPM PPQT	4Q95	2605
• (U) Conduct ACPM Initial Operational Test and Evaluation (IOT&E)	4Q95	500
• (U) Initiate AICPS design configuration testing	2Q95	700
• (U) Initiate AICPS prototype fabrication	2Q95	2400
• (U) ACPM and AICPS test assessment	4Q95	744
Total		**9174**

(U) **Project D019 - Chemical/Biological Individual Protection Materiel:** The project supports the EMD of the XM45 Aircrew Protective Mask (ACPM) to provide the required capability for air crew individual protection which is also compatible with aircraft sighting and navigation systems. Also supports the M40/M42 Pre-Planned Product Improvement (P3I) to include a second skin and quick doff hood for simplified decontamination procedures.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Work performed on ACPM restructured to Proj DO17 in FY 94		
• (U) Conducted M40/M42 P3I MSIII ITC in-process review	1Q93	53

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604806A
PE Title: NBC Defense Systems - Engineering Development **Budget Activity: #5**

Total	**53**

(U) FY 1994 Planned Program:
- (U) See PE #0604806A, Proj DO17

(U) **Project DO20 - NBC Defense Systems:** This project provides for the Engineering and Manufacturing Development (EMD) of new nuclear and chemical defensive equipment to enhance U.S. capability to detect and identify threat agents on the battlefield. The project supports: (1) XM22 Automatic Chemical Agent Detector Alarm (ACADA), which is more sensitive and responsive than current detectors and is capable of concurrent nerve and blister agent detection; (2) Multipurpose Integrated Chemical Agent Alarm (MICAD) which automates NBC warning and reporting throughout the battlefield and links digital data into the Army's command, control and communications systems; (3) System Improvement Program (SIP) for the NBC Reconnaissance System (NBCRS). The upgraded NBCRS, designated the XM93E1 Fox, meets full Army requirements with the addition of the Remote Sensing Chemical Agent Alarm (RSCAAL), currently in production; integration of an advanced navigation system; jam resistant communications, and sensor/data processing systems to reduce the crew to three soldiers; (4) AN/UDR-13 Pocket Radiac Set which provides ground troops with a lightweight, user-friendly tactical device for measuring and detecting radiation; (5) Advanced Airborne Radiac System (AARS) to provide rapid, accurate, and safe measurement of radiation from the air and for correlating airborne readings to ground radiation readings and positions; and, lastly, (6) Biological Detector Kits to provide a manual means of identifying biological threat agents as a component of the Biological Integrated Defense System (BIDS).

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Continued ACADA engineering and manufacturing development	4Q93	10322
• (U) Completed ACADA Pre-Production Testing (PPT)	4Q93	400
• (U) Conducted XM93E1 NBCRS Technical Test Readiness Review (TTRR)	1Q93	2150
• (U) Initiated Pre-Production Qualification Testing (PPQT) for the XM93E1	2Q93	6686
• (U) Awarded EMD contract for the MICAD	2Q93	7100
• (U) Completed prototype assembly and initiated documentation development for XM93E1	4Q93	7032
• (U) Conducted RSCAAL Risk Reduction Program (RRP) pursuant to full production	4Q93	1652
Total		**35342**

(U) FY 1994 Planned Program:		
• (U) Complete Technical Testing (TT) for the AARS	4Q94	400
• (U) Conduct Pocket Radiac MS III/TC IPR	4Q94	942
• (U) Complete TT\UT for Pocket Radiac Set	4Q94	500

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604806A**
PE Title: **NBC Defense Systems - Engineering Development** Budget Activity: **#5**

• (U) Initiate comparative testing of ACADA non-developmental items (NDI)	4Q94	1200
• (U) Complete PPQT and initiate/complete IOT&E for the XM93E1 NBCRS	3Q94	15100
• (U) Conduct XM93E1 NBCRS Milestone III/TC IPR	4Q94	371
• (U) Conduct MICAD critical design review	3Q94	8164
• (U) Initiate bio detector kit program (design, fabrication of tickets)	1Q94	3240
• (U) Complete pocket radiac prototypes, AARS prototype, and hardware construction for PPQT of these items	4Q94	7131
Total		**37048**

(U) FY 1995 Planned Program:

• (U) Complete XM93E1 NBCRS engineering and testing efforts prior to full type classification	1Q95	3295
• (U) Transfer Bio Detector Kits Program to JPO for Biological Defense PE 0208051 Project BDB1	1Q95	
Total		**3295**

(U) Project D517 - Radiac Equipment Engineering Development: Provides for EMD of hand-held and aircraft mounted detection, monitoring, and warning equipment for nuclear battlefield hazards. The Alpha Radiac Monitor detects and measures Alpha and X-ray radiation. The Advanced Airborne Radiac System (AARS) will provide rapid, accurate and safe measurement of radiation from an airborne platform for correlating airborne readings to ground radiation readings and positions. Funding also supports the EMD of the AN/UDR-13 Pocket Radiac Set to provide ground troops with a hand-held device capable of acting as a radiation dose rate meter and a cumulative dosimeter.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Achieved full production approval for Alpha Radiac Set	3Q93	295
• (U) Initiated integration of radiation data into the Automated NBC Information System (ANBACIS)	2Q93	50
• (U) Awarded EMD contract for AARS	4Q93	545
• (U) Completed design and fabrication of first prototype Pocket Radiac	4Q93	300
• (U) Conducted Pocket Radiac Critical Design Review	3Q93	950
• (U) Alpha Radiac and AARS development	4Q93	700
• (U) Work performed in this project is restructured to PE #0604806, Proj D020		
Total		**2840**

(U) FY 1994 Planned Program:
- (U) See PE #0604806, Proj D020

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604806A**
PE Title: **NBC Defense Systems - Engineering Development**

Budget Activity: **#5**

(U) Project DF97 - NBC Decontamination Systems: Provides for ED of new NBC decontamination solutions and equipment. Program funding supports the XM295 Individual Equipment Decontamination Kit which provides a more effective system for decontaminating individual equipment. Utilizing an adsorbent resin, the kit will be used to decontaminate soldier protective equipment as well as weapons, helmets and load bearing equipment. This project also supports the Sorbent Decontamination System, which provides a more environmentally sound system for decontaminating personal equipment, key areas of vehicles, and crew served weapons, while reducing transfer vapor and contact hazards.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Conducted XM295 Milestone III In-Process Review (IPR)	1Q93	
• (U) M295 procurement contract preparation	3Q93	60
Total		**60**

(U) FY 1994 Planned Program:

- (U) No planned program

(U) FY 1995 Planned Program:

• (U) Approve Sorbent Decon System ORD, Acquisition Strategy (AS), and Acquisition Plan (AP)	1Q95	3
• (U) Conduct Sorbent Decon System Milestone I In-Process Review (IPR)	1Q95	3
• (U) Conduct preliminary design studies and reviews; develop technical data package for Sorbent Decon System	4Q95	999
Total		**1005**

(U) Work Performed By: Project Manager for NBC Defense Systems, Aberdeen Proving Ground (APG), MD; U.S. Army Chemical and Biological Defense Command, APG, MD; Edgewood Research, Development and Engineering Center, APG, MD; U.S. Army Tank and Automotive Command, Warren, MI; U.S. Army Communications and Electronics Command, Fort Monmouth, NJ; U.S. Army Test and Evaluation Command, APG, MD; Night Vision Electro-Optics Laboratory, Fort Belvoir, VA; Human Engineering Laboratory, APG, MD; and Electronic Warfare/Reconnaissance, Surveillance and Target Acquisition Center, Fort Monmouth, NJ. Contractors include: Brunswick, Deland, FL; TRW Defense Systems Group, Redondo, CA; Texas Instruments, Dallas, TX; Nuclear Research Corp, Warrington, PA; Environmental Technologies Group, Inc., Baltimore, MD; ILC Dover, Dover, DE; Rohm & Haas, Trenton, NJ; and, Donaldson Corp., Minneapolis, MN.

(U) Related Activities: Program Elements #0602622A (Chemical, Smoke, and Equipment Defeating Technology) and #0603806A (NBC Defense Systems - Advanced Development). Department of Defense Directive 5160.5 designates the U.S. Army as the executive agent for the Chemical and Biological (CB) Defense Research, Development, and Acquisition (RDA) program to ensure that the services embark on a collective management approach to prioritize, coordinate, and consolidate CB defense needs. A number of management oversight committees, such as the Joint Service

Program Element: #0604806A
PE Title: NBC Defense Systems - Engineering Development

Budget Activity: #5

Requirements Group and the Joint Panel on CB Defense, are therefore chaired by the Army to execute this responsibility and periodically review the programs to ensure that essential requirements are being satisfied, and that duplicative efforts are not being pursued by the services. Joint service coordination is also enhanced by the periodic reviews of the Joint-CB Research, Development, Test and Evaluation Program, the Joint Service Coordination Committee, and the Joint Directors of Laboratories' Technology Panel for CB Defense. International coordination and cooperation is fostered through several programs and agreements that include memoranda of understanding (MOU), the Technical Cooperative Program, and Data Exchange Annexes as well as periodic meetings of the North Atlantic Treaty Organization AC/255 (Panel VII), and Quadripartite working groups. There is no unnecessary duplication of effort within the Army or DoD.

(U) Other Appropriation Funds:

($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Procurement - OPA-3							
MA0600 FOX NBCRS, MODS				18712	27831	27598	27542
MB3001 Lin 121 (Pocket Radiac) Radiation Mont Systems				3748	3719	2753	
M96800 Lin 116, Agent Alarm XM21							
Remote Sensing Chemical	6419		18975	4211			
M98800, Lin 118 Auto Chemical Agent Alarm, (ACADA) XM22			13046	13794	13574	32268	46013

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604806A**
PE Title: **NBC Defense Systems - Engineering Development** Budget Activity: **#5**

(U) International Cooperative Agreements: PM NBC Defense Systems has been authorized to negotiate with Germany for a cooperative Logistics Support Agreement for the XM93E1 Fox NBCRS. This agreement will allow the Army to procure, from Germany, spare and repair parts that are not available from U.S. sources.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604807A**
Title: **Medical Materiel/Medical Biological Defense Equipment** Budget Activity: **#5**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D812 Military HIV Vaccine and Drug	4643	6303	6438	2487	2557	2542	2525	CONT	CONT
D832 Combat Medical Materiel	3419	2743	1618	1598	1763	1804	1930	CONT	CONT
D834 Soldier Systems Protection	2	813	0	905	920	955	967	CONT	CONT
D847 Medical Biological Defense	1881	3180	0	0	0	0	0	0	24,785
D848 Medical Chemical Defense Life Support Material	643	1761	52	346	227	217	167	CONT	CONT
D849 Infectious Diseases Drug and Vaccine	3471	4769	4691	2058	2103	2134	2118	CONT	CONT
PE TOTAL	14059	19569	12799	7394	7570	7652	7707		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This full scale development program funds improved medical equipment and drugs essential to counteracting lethal and human performance degrading effects of chemical and biological threats, and medical equipment essential to meeting medical requirements on the integrated battlefield with emphasis on decreased size/weight and high mobility, yet supporting large numbers of combat casualties. Additionally, foreign medical materiel may be procured for exploitation of advanced technology and development to meet Army medical defense goals. This program element also supports the full-scale development of vaccines, prophylactic and therapeutic drugs, resuscitation fluids and drug products, rapid identification and diagnostic systems, and arthropod vector repellent systems of the prevention of naturally occurring diseases and Acquired Immumo Deficiency Syndrome (AIDS). Additionally, the PE funds engineering development of medical equipment which provides measurement of or protecti .. against physiological, psychological or environmental factors which degrade physical and/or mental performance. This includes development of equipment to monitor environmental health and medical water quality.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604807A
Title: **Medical Materiel/Medical Biological Defense Equipment** Budget Activity: #5

(U) Project D812 - Military Human Immunodeficiency Virus (HIV) Vaccine and Drug - Engineering Development: This project funds Congressionally-mandated, militarily relevant HIV medical countermeasures. This provides for engineering and manufacturing of sufficient candidate vaccines and drugs to permit large-scale field testing and education/training materials. Efforts are directed to answer militarily unique needs affecting manning, mobilization and deployment.

(U) FY 1993 Accomplishments:	COMPLETE	COST
• (U) Field site preparation and protocol review for GP160 vaccine in sero-positive individuals in Thailand	2Q93	200
• (U) Completed expansion of GP160 therapeutic efficacy trial in 600 individuals	4Q93	4443
TOTAL		**4643**

(U) FY 1994 Program:	COMPLETE	COST
• (U) Completion of Thai GP160 protocol for individuals with HIV infection	4Q94	200
• (U) Conduct interim look of GP160 therapeutic efficacy trial	4Q94	6103
TOTAL		**6303**

(U) FY 1995 Planned Program:		
• (U) Complete Thai GP160 protocol in individuals with HIV infection	3Q95	6438
TOTAL		**6438**

(U) Project D832 - Combat Medical Materiel - Engineering Development: Supports advanced development to field new and improved medical materiel essential for combat casualty care to reduce logistical support requirements and minimize losses from duty rates.

(U) FY 1993 Accomplishments:	COMPLETE	COST
· (U) Modified and tested two units that produce sterile water from drinking water	2Q93	3268
Prepared documentation for a cooperative research and development for development of Hypertonic Saline Dextran	4Q93	151
TOTAL		**3419**

(U) FY 1994 Planned Program:		
• (U) Complete contract for a portable sterile water for injection system	3Q94	2546
• (U) Complete study for fielding commercial liquid oxygen generators	4Q94	141
• (U) Evaluate human efficacy of Hypertonic Saline Dextran	*	56
TOTAL		**2743**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604807A**
Title: **Medical Materiel/Medical Biological Defense Equipment** Budget Activity: **#5**

(U) FY 1995 Planned Program:

• (U) Contract for prototype Armored Ambulance using medical interior concepts	*	1169
• (U) Test commercial injection systems for rapid replacement of blood or blood volume expanders	2Q95	409
• (U) Conduct market investigation for lightweight portable ceramic oxygen generators	4Q95	20
• (U) Prepare and submit to FDA a New Drug Application for Hypertonic Saline Dextran	*	20
TOTAL		**1618**

* This is continuing research which is reviewed periodically, ensuring quality, relevance, and priority

(U) Project D834 - Soldier System Protection - Engineering Development: Supports advanced engineering development of preventive medicine materiel, including devices, pharmacologicals and other tools, to provide protection, sustainment, and enhancement of the physiological and psychological capabilities of soldiers in the face of combat operations under all environmental conditions. Focus is on reduction in the incidence of personnel losses due to preventable disease and non-battle injuries through development of environmental and physiological performance monitors and other preventive medicine countermeasures.

(U) FY 1993 Accomplishments:	**COMPLETE**	**COST**
• (U) NOTE: This project was created to accommodate a FY92-97 redistribution of funds to separately account for soldier system protection RDTE, formerly combined under Project D832, and does not represent a new start. No products had been transitioned to advanced engineering development under this Project in FY93, thus, no accomplishments can be reported.	4Q93	2
TOTAL		**2**

(U) FY 1994 Planned Program:

• (U) Provide optometry and engineering support in the design, fabrication and testing of special eyewear incorporated into protective masks	4Q94	813
TOTAL		**813**

(U) FY 1995 Planned Program:

• (U) NOTE: Project designation eliminated. Planning, programming, and execution of this effort will occur through integration with Project D832 under PE #0603807 commencing in FY95.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604807A**
Title: **Medical Materiel/Medical Biological Defense Equipment** Budget Activity: **#5**

(U) Project D847 - Medical Biological Defense - Engineering Development: This project funds US Army Medical Research and Development Command as the DoD executive Agent for exploratory research on the development of vaccines and drugs to provide an effective medical defense against validated biological threat agents including bacteria, toxins, viruses and other agents of biological origin. By employing biotechnology, medical systems will be designed to rapidly identify, diagnose, prevent and treat disease due to exposure to biological threat agents.

(U) FY 1993 Accomplishments:	COMPLETE	COST
• (U) Completed consistency lot trials of Tularemia vaccine	3Q93	520
• (U) Completed trials of Botulism Immune Globulin (Human)4Q93		1361
TOTAL		**1881**

(U) FY 1994 Planned Program:		
• (U) Prepare Product and Establishment License Application for Tularemia vaccine	4Q94	183
• (U) Complete development of Human Botulism Immune Globulin for contingencies	3Q94	643
• (U) Test and evaluate automated systems for rapid diagnosis of biological warfare agent exposure	*	2354
TOTAL		**3180**

* This is continuing research which is reviewed periodically, ensuring quality, relevance, and priority

(U) FY 1995 Planned Program:
- (U) This project transitioned to the Joint Program Office under OSD PE/Project 28051.BD2

(U) Project D848 - Medical Chemical Defense Life Support Materiel: This project addresses joint service and Army-unique requirements for the development of medical materiel necessary to field an effective capability for medical defense against chemical agent threats facing U.S. forces in the field. The Army has been designated as the Department of Defense (DOD) Executive Agent for chemical defense research and development, and the U.S. Army Medical Research and Development Command (USAMRDC) executes the medical defense portion of this executive agent role.

(U) FY 1993 Accomplishments:	COMPLETE	COST
• (U) Conducted extended stability testing of the Medical Aerosolized Nerve Agent Antidote, Convulsant Antidote for Nerve Agents, and Nerve Agent Pretreatment Pyridostigmine	*	190
• (U) Prepared and assembled data for New Drug Application for Nerve Agent Pretreatment, Pyridostigmine	*	453
TOTAL		**643**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604807A**
Title: **Medical Materiel/Medical Biological Defense Equipment** Budget Activity: **#5**

(U) FY 1994 Planned Program:		
• (U) Conduct extended stability testing of the Medical Aerosolized Nerve Agent Antidote, Convulsant Antidote for Nerve Agents, and Nerve Agent Pretreatment Pyridostigmine	*	1409
• (U) File New Drug Application for Nerve Agent Pretreatment, Pyridostigmine with FDA	4Q94	352
TOTAL		**1761**
(U) FY 1995 Planned Program:		
• (U) Conduct extended stability testing of the Medical Aerosolized Nerve Agent Antidote, Convulsant Antidote for Nerve Agents, and Nerve Agent Pretreatment Pyridostigmine	*	52
TOTAL		**52**

(U) Project D849 - Infectious Diseases Drug and Vaccine - Engineering Development: This project funds engineering and manufacturing of sufficient candidate medical countermeasures to permit large-scale field testing and complete studies required for FDA licensure. Work performed in laboratories and among troop populations is directed to prevention, diagnosis and treatment of viral, bacterial and parasitic diseases, so as to prevent casualties, sustain operational performance and minimize deaths and disability of armed forces during military operations.

(U) FY 1993 Accomplishments:	**COMPLETE**	**COST**
• (U) Perform consistency lot clinical trials for licensure of new source of plague vaccine	4Q93	58
• (U) Accelerated immunization schedule for Tick-Borne Encephalitis vaccine	3Q93	112
• (U) Performed analysis of Hepatitis A field trial data in support of a Product Licensure Application	4Q93	1509
* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.		
• (U) Completed the dosing trial on Argentine Hemorrhagic Fever vaccine	4Q93	110
• (U) Evaluated human efficacy trials of Schistosome Topical Antipenetrant	*	1498
• (U) Conducted Phase I clinical trials of Chikungunya Live Vaccine	4Q93	184
TOTAL		**3471**
(U) FY 1994 Planned Program:		
• (U) Conduct field trial for Whole Cell/B Subunit Cholera vaccine	4Q94	1350
• (U) Transition Hepatitis A vaccine to production	4Q94	1391
• (U) Perform clinical testing of lyophilized Tick-Borne Encephalitis vaccine	*	154
• (U) Complete lot trials on Argentine Hemorrhagic Fever vaccine	4Q94	288
• (U) Conduct additional Phase III clinical trials for Topical Antipentetrant	*	817

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604807A**
Title: **Medical Materiel/Medical Biological Defense Equipment**

Budget Activity: **#5**

• (U) Conduct expanded Phase I clinical trials of Chikungunya Live Vaccine	*	658
• (U) Conduct challenge study for efficacy of cholera vaccine	3Q94	34
• (U) Accelerate immunization schedule for Tick-Borne Encephalitis Vaccine	3Q94	77
TOTAL		**4769**

(U) FY 1995 Planned Program:

• (U) Conduct field trials of E. coli/Shigella vaccine	*	497
• (U) Complete field study with Whole Cell/B subunit Cholera vaccine	4Q95	1154
• (U) Prepare Product Licensure Application for Argentine Hemorrhagic Fever vaccine	2Q95	40
• (U) Conduct additional Phase III clinical trials for Topical Antipenetrant	*	1053
• (U) Complete clinical trials and initiate passive immunity studies with Chikungunya Live Vaccine	3Q95	308
• (U) Conduct Rift Valley Fever Live Vaccine Phase II efficacy trials	*	291
• (U) Produce new lots of purified Botulinum Toxoid Pentavalent	*	1063
• (U) Complete Phase III field study with cholera vaccine	4Q95	228
• (U) Perform clinical testing of lyophilized Tick-Borne Encephalitis Vaccine	3Q95	57
TOTAL		**4691**

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

(U) Work Performed By:

D812: Walter Reed Army Institute of Research, along with field units in Thailand, Korea, Brazil, and Kenya, the U.S. Army Medical Research Institute of Infectious Diseases perform in-house Army research. The remainder is performed by the Naval Medical Research Institute and the U.S. Navy field units and by extramural non-profit organizations, universities, and industries. The major contractor is Henry M. Jackson Foundation for the Advancement of Military Medicine, Rockville, MD.

D832: Work is performed in-house by U.S. Army Medical Materiel Development Activity, Fort Detrick, MD; and the U.S. Army Institute of Dental Research. Major contractors are the Sterimatics Corporation, New Bedford, MA; and EER Incorporated, Vienna, VA.

D834: Walter Reed Army Institute of Research (WRAIR), Washington, D.C.; Army Medical Research Detachment (Occupational Toxicology Research), WRAIR, Wright-Patterson Air Force Base, OH.; U.S. Army Medical Materiel Development Activity, Ft. Detrick, MD.

D847: Contractors are Ogden Bioservices Corporation, Gaithersburg, MD; University of Alabama, Birmingham, AL; Harvard University, Cambridge, MA; and The New England Deaconess Hospital, Boston, MA

D848: In-house work is conducted at the U.S. Army Medical Materiel Development Activity, Fort Detrick, MD. Contractors include Guild Corporation, Dayton, OH; Duphar, Marietta, GA, Guild Associates, Columbus, OH.

D849: Walter Reed Army Institute of Research, along with field units in Thailand, Korea, Brazil, and Kenya, the U.S. Army Medical Research

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604807A
Title: Medical Materiel/Medical Biological Defense Equipment Budget Activity: #5

Institute of Infectious Diseases perform in-house Army research. The remainder is performed by the Naval Medical Research Institute and the U.S. Navy field units and by extramural non-profit organizations, universities, and industries

(U) Related Activities:

PE #0601102A (Defense Medical Sciences)
PE #0602720A (Environmental Quality Technology) (DA Proj 835 only)
PE #0603002A (Medical Advanced Technology)
PE #0603105A (Military Human Immunodeficiency Virus (HIV) Research)
PE #0603807A (Medical Systems-Advanced Development)
PE #0604807A (Medical Materiel/Medical Defense Equipment-Engineering Development)
PE #0605801A (Program wide Activities, Project MMO2)
PE #0605898A (Management Headquarters R&D, Project MM03)

There is no unnecessary duplication of efforts in the Army or DOD programs. Duplication of effort within the Army is avoided through centralized management at the U.S. Army Medical Research and Development Command. This effort is coordinated annually, or more frequently as required, with Department of Defense, Director for Research and Engineering; Joint Technology Coordinating Groups of the Armed Services Biomedical Research Evaluation Management Committee; Joint Services Container Steering Group; DOD Executive Agent for Land-Based Water Resources; Program Advisory Group for Bulk Petroleum Fuels Distribution; World and Pan American Health Organizations. Research efforts are also coordinated with Quadripartite, NATO and other cooperative nations through meetings and data exchange agreements.

(U) Other Appropriation Funds: ($ in Thousands) Procurement of completed products is provided for in Other Procurement, Army (OPA), or Operation and Maintenance, Army (OMA) or passed to other procuring agencies of DoD and the Military Departments, as appropriate.

(U) International Cooperative Agreements: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604808A
PE Title: Landmine Warfare/Barrier-Engineering Development Budget Activity: **#5**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DO16 Mine Systems Engineering Development	3824	2957	6849	10062	4734	0	0	0	49927
D415 Mine Neutralization/Detection	0	0	945	901	14843	20427	25155	CONT	CONT
PE TOTAL	3824	2957	7794	10963	19577	20427	25155		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element (PE) provides for engineering and manufacturing development of mine and countermine systems. The PE provides for the increased tactical effectiveness and responsiveness of landmines by supporting the development of a Minefield Command and Control (MC2) system for the Family of Scatterable Mines (FASCAM), which can be dispensed rapidly from helicopters, ground dispensers, artillery systems and tactical aircraft. Project D415, Mine Neutralization/Detection Engineering Development, is the engineering and manufacturing development for the Light In-Stride Extraction Capability, the Standoff Minefield Detection System (STAMIDS) and Explosive Standoff Minefield Breacher (SMB). It provides a group of mutually supported mine detection and neutralization devices to counter a variety of threat mines, minefields and obstacles necessary for implementing the Army's Countermine Modernization Plan.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:
(U) Project D016 - Mine Systems Engineering Development: Provides for engineering and manufacturing development of Scatterable Mines (FASCAM) and new smart mines.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Designed, Built and Tested Multi-Sensor Electric Package (MSEP) prototype	2Q93	905
• (U) Developed & Proved Out corrective actions from Prototype Testing	3Q93	1258
• (U) Procured Components for M87E1 Qualifying and Technical Testing	4Q94	1661
TOTAL		3824

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604808A**
PE Title: **Landmine Warfare/Barrier-Engineering Development** Budget Activity: **#5**

(U) FY 1994 Planned Program:		
• (U) Build Hardware and complete M87E1 Canister Qual Testing	1Q94	707
• (U) Develop corrective actions and build Tech Test(TT) hardware	3Q94	1713
• (U) Complete Technical Testing	4Q94	537
TOTAL		2957

(U) FY 1995 Planned Program:		
• (U) Design Communication Module and Safe & Arming (S&A) Device for Minefield Command & Control (MC2) WAM	4Q95	1200
• (U) Design Communication Module ASIC, Develop Test Plans, Fabricate & Test Simulators	4Q95	3919
• (U) Develop COMSEC system, upgrade NSA approved algorithms for WAM	4Q95	1730
TOTAL		6849

(U) **Project D415 - Mine Neutralization/Detection:** Provides for engineering and manufacturing development of US countermine systems.

(U) FY 1993 Accomplishments:
- (U) Program not funded

(U) FY 1994 Planned Program:
- (U) Program not funded

(U) FY 1995 Planned Program:	**Complete**	**Cost**
• (U) Prepare Production Solicitation for Light In-stride Extraction Capability (LIEC)	4Q95	400
• (U) Prepare IPR Documentation	2Q95	200
• (U) Vehicle modification Engineering for LIEC	3Q95	345
TOTAL		945

D. (U) Work Performed By: The Project Manager for Mines, Countermine and Demolitions, Picatinny Arsenal, NJ, is assigned the responsibility for landmine, countermine and explosive demolition development. The major supporting laboratories are the Armament Research, Development and Engineering Center, Picatinny Arsenal, NJ and the Belvoir Research, Development and Engineering Center, Fort Belvoir, VA

(U) **Related Activities:** Component work and concept exploration/definition phase work for this program are conducted in program elements

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604808A
PE Title: Landmine Warfare/Barrier-Engineering Development Budget Activity: **#5**

#0602624A (Weapons and Munitions Technology), **#0602786A** (Logistics Technology), **#0602784A** (Military Engineering Technology), **#0603606A** (Landmine Warfare and Barrier Advanced Technology), and **#0603619A** (Landmine Warfare and Barrier-Advanced Development). Engineering and manufacturing development efforts which result from this program are accomplished in program element **#0604619A** (Landmine Warfare). Mine and countermine efforts are closely coordinated to incorporate counter-countermeasures as applicable. The Project Manager for Mines, Countermine and Demolitions monitors related programs to ensure no unnecessary duplication of effort within the Army DoD. Development information on mines is coordinated and exchanged among the services by the Tri-Service Joint Technical Coordinating Group for Unpowered Weapons. The Department of Defense's Office of Munitions monitors the scatterable mine program to avoid service duplication.

(U) Other Appropriation Funds:

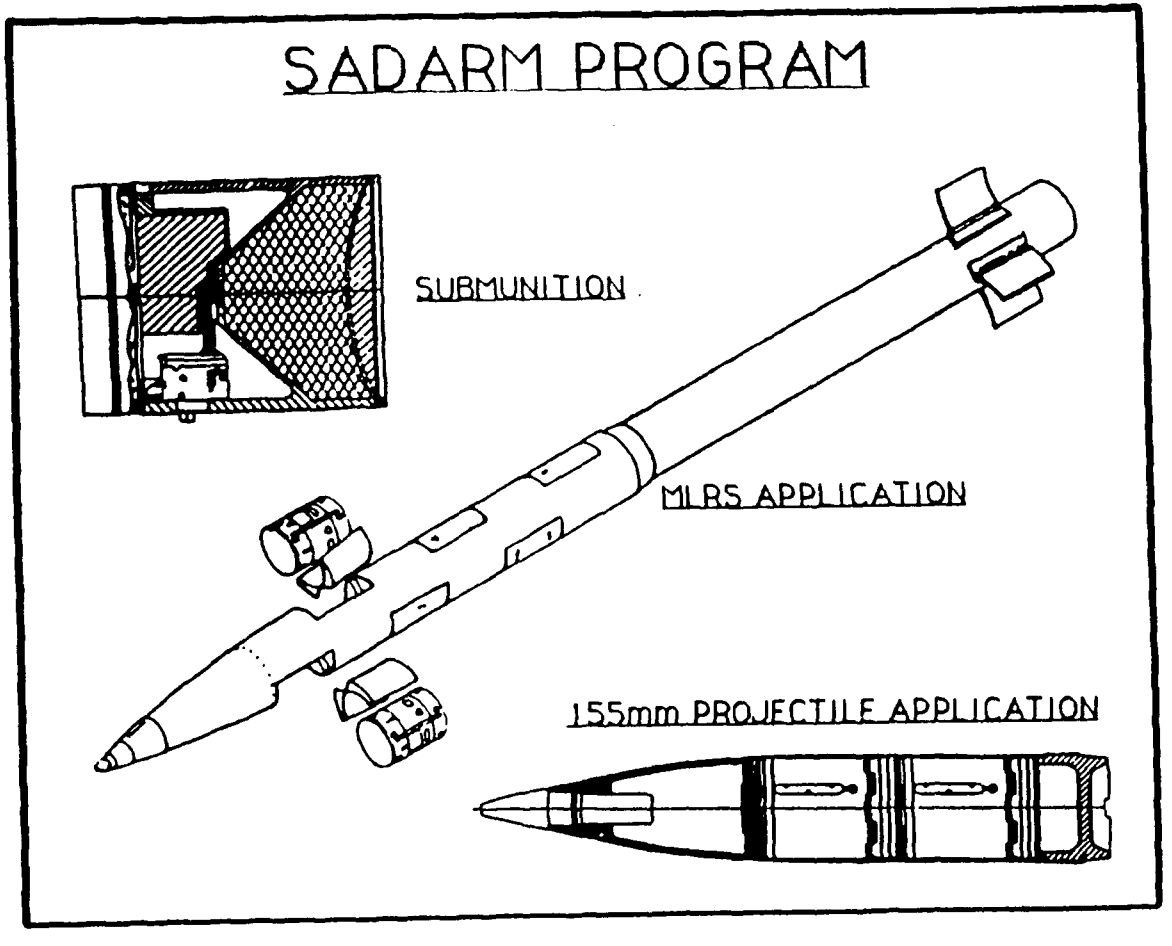
	($ in Thousands)						
Appropriation	**FY 1993 Actual**	**FY 1994 Estimate**	**FY 1995 Estimate**	**FY 1996 Estimate**	**FY 1997 Estimate**	**FY 1998 Estimate**	**FY 1999 Estimate**
Procurement Ammunition, Army							
SSN E72190 (VOLCANO)	2953	2466	5478	5717	4959		
SSN E72195 (VOLCANO)	30000		44248				
Other Procurement Army							
SSN G39100 (VOLCANO)	10941	15933	16222	5229			

(U) International Cooperative Agreements: None

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604814A
PE Title: Sense and Destroy Armor (SADARM)-Engineering Development
Project Title: Generic SADARM Engineering Development

Project Number: #D644
Budget Activity: #5



POPULAR NAME: SADARM

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604814A**
PE Title: **Sense and Destroy Armor (SADARM)-Engineering Development**
Project Title: **Generic SADARM Engineering Development**

Project Number: **#D644**
Budget Activity: **#5**

A. (U) SCHEDULE/BUDGET INFORMATION: ($ In Thousands)

SCHEDULE	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	TO COMPLETE
Program Milestones				MS IIIA 1Q96	MS III 4Q97			
Engineering Milestones								
T&E Milestones				COMPLETE 155 TECH TEST 4Q96				
Contract Milestones				155mm LRP AWARD 2Q96				
BUDGET ($000)	**FY 1993**	**FY 1994**	**FY 1995**	**FY 1996**	**FY 1997**	**FY 1998**	**FY 1999**	**PROGRAM TOTAL (TO COMP)**
Major Contract	77330	24000	60700	73900				790907
Support Contract	475	280	900	1000				53992
In-House Support	8592	2815	5500	5600				90826
GFE/ Other	11358	1405	4971	7617				90958
Total	97755	28500	72071	88117	0	0	0	1026683

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604814A**
PE Title: **Sense and Destroy Armor (SADARM)-Engineering Development**
Project Title: **Generic SADARM Engineering Development**

Project Number: **#D644**
Budget Activity: **#5**

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Sense and Destroy Armor (SADARM) munitions will provide an enhanced fire/counterfire capability for Multiple Launch Rocket System (MLRS) and 155mm howitzer delivery systems with both systems capable of attacking targets well beyond the Forward Line of Troops (FLOT) in a fire-and-forget mode. SADARM will be capable for use, both day and night, in inclement weather and degraded battlefield conditions. SADARM munitions are designed for use against self-propelled howitzers and armored vehicles acquired while providing counterfire, close support, suppression of enemy air defense (SEAD) and interdiction fires. Upon ejection from the 155mm projectile or the MLRS rocket, the submunition deploys and descends toward the ground at a constant velocity and spin rate. The submunition contains a sensing mechanism which is a dual-mode millimeter wave sensor and an infrared sensor array. If a target is present within the scan area, the sensor detects its presence and fires an explosively formed penetrator (an explosive charge forms a ballistically shaped penetrator from a metal liner) into the target.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

	Complete	Cost
(U) FY 1993 Accomplishments:		
• 155mm SADARM technical testing	(4Q96)	(22600)
• MLRS SADARM development	(4Q96)	(68700)
• Initiated MLRS-SADARM technical testing	(1Q93)	(6400)
Total		**97700**
(U) FY 1994 Planned Program:		
• 155mm engineering failure analysis	(2Q94)	(15300)
• 155mm corrective action	(3Q94)	(6100)
• 155mm SADARM technical testing	(4Q96)	(6400)
• MLRS sustainment	(4Q96)	(700)
Total		**28500**
(U) FY 1995 Planned Program:		
• 155mm engineering/corrective action	(4Q95)	(62400)
• 155mm technical testing	(4Q96)	(8200)
• MLRS sustainment	(4Q96)	(1500)
Total		**72100**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604814A**
PE Title: **Sense and Destroy Armor (SADARM)-Engineering Development**
Project Title: **Generic SADARM Engineering Development**

Project Number: **#D644**
Budget Activity: **#5**

D. (U) WORK PERFORMED BY: Overall, the program is managed by the Project Manager SADARM under the auspices of the Program Executive Officer for Armaments. The Product Manager MLRS-SADARM is responsible for integrating SADARM submunitions into MLRS carriers. The major supporting government installations are the US Army Armaments Research Development and Engineering (RDE) Center, Picatinny Arsenal, NJ and the RDE Center, Huntsville, AL. The principal SADARM contractor is Aerojet Electronic Systems Division, Azusa, CA. The major subcontractor is Alliant Techsystems, Minnetonka, MN. The principal MLRS integration contractor is Loral Vought Systems, Camden, AR.

E. (U) COMPARISON WITH FY 1994 AMENDED DESCRIPTIVE SUMMARY:
NARRATIVE DESCRIPTION OF CHANGES

1. TECHNICAL CHANGES: SADARM developmental testing was suspended in July 1993 because of lower than expected performance. The Army is concentrating its efforts on high payoff problems with the vortex ring parachute, the Fuze Safe and Arm (FS&A), and the DC-to-DC converter. Testing to confirm the fixes will take place April 94.

2. SCHEDULE CHANGES: The Sep 1993 Milestone IIIa approval of Low Rate Initial Production of 155mm SADARM was postponed. The program has been placed in a "standby status" while the Army conducts an analysis. Results of this analysis are due to Congress in May 94, at which time the future program will be determined.

3. COST CHANGES: RDTE funding for the SADARM program was increased by $107.8 million in FY95 to support the extended Engineering Manufacturing Development(EMD) necessitated by reliability problems uncovered in developmental testing.

F. (U) *PROGRAM DOCUMENTATION*:

Required Operational Capability (ROC)	6/87
Decision Coordinating Paper (DCP)	5/88
Integrated Logistics Support Plan (ILSP)	7/91
Program Baseline	9/91
Test and Evaluation Master Plan (TEMP)	5/92

G. (U) RELATED ACTIVITIES: There is no unnecessary duplication of effort within the Army or DoD.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604814A**
PE Title: **Sense and Destroy Armor (SADARM)-Engineering Development**
Project Title: **Generic SADARM Engineering Development**

Project Number: **#D644**
Budget Activity: **#5**

H. (U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation		FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Procurement								
Ammunition	155mm SADARM	0	0	0	0	46932	47794	55898
Missiles	SADARM MLRS	0	0	0	0	114877	111602	130293

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable

J. (U) TEST AND EVALUATION DATA:

The 155mm SADARM demonstrated satisfactory lethality and reliability at low zones during June-July 93 developmental testing, but had problems at high zones. Early tests of MLRS SADARM also demonstrated lower than anticipated results. The Army is concentrating on high payoff fixes to the 155mm SADARM. These fixes will be tested in high zone firings scheduled for April 94.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604816A
PE Title: Longbow

Budget Activity: #5

A. (U) RESOURCES: ($ in Thousands)

Project Number Title	FY 1993/Prior Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DC13 Hellfire Seeker	0	107139	35502	0	0	0	0	0	386827
DC27 Longbow - Engineering Development	201191	82472	26203	0	0	0	0	0	768281
DC31 Longbow - Apache	89668	88143	105441	9307	0	0	0	0	557090
D2DT LBA Operational Test	0	0	24157	0	0	0	0	0	24157
PE TOTAL	290859	277754	191303	9307	0	0	0	0	1736355

B. (U) BRIEF DESCRIPTION OF ELEMENT: Longbow Project DC27 consists of the development of a mast-mounted Fire Control Radar (FCR) for the AH-64 and the development of a radar frequency (RF) missile seeker for the Hellfire missile. Longbow will provide the AH-64 a fire-and-forget Hellfire capability, greatly increasing weapon system effectiveness and aircraft survivability. The weapon system will be employable by day or night in adverse weather and in countermeasures environments. The Hellfire missile will effectively engage and destroy advanced threat armor on the digital battlefield of the later 1990s and into the next century. Project DC31 encompasses efforts necessary to effectively and efficiently integrate the FCR and RF missile onto the Apache aircraft. It includes two versions of the Longbow Apache AH-64D series aircraft: AH-64D with the Fire Control Radar (FCR) mission kit plus upgraded 701C engine, and AH-64D without FCR mission kit and upgrade engine. A new project has been transferred from support of operational test program element (PE) 65712 to this PE to fund the direct costs of the FDTE scheduled for Oct 94, Longbow Operational Test, D2DT.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604816A**
PE Title: **Longbow**
Project Title: **Hellfire Seeker**

Project Number: **DC13**
Budget Activity: **#5**

PICTURE NOT AVAILABLE

POPULAR NAME: Hellfire Seeker

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604816A**
PE Title: **Longbow**
Project Title: **Hellfire Seeker**

Project Number: **DC13**
Budget Activity: **#5**

A. (U) SCHEDULE/BUDGET INFORMATION: ($ In Thousands)

SCHEDULE	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	To Complete
Program Milestones			Long Lead Conventional Systems Committee	MS IIIA (Low Rate Production)				
Engineering Milestones								
T&E Milestones		Tower Test - 1Q 94 High Speed Captive Flight Test - 3Q 94 Missile Firings (Rail Launched) - 3Q 94	MSL Firings Helo-launched - 1Q 95 HWIL Test - 1Q 95 Sys Qual Test - 1Q 95 IOTE - 2Q 95 Live Fire - 2Q 95					
Contract Milestones								
BUDGET ($000)	**FY 1993**	**FY 1994**	**FY 1995**	**FY 1996**	**FY 1997**	**FY 1998**	**FY 1999**	**Program Total (To Complete)**
Major Contract	(See note below)	87223	21463					333517
Support Contract		6010	2176					14850
In-House Support		13906	11863					38460
GFE/Other		0	0					0
Total		107139	35502					386827 (0)

Note: FY 93 is included in DC27.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604816A**
PE Title: **Longbow**
Project Title: **Hellfire Seeker**

Project Number: **DC13**
Budget Activity: **#5**

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Longbow Hellfire is capable of being employed day or night, in adverse weather, and in a countermeasures environment against armored targets and air defense systems. Its millimeter wave seeker and inertial guidance system provide a fire-and-forget capability which greatly reduces aircraft exposure time. It utilizes a Hellfire II warhead system to destroy threat armor projected for early into the 21st century.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:	Complete	Cost
(U) FY 1993 Accomplishments: included in DC27		
(U) FY 1994 Planned Program		
● (U) Eng dev contract	4Q 94	87223
● (U) Engineering		6543
● (U) Hardware in the Loop	4Q 94	(2800)
● (U) Technical Support	4Q 94	(3743)
● (U) Testing		10819
● (U) Missile Flight Testing	1Q 95	(6932)
● (U) Qualification Testing	3Q 95	(1748)
● (U) Electromagnetic Environmental Effect (E3) Testing	3Q 95	(1049)
● (U) Warhead/Live Fire Testing	3Q 95	(442)
● (U) Countermeasure Testing	1Q 95	(648)
● (U) In House Support		2554
● (U) **TOTAL**		**107139**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604816A**
PE Title: **Longbow**
Project Title: **Hellfire Seeker**

Project Number: **DC13**
Budget Activity: **#5**

(U) FY 1995 Planned Program

● (U) Complete Engineering Development Contract	3Q 95	21463
● (U) Engineering		4890
● (U) Complete Hardware in the Loop	4Q 95	(1800)
● (U) Complete Technical Support	4Q 95	(3090)
● (U) Testing		5449
● (U) Missile Flight Testing	1Q 95	(2824)
● (U) Qualification Testing	3Q 95	(583)
● (U) Electromagnetic Environmental Effect (E3) Testing	3Q 95	(375)
● (U) Warhead/Live Fire Testing	3Q 95	(1491)
● (U) Countermeasure Testing	3Q 95	(176)
● (U) Complete In House Support		3700
● (U) **TOTAL**		**35502**

D. (U) WORK PERFORMED BY: The Longbow Fire Control Radar and RF missile programs are being accomplished by a Joint Venture (JV) comprised of Martin Marietta Technologies Incorporated (Orlando, Florida) and Westinghouse Electric Corporation (Baltimore, Maryland).

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** None
2. **SCHEDULE CHANGES:** None
3. **COST CHANGES:** None

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604816A**
PE Title: **Longbow**
Project Title: **Hellfire Seeker**

Project Number: **DC13**
Budget Activity: ***#5***

F. (U) PROGRAM DOCUMENTATION:

Organization and Operational Plan	08/85
System Concept Paper	10/85
TRADOC Letter of Agreement	01/86
Required Operational Capability	08/90
Acquisition Plan	08/90
Decision Coordinating Paper	12/90

G. (U) RELATED ACTIVITIES:

(U) Longbow Hellfire will be integrated onto the Longbow Apache (AH-64D Series) helicopter (PE #0604816A). There is no unnecessary duplication of effort within the Army or DoD.

H. (U) OTHER APPROPRIATION FUNDS:

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Missile Procurement, Army	0	0	41995	198389	263927	281756	303772

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604816A**
PE Title: **Longbow**
Project Title: **Hellfire Seeker**

Project Number: **DC13**
Budget Activity: **#5**

J. (U) TEST AND EVALUATION DATA:

Event	Dates
Tower Test	1Q 94
High Speed Captive Flight Test	3Q 94
Missile Firings (Rail-launched)	3Q 94
Missile Firings (Helo-launched)	1Q 95
Hardware-In-The-Loop Tests	1Q 95
System Qualification Tests	1Q 95
IOTE	2Q 95
Live Fire Tests	2Q 95

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604816A**
PE Title: **Longbow**
Project Title: **Longbow - Engineering Development**

Project Number: **DC27**
Budget Activity: **#5**

PICTURE NOT AVAILABLE

POPULAR NAME: Fire Control Radar (FCR)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604816A**
PE Title: **Longbow**
Project Title: **Longbow - Engineering Development**

Project Number: **DC27**
Budget Activity: **#5**

A. (U) SCHEDULE/BUDGET INFORMATION: ($ In Thousands)

SCHEDULE	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	To Complete
Program Milestones			Long Lead IPR 1Q 95					
Engineering Milestones			FCA 2Q 95					
T&E Milestones		Technical Test 4Q 94	FDTE 1Q 95 IOTE 2Q 95					
Contract Milestones			Long Lead Contract Award 1Q 95					
BUDGET ($000)	**FY 1993**	**FY 1994**	**FY 1995**	**FY 1996**	**FY 1997**	**FY 1998**	**FY 1999**	**Program Total (To Complete)**
Major Contract	195673 (See note below)	68747	15872					728246 (0)
Support Contract	1145	2597	2727					7671 (0)
In-House Support	2914	5066	6095					23334 (0)
GFE/Other	1459	6062	1509					9030 (0)
Total	201191	82472	26203					768281 (0)

Note: FY 93 Major Contract Amount includes 82150 for Hellfire Seeker contract.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604816A**
PE Title: **Longbow**
Project Title: ***Longbow - Engineering Development***

Project Number: **DC27**
Budget Activity: **#5**

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Longbow (Project DC27) consists of a mast-mounted Fire Control Radar (FCR) that will be integrated onto the AH-64 airframe, and a radar frequency (RF) seeker (Project DC13 in FY94) in the Hellfire II missile. The FCR integration will provide the AH-64 a fire-and-forget Hellfire capability, greatly increasing weapon system effectiveness and aircraft survivability. The weapon system will be employable day or night, in adverse weather, and in countermeasure environments. The Hellfire will effectively engage and destroy high-value targets including advanced armor on the battlefield of the later 1990s and into the next century. To be effective and survive on this future battlefield, the attack helicopter team must rapidly engage multiple targets with minimum exposure time and deploy a system that is inherently resistant to threat countermeasures.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:	**Complete**	**Cost**
(U) FY 1993 Accomplishments		
● (U) Engineering Development Contract	4Q 93	113523
● (U) Limited fabrication of FCR prototypes	4Q 94	
● (U) Initiated engineering tests	3Q 94	
● (U) Conducted first flight with Longbow	4Q 93	
● (U) Conducted Intermediate Production Readiness Review	4Q 93	
● (U) In House Support	4Q 93	2914
● (U) Test Support	4Q 93	1459
● (U) Development Testing	4Q 93	(1394)
● (U) Qualification Testing		(0)
● (U) Live Fire Test and Evaluation		(0)
● (U) Target Support	4Q 93	(65)
● (U) Support Contracts	4Q 93	1145
● (U) Technical support	4Q 93	(544)
● (U) Software support	4Q 93	(367)
● (U) Logistics support	4Q 93	(77)
● (U) Planning support	4Q 93	(157)
● **(U) Subtotal**		**119041**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604816A**
PE Title: **Longbow**
Project Title: **Longbow - Engineering Development**

Project Number: **DC27**
Budget Activity: **#5**

● **(U) Hellfire Seeker**		
● (U) Engineering Development Contract	4Q 93	75063
● (U) Engineering		2406
● (U) Hardware in the Loop	4Q 93	(377)
● (U) Technical Support	4Q 93	(2029)
● (U) Testing		2172
● (U) Engineering Development Testing	1Q 94	(288)
● (U) Qualification Testing	3Q 95	(578)
● (U) Launcher Testing	3Q 94	(208)
● (U) Tower Testing	1Q 95	(278)
● (U) Missile Flight Testing	1Q 95	(820)
● (U) In House Support		2509
● **(U) Subtotal**		**82150**
● **(U) TOTAL**		**201191**

(U) FY 1994 Planned Program

● (U) Engineering Development Contract	4Q 94	68747
● (U) Complete Aircraft Integration	2Q 94	
● (U) Complete 1,000 Hour Test Analyze and Fix Test	3Q 94	
● (U) Complete FCR Mode Development	3Q 94	
● (U) Conduct FCR Specification Verification Tests	3Q 94	
● (U) Conduct Government Technical Test	4Q 94	
● (U) Complete Delivery of FCR Prototypes	4Q 94	
● (U) Conduct Environmental Qualification Tests	1Q 95	
● (U) In House Support	4Q 94	5066

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604816A** Project Number: **DC27**
PE Title: **Longbow** Budget Activity: **#5**
Project Title: **Longbow - Engineering Development**

● (U) Test Support	4Q 94	6062
● (U) Development Testing	4Q 94	(3092)
● (U) Qualification Testing	4Q 94	(1867)
● (U) Live Fire Test and Evaluation	4Q 94	(275)
● (U) Target Support	4Q 93	(828)
● (U) Support Contracts	4Q 94	2597
● (U) Technical Support	4Q 94	(719)
● (U) Software Support	4Q 94	(653)
● (U) Logistics Support	4Q 94	(825)
● (U) Planning Support	4Q 94	(400)
● (U) **TOTAL**		**82472**

(U) FY 1995 Planned Program

● (U) Engineering Development Contract	2Q 95	15872
● (U) Conduct FDTE	1Q 95	
● (U) Complete environmental qualification	1Q 95	
● (U) Award Long Lead Production Contract	1Q 95	
● (U) Complete systems test	2Q 95	
● (U) Conduct Functional Configuration Audit	2Q 95	
● (U) Conduct Initial Operational Test and Evaluation	2Q 95	
● (U) Complete Development Program	2Q 95	
● (U) In House Support	4Q 95	6095
● (U) Test Support	2Q 95	1509
● (U) Development Testing	3Q 95	(1073)
● (U) Qualification Testing	2Q 95	(55)
● (U) Live Fire Test and Evaluation	2Q 95	(350)
● (U) Target Support	4Q 95	(31)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604816A**
PE Title: **Longbow**
Project Title: **Longbow - Engineering Development**

Project Number: **DC27**
Budget Activity: **#5**

● (U) Support Contracts	4Q 95	2727
● (U) Technical Support	4Q 95	(755)
● (U) Software Support	4Q 95	(686)
● (U) Logistics Support	4Q 95	(866)
● (U) Planning Support	4Q 95	(420)
● (U) TOTAL		26203

D. (U) WORK PERFORMED BY: The Fire Control Radar (FCR) and RF missile programs are being accomplished by a Joint Venture (JV) comprised of Martin Marietta Technologies, Incorporated (Orlando, Florida) and Westinghouse Electric Corporation (Baltimore, Maryland).

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** None
2. **SCHEDULE CHANGES:** None
3. **COST CHANGES:** The FY 95 Program was increased for JV contract support for the AH-64D series without FCR.

F. (U) PROGRAM DOCUMENTATION:

Organization and Operational Plan	08/85
System Concept Paper	10/85
TRADOC Letter of Agreement	01/86
Required Operational Capability	08/90
Decision Coordinating Paper	12/90
Acquisition Decision Memorandum	12/90
Acquisition Plan	06/92
Acquisition Strategy	01/93

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604816A**
PE Title: **Longbow**
Project Title: **Longbow - Engineering Development**

Project Number: **DC27**
Budget Activity: **#5**

G. (U) RELATED ACTIVITIES:

(U) Longbow will be integrated onto the Apache (AH-64) helicopter. The AH-64 integration was performed under PE # 0203744A, Aircraft Modifications, through FY 1990 and continued integration funding will be performed in project DC31 within this PE. In FY94, missile development will be funded under Project DC13 within this PE. There is no unnecessary duplication of effort within the Army or DoD. However, the growth capable, software intensive architecture of the Longbow Fire Control Radar facilitates the continued insertion of advancing technologies related to millimeter wave. Examples are integration of battlefield combat identification capabilities, joint precision strike targeting or fully adaptive terrain clutter discrimination.

H. (U) OTHER APPROPRIATION FUNDS:

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Aircraft Procurement,Army Apache Longbow FCR (AA6608)				76800	84760	96300	115400

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

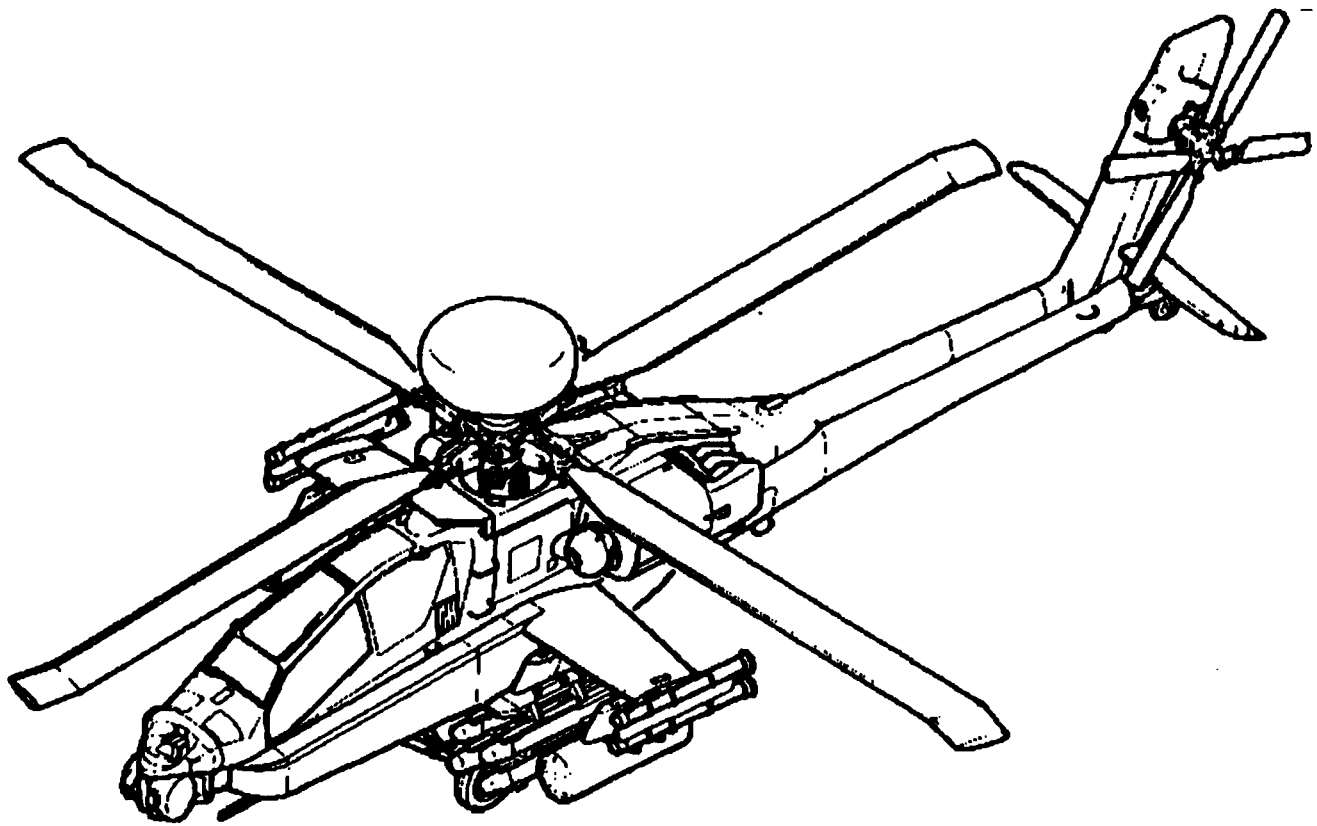
J. (U) TEST AND EVALUATION DATA:

Event	Dates
BIT Demonstrations	2Q 94
Log Demonstrations	2Q 94
FCR Mode Performance Demonstration (to verify Prime Item Development Specifications)	3Q 94
Technical Test	4Q 94
Adverse Weather Test	1Q 95
FDTE	1Q 95
IOTE	2Q 95

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604816A**
PE Title: **Longbow**
Project Title: **Longbow - Apache**

Project Number: **DC31**
Budget Activity: **#5**



POPULAR NAME: **Longbow**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604816A**
PE Title: **Longbow**
Project Title: **Longbow - Apache**

Project Number: **DC31**
Budget Activity: **#5**

A.(U) SCHEDULE/BUDGET INFORMATION: ($ In Thousands)

SCHEDULE	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	To Complete
Program Milestones			Long Lead IPR 1Q 95					
Engineering Milestones			FCA 2Q 95					
T&E Milestones		Technical Test 4Q 94	FDTE 1Q 95 IOTE 2Q 95					
Contract Milestones			Long Lead Contract Award 1Q 95					
BUDGET ($000)	**FY 1993**	**FY 1994**	**FY 1995**	**FY 1996**	**FY 1997**	**FY 1998**	**FY 1999**	**Program Total (To Complete)**
Major Contract	81509	67773	98877	8857				497218
Support Contract	872	2000	1000					7934
In-House Support	6387	15870	4564	450				46326
GFE/Other	900	2500	1000					5612
Total	89668	88143	105441	9307				557090 (0)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604816A
PE Title: Longbow
Project Title: Longbow - Apache

Project Number: DC31
Budget Activity: #5

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The Longbow program encompasses modifications to the AH-64 Apache as well as upgrades to the aircraft systems for the AH-64D Series to receive the FCR and missile. It provides an adverse weather fire-and-forget missile capability that increases the AH-64 lethality and survivability. The Longbow Apache also retains the capability to fire the Semi-active Laser Hellfire. The greatly-improved design enhancements increase operational capability of the crew and provide increased survivability and lethality.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:	Complete	Cost
(U) FY 1993 Accomplishments		
● (U) Prototype Design & Fabrication	4Q 93	14954
● (U) Fabricate Aircraft #2, #3, and #4		
● (U) Engineering Test and Verification	4Q 93	28526
● (U) Performance Demonstration		
● (U) Loads Survey		
● (U) Armament Survey		
● (U) Aircraft Survivability Equipment Survey		
● (U) Communications Survey		
● (U) Navigation Survey		
● (U) Preliminary Airworthiness Evaluation Phase I and II		
● (U) Fire Control Radar Integration		
● (U) Software Development	4Q 93	5578
● (U) Other	4Q 93	32451
● (U) Support Contract	4Q 93	872
● (U) GFE	4Q 93	900
● (U) In House Support	4Q 93	6387
● (U) TOTAL		89668

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604816A**
PE Title: **Longbow**
Project Title: **Longbow - Apache**

Project Number: **DC31**
Budget Activity: **#5**

(U) FY 1994 Planned Program

● (U) Prototype Design & Fabrication	2Q 94	14733
● (U) Fabricate Aircraft #5 and #6		
● (U) Engineering Test and Verification	4Q 94	26903
● (U) Electromagnetic Vulnerability (EMV)/Hazards of Electromagnetic Radiation to Ordnance Test		
● (U) Electromagnetic Compatibility (EMC) Demonstration		
● (U) Physical Teardown Logistics Demonstration (PTLD)		
● (U) Preliminary Production Qualification Test (PPQT)		
● (U) Improved Data Modem (IDM) Testing		
● (U) Handling Qualities Testing		
● (U) Software Development	4Q 94	3702
● (U) Log Demonstrations	3Q 94	2000
● (U) Training	2Q 95	4800
● (U) PPQT Pilot Training		
● (U) Force Development Test and Experimentation (FDTE) Maintenance Training		
● (U) Aviation Mission Planning Station (AMPS) Training		
● (U) Other	4Q 94	15635
● (U) Support Contract	4Q 94	2000
● (U) GFE	4Q 94	2500
● (U) In House Support	4Q 94	15870
● (U) **TOTAL**		**88143**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604816A**
PE Title: **Longbow**
Project Title: **Longbow - Apache**

Project Number: **DC31**
Budget Activity: **#5**

(U) FY 1995 Planned Program

● (U) Force Development Test and Experimentation	1Q 95	39987
● (U) Initial Operational Test and Evaluation (IOTE)	2Q 95	55990
● (U) Training	2Q 95	800
● (U) Other	2Q 95	2100
● (U) Support Contract	4Q 95	1000
● (U) GFE	2Q 95	1000
● (U) In House Support	4Q 95	4564
● (U) **TOTAL**		**105441**

(U) Planned Program to Completion

● (U) Functional Configuration Audit	2Q 96	3400
● (U) Computer Aided Logistics System	2Q 96	2300
● (U) Other	2Q 96	3157
● (U) In House	2Q 96	450
● (U) **TOTAL**		**9307**

D. (U) WORK PERFORMED BY: McDonnell Douglas Helicopter Company, Mesa, AZ

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** None.
2. **SCHEDULE CHANGES:** None.
3. **COST CHANGES:** FY1995 RDT&E funding was increased for training and risk reduction efforts.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604816A
PE Title: Longbow
Project Title: Longbow - Apache

Project Number: DC31
Budget Activity: #5

F. (U) PROGRAM DOCUMENTATION:

Advanced Attack Helicopter Mission Needs	09/90
Decision Coordinating Paper	09/90
Test and Evaluation Master Plan	04/91
Acquisition Decision Memorandum	12/90
Acquisition Plan	06/92

G. (U) RELATED ACTIVITIES: There is no unnecessary duplication of effort within the Army or the Department of Defense. However, science and technology programs have the potential to reduce development risk, improve operational capabilities and reduce weight for the Longbow Apache and any future Longbow Apache upgrades. The open systems architecture of Longbow Apache facilitates the continued insertion of advanced technologies as they mature and requirements for product improvements become more defined. Examples are color flat panel displays (active matrix liquid crystal), integrated fire and flight controls, sensors, digital mapping, cognitive decision aiding, and other rotorcraft pilot technologies which promote improvements in performance, reliability, and weight reduction. PE 0603003, Aviation Advanced Technology, provides funding for the Rotorcraft Pilot's Associate (RPA) program. RPA is premised on the fact that continuing improvements in cockpit automation, communications systems, and sensors have been and will continue to be applied to DoD/Army rotorcraft. RPA focuses squarely in the cognitive processing issue through the use of expert systems, artificial intelligence, data fusion, and advanced information processing technology. Longbow Apache computer and software life cycles include plans to integrate RPA technology. The RPA program contract awarded to McDonnell Douglas Helicopter Company, Mesa, AZ., including a major subcontract to IBM, Binghamton, NY., in June 1993 is addressing these key technology insertion areas.

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Aircraft Procurement, Army							
Apache Longbow (AA6607)	0	0	117588	275511	308100	356509	444211

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604816A**
PE Title: **Longbow**
Project Title: **Longbow - Apache**

Project Number: **DC31**
Budget Activity: **#5**

J. (U) TEST AND EVALUATION DATA:

Event	Dates
Completion of Preliminary Airworthiness Evaluation	2Q 93
BIT Demonstrations	2Q 94
Log Demonstrations	2Q 94
Technical Test	4Q 94
FDTE	1Q 95
IOTE	2Q 95

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604816A
PE Title: Longbow
Project Title: LBA Operational Test

Project Number: D2DT
Budget Activity: #5

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D2DT LBA Operational Test	0	0	24157	0	0	0	0	0	24157

B. (U) BRIEF DESCRIPTION OF ELEMENT: Project D2DT finances the direct costs of planning and conducting operational testing and evaluation of the Longbow Apache system by the Operational Test and Evaluation Command (OPTEC). The Longbow Apache is an Acquisition Category (ACAT) I system with a dedicated Initial Operational Test and Evaluation (IOTE) in FY95 in support of a Milestone III production decision. Operational testing is conducted under conditions as close as possible to those encountered in actual combat with typical user troops trained to employ the system. OPTEC provides Army leadership with an independent test and evaluation of effectiveness and suitability of the system. ***Project D2DT is not a new start. It has been transferred from PE 0605712, Support of Operational Testing, Project D001, OPTEC Initial Operational Test and Evaluation.***

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:	**Complete**	**Cost**
(U) FY 1993 Accomplishments:		
● (U) Not Applicable		
(U) FY 1994 Planned Program:		
● (U) Not Applicable		
(U) FY 1995 Planned Program:		
● (U) Longbow Apache IOTE	4Q 95	24157

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604816A | **Project Number: D2DT**
PE Title: Longbow | **Budget Activity: #5**
Project Title: LBA Operational Test

D. (U) WORK PERFORMED BY: A majority of Project D2DT work is performed by Test and Evaluation Directorates of the Operational Test and Evaluation Command (OPTEC) from Alexandria, VA; Fort Hood, TX; Fort Bliss, TX; and by OPTEC's Test and Experimentation Center (TEC), Fort Hunter-Liggett, CA. All organizations are staffed by military and civilian government personnel. Contractors expected to perform work for this project include BDM International, Inc., McLean, VA; Test and Experimentation Services Company, Albuquerque, NM; Computer Science Corporation, San Diego, CA; and Planning Research Corporation/ORI Joint Venture, McLean, VA.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** Not applicable.
2. **SCHEDULE CHANGES:** Not applicable.
3. **COST CHANGES:** Costs were formerly included in PE 0605712, Project D001.

F. (U) PROGRAM DOCUMENTATION: Not applicable.

G. (U) RELATED ACTIVITIES: Project D2DT has been transferred from PE 0605712, Project D001. There is no unnecessary duplication of effort within the Army or DOD. The Army staff monitors all tests for materiel development and activities to avoid duplication of effort. The Deputy Director of Defense Research and Engineering (Test and Evaluation), and Director of Operational Test and Evaluation, Office of the Secretary of Defense, also review planned testing and development of support equipment to ensure integration of testing by the services and to avoid duplicative testing. High level staff management of resources for user testing is provided by the U.S. Army Test Schedule and Review Committee which is chaired by OPTEC. Unnecessary duplication of like items prevented by coordination with Project Manager, Instrumentation, Targets and Threat Simulators (PM-ITTS), the Operational Test and Evaluation Coordinating Council, review by the Army Test and Evaluation Committee and by coordination with the Test Scheduling and Review Committee.

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

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE: Not Applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604817A
PE Title: Combat Identification

Budget Activity: #5

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D356	Non-Cooperative Target Recognition-Electronic Support Measures (NCTR-ESM)								
	13507	20526	0	0	0	0	0	0	64618
D482	Ground Combat Identification (Ground CID)								
	9425	13624	13666	10002	10026	10063	10104	CONT	CONT
D494	Non-Cooperative Target Recognition-Hostile Aircraft Identification Equipment (NCTR-HAIDE)								
	585	0	0	0	0	0	0	0	38501
D495	Non-Cooperative Target Recognition-Non-Imaging Sensors(NCTR-NIS)								
	1	0	0	0	0	0	0	0	25058
PE TOTAL	23518	34150	13666	10002	10026	10063	10104		

B. (U) BRIEF DESCRIPTION OF ELEMENT: The ability of weapon systems to engage targets at longer ranges has advanced further than the capability to positively identify them. Hence, new weapons cannot be used at maximum range or high levels of fratricide may occur. This Program Element (PE) is directed toward design and development of signal processing techniques and equipment and system interfaces to provide four separate and distinct technology devices that help to resolve this battlefield uncertainty.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:

(U) Project D356 (NCTR-ESM): - The dynamic nature of Airland Battle requires that Army forces capitalize on the beyond visual identification range capabilities of Forward Area Air Defense (FAAD) weapons yet maintain freedom of maneuver by friendly aviation and air forces. Target Acquisition and Identification devices developed by this project will locate and identify targets at a range sufficient to permit maximum weapons range and preclude engagement of friendly aircraft (fratricide). Current development is for the Avenger weapon platform. This system currently does not have the capability to search and locate targets outside of the Forward Looking Infra Red (FLIR) field of view. NCTR-ESM passively identifies aircraft by recognizing their electronic emissions. The device passively collects, processes, and analyzes data for comparison to a signature library to identify the aircraft. The NCTR device will be physically and electronically integrated into the Avenger weapon (Model 1) and/or Ground Based Sensor (Model 2). The identification data will be displayed on the fire control display of the Avenger and provide real time target location and identification to the operator. However, due to program reprioritization within the Army, the Model 2 NCTR FY94 program funds have been diverted to the Ground Combat Identification Program (D482).

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604817A
PE Title: Combat Identification

Budget Activity: #5

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Completed development of NCTR-ESM (Avenger/Model 1)	4Q93	12162
• (U) Initiated integration of NCTR-ESM (Avenger/Model 1) units with host platform	1Q94	1345
Total		13507

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Complete integration of NCTR-ESM (Avenger/Model 1) units with host platform	1Q94	1700
• (U) Conduct NCTR-ESM (Avenger/Model 1) Pre-Production Qualification Test/Operational Assessment(PPQT/OA)	2Q94	2500
• (U) Complete Engineering, Manufacturing & Development (EMD) effort	2Q94	4856
• (U) Model 2 funds in D356 will be moved to Project D482	2Q94	11470
Total		20526

(U) FY 1995 Planned Program:
- (U) The US Marine Corps has budgeted funds to procure NCTR-ESM (AVENGER/Model 1) Systems beginning in FY 95.

(U) Project D494 (NCTR-HAIDE): - The hostile aircraft identification equipment (HAIDE) is a sensor with processing electronics mounted on and integrated into air-defense radars which provide passive, non-cooperative identification of friendly and threat aircraft. HAIDE was initially designed for use with the HAWK weapon system and had been modified to work with the Forward Area Air Defense (FAAD) Ground Based Sensor (GBS).

(U) FY 1993 Accomplishments:	Complete	Cost
• J) Completed integration with GBS (GBS/Model 2)	4Q93	64
• (U) Demonstrated system capability at Joint Air Defense Operation/Joint Engagement Zone exercise	4Q93	75
• (U) Completed Engineering Manufacturing Development (EMD) effort	4Q93	446
Total		585

(U) FY 1994 Planned Program:
- (U) No planned program.

(U) FY 1995 Planned Program:
- (U) No planned program.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604817A
PE Title: Combat Identification

Budget Activity: #5

(U) Project D495 (NCTR-NIS) - NCTR-NIS Engineering and Manufacturing Development (EMD) program was terminated by Letter In Process Review (IPR) on 14 July 1992, due to the cancellation of the host NLOS and ADATS platforms programs.

(U) FY 1993 Accomplishments:
- (U) Transferred funds to higher priority PEO IEW program.

(U) FY 1994 Planned Program:
- (U) No planned program.

(U) FY 1995 Planned Program:
- (U) No planned program.

(U) Work Performed By:
ESM: In-house work is managed by Program Director, NCTR at Fort Monmouth, NJ. Integration with air defense weapons and radars is coordinated with Program Executive Officer (PEO), Tactical Missiles at Redstone Arsenal, AL. Program oversight is through Project Manager, Combat Identification at Fort Monmouth, NJ and PEO, Intelligence and Electronic Warfare at Vint Hill Farms Station, Warrenton, VA. Technical assistance is provided by CECOM's Night Vision and Electronic Sensor Directorate at Fort Monmouth, NJ and MICOM's Research and Development Engineering Center at Huntsville, AL. Prime Contractor for NCTR-ESM is Magnavox Government and Industrial Electronics Company, Fort Wayne, IN.
HAIDE: Prime contractor for HAIDE II is Scope Electronics of Reston, VA. In-house work is managed by Program Director, NCTR at Fort Monmouth, NJ. Integration with air defense weapons and radars is coordinated with the Program Executive Officer (PEO), Tactical Missiles at Redstone Arsenal, AL. Program oversight is through Project Manager, Combat Identification at Fort Monmouth, NJ and PEO, Intelligence and Electronic Warfare (IEW) at Vint Hill Farms Station, Warrenton, VA. Technical assistance is provided by CECOM's Night Vision and Electronic Sensor Directorate at Fort Monmouth, NJ and MICOM's Research and Development Engineering Center at Huntsville, AL.

(U) Related Activities: PE #0603757A (Forward Area Air Defense (FAAD) System) relates to advanced development. There is no unnecessary duplication of effort within the Army or the Department of Defense.

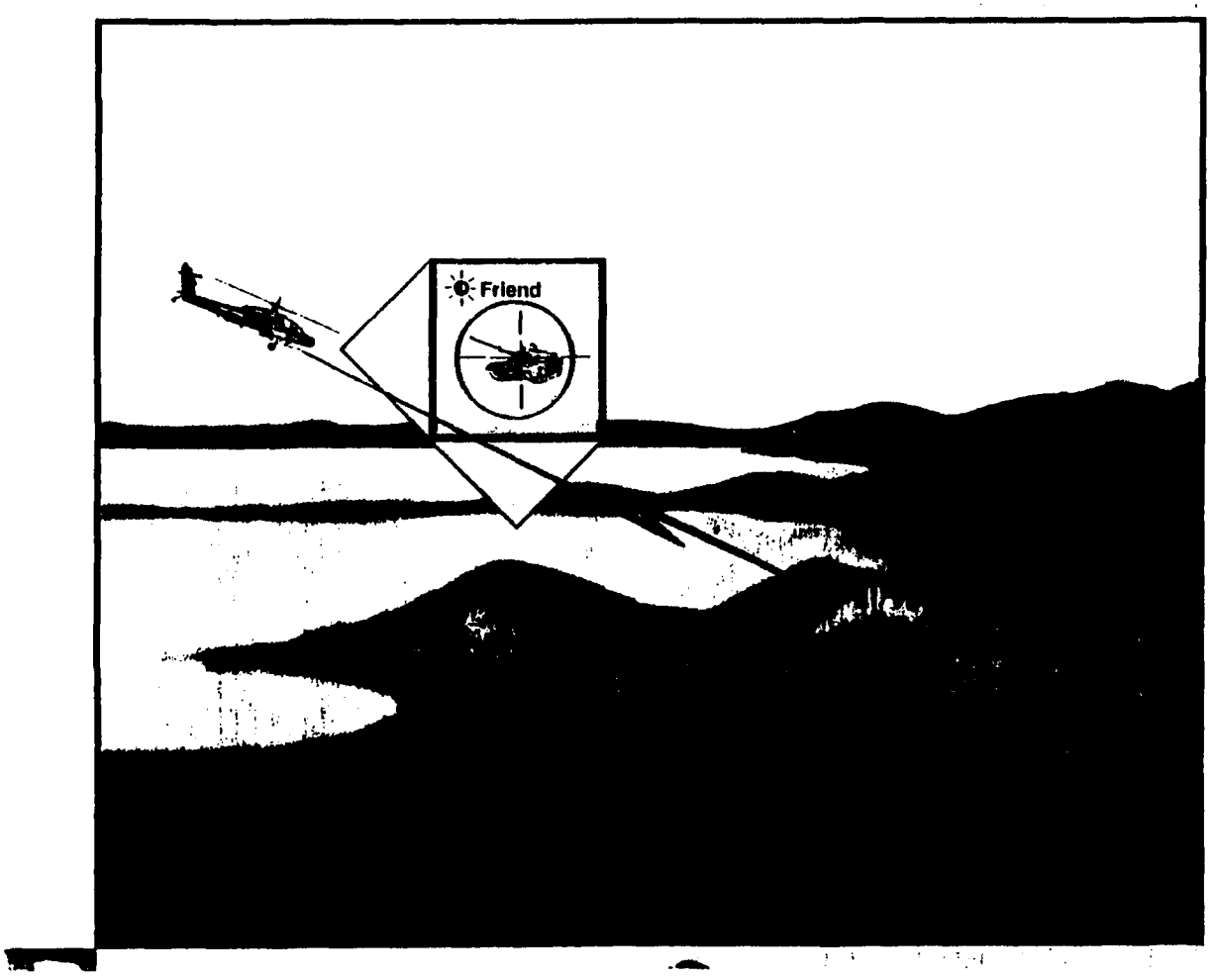
(U) Other Appropriation Funds: None.

(U) International Cooperative Agreements: None.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604817A
PE Title: Combat Identification
Project Title: Ground Combat Identification

Project Number: #D482
Budget Activity: #5



Popular Name: Battlefield Combat Identification System

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604817A
PE Title: Combat Identification
Project Title: Ground Combat Identification

Project Number: #D482
Budget Activity: #5

A. (U) SCHEDULE/BUDGET INFORMATION: ($ in Thousands)

SCHEDULE	FY1993	FY1994	FY1995	FY1996	FY1997	FY1998	FY1999	To Complete
Program Milestones	MS I/II 7/93							
Engineering Milestones		PDR 12/93 CDR 3/94						
T&E Milestones			PPQT LUT 4/95	PPQT 10/96				
Contract Milestones	EMD Award 8/93							
BUDGET ($000)	FY1993	FY1994	FY1995	FY1996	FY1997	FY1998	FY1999	Program Total (To Complete)
Major Contract	5400	9920	6246	5347	6276	5868	2804	40,861 Cont
Support Contract	1451	917	1620	1150	1700	1100	1000	8,938 Cont
In House Support	2574	2787	2800	1505	2050	1595	1648	14,959 Cont
GFE/Other	0	0	4000	2000	0	1500	4652	12,152 Cont
Total	9425	13624	13666	10002	10026	10063	10104	76,910 Cont

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604817A
PE Title: Combat Identification
Project Title: Ground Combat Identification

Project Number: #D482
Budget Activity: #5

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:

As a result of numerous fratricide incidents during Operation Desert Storm, Army leadership determined there was a critical need to develop initiatives that would minimize fratricide while maximizing combat effectiveness. Battlefield Combat Identification Systems (BCIS) will be used by Combat, Combat Support, and Combat Service Support units to positively identify friendly ground and air vehicles, in the ground to ground and air to ground engagement scenarios. BCIS will be capable of operating across the operational continuum. This includes war and operations short of war conflicts in various regions of the world. Threat forces will range from light infantry and insurgent forces to mechanized or armored formations with large amounts of artillery. The initial requirement is to equip ground and air vehicles in the Corps Contingency Force, with priority to those which operate forward of the Brigade Support Area.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

	Complete	Cost
(U) FY 1993 *Accomplishments:*		
• (U) Operation Requirements Document (ORD) Approved	3Q93	N/A
• (U) Milestone I/II ASARC Review Decision	4Q93	3025
• (U) Engineering and Manufacturing Development (EMD) Contract Award	4Q93	6400
Total		**9425**
(U) FY 1994 Planned Program:		
• (U) Conduct Preliminary Design Review (PDR)	1Q94	N/A
• (U) Conduct Critical Design Review (CDR)	2Q94	1500
• (U) Award Platform Integration Contracts	2Q94	5282
• (U) Conduct Dismounted Soldier/Fixed Wing/Training Studies	4Q94	500
• (U) Prototype Hardware Fabrication/Assembly/Test	4Q94	6342
• (U) Funds from NCTR (project D356) Complete EMD		
Total		**13624**
(U) FY 1995 Planned Program:		
• (U) Prototype Hardware Fab/Assy/Test	2Q95	3500
• (U) Complete Platform Integration	2Q95	5000
• (U) Conduct Pre-Production Qual/Limited User Test	3Q95	4000
• (U) Technical Data Package (TDP) Validation	4Q95	1166
Total		**13666**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604817A
PE Title: Combat Identification
Project Title: Ground Combat Identification

Project Number: #D482
Budget Activity: #5

D. (U) WORK PERFORMED BY: The Prime Contractor is TRW Inc., Redondo Beach, CA. In-house work is managed by the Product Manager, Battlefield Combat Identification System (PM BCIS), with program oversight by the Project Manager Combat Identification and the Program Executive Officer (PEO) Intelligence and Electronic Warfare at Vint Hill Farms Station. Integration with host platforms is coordinated with platform PMs. Technical assistance is provided by the CECOM Night Vision and Electronic Sensor Directorate at Ft. Monmouth, NJ.

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** None
2. **SCHEDULE CHANGES:** None
3. **COST CHANGES:** None

F. (U) PROGRAM DOCUMENTATION: Army Combat Identification Capstone O&O Plan, 15 Jan 91; Joint Mission Need Statement (MNS) for Combat Identification, Mar 92; Operational Requirements Document (ORD) for Battlefield Combat Identification System (BCIS), 14 Apr 93; Test and Evaluation Master Plan, Apr 93; Army Cost Position, 8 Jun 93; and Acquisition Decision Memorandum, 12 Jul 93.

G. (U) RELATED ACTIVITIES: There is no unnecessary duplication of effort within the Army or Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS: None

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable

J. (U) TEST AND EVALUATION DATA:

No test and evaluation data available prior to FY95 when PPQT-GT/LUT will occur.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604818A
PE Title: Army Tactical Command and Control (C2) Hardware and Software — Budget Activity: #5

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DC34 Army Tactical C2 Systems (ATCCS) Engineering	9356	11778	10472	10769	8960	8880	8790	Cont	Cont
DC36 C3I Interoperability Test Suite	0	1901	0	0	0	0	0	0	1901
D323 Common Hardware Software (CHS)	10094	8313	8824	8053	8031	7956	7872	Cont	Cont
PE TOTAL	19450	21992	19296	18822	16991	16836	16662		

B. (U) BRIEF DESCRIPTION OF ELEMENT: The umbrella program to exploit automation technology for the conduct of combat operations is the Army Tactical Command and Control System (ATCCS) program. The ATCCS program provides automation in the five battlefield functional areas (BFAs) with the following specific systems: (1) Maneuver Control System (MCS); (2) Advanced Field Artillery Tactical Data System (AFATDS); (3) All Source Analysis System (ASAS) for Intelligence/Electronic Warfare; (4) Forward Area Air Defense Command, Control and Intelligence System (FAADC2I); and (5) Combat Service Support Control System (CSSCS) and to other Army Joint and Allied Systems. To provide an overall technically sound, cost effective, and operationally responsive approach, the design and development of ATCCS must be accomplished on a total systems basis. The ATCCS Engineering program provides the required systems engineering to assure integrated Army tactical command and control, and the utilization of common hardware and software throughout the five ATCCS nodal systems. The Command, Control, Communications and Intelligence (C3I) interoperability test bed provides each system developer the capability to conduct system compatibility and interoperability evaluations with other systems without requiring the interfacing systems to be relocated. Each ATCCS life-cycle software engineering center throughout the country is connected via commercial leased lines to each of the other centers to test the interfaces prior to field testing.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604818A
PE Title: Army Tactical Command and Control (C2) Hardware and Software — Budget Activity: #5

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:

(U) Project DC36 - C3I Interoperability Test Suite. The ATCCS C3I Interoperability Test Suite is a collection of equipment and software that collectively represents BFA Central Systems (BFACS) in a pseudo-realistic command post setting. The Suite is linked to other compatible test, experimentation, validation, and demonstration sites (ATCCS Experimentation Site--AES; Total System, Tactical Validation--TSTV; Battle Laboratory--BCBL; Electronic Proving Ground--EPG, etc) via the Army Interoperability Network (AIN). The Suite provides a capability to do rapid prototyping, intra-Army and joint services compatibility and interoperability (C&I) evaluations, and certification of various message exchange implementations prior to live testing. Furthermore one may conduct rapid cost effective experiments and demonstrations on the ATCCS family of systems as hardware, software and concepts evolve. The activity supports early evaluation of emerging technology in the development of interoperable automated Command and Control (C2) systems, facilitates the smooth transition from the initial to the objective systems and supports evaluation of communication systems and hardware platforms integral to the ATCCS family of systems. This is not a new start, efforts are currently funded by the Operations Maintenance, Army (OMA) appropriation.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Not applicable.	N/A	0

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Experimentation in support of battlefield functional area (BFA) block/version developments, which include MCS , ASAS , CSSCS V3.3 & 4, FAADC2 V4 and AFATDS V1 & V2.	4Q94	450
• (U) Execute follow-on ATCCS logistics maintainability demonstration (LMD) with Standardized Integrated Command Post System (SICPS), common hardware software (CHS) lightweight computer unit (LCU)	1Q94	200
• (U) Execute ATCCS confidence demonstration to determine the operational and technical readiness of ATCCS to proceed to ATCCS III test and evaluation	3Q94	950
• (U) Experimentation in support of BFA developments, to include FAADC2 V4 (Heavy), CSSCS V4 and AFATDS V2	4Q94	165
• (U) Evaluate methods and implementation of common ATCCS support software (CASS) V2 into ATCCS and BFA's	2Q94	136
TOTAL		1901

(U) FY1995 Planned Program:	Complete	Cost
• (U) No planned program.	N/A	0

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604818A
PE Title: **Army Tactical Command and Control (C2) Hardware and Software** Budget Activity: #5

(U) Work Performed By: US Army Communications-Electronics Command (CECOM), FT Monmouth, NJ; US Army Test andEvaluation Command (TECOM), FT Huachuca, AZ; and Communications Electronics Board (C4B), FT Gordon, GA.

(U) Related Activities: Related program elements are as follows:
PE #0203740A (Maneuver Control System)
PE #0203726A (Advanced Field Artillery Tactical Data System)
PE #0603805A (CSSCS Evaluation & Analysis)
PE #0604741A (Air Defense C2I - Engineering Development)
PE #0604321A (ASAS)
There is no unnecessary duplication of effort with the Army or DoD.

(U) Other Appropriated Funds: Not Applicable

(U) International Cooperative Agreements: Not applicable

(U) Project D323 - Common Hardware Software (CHS). CHS is the Army's program to equip all five battlefield functional areas (BFAs), from Corps to foxhole, with common hardware software. The overall goal is to improve interoperability and lower life cycle costs by standardizing Battlefield Command and Control (C2) automation through centralized buys of non-developmental items, standardized protocol and reusable software. Four hardware versions are available to meet the specific needs of each BFA, i.e., hand-held, portable, transportable, and Lightweight Computer Unit (LCU).

(U) FY 1993 Program Accomplishments:	**Complete**	**Cost**
• (U) Executed the Common Hardware, Software Reuse and Standard Integrated Command Post System (SICPS) programs.	4Q93	8459
• (U) Delivered CHS-1/LCU to meet customers needs.	4Q93	500
• (U) Initiated Source Selection process for CHS-2.	4Q93	1135
TOTAL		10094

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604818A
PE Title: Army Tactical Command and Control (C2) Hardware and Software

Budget Activity: #5

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Continue to deliver CHS-1/LCU to meet customers needs.	4Q94	825
• (U) Continue to execute the Common Hardware, Software Reuse program and the SICPS program.	4Q94	6283
• (U) Complete Source Selection process for CHS-2.	4Q94	1105
• (U) Conduct testing on CHS-2 equipment.	4Q94	100
TOTAL		**8313**

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Deliver initial CHS-2 V3 units (customer funded).	3Q95	
• (U) Continue deliveries of CHS-1/LCU to meet customer needs.	4Q95	1000
• (U) Support BFA limited user and operational testing (BFA Software).	2Q95	449
• (U) Conduct CHS-2/SICPS Integration testing.	1Q95	450
• (U) Deliver SICPS, Rigid Wall Shelter (RWS)/M1068/5-Ton/Softtop production units.	1Q95	1190
• (U) Continue execution of the SICPS, Common Hardware, and Software Reuse programs.	4Q95	5735
TOTAL		**8824**

(U) Work Performed By: CHS-1 Contractor: MILTOPE Corporation, Melville, New York; LCU Contractor: Science Applications International Corporation (SAIC), San Diego, California. The in-house developing agency is Project Manager, Common Hardware Software (PM, CHS), Program Executive Office, Command and Control Systems (PEO, CCS), Fort Monmouth, New Jersey. Program support is provided by U.S. Army Communications-Electronics Command (CECOM) functional activities, MITRE Corporation, McLean, Virginia; Venntronix Corporation, Roslyn, New York; Logicon R&D Associates, Los Angeles, California; COMCON Incorporated, Morristown, New Jersey; TELOS Corporation, Santa Monica, California; and General Electric Company, Philadelphia, Pennsylvania provided PM support.

(U) Related Activities: Related program elements are:
PE #0203726A (Advanced Field Artillery Tactical Data System)
PE #0203740A (Maneuver Control System)
PE #0604321A (All Source Analysis System)
PE #0604741A (Air Defense Command, Control and Intelligence (C2I) - Engineering Development)
PE #0603805A (Combat Service Support Control System Evaluation and Analysis)
PE #0604640 (Advanced Command and Control Vehicle)

There is no unnecessary duplication of effort with the Army or DoD.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604818A
PE Title: Army Tactical Command and Control (C2) Hardware and Software

Budget Activity: #5

(U) Other Appropriation Funds: Not applicable

(U) International Cooperative Agreements: Not applicable

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604818A
PE Title: Army Tactical Command and Control (C2) Hardware and Software

Project Number: #DC34
Budget Activity: #5

A. (U) RESOURCES: ($ in Thousands)
Project Title: Army Tactical C2 Systems (ATCCS) Engineering

Popular Name	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
ATCCS Systems Engineering & Integration	9356	11778	10472	10769	8960	8880	8790	Cont	Cont

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The AirLand Battle doctrine requires military leaders to make sound and timely command and control decisions to direct the activities of assigned and supporting units. The umbrella program to exploit automation technology in support of this mission is the Army Tactical Command and Control System (ATCCS) Program. The effort to achieve horizontal integration of the ATCCS battlefield functional areas (BFA), although going on independently in each BFA, was not disciplined enough to address all connections and needs within the entire spectra of communications and control. Therefore, to ensure this horizontal integration effort is complete and automated, a significant management, systems engineering and integration effort is required. This project provides the technical and programmatic disciplines required for systems engineering and integration, experimentation acquisition management, testing, Ada software development interoperability, fielding, and sustainment to assure an interoperable, as well as affordable ATCCS. The Program Executive Officer Command and Control Systems (PEO CCS) has planned an evolutionary approach to fielding the ATCCS as soon as possible.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Initiated ATCCS compatibility demonstrations.	4Q93	800
• (U) Conducted/supported preliminary system configuration operational confidence demonstration and the first of two early user test and experimentation (EUTE I).	1Q94	1500
• (U) Updated ATCCS System specification and ATCCS cross functional interface specification	4Q93	1000
• (U) Integrated ATCCS BFA systems into common hardware software (CHS) in Standardized Integrated Command Post System (SICPS) shelters.	4Q93	4000
• (U) Provided ATCCS interoperability and system level engineering	4Q93	2056
TOTAL		9356

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604818A
PE Title: Army Tactical Command and Control (C2) Hardware and Software

Project Number: #DC34
Budget Activity: #5

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Prototype and demonstrate battalion and below command and control (B2C2) rapid prototype to meet identified B2C2 functions in support of National Training Center Rotation.	2Q94	1000
• (U) Conduct/support system configuration/operational demonstrations and system interface compatibility demonstrations in conjunction with ATCCS III.	4Q94	3700
• (U) Conduct technical Horizontal interoperability engineering and interoperability lab.	3Q94	2500
• (U) Update the command post analysis to finalize follow-on test and evaluation, ATCCS III, command post hardware layouts.	4Q94	1000
• (U) Provide ATCCS interoperability and system level engineering support.	1Q95	3000
• (U) Initiate a tech insertion program for ATCCS, e.g., voice recognition global positioning system (GPS), terrain evaluation, and weather tactical decision aids.	4Q94	578
TOTAL		11778

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Perform functional analysis and update Command Post analysis to allow FOTE/fieldings.	4Q95	1000
• (U) Establish an ATCCS data architecture and standardization program.	3Q95	800
• (U) Continue the tech insertion program, e.g., large screen display, plotters and advanced networking.	4Q95	500
• (U) ATCCS interoperability engineering and system level engineering support.	4Q95	3000
• (U) Produce and test voice recognition and GPS prototypes.	3Q95	700
• (U) Continue B2C2 applications, including Brigade/Battalion task force and Operation Plan/Operations Order, and refine communications interface.	2Q95	672
• (U) Conduct/support system configuration developmental/operational demonstrations in conjunction with ATCCS IV.	1Q96	3800
TOTAL		10472

D. (U) WORK PERFORMED BY: In house organization: Program Executive Officer for Command and Control Systems, Fort Monmouth, NJ. Contractor: Martin Marietta Corporation, Ft. Washington, PA.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604818A
PE Title: Army Tactical Command and Control (C2) Hardware and Software

Project Number: #DC34
Budget Activity: #5

E. (U) COMPARISON WITH FY 1994 DESCRIPTIVE SUMMARY:
NARRATIVE DESCRIPTION OF CHANGES:

1. (U) TECHNICAL CHANGES: None
2. (U) SCHEDULE CHANGES: None
3. (U) COST CHANGES: None

F. (U) PROGRAM DOCUMENTATION:

ATCCS Acquisition Plan: (AP)	8/88
ATCCS System Development Master Plan	1/90
Block A Specification Document	5/90
ATCCS TEMP (Update #1-Change #4)	10/93
ATCCS Objective System Specification (Draft 3)	7/94
ATCCS Objective System Specification (Final)	12/95

G. (U) RELATED ACTIVITIES: Related program elements are:
PE #0203726A (Advanced Field Artillery Tactical Data System)
PE #0203740A (Maneuver Control System)
PE #0604321A (All Source Analysis System)
PE #0604741A (Air Defense C2I-Engineering Development)
PE #0603805A (CSSCS Evaluation and Analysis)
PE #0604640 (Advanced Command and Control Vehicle)

There is no unnecessary duplication of effort within Army or DoD.

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

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604818A
PE Title: Army Tactical Command and Control (C2) Hardware and Software

Project Number: #DC34
Budget Activity: #5

J. (U) MILESTONE SCHEDULE:

Milestones	Dates
ATCCS System Engineering and Integration (SE&I) Contract Awarded	08/89
ATCCS Target System Baseline Definition Completion	01/91
ATCCS Target System Specification Completion	03/91
ATCCS SE&I Contractor Preliminary Target System Confidence Demonstration 1	07/92
ATCCS (Manual) Force Level Early User Test and Experimentation (EUT&E)	10/92
ATCCS SE&I Contractor Automated Target System Confidence Demonstration 2	08/93
ATCCS II Operational Test & Evaluation	10/93
ATCCS System Confidence Demonstration 3	04/94
ATCCS III Operational Test & Evaluation	07/94
ATCCS System Confidence Demonstration 4	05/95
ATCCS Operational Test & Evaluation IV	08/95
Finalize Objective ATCCS Specification	12/95
ATCCS System Confidence Demonstration 5	02/96
ATCCS V Operational Test & Evaluation	05/96
ATCCS System Confidence Demonstration 6	04/97
ATCCS VI Operational Test & Evaluation	06/97
Finalize design, development, test and fielding of Objective ATCCS	04/95-04/99

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604820A
PE Title: Radar Development

Budget Activity: #5

A. (U) RESOURCES: ($ in Thousands)

Project Number Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
Project DE10 (FAAD Ground Based Sensor)	17,613	17,934	5,981	0	0	0	0	0	136,794
Project D2IT (FAAD C³I Oper Test)			5,018	0	0	0	0	0	5,018
Total	17,613	17,934	10,999	0	0	0	0	0	141,812

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Forward Area Air Defense (FAAD) Ground Based Sensor (GBS) is the key air surveillance and target acquisition/tracking capability for Divisional and Corps FAAD weapons. The GBS consists of a radar-based sensor system with its prime mover/power, Identification Friend or Foe (IFF) and FAAD Command and Control Intelligence (C^2I) interfaces. The GBS is an advanced three dimensional battlefield air defense radar which contributes to the digital battlefield by automatically detecting, tracking, classifying, identifying, and reporting targets (rotary wing, unmanned aerial vehicles, cruise missiles, and fixed wing aircraft) to FAAD weapons and forward maneuver forces. Project D2IT is not a "new start". It has been reprogrammed from PE0605712, Support of Operational Testing, Project D001, OPTEC Initial Operational Test and Evaluation (IOTE).

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:

(U) Project D2IT: Project D2IT finances the direct costs of planning and conducting operational testing and evaluation of the Forward Area Air Defense Command, Control, Communications and Intelligence (FAAD C3I) system by the Operational Test and Evaluation Command (OPTEC). The FAAD C3I is an Acquisition Category (ACAT) I system with a dedicated Initial Operational Test and Evaluation (IOTE) in FY95 in support of a Milestone III full production decision. (In FY95, funding for operational testing of ACAT I Systems is programmed with the PE funding development for each system. Future fiscal years will be reprogrammed when system information becomes available.) Operational testing is conducted under conditions, as close as possible, to those encountered in actual combat with typical user troops trained to employ the system. OPTEC provides Army leadership with an independent test and evaluation of effectiveness and suitability of the system.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Not Applicable	N/A	0

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604820A
PE Title: Radar Development

Budget Activity: #5

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Not Applicable	N/A	0

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Conduct Ground Based Sensor/C³I Initial Operational Test and Evaluation	1Q FY 1995	1,100
• (U) Conduct delta test for HMMWV conversion	2Q FY 1995	1,200
• (U) Provide interim contractor support for test activities	2Q FY 1995	1,118
• (U) Conduct Electronic Countermeasures Test	2Q FY 1995	1,600
	Total	5,018

(U) **Work Performed By:** A majority of Project D2IT work is performed by Test and Evaluation Directorates of the Operational Test and Evaluation Command (OPTEC) from Alexandria, VA, and Fort Bliss, TX. All organizations are staffed by military and civilian government personnel. Contractors expected to perform work for this project include: Breuls Research Corporation, Thousand Oaks, CA; United International Engineering, Fort Bliss, TX.

(U) **Related Activities:**
Project D2IT is reprogrammed from PE 0605712A, Project D001. There is no unnecessary duplication of effort within the Army or DOD. The Army staff monitors all tests for materiel development and activities to avoid duplication of effort. The Director, Test and Evaluation, and Director of Operational Test and Evaluation, Office of the Secretary of Defense, also review planned testing and development of support equipment to ensure integration of testing by the services and to avoid duplicative testing. High-level staff management of resources for user testing is provided by the U.S. Army Test Schedule and Review Committee which is chaired by OPTEC. Unncecssesary duplication of like items is prevented by coordination with Program Manager, Instrumentation, Targets and Threat Simulators (PM-ITTS), the Operational Test and Evaluation Coordinating Council, review by the Army Test and Evaluation Coordinating Council, review by the Army Test and Evaluation Committee and by coordination with the Test Scheduling and Review Committee. There is no unnecessary duplication of effort within the Army or the Department of Defense.

(U) **International Cooperative Agreements:** Not Applicable

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604820A
PE Title: Radar Development
Project Title: FAAD Ground Based Sensor

Project Number: #DE10
Budget Activity: #5



POPULAR NAME: FAAD Ground Based Sensor

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604820A
PE Title: Radar Development
Project Title: FAAD Ground Based Sensor

Project Number: #DE10
Budget Activity: #5

A. (U) SCHEDULE/BUDGET INFORMATION: ($ In Thousands)

SCHEDULE	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	To Complete
Program Milestones		PEO IPR 3Q94	MS III (DAB) FSP (Pre-Prod) 3/95		FUE 4/97			
Engineering Milestones	Technical Review	Production Readiness Assessment						
T&E Milestones	BSFV SAFE AIR Demos	Development Test	IOTE 11/94					
Contract Milestones		Award LLI Contract Option 4/94	Award LRIP Contract 11/94 Option	Award 1st FSP Option (OPA)	Award 2nd FSP Option (OPA)	Award 3rd FSP Option (OPA)	Award 4th FSP Option (OPA)	
BUDGET ($000)	**FY 1993**	**FY 1994**	**FY 1995**	**FY 1996**	**FY 1997**	**FY 1998**	**FY 1999**	**Program Total (To Complete)**
Major Contract	13566	12306	4281					70219 (0)
Support Contract	378	447	500					9338 (0)
In-House Support	3669	5181	1200					57237 (0)
GFE/Other								0 (0)
Total	17613	17934	5981	0	0	0	0	136794 (0)

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604820A
PE Title: Radar Development
Project Title: FAAD Ground Based Sensor

Project Number: #DE10
Budget Activity: #5

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The Forward Area Air Defense (FAAD) Ground Based Sensor (GBS) is the key air surveillance and target acquisition/tracking capability for Divisional and Corps FAAD weapons. The GBS consists of a radar-based sensor system with its prime mover/power, Identification Friend or Foe (IFF) and FAAD Command and Control Intelligence (C^2I) interfaces. The GBS is an advanced three dimensional battlefield air defense radar which contributes to the digital battlefield by automatically detecting, tracking, classifying, identifying, and reporting targets (rotary wing, unmanned aerial vehicles, cruise missiles, and fixed wing aircraft) to FAAD weapons and forward maneuver forces. Targets can be hovering to fast moving, from nap of the earth to the maximum engagement altitude of FAAD weapons. Very accurate and quick reacting, GBS acquires targets sufficiently forward of the Forward Line of Own Troops (FLOT) to improve FAAD weapon reaction time and allow engagement at optimum ranges. GBS's integrated Identification Friend or Foe (IFF) prevents fratricide of Army Aviation and Air Force aircraft. Highly mobile and reliable, GBS's performance against Anti-Radiation Missile and Electronic Counter-Measures support Army Corps and Divisional Air Defenses across the full spectrum of conflict. GBS is a Non-Developmental Item, derived from Hughes Aircraft Company's FIREFINDER (TPQ-36) radar. A similar air defense variant is in service with Norwegian Air Force HAWK air defense units.

The GBS mission is to alert/cue AVENGER, the Bradley Stinger Fighting Vehicle (BSFV) and Man Portable Air Defense System (MANPADS) teams to hostile and unknown aircraft, protect friends from fratricide, and provide air situation data to command and control centers. FAAD GBS performs this mission by providing its air picture data directly to support fire units over Single Channel Ground Air Radio (SINCGARS)/Enhanced Position Location Reporting System (EPLRS) or through FAAD C^2I system. The FAAD GBS is the only planned Army air defense radar that has the range and accuracy, plus performance against Electronic Counter Measures and Anti-Radiation Missile, to perform this vital mission within current force structure, throughout the spectrum of conflict in support of light and heavy forces. The FAAD GBS has the ability to expand it's capability to keep current with evolving threat.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Continued development and fabrication of pre-production sensors	4Q93	12887
• (U) Developed a radar target generator and conducted engineering studies and analyses	4Q93	679
• (U) Updated baseline cost estimate, integrated logistics support plan, and developed preliminary draft equipment publication for GBS operator and maintainer	4Q93	378
• (U) Conducted production prove out tests to include demonstrations with Bradley Stinger Fighting Vehicle and participated in SAFE AIR Demonstration	4Q93	1350
• (U) Provided programmatic and technical support to insure adequate contractor performance, program planning and execution	4Q93	2319
TOTAL		17613

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604820A | **Project Number: #DE10**
PE Title: Radar Development | **Budget Activity: #5**
Project Title: FAAD Ground Based Sensor

	Complete	Cost
(U) FY 1994 Planned Program:		
• (U) Conduct Development Test I	1Q94	250
• (U) Conduct PEO in process review (IPR)	3Q94	
• (U) Conclusion of development and fabrication of six pre-production sensors and convert one pre-production Antenna Transceiver Group to the HMMWV configuration	4Q94	9957
• (U) Prepare and update documentation defined by DODI 5000.2 and conduct pre-milestone activities for Milestone III DAB review	4Q94	447
• (U) Continue system test to include logistics and maintainability demonstration, and developmental tests with FAAD C3I	4Q94	1415
• (U) Continue programmatic and technical support	4Q94	3558
• (U) Development of prime mover and power for HMMWV configuration	4Q94	1305
• (U) Conclude integrated logistics development and equipment publications for GBS 5-ton and HMMWV configuration	4Q94	1002
TOTAL		**17934**
(U) FY 1995 Planned Program:		
• (U) Conduct Milestone III DAB	2Q95	
• (U) Develop GBS Intermediate Maintenance Trainer	2Q95	4281
• (U) Prepare and update cost estimates, and perform engineering analysis	4Q95	500
• (U) Plan and conduct Pre-production First Unit Equipped (FUE)	3Q95	
• (U) Continue programmatic and technical support	4Q95	1200
TOTAL		**5981**

D. (U) WORK PERFORMED BY: In-House: FAAD Sensors Product Office, Redstone Arsenal, AL.; PEO Intelligence & Electronic Warfare, Vint Hill Farms, VA. assisted by the U.S. Army Communications-Electronics Command's (CECOM) Electronic Warfare/Reconnaissance Surveillance and Target Acquisition (EW/RSTA) Center, Fort Monmouth, NJ.; U.S. Army Missile Command (MICOM Research, Development and Engineering Center (RDEC), Redstone Arsenal, AL. Prime Contractor: Hughes Aircraft Company, Ground Systems Group, Fullerton, CA.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604820A
PE Title: Radar Development
Project Title: FAAD Ground Based Sensor

Project Number: #DE10
Budget Activity: #5

E. (U) COMPARISON WITH FY 1994 RDTE DESCRIPTIVE SUMMARY:

1. (U) **TECHNICAL CHANGES:** One GBS radar system which was to be delivered on a 5-ton truck, is now being converted to a more rapidly deployable HMMWV configuration. The HMMWV version will give the combat user greater mobility allowing the systems to be lifted by helicopter, and reducing employment and movement times.

2. (U) **SCHEDULE CHANGES:** Test schedule has been changed to allow for additional testing of the GBS radar in the HMMWV configuration. The HMMWV version will be delivered in time to participate in IOTE with FAAD C^{2}I. The changes made to the schedule will not delay production start.

3. (U) **COST CHANGES:** Procurement of a level II technical data package has been deferred until the production phase and a requirement for the GBS Radar Instrumentation Testbed (GRIT) has been delayed.

F. (U) PROGRAM DOCUMENTATION:

ROC 11/89, Revision #2
Acq Plan 2/90
BCE 7/92
TEMP 5/93
APB 5/93

G. (U) RELATED ACTIVITIES:

PE #0604741A (Air Defense Command, Control and Intelligence)
PE #0604817A (Non-Cooperative Target Recognition-Engineering Development)
There is no unnecessary duplication of effort within the Army or the Department of Defense.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604820A | **Project Number: #DE10**
PE Title: Radar Development | **Budget Activity: #5**
Project Title: FAAD Ground Based Sensor

H. (U) OTHER APPROPRIATION FUNDS:

($ In Thousands)

Appropriation	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Other Procurement Army-2								
SSN WK5053	0	0	7,900	64,316	74,653	78,116	87,864	18,531
(Quantity)				9	14	20	26	4
Spares BA9732					5,302	8,135	11,415	11,804

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: The GBS System (AN/MPQ-64) was approved 29 Oct 93 for Foreign Military Sales (FMS) by the Defense Security Assistance Agency. A Letter of Agreement between the U.S. and Turkey was signed on 20 Dec 93. The agreement calls for the sale of an Air Defense Early Warning System consisting of one GBS system, two Light and Special Division Interim Sensor (LSDIS), and support equipment/services to the Turkish Land Forces Command (TLFC). There is a potential FMS follow-on for an additional 13 GBS systems and 39 LSDIS systems in FY 95. The Norwegian Air Force procured, through direct sales, and deployed twenty-four (24) TPQ-36A radars (predecessor to the MPQ-64) for use with their HAWK missile systems and future NASAMS air defense system. Norway is seeking to upgrade their TPQ-36As to the GBS AN/MPQ-64 configuration. A potential FMS case for joint testing and procurement of GBS AN/MQP-64 upgrade is being discussed and pursued to begin in late FY 94.

J. (U) TEST AND EVALUATION DATA:

MILESTONES	MILESTONE DATES
Milestone II/IIIA Review (JRMB)	07/86
Request for Proposal (RFP) Issued	05/90
Seven Proposals Received	09/90
Evaluation Complete	12/91
Pre-Production Contract Award	02/92
Award LLI Option	04/94
Award LRIP Option	11/94
IOT&E Complete	12/94
Milestone III DAB-FSP	03/95
First Unit Equipped	04/97

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605103A
PE Title: RAND Arroyo Center

Budget Activity: #6

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D732 Arroyo Center Support	19111	15492	15838	15899	16043	16774	17036	Cont	Cont

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program funds the RAND Arroyo Center, the Department of the Army's Federally Funded Research and Development Center (FFRDC) for studies and analysis, which has operated at RAND since FY 1985. The Arroyo Center draws its researchers from RAND's staff of 590 professionals trained in a broad range of disciplines. About 90 percent of RAND's staff are located at the corporate headquarters in Santa Monica, California; the remainder are based at RAND's Washington D.C. office. The RAND Arroyo Center provides for continuing analytical research across a broad spectrum of issues and concerns, which are grouped in four major research areas: Strategy and Doctrine; Military Logistics; Manpower and Training; and Force Development and Technology. The RAND Arroyo Center research agenda is primarily focused on mid/long-term concerns. Results and analytical findings directly impact senior management deliberations on major issues. Arroyo Center research is sponsored by the Secretary of the Army, the Assistant Secretaries, the Chief of Staff and Vice Chief of the Army, the Deputy Chiefs of Staff of the Army, and most of the Army's major commands. The Arroyo Center is provided guidance from the Army through the Arroyo Center Policy Committee (ACPC), which is co-chaired by the Vice Chief of Staff of the Army and the Assistant Secretary of the Army (Research, Development, and Acquisition). The ACPC reviews, monitors, and approves the annual Arroyo Center research plan as well as all individual research projects. Each project requires General Officer (or SES equivalent) sponsorship and involvement on a continuing basis. RAND Arroyo provides the Army with a unique multi-disciplinary capability for independent analysis. Although the Arroyo Center staff work with analysts in the Army's internal study program, the Arroyo Center is an independent organization that provides analysis for both the Army and the broader national security community. Work in this program element is consistent with the resource constrained Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan, and Project Reliance.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605103A
PE Title: RAND Arroyo Center

Budget Activity: #6

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project D732 - Arroyo Center Support:

(U) FY 1993 Accomplishments*:	Complete	Cost
• (U) Research on strategic setting and framework addressed the Army's future role in multinational operations (including the assessment of likely circumstances of involvement, and required Army force adaptions) and examined the new strategic challenges for the U.S., U.S. Army in Europe, and the former Soviet Union (with particular emphasis on the role of European-based Army forces in out-of-area contingencies).	4Q93	3077
• (U) Research on equipping the Army included assessing advanced technologies and their potential military utility, and providing recommendations to the Army on how to improve its current investment strategy in the changing defense environment.	4Q93	3563
• (U) Research on the Army of the 21st Century included examining the Army's role in the nation's environmental challenge by inventorying the Army's existing operations, capabilities, and problems and developing policy options for Army approaches to implementing its environmental strategy	4Q93	3887
• (U) Research on training the Army included assisting in the improvement of the Army's analytic capabilities for assessing reserve component peacetime and post-mobilization training	4Q93	1620
• (U) Research on supporting the Army included development of an approach for managing Army logistics resources and processes (in terms of their effect on weapon system availability) and evaluating the Army's materiel distribution system and ways to improve its efficiencies	4Q93	5668
• (U) Research on personnel planning and new possibilities included monitoring and evaluating the effects of ongoing drawdown policies and developing new program options and strategies to respond to increasingly constrained resources	4Q93	1296
Total		19111

* Much of this research was completed in FY 1993. Some is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

(U) FY 1994 Planned Program*:	Complete	Cost
• (U) Research on addressing the external factors affecting the future Army, to include collective engagement operations, ethnic-nationalist conflict, and regional conflict case studies	4Q94	2633

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605103A
PE Title: RAND Arroyo Center

Budget Activity: #6

• (U) Research on Army restructuring and methods for becoming more efficient, to include reserve component peacetime and post-mobilization training, deployment risk assessments, rethinking the Army sustainment structure, and implications of missions other than war for active-reserve mix	4Q94	7126
• (U) Research on adapting Army institutions to a changing military and social context, to include personnel planning for reserve force readiness and Army culture in a time of great change	4Q94	1705
• (U) Research on using technology to better serve the Army's missions, to include National Training Center Research, dual-use technology, combat identification and fratricide, and logistics data requirements and quality	4Q94	2633
• (U) Research on interacting with the Army's agents of change, to include support for Battle Labs and Louisiana Maneuvers	4Q94	1395
Total		**15492**

* Much of this research will be completed by the end of FY 1994. Some is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

(U) FY 1995 Planned Program*:

	Complete	Cost
• (U) Continued research on external factors and the Army	4Q95	2693
• (U) Continued research on Army restructuring	4Q95	7285
• (U) Continued research on adapting Army institutions to change	4Q95	1742
• (U) Continued research on using technology to serve the Army	4Q95	2693
• (U) Continued research and analytic support for the Army's agents of change	4Q95	1425
Total		**15838**

* This presumes guidance from the Arroyo Center Policy Committee will be similar to that received for FY 1994. Adjustments in this senior Army leadership guidance on research directions for FY 1995 could alter specific research thrusts and allocation of resources. Much of this research will be completed by the end of FY 1995. Some is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

(U) Work Performed By: Work is primarily performed at the headquarters of the RAND Arroyo Center located in Santa Monica, CA, with the remaining work performed at RAND's Washington DC office.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605103A
PE Title: RAND Arroyo Center

Budget Activity: #6

(U) Related Activities: RAND Arroyo Center efforts span functional and organizational boundaries. As a result, the research conducted relates to a wide spectrum of Army activities. Research results are deposited with the Defense Technical Information Center for appropriate dissemination to other qualified recipients. RAND is a private, nonprofit institution with a long history of research on issues relating to the national security and public welfare of the United States. Three other FFRDCs are also housed at RAND, Project Air Force (PAF), The National Defense Research Institute (NDRI), and the Critical Technologies Institute (CTI). PAF conducts studies and analyses for the United States Air Force. NDRI conducts studies and analyses for the Office of the Secretary of Defense, the Joint Chiefs of Staff, and the defense agencies. CTI conducts studies and analysis for the Office of Science and Technology Policy. The RAND Arroyo Center interfaces with Project Air Force (PE #0605101F) and the National Defense Research Institute (PE #0605112D) on issues of a joint nature. There is no duplication of effort within the Army or the Department of Defense.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605104A
PE Title: LAMPF/LANSC

Budget Activity: #6

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DE48 Los Alamos Meson Physics Facility/Los Alamos Neutron Scattering Center (LAMPF/LANCE)	0	15000	0	0	o	0	0		

B. (U) BRIEF DESCRIPTION OF ELEMENT: The FY 1994 Joint Appropriation Conference Report provided $15,000,000 for an upgrade of LAMPF/LANCE and directed the Army "to transfer funds without delay to the Defense Nuclear Agency (DNA) for execution of this project upon the determination by the secretaries of Defense and Energy that the project will make a significant contribution to enhancing national security." This one-time increase was appropriated, but not authorized.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project DE48 - Los Alamos Meson Physics Facility/Los Alamos Neutron Scattering Center (LAMPF/LANCE):

(U) FY 1993 Accomplishments: Not funded in the Army RDT&E program.

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) *Transfer funds to DNA for execution upon authorization by Congress.*	4Q94	15000

(U) FY 1995 Planned Program: Not funded in the Army RDT&E program.

(U) Work Performed By: Defense Nuclear Agency.

(U) Related Activities: Not applicable.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0605301A**
PE Title: **Army Kwajalein Atoll**

Budget Activity: **#6**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
MAC2 Host Nation Compliance	4610	4773	5103	5851	3305	3179	3263	Cont	Cont t
D614 Army Kwajalein Atoll	176848	165099	162594	151367	158809	151464	146093	Cont	Cont
PE TOTAL	181458	169872	167697	157218	162114	154643	149356		

B. (U) BRIEF DESCRIPTION OF ELEMENT: U.S. Army Kwajalein Atoll (USAKA) is a remote (located in the Republic of the Marshall Islands), secure activity of the Major Range and Test Facility Base as constituted by DoD Directive 3200.11. Its function is to support test and evaluation of major Army and DoD missile systems, Army space surveillance and object identification, and National Aeronautics and Space Administration (NASA) scientific and space programs. Programs supported include Army missile defense, Ballistic Missile Defense Organization (BMDO) demonstration/validation tests, Air Force Intercontinental Ballistic Missile (ICBM) development and operational tests, U.S. Space Surveillance Network, and NASA Space Transportation System (Shuttle) and orbital debris experiments. USAKA supports the Missile Defense Act of 1991 to put in place a Ground Based Defense System by 2006 or earliest date possible. The technical element of USAKA is the Kwajalein Missile Range which consists of a number of sophisticated, one-of-a-kind, radar, optical, telemetry, command/control/communications, and data reduction systems. These systems include the four unique radars of the Kiernan Reentry Measurements Site (KREMS), super-RADOT long-range video tracking systems, high density data recorders for high data-rate telemetry, and sonobuoy missile impact location system data analysis and reduction hardware and software. USAKA is contractor operated and is therefore totally dependent upon its associated support contractors. Program also provides funds for the contractors to accomplish installation operation and maintenance. Program has been restructured to provide funding for environmental compliance and disposal of hazardous waste at USAKA to ensure compliance with existing environmental laws and regulations.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) **Project MAC2 - Host Nation Compliance - USAKA.** Resources for this program are used to fund legally mandated environmental compliance activities. Resources were transferred to this program from PE #0605856A (Environmental Compliance - RDT&E), to provide continued

funding of environmental compliance issues and disposal of hazardous waste at USAKA. This zero-sum realignment ensures compliance with host nation and U.S. environmental laws and regulations relegated under Section 161 of the Compact of Free Association.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Continued support of Logistic Engineering Contractor Environmental Compliance Oversight Program.	4Q93	527
• (U) Continued shipment of hazardous wastes to off-island disposal.	4Q93	250
• (U) Continued testing of materials to determine hazardous characteristics as required by regulation.	4Q93	90
• (U) Continued identification, removal, and off-island disposal of asbestos containing materials.	4Q93	150
• (U) Continued location, removal, and integrity testing of underground storage tanks.	4Q93	70
• (U) Maintained hazardous materials dispensing and staging areas to comply with regulations.	4Q93	50
• (U) Performed cleanup/removal/disposal of hazardous wastes from burn pits.	4Q93	400
• (U) Continued development of the Spill Contingency Plans to comply with Clean Water Act.	4Q93	10
• (U) Continued identification, removal, and off-island disposal of PCB dielectric fluids and equipment.	4Q93	200
• (U) Replaced PCB equipment.	4Q93	366
• (U) Continued training of USAKA environmental staff to maintain current knowledge of compliance regulations.	4Q93	36
• (U) Supported other agency travel in support of USAKA environmental standards development and implementation.	4Q93	63
• (U) Provided environmental awareness training for personnel to ensure understanding of compliance requirements.	4Q93	33
• (U) Continued Hazardous Waste Remedial Actions Program (HAZWRAP) investigations and environmental information management system development.	4Q93	2000
• (U) Continued potable water testing to ensure protection of public health and Safe Drinking Water Act compliance.	4Q93	125
• (U) Continued support of USASSDC Systems Engineering Technical Advisory Contractor (SETAC) assistance in environmental standards development and mitigation tracking.	4Q93	100
• (U) Support of USASSDC contractor efforts on USAKA Supplemental Environmental Impact Statement.	4Q93	140
Total		**4610**

(U) FY 1994 Plans:	Complete	Cost
• (U) Continue support of Logistic Engineering Contractor Environmental Compliance Oversight Program.	4Q94	600
• (U) Continue shipment of hazardous wastes to off-island disposal.	4Q94	200
• (U) Continue testing of materials to determine hazardous characteristics as required by regulation.	4Q94	90
• (U) Continue identification, removal, and off-island disposal of asbestos containing materials.	4Q94	125
• (U) Operate solid waste incinerators procured under the Productivity Capital Investment Program.	4Q94	200

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605301A
PE Title: Army Kwajalein Atoll — Budget Activity: #6

• (U) Continue integrity testing of underground storage tanks.	4Q94	30
• (U) Construct and upgrade hazardous materials dispensing and staging areas to comply with regulations.	4Q94	150
• (U) Complete cleanup/removal/disposal of hazardous wastes from Kwajalein landfill burn pits.	4Q94	350
• (U) Continue development of the Spill Contingency Plans to comply with Clean Water Act.	4Q94	50
• (U) Continue identification, removal, and off-island disposal of PCB dielectric fluids and equipment.	4Q94	150
• (U) Replace PCB equipment.	4Q94	150
• (U) Develop a compliant Ozone Depleting Chemical reduction program, including reclamation and disposition.	4Q94	239
• (U) Implement waste minimization program including life-cycle material considerations and product substitution.	4Q94	100
• (U) Develop a hazardous materials communication program to support prevention and response needs.	4Q94	70
• (U) Investigate technologies for effective reuse of contaminated (not hazardous) sandblast grit to reduce disposal cost.	4Q94	70
• (U) Continue training of USAKA environmental staff to maintain current knowledge of compliance regulations.	4Q94	40
• (U) Support other agency travel in support of USAKA environmental standards development and implementation.	4Q94	50
• (U) Provide environmental awareness training for personnel to ensure understanding of compliance requirements.	4Q94	35
• (U) Continue HAZWRAP investigations and environmental information management system development.	4Q94	1574
• (U) Water quality and wastewater discharge investigations to support applications for discharge permits/agreements.	4Q94	225
• (U) Inventory existing air emissions and perform baseline air quality modeling as required by Clean Air Act.	4Q94	50
• (U) Continue potable water testing to ensure protection of public health and Safe Drinking Water Act compliance.	4Q94	125
• (U) Continue support of USASSDC SETAC assistance in environmental standards development and mitigation tracking.	4Q94	100
Total		**4773**

(U) FY 1995 Plans:	Complete	Cost
• (U) Continue support of Logistic Engineering Contractor Environmental Compliance Oversight Program.	4Q95	700
• (U) Continue shipment of hazardous wastes to off-island disposal.	4Q95	200
• (U) Continue testing of materials to determine hazardous characteristics as required by regulation.	4Q95	100
• (U) Continue identification, removal, and off-island disposal of asbestos containing materials.	4Q95	125
• (U) Operate solid waste incinerators procured under the Productivity Capital Investment Program.	4Q95	250
• (U) Continue identification, removal, and off-island disposal of PCB dielectric fluids and equipment.	4Q95	1783
• (U) Continue training of USAKA environmental staff to maintain current knowledge of compliance regulations.	4Q95	60
• (U) Continue potable water testing to ensure protection of public health and Safe Drinking Water Act compliance.	4Q95	125
• (U) Perform periodic testing of wastewater discharges to establish compliance with Clean Water Act requirements.	4Q95	60

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605301A
PE Title: Army Kwajalein Atoll

Budget Activity: #6

• (U) Characterize and cleanup fuel and oil contamination.	4Q95	1500
• (U) Maintain hazardous materials dispensing and staging areas to comply with regulations.	4Q95	50
• (U) Continue ozone depleting chemical reduction program.	4Q95	75
• (U) Establish a program to replace Halon fire suppression systems.	4Q95	75
Total		**5103**

(U) Project D614 - Army Kwajalein Atoll. The Army, Air Force, Navy and BMDO have programs planned which have significant test and data gathering requirements at the USAKA. Air Force programs require firing at full range with complete data collection during late mid-course and terminal trajectory. BMDO programs require range sensors to collect technical data in support of programs being conducted at USAKA. These test data cannot be obtained except through the use of technical facilities available on and in the vicinity of USAKA. Data collection on objects in space remains significant because the Advanced Research Project Agency Long-Range Tracking and Instrumentation Radar (ALTAIR), located at USAKA, is one of only three sensors world-wide that has deep-space tracking capability.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Management support (salaries, training, travel, SSDC matrix support, etc.)	4Q93	10500
• (U) Accomplished $5.1 million of Backlog of Maintenance and Repair (BMAR) projects leaving a BMAR of $67.2 million. BMAR included completing renovations to hospital and upgrades to current accreditation standards.	4Q93	5100
• (U) Provided air and sea transportation (cargo to and from continental United States).	4Q93	9300
• (U) Procured petroleum, oil and lubricants (POL) and other mission/operating supplies.	4Q93	18600
• (U) Continued improvement and modernization of range facilities for most cost-effective testing and to support continuous update of range requirements and facilities. Completed new Kwajalein Missile Control Center and brought new systems on-line.	4Q93	5600
• (U) Continued to support strategic operational and developmental testing for all services: Air Force programs such as Peacekeeper, Minuteman III, and Delta; the Army's Ground Based Interceptor, Theater Missile Defense Countermeasure Mitigation Program, Strategic Target Systems (STARS), and Airborne Surveillance Testbed (AST) programs; NASA's Space Transportation System (STS) program; and the Air Force Space and Missile Center's associated operations. Also awarded the integrated range engineering contract and continued planning and support to PEO Missile Defense system integration testing.	4Q93	63200
• (U) Provide logistic support to self-contained islands of USAKA.	4Q93	59048
• (U) Encrypted all range radios and completed preliminary design efforts for a new USAKA electronic security system. Implemented a USAKA-wide Operation Security (OPSEC) program which will impact on range operations and tests conducted at USAKA. Completed Submarine Fiber-Optic Telecommunications System (SFOTS) installation.	4Q93	5500
Total		**176848**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605301A
PE Title: Army Kwajalein Atoll

Budget Activity: #6

(U) FY 1994 Plans:	Complete	Cost
• (U) Management support (salaries, training, travel, SSDC matrix support, etc.)	4Q94	11100
• (U) Accomplish BMAR projects (bachelor quarters, water catch/tanks, roofs, etc).	4Q94	13600
• (U) Procure POL and other mission/operating supplies.	4Q94	18500
• (U) Provide air and sea transportation (cargo to and from continental United States).	4Q94	9300
• (U) Continue improvement and modernization of non-major and sustaining range instrumentation and facilities.	4Q94	1900
• (U) Continue to support strategic operational and developmental testing for the Army and Air Force; conduct missile defense logistical system integration test using element surrogates; continue integration of USAKA technical contract efforts and implement findings of HQDA directed efficiency review.	4Q94	54300
• (U) Provide logistic support to self-contained islands of USAKA to include awarding new contract for USAKA logistical support.	4Q94	54699
• (U) Complete installation of USAKA electronic security system and support physical security upgrades to existing USAKA facilities.	4Q94	1700
Total		**165099**

(U) FY 1995 Plans:	Complete	Cost
• (U) Management support (salaries, training, travel, SSDC matrix support, etc.)	4Q95	11900
• (U) Accomplish BMAR projects (repair roofs, unaccompanied personnel housing).	4Q95	13000
• (U) Procure POL and other mission/operating supplies.	4Q95	20100
• (U) Provide air and sea transportation (cargo to and from continental United States).	4Q95	9600
• (U) Continue improvement and modernization of non-major and sustaining range instrumentation and facilities.	4Q95	1600
• (U) Continue to support Army, BMDO, NASA and Air Force developmental and operational missile testing. Complete integration of range technical support contract efforts.	4Q95	50900
• (U) Provide logistic support to self-contained islands of USAKA.	4Q95	53694
• (U) Continue support and physical security upgrades to existing USAKA facilities.	4Q95	1800
Total		**162594**

(U) <u>WORK PERFORMED BY:</u> USAKA is a subordinate command of the U.S. Army Space and Strategic Defense Command. Contractors are: Johnson Controls World Services, Cape Canaveral, FL; Lincoln Laboratory, Massachusetts Institute of Technology, Lexington, MA; Range Systems Engineering Company, Burlington, MA; Am Pro Protective Agency, Inc., Columbia, SC; and Aeromet Inc., Tulsa, OK.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0605301A**
PE Title: **Army Kwajalein Atoll** Budget Activity: **#6**

(U) **RELATED ACTIVITIES:** U.S. Army Kwajalein Atoll is essential to accomplishment of the Ballistic Missile Defense Organization Missile Defense program, the operational and developmental testing of deployed strategic ICBM systems such as Minuteman and Peacekeeper, and the USSPACECOM space surveillance mission. There is no unnecessary duplication of effort within the Army or the DoD.

(U) **OTHER APPROPRIATION FUNDS:** ($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
Military Construction, Army	0	21200	6400	38000	2568	26300	23100
Other Procurement, Army (BCE)	1250	450	0	0	0	0	0
Real Property Maintenance, Defense	1500	0	0	0	0	0	0
RDTE, Defense (GBI)	0	0	2000	4000	0	0	0
O&M, Defense	1343	0	0	0	0	0	0

(U) **INTERNATIONAL COOPERATIVE AGREEMENTS:** The use of land at USAKA is provided for in the Compact of Free Association between the U.S. Government and the Government of the Republic of the Marshall Islands (RMI). Specific issues are covered in the Status of Forces Agreement (SOFA) and the Military Use and Operating Rights Agreement (MUORA). USAKA provides no direct research, development, test and evaluation support to foreign governments. Services provided to the RMI by the test activities are of a community service nature and are reimbursable. Funding associated with the SOFA and MUORA are provided directly to the RMI government by U.S. Department of the Interior.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605601A
PE Title: Army Test Ranges and Facilities

BudgetActivity:#6

A. (U) RESOURCES: ($ in Thousands)

Project Number Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DE90 Yuma Proving Ground	19119	17077	20680	18424	26040	24971	25972	Cont	Cont
DE91 Combat Systems Test Activity	38238	36458	40387	36234	41983	36801	38315	Cont	Cont
DE92 Dugway Proving Ground	12728	13255	11532	12600	13706	9960	10342	Cont	Cont
DE93 White Sands Missile Range	54353	42578	65219	57065	60998	49882	51747	Cont	Cont
DE94 Army Electronic Proving Ground	9342	9785	0	0	0	0	0	Cont	Cont
D452 Cold Regions Test Center	3745	4285	0	0	0	0	0	Cont	Cont
D618 Aviation Technical Test Center	17165	17405	12279	12940	0	0	0	Cont	Cont
D630 TECOM Test Design and Evaluation	3157	3395	3259	3399	3560	3640	3754	Cont	Cont
D632 Redstone Technical Test Center	0	994	1064	1072	1099	1127	1157	Cont	Cont
TOTAL	157847	145232	154420	141734	147386	126381	131287		

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B. (U) BRIEF DESCRIPTION OF ELEMENT: Sustains a technical test capability for testing DoD materiel, weapons and weapon systems from concept through production within the acquisition cycle at five Major Range and Test Facility Bases (MRTFB): Yuma Proving Ground, AZ; Combat Systems Test Activity, Aberdeen Proving Ground, MD; Dugway Proving Ground, UT; White Sands Missile Range, NM; and Electronic Proving Ground, Ft. Huachuca, AZ. This PE also sustains a technical test capability at Aviation Technical Test Center, Ft. Rucker, AL; Redstone Technical Test Center, Redstone Arsenal, AL; and Cold Regions Test Center, Ft. Greely, AK; and a capability to perform test design and assessment functions. Technical test capabilities at each test range have been uniquely established, are in place to support test and evaluation requirements of funded weapons programs, and are required to assure technical performance adherence to safety requirements, reliability, logistics supportability, and quality of materiel in development and in production. Current testing capabilities are non-mission duplicative and represent baseline requirements to assure acceptable risk to the soldier as new technologies emerge into fielded weapon systems. As part of the DoD RELIANCE initiative, the Army (via this program) has committed at the highest senior service levels to be the lead agency for ground vehicles, gun munitions, surface-to-air missiles, nuclear effects and chemical/biological testing. This initiative is currently supported by the service Vice Chiefs in their role as the Test and Evaluation Board of Directors. This program element (PE) finances indirect test operating costs not billable to test customers, maintenance cost of test facilities, replacement of test equipment and test modernization projects to maintain current testing capabilities and improvements to safety, environmental protection and efficiency of test operations. This PE does not finance reimbursable costs directly identified to a user of these ranges; those direct costs are borne by materiel developers and project/product managers in accordance with DoD funding policies. To accomodate T&E consolidations within the Army, the following organizational realignments are planned: Electronic Proving Ground will be consolidated under White Sands Missile Range effective 1 Oct 94; Cold Regions Test Center will be consolidated under Yuma Proving Ground effective 1 Oct 94; Aviation Technical Test Center will be consolidated at Yuma Proving Ground effective 1 Oct 96; and Dugway Proving Ground will drawdown to a chemical/biological test facility with no general purpose capability effective 1 Oct 96. To accomplish these objectives and still conduct a viable T&E test capability requires that sufficient funding be available for personnel termination costs, one-time costs associated with consolidations, and essential modernization of test ranges and facilities.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project DE90 - Yuma Proving Ground (YPG), AZ. YPG is the DoD's primary artillery, air delivery and desert test range. Vast tracts of varied desert terrain provide testers with conditions found in the Middle East and other desert areas. YPG's mission is to plan, conduct, analyze, and report the results of development and other tests of aircraft armament, long-range artillery, air delivery, and mobility systems. Major facilities include an artillery firing range; Army's only tracking air-to-ground aircraft armament range with precision real-time instrumentation; the Army's only weapons accuracy range with actual targets for testing direct fire aircraft and tank weapons; an instrumented air delivery test area; and desert and dust mobility test areas. YPG is designated as the DoD primary test site for electromagnetic/electrothermal gun systems under Project Reliance. Under Reliance, YPG is also designated as primary site for conduct of indirect fire gun munitions and land vehicle testing. YPG is scheduled to

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assume the munitions production acceptance testing mission from Jefferson Proving Ground by FY 1995 under the Base Realignment and Closure Act (BRAC). Effective FY 1995, YPG will assume management of all environmental testing (desert, cold weather and tropic) with no change in physical locations (tropic testing will continue in Panama and cold weather testing in Alaska). Effective FY 1997, the Army plan is to consolidate aviation testing, currently managed by Aviation Technical Test Center (ATTC), Ft Rucker, AL, at YPG.

(U) FY 1993 Accomplishments:	Complete	Cost
■ (U) Approximately 350 tests were accomplished. Systems tested included: - Military tires - Advanced Field Artillery System (AFAS) - USAF C-17, Army Interface - RAH-66, COMANCHE Helicopter - U.S Marine Light Armored Vehicle (LAV) - Family of Medium Tactical Vehicles - Tactical Quiet Generators - BRADLEY Fighting Vehicle	4Q93	18149
■ (U) Range modernization projects include Gun Position 15 Safety Bunker, Runway/Taxiway Improvements and installation of under ground power to facilities.	4Q93	970
■ (U) Initiated transfer of Jefferson Proving Ground mission.		
Total		**19119**

(U) FY 1994 Plans:	Complete	Cost
■ (U) Approximately 325 tests will be accomplished. Some of the systems to be tested include: - Heavy Equipment Transportation System - M762/767 Artillery Electronic Fuze - Improved Recovery Vehicle - Advanced Air Drop System - BRADLEY Fighting Vehicle System - Advanced Field Artillery System (AFAS) - Field Artillery Resupply Vehicle (FARV-A)	4Q94	16287

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■ (U) Range modernization which includes upgrade of heliport complex.	4Q94	790
Total		17077

(U) FY 1995 Plans:	Complete	Cost
■ (U) Approximately 375 tests will be accomplished.	4Q95	14922

Some of the systems to be tested include:
- Generic SADARM
- AFAS
- Wide Area Mine (WAM)
- Countermine/Counterbarrier
- Soldier Enhancement Program
- BRADLEY Improvement Program
- Lightweight Arctic Refueling Systems
- LONGBOW-APACHE
- Modular Decontamination System

■ (U) Range modernization projects include Gun Position Instrumentation Power Upgrade, Test Vehicle Exhaust Ventilation Upgrade, and other test range safety improvements and upgrades.	4Q95	5758
Total		20680

(U) <u>Project DE91 - Combat Systems Test Activity (CSTA), Aberdeen Proving Ground, Maryland.</u> CSTA is DoD's designated lead agency for land vehicle testing and Congressionally mandated live fire testing. Under Project Reliance, CSTA is designated as primary test site for land vehicle and direct fire gun munitions testing. CSTA is responsible for conducting technical tests of weapons and weapon systems; munitions and components; survey and target acquisition equipment; combat, special, and general-purpose vehicle and ancillary automotive equipment; combat engineer equipment; and troop support equipment. CSTA is the DoD tester for vulnerability/lethality of Army systems. CSTA also has a capability for a radiation environment simulating the neutron and gamma output of a nuclear weapon using a fast-burst nuclear reactor, and prompt gamma pulse simulator and conducts nuclear radiation evaluations. This provides a key capability to replace underground nuclear tests. Major facilities include the Munson automotive test course, firing ranges addressing a wide variety of firing capabilities, cross-country automotive test sites, a radar tracking site facility, a unique robotic vehicle test facility, moving target simulation facility, live fire evasive target, armor/anti-armor depleted uranium containment facility (super box), the elevated rail threat launch facility, underwater explosive test facility (Navy support), and a number of special test laboratories.

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(U) FY 1993 Accomplishments:	Complete	Cost
■ (U) Approximately 680 tests were accomplished. Systems tested included: - M44A2 Truck - M1A2 ABRAMS Tank - Quiet Tactical Generators - M1A2 Live Fire Test - NBC Reconnaissance Vehicle - Heavy Equipment Transporter - Advanced Armor Designs	4Q93	35883
■ (U) Range modernization projects include: road test course repairs, correction of safety issues from building inspections, and correction of test site sedimentation and erosion problems.	4Q93	2355
■ (U) Closed small arms test facility at Fort Dix, N.J.		
Total		**38238**

(U) FY 1994 Plans:	Complete	Cost
■ (U) Approximately 630 tests will be accomplished. Some of the systems to be tested include: - Family of Medium Tactical Vehicles - Navy ship structures shock testing - Ground Combat Identification (CID) - Armored Gun System - Unmanned Ground Vehicle - Halon Substitutes for Auto Fire Extinguishing System - Generic Applique Armor for Bradley Fighting Vehicle System	4Q94	35192
■ (U) Improvements/repairs to road test course, correction of safety issues from building inspections, and correction of test site sedimentation and erosion problems.	4Q94	581
■ (U) Voluntary Early Retirement Authority/Voluntary Separation Incentive Program (VERA/VSIP) and/or reduction-in-force (RIF) costs associated with downsizing of TECOM's workforce.	4Q94	685
Total		**36458**

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(U) FY 1995 Plans:

	Complete	Cost
■ (U) Approximately 580 tests will be accomplished. Some of the systems to be tested include: - Armored Gun System - Armored Mortar System - M1A2 Upgrade Program - Armored Security Vehicle - Soldier Enhancement Program - Heavy Dry Support Bridge - Wide Area Mine	4Q95	33663
■ (U) VERA/VSIP and/or RIF costs associated with downsizing of TECOM's workforce.	4Q95	965
■ (U) Range modernization projects to be completed in FY 1995 include firing range improvements, renovations of X-Ray building and safety improvements and upgrades to test ranges and facilities.	4Q95	5759
Total		40387

(U) <u>Project DE92 - Dugway Proving Ground (DPG), UT.</u> DPG is the DoD designated primary test facility under Project Reliance for chemical/biological defense testing. Project provides for maintaining a capability for development, production, and product improvement test of chemical/biological defense systems and smoke munitions systems; battle field obscurant/smoke testing; and chemical warfare/chemical biological defense (CW/CBD) support for DoD agencies. Through FY 1994, tropical environmental testing is funded within this project. Effective FY 1995, the tropical testing mission in Panama will be funded within project DE90, YPG. Effective FY 1997, it is the Army plan to drawdown DPG to a chemical/biological test facility with no general purpose test capability.

(U) FY 1993 Accomplishments:

	Complete	Cost
■ (U) Approximately 280 tests were accomplished. Systems tested included: - NBC Reconnaissance Vehicle - Improved Chemical Agent Monitor - Remote Sensing Chemical Agent Alarm - Joint Chemical/Biological Point of Contact Program - Troop Safe Smoke - Cryofracture of Explosive Materials	4Q93	12728

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PE Title: **Army Test Ranges and Facilities** BudgetActivity:#6

- Chemical Warfare Treaty Verification
- Biological Integrated Detection System (BIDS)

(U) FY 1994 Plans:	Complete	Cost
■ (U) Approximately 260 tests will be accomplished.	4Q94	13255

Some of the systems to be tested include:
- Collective Protection Systems
- Joint Chemical Biological Point of Contact Program
- Contamination Avoidance Systems
- Chemical Warfare Treaty Verification
- Tank Crew Mask System

(U) FY 1995 Plans:	Complete	Cost
■ (U) Approximately 225 tests will be accomplished.	4Q95	11532

Some of the systems to be tested include:
- NBC Decontamination Systems
- Joint Chemical/Biological Point of Contact Program
- Cryofracture of Explosive & Hazardous Materials
- Chemical Warfare Treaty Verification
- Biological Integrated Detection System
- NBC Contamination Avoidance Systems

(U) Project DE93 - White Sands Missile Range (WSMR), NM. WSMR is the largest, all-purpose, overland test range within DoD. This project provides for testing of ballistic and guided missiles, air defense systems, and artillery missiles for all services. It is the DoD designated primary test facility for overland surface-to-air testing under Project Reliance. Launch complexes are integrated into a modern real-time data collection and data reduction processing system. Facilities include optical and calibration laboratories, inertial guidance test facilities, full spectrum nuclear effects facilities (i.e., radiation, thermal, blast, electromagnetic pulse), and a fully landlocked/secure test flight facility. WSMR is a primary test facility supporting nuclear effects testing under Project Reliance. Test capabilities include temperature, shock, vibration, and electromagnetic effects. WSMR facilities and services are extensively used by the Tri-Services, National Aeronautics and Space Administration, other government agencies, etc. In FY 1993, this project funded the Redstone Technical Test Center (RTTC). Effective FY 1994, RTTC is funded in this PE in Project D632. Effective FY 1995, it is the Army plan to consolidate management of Electronic Proving Ground under WSMR.

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	Complete	Cost
(U) FY 1993 Accomplishments:		
■ (U) Approximately 250 tests were accomplished at White Sands Missile Range.	4Q93	52538
Systems tested included:		
- Army Tactical Missile System (ATACMS)		
- Navy Standard Missile		
- Air Force Advanced Medium Range Air to Air Missile (AMRAAM)		
- STINGER/AVENGER		
- DC-X Single Stage Rocket		
- PATRIOT		
- Nuclear Hardness, ABRAMS and BRADLEY		
■ (U) Approximately 180 tests were accomplished at Redstone Technical Test Center (RTTC). (Effective FY 1994, funding for RTTC is transferred within this PE to Project D632.)	4Q93	1100
Systems tested included:		
- JAVELIN		
- Multiple Launch Rocket System (MLRS)		
- LONGBOW		
- TOW Ground		
- Brilliant Anti-Armor Submunition (BAT)		
- Unmanned Aerial Vehicle (UAV) Short Range		
- HYDRA-70		
- Ground Based Sensor		
■ (U) Range modernization projects include a study to determine a replacement for FREON and upgrade of environmental chemical laboratory to meet Environmental Protection Agency (EPA) standards.	4Q93	590
■ (U) Funded VERA/VSIP costs associated with downsizing of TECOM's workforce.	4Q93	125
Total		**54353**

	Complete	Cost
(U) FY 1994 Plans:		
■ (U) Approximately 225 tests will be accomplished.	4Q94	41988
Some of the systems to be tested included:		
- PATRIOT Product Improvements		
- DC-X Single Stage Rocket		

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- AVENGER/STINGER Product Improvements
- Line of Sight Anti-Tank (LOSAT) Demo
- Close Combat Non-Line-of-Sight Missile Demo
- Multiple Launch Rocket System (MLRS)
- Brilliant Anti-Armor Submunition (BAT)

■ (U) Range modernization projects include improvement/repair to Vibration and Temperature Test Facilities and establishment of EPA certified hazardous waste analysis capability. 4Q94 590

Total **42578**

(U) **FY 1995 Plans:**	**Complete**	**Cost**
■ (U) Approximately 365 tests will be accomplished. Some of the systems to be tested include:	4Q95	59460

- PATRIOT Product Improvements
- Forward Area Air Defense Command and Control
- AVENGER Product Improvements
- Extended Range Rocket (MLRS)
- Brilliant Anti-Armor Submunition (BAT)
- Tactical Electronic Surveillance System
- All Source Analysis System (ASAS)
- Army Joint Surveillance and Target Attack Radar System (JSTARS)

■ (U) Range modernization projects to be completed in FY 1995 include upgrade of fixed test facilities to comply with OSHA recommendations to correct ventilation, illumination and access deficiencies; upgrade of a major launch complex supporting Forward Area Air Defense (FAAD) C3I, Non-Cooperative Target Recognition (NCTR), and radar sensor testing; equipment purchases to upgrade data acquisition and reporting systems. 4Q95 5759

Total **65219**

(U) <u>Project DE94 - Army Electronic Proving Ground (EPG), Fort Huachuca, AZ.</u> EPG is unique within DoD because of it's electromagnetically "clean" environment, extensive real estate, low annual rainfall, and special facilities required to perform developmental testing for communications, command and control, optical/electro-optical, signal intelligence, and electronic warfare equipment and systems. EPG operates an electro-magnetic environmental test facility, an electronic countermeasures vulnerability test facility, an unmanned aerial vehicle test facility, antenna test facility, Electro-Magnetic Interference (EMI)/Electro-Magnetic Compatibility (EMC)/TEMPEST test facility, environmental test facility,

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a systems test facility, a systems interoperability and computer software testing facility, an electronic realistic battlefield environmental facility, communications test facility and an electro-optical systems test facility. The mission of creating, developing, and maintaining data bases for standard tactical deployment scenarios for electromagnetic capability and vulnerability analysis will be continued. Effective FY 1995, it is the Army plan to consolidate management of EPG under Project DE93, White Sands Missile Range.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
■ (U) Approximately 145 tests were accomplished. Systems tested included: - All Source Analysis System (ASAS) - Global Positioning System Receivers - GUARDRAIL - Enhanced Position Locating & Reporting System (EPLRS) - Army Tactical Command and Control System (ATCCS) - Unmanned Aerial Vehicle, Short Range - Joint Tactical Information Distribution System (JTIDS)	4Q93	9342

(U) FY 1994 Plans:	**Complete**	**Cost**
■ (U) Approximately 160 tests will be accomplished. Some of the systems to be tested include: - Unmanned Aerial Vehicle, Short, and Close Range - Army Tactical Command and Control System (ATCCS) - Global Positioning System (GPS) Receivers - Combat Service Support Control System - EPLRS Downsized Net Control Station - Automated COMSEC Management Engineering System (ACEMES) - Quick Erection Antenna Mast (QEAM) - Defense Communication System - Army JSTARS	4Q94	9507
■ (U) VERA/VSIP and/or RIF costs associated with downsizing TECOM workforce.	4Q94	278
Total		**9785**

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(U) FY 1995 Plans:

- **(U)** Tests conducted at the EPG site have been included as part of Project DE93 (WSMR) FY 1995 plans.

(U) Project D452 - Cold Regions Test Center (CRTC), Fort Greely, AK. CRTC is the only cold region environmental test center within DoD. This program includes developmental and production acceptance testing to determine the effects of extreme cold weather, wind, and snow on the performance of weapon systems and materiel in full operation and the man/materiel interface as well as the performance of extreme cold weather specific equipment. Effective FY 1995, it is the Army plan to consolidate the management of this mission under Project DE90, Yuma Proving Ground, AZ.

(U) FY 1993 Accomplishments:

	Complete	Cost
■ **(U)** Approximately 50 tests were accomplished.	4Q93	3745

Systems tested include:

- BRADLEY Fighting Vehicle System
- Chemical Agent Detector
- M1A1 ABRAMS Tank
- Standardized Integrated Command Post
- Marine Corps Cold Weather Glove
- Individual Body Armor Set
- Special Protective Eyewear
- Insulated Food Container

(U) FY 1994 Plans:

	Complete	Cost
■ **(U)** Approximately 50 tests will be accomplished.	4Q94	4285

Some of the systems to be tested include:

- Soldier Enhancement Program
- M1A1 ABRAMS Tank
- Family of Medium Tactical Vehicles
- BRADLEY Fighting Vehicle System
- NBC Reconnaissance Vehicle Systems
- Arctic Forward Area Refueling Equipment
- Arctic Fuel Supply System

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BudgetActivity:#6

- Navy Tow/Dragon Firing
- Remote Sensing Chemical Agent Alarm
- XM22 Automatic Chemical Agent Alarm

(U) FY 1995 Plans:

- **(U)** Tests conducted at the CRTC site have been included as part of Project DE90 (YPG) FY 1995 plans.

(U) Project D618 - Aviation Technical Test Center (ATTC), Fort Rucker, AL. (with a test directorate at Edwards AFB, CA). Provides a capability for developmental product, verification, and materiel change testing of Army aircraft, aircrew systems/subsystems and various items of related ground support equipment. Lead-the-fleet testing is conducted to develop reliability/maintainability data on new aircraft systems/subsystems in order to identify problems through testing before these problems are encountered in deployed systems. Provides foreign materiel exploitation testing for the Army and other services. Operates DoD's only helicopter icing spray capability and low speed, fixed wing cloud physics instrumented aircraft which provide for qualification of helicopters for flight under icing conditions. Effective FY 1997, it is the Army plan to consolidate this mission under Project DE90, Yuma Proving Ground, AZ.

(U) FY 1993 Accomplishments:

	Complete	Cost
■ **(U)** Approximately 140 tests were accomplished.	4Q93	17165

Systems tested include:
- Lead-the-Fleet
- Rotary Wing Aerial Targets
- KIOWA WARRIOR
- COMANCHE
- Ultra-Lightweight Camouflage Net System (ULCANS)
- GRISLEY HUNTER
- APACHE
- LONGBOW

(U) FY 1994 Plans:

	Complete	Cost
■ **(U)** Approximately 140 tests will be accomplished.	4Q94	17405

Some of the systems to be tested include:
- COMANCHE

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- LONGBOW
- APACHE
- Lead the Fleet
- 2nd Generation Forward Looking Infra-Red (FLIR)
- Aircraft Survivability Equipment (ASE)
- Aviation Life Support Equipment (ALSE)

(U) FY 1995 Planned Program:

	Complete	Cost
■ (U) Approximately 130 tests will be accomplished.	4Q95	12279

Some of the systems to be tested include:
- COMANCHE
- LONGBOW
- APACHE
- Lead the Fleet
- T-800 Engine
- Aircraft Avionics
- 2nd Generation FLIR
- Aircraft Survivability Equipment (ASE)

(U) Project D630 - TECOM Test Design and Evaluation. Provides for independent assessment of over 300 non-major systems. Encompasses design of developmental and initial production assessment plans, test design, and subsequent independent analysis and assessment reports in support of all acquisition milestones, to include recommendations for type classification and materiel release of non-major systems. Includes some 125-150 independent assessment plans and reports annually in the area of munitions, weapons, electronics, communications, electronic warfare training devices, automotive and engineer equipment, bridging, clothing and individual equipment and chemical detection, alarms and protection equipment.

(U) FY 1993 Accomplishments:

	Complete	Cost
■ (U) Completed 24 independent assessment plans and 104 independent assessment reports. Included were plans and reports addressing the following items:	4Q93	3157

Independent Assessment Plans:
- Tactical Quiet Generators
- Chemically and Biologically Protective Shelter

- Smoke Generators
- Nondevelopmental Biological Integrated Detectors
- Selectable Lightweight Attach Munitions IAP
- Mobile Automated Instrumentation System IAP
- High Speed Container Delivery System IAP
- Gun Laying and Positioning System IAP

Independent Assessment Reports:

- HAWK Mobility Enhancement IAR
- Multi-Spectral Close Combat Decoys IAR
- TRACKWOLF IAR
- Simplified Collective Protective Equipment
- Chemical Protective Clothing (SARATOGA)
- M916A1 Truck Tractor
- Multiple Threat Body Armor
- Field Artillery Ammunition Support Vehicle
- Combat Vehicle Crewman Increased Ballistic Helmet

(U) FY 1994 Plans:	Complete	Cost
■ (U) Continue test design and assessment program, addressing new developments, production, and material changes. Programmed items include:	4Q94	3395

- Army Integrated Thermal Targets
- Airborne Standoff Minefield Detection System
- Laser Detecting Set AN/AVR-2
- Advanced Threat Radar Jammer
- Aircraft Maintenance Vehicle (AMV)
- Close Combat Tactical Trainer (CCTT)
- Anti Tank Guided Missile (ATGM) Simulator, XM27
- Individual Microclimatic Cooling System
- Self-Contained Toxic Environmental Protection Outfit
- Advanced Battledress Overgarment
- Vapor Protective Flame Resistant Undergarment

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- Chemical Biological Hardened Deployable Medical System (DEPMEDS)
- Automatic Chemical Agent Alarm
- Remote Sensing Chemical Agent Alarm

(U) FY 1995 Plans:	Complete	Cost
■ (U) Continue test design and assessment program, addressing new developments, production, and material changes. Programmed items include:	4Q95	3259

- Radar Jammer System
- IEW Common Sensor
- IEW Tactical Proficiency Trainer
- Fire Support Combined Arms Tactical Trainer
- Advanced Aerial RADIAC System
- Enhanced TRACKWOLF
- Advanced Aircraft Boresight Equipment
- Special Forces Worldwide Base Communications System
- XM81 Millimeter Wave Screening Grenade
- Individual Soldier Enhanced Rations
- Heavy Dry Support Bridge
- Large Area Smoke Generator
- Advanced Wind and Dust Goggles
- Aircrew Anti-Exposure Suit
- Improved Toxic Agent Protection (TAP) Suit

(U) Project D632 - Redstone Technical Test Center (RTTC), Redstone Arsenal, AL. RTTC provides a capability for developmental materiel and technology verification, materiel change, production acceptance and long term reliability testing of missiles and missile components. Under the Defense Management Review Decision process, the mission of RTTC was transferred from U.S. Army Missile Command, Redstone Arsenal, AL to the U.S. Army Test and Evaluation Command. No funds were transferred. In FY 1992 and FY 1993 RTTC test accomplishments were funded and included under Project DE93, White Sands Missile Range. Effective FY 1994, program was restructured and funds transferred from project DE93 to project D632 for the RTTC efforts.

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(U) FY 1993 Accomplishments:

- (U) Function was funded under Project DE93.

(U) FY 1994 Plans:

Complete	Cost
4Q94	994

- (U) Approximately 160 tests will be accomplished.
  Some of the systems to be tested include:
  - JAVELIN
  - LONGBOW/HELLFIRE
  - STINGER Product Improvements
  - Line of Sight Anti-Tank (LOSAT)
  - Close Combat Non-Line of Sight Missile
  - BAT
  - UAV Short Range

(U) FY 1995 Plans:

Complete	Cost
4Q95	1064

- (U) Approximately 145 tests will be accomplished.
  Some of the systems to be tested include:
  - PATRIOT Product Improvements
  - STINGER Product Improvements
  - LONGBOW
  - TOW Product Improvement Program
  - JAVELIN

(U) WORK PERFORMED BY: In-house testing is performed largely by personnel assigned to facilities augmented by temporarily assigned military personnel. Support functions by DynCorp, Reston, VA. Other contractors include: Dynamic Science, Phoenix, AZ; Dynacorp, Albuquerque, NM; EC-III, Albuquerque, NM; Mandex, Vienna, VA; Kentron International, Dallas, TX; Old Dominion, Hampton, VA; AAI Corp, Baltimore, MD; Consultants & Designers, Baltimore, MD; Dynamic Sciences, Inc., Frederick, MD; Frederick Manufacturing, Frederick, MD; Vanguard Technologies, Aberdeen, MD; Andrulus Corp, Bethesda, MD; LEMSCO, Houston, TX; Dyncorp & ARC, Sierra Vista, AZ; COMARCO, Sierra Vista, AZ; Dyna Corp, McLean, VA; Dynaspan, Alamagordo, NM; PSL, Las Cruces, NM; TRW, Redondo Beach, CA; Lockheed Engineering and Sciences Company, Houston, TX; Westar, Albuquerque, NM; and Boeing Corp, Philadelphia, PA ; Cincinnati Business Information Systems, Fairfax, VA; VEDA, Inc, Lexington Park, MD and TERO TEK Intl, Delano, CA.

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(U) RELATED ACTIVITIES: The five TECOM ranges (Yuma Proving Ground, AZ; Aberdeen Proving Ground, MD; White Sands Missile Range, NM; Dugway Proving Ground, UT; and Electronic Proving Ground, Ft Huachuca, AZ) plus Kwajalein Atoll comprise the Army's contribution to the DoD Major Range and Test Facility Base. This DoD base also includes designated Air Force and Navy test facilities, all of which operate under a DoD uniform funding policy. Users of these facilities pay directly identifiable testing costs, and the host activities finance all other costs associated with maintaining a testing capability. The Office of the Secretary of Defense (OSD), Office of the Director Test and Evaluation reviews management of all DoD test facilities to avoid unnecessary duplication, to ensure that highest priority capabilities are established expeditiously and suitably maintained, to insure integration of testing by the services. This program is related to the activities of other Army test facilities, commodity commands, and other military service facilities, as well as the US Army Operational Test and Evaluation Command. Extensive coordination is conducted with other services to ensure no unnecessary duplication of effort. Related programs include:

PE #0605602A (Army Technical Test Instrumentation and Targets - RDT&E)
PE #0605702A (Meteorological Support to RDT&E Activities)
PE #0605876A (Minor Construction - RPM)
PE #0605878A (Maintenance & Repair - RPM)
PE #0605856A (Environmental Compliance - RDT&E)
PE #0605896A (Base Operations - RDT&E)
PE #0604759A (Major Test & Evaluation Investments)

(U) OTHER APPROPRIATION FUNDS: ($ in Thousands)

	FY 1993 Estimate	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate
MILITARY CONSTRUCTION ARMY:				
CSTA: Upgrade Vulnerability Range		4450		
DPG: Life Science Test Facility		16500		
Target Track Upgrade (BAT)		2900		

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0605602A**
PE Title: **Army Technical Test Instrumentation**

Budget Activity: **#6**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D453 Technical Test Instrumentation*	6050	0	4990	4018	4678	3131	3794	Cont	Cont
D628 Test Technology & Sustaining Instrumentation	23817	25508	36905	29257	27504	26208	27098	Cont	Cont
PE TOTAL	29867	25508	41895	33275	32182	29339	30892		

***Resources were realigned effective FY1994 from Project D453 to PE #0604759A, Project D984 - Major Test and Evaluation Investments (over $2 million per year or $10 million total acquisition cost). The funding reported in Project D453 for FY 1993 does not match the R-1, but represents the actual costs associated with the development of major technical test instrumentation not meeting the major test and evaluation investment criteria. The actual costs associated with the purchase of major test and evaluation investment for FY 1993 are reported in PE #0604759A, Project D984 for comparability.**

B. (U) BRIEF DESCRIPTION OF ELEMENT: Funds development, acquisition and sustainment of technical test instrumentation for the Army at the Major Ranges and Test Facility Bases (MRTFB) (Yuma Proving Ground [YPG], AZ; Dugway Proving Ground [DPG], UT; White Sands Missile Range [WSMR], NM; Electronic Proving Ground [EPG], AZ; and Combat Systems Test Activity [CSTA], Aberdeen Proving Ground [APG], MD); as well as the Aviation Technical Test Center (ATTC), AL; Redstone Technical Test Center (RTTC), AL; and Cold Regions Test Center (CRTC), AK; to support testing of advanced, high technology systems and weapons developments. Included are efforts to identify advanced test technology long-range requirements and their integration into Department of Defense (DoD) efforts; test methodology improvements, standardization, and international test procedures and methods; the development of specifications and prototype instrumentation not available on-the-shelf. FY 1995 investment is required to address Congressional mandates for tri-service standardization (such as time space positioning information, common airborne instrumentation, and combat vehicle survivability), to offset personnel downsizing requirements through automation and increased test efficiencies, and sustain critical Reliance lead functions through the outyears.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605602A
PE Title: Army Technical Test Instrumentation

Budget Activity: #6

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project D453 - Technical Test Instrumentation: This investment account project develops and acquires major test technology to perform developmental testing of weapon systems at eight US Army Test and Evaluation Command (TECOM) activities (five of which are elements of the DoD MRTFB). Major instrumentation is defined as that instrumentation with one or more of the following attributes: satisfies Army requirements, used by multiple commands, high risk, produces a new developmental testing capability or requires intensive management during acquisition.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Completed CSTA's main front direct fire test range under the Direct Fire Productivity Improvement (DFPI) project by procuring high speed photography, flash x-ray, and radar instrumentation for testing munitions up to 155 millimeters.	3Q93	1000
• (U) Completed phase III of the acquisition of Micro-Test Item Stimulator (TIS) project.	4Q93	500
• (U) Continued development of the Technical Control Center as part of the capability for system level Army Tactical Command and Control System (ATCCS) technical test project at EPG. Technical Control Center will automate test execution control and provide precise feedback of test operations for real-time analysis of test data. Project has been extended to accommodate changes in the overall ATCCS program.	3Q93	1400
• (U) Initiated Advanced Armor Instrumentation (AAI) project at CSTA. This project will provide the instrumentation required to test active armor and advanced materials used for combat vehicle protection systems.	3Q93	1000
• (U) Initiated the Millimeter Wave (MMW) Closed Loop Facility at RTTC. This project will provide the capability to fully simulate missile flight dynamics and evaluate target acquisition seeker and performance on "live" missiles.	4Q93	1000
• (U) Completed aerial cable three dimensional (3D) and quick look subprojects to augment and enhance the DoD Central Test and Evaluation Investment Program (CTEIP) project, aerial cable test capability (ACTC) at WSMR. ACTC will be completed in FY 1995. These subprojects provide a simulation of the aerial cable facility to allow optimum test execution and responsive data analysis.	4Q93	555
• (U) Conducted feasibility study for the final phase of the Combat Vehicle Measurement System (CVMS) project to determine transmission signal strength rolling terrain.	2Q93	50
• (U) Developed an enhanced on-board flight data recorder capability for the Enhanced Fiber Optic Guided Missile in support of the Rapid Fire Projection Initiative for the Hybrid Smart Weapons Data Acquisition System (H-SWEDAS).	3Q93	85
• (U) Initiated the probe development (hardware and software) for Transverse Electromagnetic Reverberation Chamber at EPG. This project will provide the capability to rapidly determine radio frequency susceptibility of an entire test item instead of spot measurements that current instrumentation performs.	4Q93	400

Program Element: #0605602A Budget Activity: #6
PE Title: Army Technical Test Instrumentation

• (U)	Prepared program documentation for the Test and Evaluation Range Internetting System (TERIS).	4Q93	60
	Total		**6050**

(U) FY 1994 Plans:

• (U) No technical test instrumentation projects were funded in FY 1994 because of severe budget constraints.

(U) FY 1995 Plans:		**Complete**	**Cost**
• (U)	Continue upgrade to ranges at CSTA under the DFPI project which entails acquiring instrumentation required to enhance scoring capability for combat vehicle fire control testing.	4Q95	1500
• (U)	Continue capability for system level ATCCS technical test project at EPG.	4Q95	500
• (U)	Continue AAI project at CSTA which is the acquisition and integration of on board data acquisition for high speed data recording of active and reactive armor performance.	4Q95	1380
• (U)	Initiate C3I Distributive Interactive Simulations (DIS) Instrumentation System. This program will instrument C3 systems, digitized battlefield systems and future computer driven systems. This provides for simulations and intra-test range computer models.	3Q95	1610
	Total		**4990**

(U) <u>Project D628 - Test Technology and Sustaining Instrumentation:</u> Test technology provides critical front end efforts for development of new test methodologies, test standards, advanced test technology concepts for long range requirements, future test capabilities, and advanced instrumentation prototypes. Current test capability initiatives include Electric Gun, Sense and Destroy Armor (SADARM) and Brilliant Anti-Armor Submunition (BAT). Sustaining instrumentation maintains existing technical testing capability at Army test facilities by providing funding for replacement of unreliable, uneconomical, and irreparable instrumentation, as well as incremental upgrades of instrumentation, to assure adequate test data for acquisition milestone decisions for projects such as Patriot, M1A2 Main Battle Tank, Army Advanced Field Artillery System (AFAS) and Javelin.

(U) FY 1993 Accomplishments:		**Complete**	**Cost**
• (U)	Maintained existing capability by replacement and limited upgrade of worn out, obsolete or unserviceable equipment/instrumentation at Army technical test ranges.	4Q93	7515
• (U)	Acquired computer for Command Control Communication & Intelligence (C3I) data base as an integral part of Electromagnetic Environmental Test Facility (EMETF) distributed client-server network, which provides faster response and enhanced reporting capability when testing systems such as: Intelligence Network (INNET); Southwest Asia 4.2 Scenario (SWA 4.2); Intelligence and		

		Electronic Warfare Common Sensor (IEWCS); Single Channel Ground/Airborne Radio System (SINCGARS); Mobile Subscriber Equipment (MSE) and Enhanced Position Location and Reporting System (EPLRS).	4Q93	550
•	(U)	Developed computer software for simulation and modeling of threat radio frequencies, maintained digital signal simulation capability for communications networks such as: SINCGARS; SWA 4.2 and Global Positioning System (GPS). Also replaced obsolete, maintenance intensive Electromagnetic Interference (EMI) receivers with an automated TEMPEST system which can be used for both EMI susceptibility and TEMPEST testing; FY 1993 applications included Portable Tech Control, Patriot missile, TROJAN, Chemical Agent Detection Network (CADNET), and the German Spurpanzer Fuchs vehicle variants.	4Q93	750
•	(U)	Refurbished maintenance intensive and out-of-tolerance climatic test chambers at YPG.	3Q93	283
•	(U)	Initiated real-time graphics improvements for simulation and modeling at YPG to improve test simulations.	4Q93	495
•	(U)	Acquired photo optics and high speed digital video cameras to enhance munitions testing at YPG.	4Q93	250
•	(U)	Developed photo optics and high speed digital video cameras/modernization and enhancement video data acquisition to improve capability to track high speed, high maneuverability, low visibility missiles/projectiles.	2Q93	825
•	(U)	Maintained instrumentation and developed methodologies for meteorological support for Army RDT&E.	4Q93	1037
•	(U)	Completed acquisition of Inertial Reference System required for airworthiness, weapons integration and flight safety testing of Army aircraft at ATTC.	4Q93	990
•	(U)	Acquired environmental monitors for nuclear effects testing at WSMR to comply with latest Environmental Protection Agency (EPA) regulations. Four year effort to end in FY 1996.	4Q93	702
•	(U)	Initiated refurbishment and modernization of cinetheodolite for small missile tracking capability at RTTC.	4Q93	385
•	(U)	Installed a local area network at CSTA to automatically monitor and control testing in climatic chambers at remote sites.	3Q93	300
•	(U)	Acquired armor test data acquisition equipment on combat vehicle survivability test ranges to support Congressionally mandated live-fire testing at CSTA.	4Q93	1275
•	(U)	Replaced obsolete, labor intensive, 20 year old film cameras at CSTA, greatly reducing set-up time and maintenance burden, and providing instant data feedback required for range safety.	4Q93	275
•	(U)	Expanded methodologies and test instrumentation development in support of hypervelocity projectiles from the electric gun; focused on application of simulation to testing such as Virtual Reality; strengthened linkage of technology base to next generation/future systems; and initiated supporting advance test technologies to include expanded electromagnetic environmental efforts, robotics, and directed energy test methods and capabilities.	4Q93	2010
•	(U)	Procured instrumentation and supporting equipment for security and safety on test ranges, and computer upgrades to include data recording and reduction instrumentation at ATTC, and instrumentation for chemical data acquisition at DPG.	4Q93	2665
•	(U)	Integrated instrumentation in vans to improve remote video tracking systems for missile flight data acquisition in the launch and terminal test areas at WSMR.	4Q93	131

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605602A
PE Title: Army Technical Test Instrumentation

Budget Activity: #6

• (U)	Acquired monolithic microwave integrated circuit (MMIC) failure analysis instrumentation for the Millimeter Wave Test Facility at RTTC.	4Q93	700
• (U)	Provides management and support cost.	4Q93	2679
	Total		23817

(U) **FY 1994 Plans:**		**Complete**	**Cost**
• (U)	Funds numerous low-dollar value (less than $75 thousand each) replacements and limited upgrades of worn-out, obsolete or unserviceable equipment/instrumentation at multiple test ranges. Planned instrumentation sustainment efforts will focus on maintaining test efficiency, economy and safety, while addressing mandated personnel reductions.	4Q94	3353
• (U)	Procure pulse waveform generators/amplifiers, antenna systems and associated hardware in support of EMI testing of electronics communications and countermeasure equipment, aircraft auxiliary electrical equipment and other C3I systems at EPG.	4Q94	400
• (U)	Replace obsolete or unmaintainable flight test cockpit indicators required for airworthiness and weapons integration testing of Army aircraft at ATTC.	2Q94	1220
• (U)	Refurbish vibration equipment to comply with new requirements of MIL-STD-810 at YPG and procure replacement environmental and metrology test equipment.	4Q94	758
• (U)	Continue development of real-time graphics improvements at YPG in order to provide enhanced resolution of simulated terrain features to test high cost target detection sensors in realistic 3D models, significantly reducing actual firing of weapons using the detectors.	2Q94	400
• (U)	Improve acoustic scoring techniques and instrumentation for projectile tracking and impact points and replace optics and electronic instrumentation at YPG.	4Q94	1315
• (U)	Continue improvement of simulation and modeling software at EPG. High priority requirement is the development of a capability to modify a C3I database to interact with other databases.	4Q94	785
• (U)	Maintain instrumentation and continue development of methodologies for meteorological support for Army RDT&E.	4Q94	325
• (U)	Continue acquisition of environmental monitors for Nuclear Effects testing at WSMR.	4Q94	500
• (U)	Continue modernization and enhancement of video data acquisition at WSMR.	2Q94	400
• (U)	Initiate two year effort to develop prototype for refurbishment of telemetry data acquisition at WSMR.	4Q94	750
• (U)	Sustain optical tracking systems and implement USAF Gulf Range Drone Control Upgrade System (GRDCUS) QF4 software into existing range system for control of the QF-4 drone at WSMR.	4Q94	934
• (U)	Continue refurbishment of small missile tracking capability, complete MMW seeker test equipment and procure data acquisition equipment at RTTC.	4Q94	685

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0605602A** Budget Activity: **#6**
PE Title: **Army Technical Test Instrumentation**

• (U)	Initiate multi-year effort for refurbishment and modernization of the backbone radar tracking capability, consisting of 12 AN/FPS-16 radars with an average age of 33 years, to support range safety and flight data requirements for missile testing at WSMR. Refurbishment/modernization cost is estimated at 1/15th the cost of replacing the radars. Project to be completed in FY 1999.	4Q94	2280
• (U)	Initiate acquisition of instrumentation for Subsystem Test and Simulation Facility at RTTC to provide test capability for subsystem and component testing of advanced missile systems to reduce requirements for system level testing and support R&D and production testing. Three year project ending in FY 1996.	4Q94	800
• (U)	Continue replacement of chemical/biological laboratory analysis instrumentation to sustain the Nuclear, Biological, Chemical (NBC) Defense mission at DPG.	4Q94	900
• (U)	Replace two worn-out instrumentation vans, customized to the poor roads and climatic extremes of central Alaska, to transport and shelter test instrumentation to remote sites at CRTC.	4Q94	400
• (U)	Continue installation of data acquisition equipment and sensors on the combat vehicle survivability test ranges and the live fire vulnerability ranges at CSTA to support highly complex Congressionally mandated live-fire testing.	4Q94	1025
• (U)	Acquire high-speed, multi-media data handling equipment at CSTA (interfacing to the Fiber Optic Network), automating test management and data flow processes to accommodate pending reductions in the workforce.	4Q94	1150
• (U)	Continue to develop test operations procedures (TOPs) and international test operations procedures (ITOP) to ensure quality and consistency of test results throughout Army and for international cooperative applications, develop prototype instrumentation and and perform advanced concept studies for development of new technologies.	4Q94	3716
• (U)	Initiate studies on test requirements for Advanced Field Artillery System (AFAS) at YPG to determine the type of instrumentation and test procedures needed.	4Q94	72
• (U)	Provide management and support cost.	4Q94	3340
	Total		**25508**

(U) FY 1995 Plans:		**Complete**	**Cost**
• (U)	Funds numerous low-dollar value (less than $75 thousand each) replacements and limited upgrades of worn-out, obsolete or unserviceable equipment/instrumentation at multiple test ranges.	4Q95	6395
• (U)	Continue modeling and simulation efforts at EPG, including development of computer models/simulation and man-in-the-loop hardware for testing state-of-the-art interoperability and vulnerability to hostile countermeasures in an electromagnetic realistic battlefield environment, and acquire scenario generation capability to enhance EPG's testing of tactical electronic message equipment. This effort will support Army Tactical Command and Control System (ATCCS), Mobile Automated Instrumentation Suite (MAIS), IEW Functional Area Model (IEWFMA), IEW Tactical Proficiency Trainer (IEWTPT), IEWCS, the National Training Center and C3I/Combat Model Integration. INNET/threat data, Blue Forces data, equipment characteristics data, spectrum management data,		

		civil emitter data and Defense Mapping Agency data are required in order to test the C3I system's ability to operate in it's intended operational environment.	4Q95	3506
•	(U)	Continue refurbishment at YPG of vibration equipment to new MIL-STD-810E requirements for simulated road vibration profiles for wheeled and tracked vehicles.	2Q95	1210
•	(U)	Complete acoustic scoring techniques and instrumentation at YPG for projectile tracking and impact points.	4Q95	510
•	(U)	Initiate follow on studies to enhance the application of simulation to testing at YPG.	4Q95	400
•	(U)	Replace obsolete aircraft instrumentation recorders at ATTC.	4Q95	1565
•	(U)	Continue acquisition of environmental monitors for nuclear effects testing at WSMR.	4Q95	698
•	(U)	Continue refurbishment of backbone radar tracking capability at WSMR. Project completed in FY 1999.	4Q95	3215
•	(U)	Complete prototype for refurbishment of telemetry at WSMR.	4Q95	1700
•	(U)	Initiate refurbishment of data acquisition capability required for small missile testing at RTTC.	2Q95	2000
•	(U)	Continue acquisition of instrumentation for Subsystem Test and Simulation Facility at RTTC.	4Q95	1150
•	(U)	Complete the Mission Control Center and Command, Control and Communications Network required for communications and personnel safety in the chemical surety, chemical chamber testing, defensive test chamber operations, and life sciences test facility operations at DPG.	4Q95	612
•	(U)	Acquire transient temperature measurement equipment with newly required 1 microsecond rise time, additional mobile flash x-ray equipment, and ammunition compartment survivability test instrumentation to address shortfalls in test instrumentation resulting from AFAS, and Advanced Technology Demonstration program Automotive Test Rig (ATR) and Composite Armored Vehicle (CAV) workloads coming to CSTA in FY 1995-1997.	4Q95	2085
•	(U)	Maintain instrumentation and develop methodologies for meteorological support for Army RDT&E.	4Q95	1930
•	(U)	Develop non-field perturbing sensors to measure energy distribution at targets for testing of high power microwave and other directed energy weapons.	4Q95	80
•	(U)	Develop ruggedized subminiature telemetry package to transmit, in real-time, flight dynamics data for hypervelocity projectiles fired form electromagnetic, electrothermal, and liquid propellant guns.	4Q95	78
•	(U)	Develop detailed design criteria for comprehensive multi-spectral sensor test facility, the Target Recognition Range.	2Q95	100
•	(U)	Develop test methodology and requirements/specifications for instrumentation to test combat vehicles with advanced embedded computing/electronics systems (Vehicle Electronics [VETRONICS]) such as the M1A2, Automatic Target Recognition (ATR), AF[illegible] and Component Advanced Technology Test Bed (CATTB) at CSTA.	4Q95	2105
•	(U)	Develop image enhancement algorithms and automated image processing techniques to provide precise flight dynamics data of missiles and projectiles at long ranges.	4Q95	2282

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605602A Budget Activity: **#6**
PE Title: Army Technical Test Instrumentation

•	(U)	Develop methodology and software tools to test systems containing advanced control/decision aids such as embedded neural nets and virtual reality.	4Q95	400
•	(U)	Continue methodology studies, research and development of instrumentation, development of TOPs and ITOPS to ensure quality and consistency of test results throughout Army and for International Cooperative Applications.	4Q95	1084
•	(U)	Provides for management and support cost.	4Q95	3800
		Total		**36905**

(U) WORK PERFORMED BY: ***Major contractors are:*** AACOM, Concord, CA; Applied Research Laboratory - University of Texas, Austin, TX; Astro-Med, West Warwich, RI; Atlantic Research Corp, Fort Huachuca, AZ; Best Power Tech, Necedah, WI; Data Pages, Dover NJ; Digital Equip Corp, Ridgecrest, CA; Dynacorp, Albuquerque, NM; Dynaspan, Las Cruces, NM; EON Instrumentation, Van Nuys, CA; Encore, Phoenix, AZ; Enderlyne Tech, Santee, CA; Environmental Research Institute of Michigan, Detroit, MI; Exide Electric Corp, White Sands, NM; Frederick Manufacturing Div, Frederick, MD; Hewlett Packard, Rockville, MD, Englewood, CA; Info Management Systems, Yuma, AZ; Lockheed, Los Angeles, CA; Logicon R&D Associates, White Sands, NM; Loral Data Systems, Lancaster, CA; Loral Instrumentation, San Diego, CA; Mallory Engineering, Inc., Salt Lake City, UT; Microdyne Corp, Livermore, CA; Odet Prec Time Div, Anaheim, CA; Physical Sciences Lab, New Mexico State Univ, Las Cruces, NM; Quadtron, Inc., Feasterville, PA; SCI Inc., Huntsville, AL; Science and Technology Corp, Hampton, VA; Sekai Electronics, Santa Fe, CA; Silicon Graphics Inc, Phoenix, AZ, Mountain View, CA; Smartstar Corp, Manhattan Beach, CA; Sperry Corporation, Reston, VA; TVI Corporation, Beltsville, MD; Unisys Corp, McLean, VA; V.I. Corp., Manhattan Beach, CA; GE Corp, Morristown, NJ; Westinghouse, Baltimore, MD; JET Propulsion Lab, Palo Alto, CA; National Institute of Standards and Technology, Boulder, CO; Bell Technical Operations, Inc., Ft. Walton Beach, FL; Ratheon Corp., Manchester, NJ; Honeywell, Inc., Defense Avionics Systems Division, Albuquerque, NM; and Beach Aircraft, Wichita, KS. ***Study contracts with***: Aircraft Armaments International Corp, Baltimore, MD; Colsa Inc., Huntsville, AL; Georgia Tech Research Institute, Atlanta, GA; Illinois Institute of Technology Research Center, Chicago, IL; Physical Science Lab, New Mexico State University, Las Cruces, NM; SRS Technologies, Huntsville, AL; AAI Corp, Baltimore, MD; AMTEC Inc., Huntsville, AL; and Atlantic Research Corporation, Sierra Vista, AZ.. ***In-house:*** Army Corps of Engineers, Fort Worth, TX; Sandia National Lab, Kirtland Air Force Base, NM; National Institute of Standard and Technology, Boulder, CO; US Army Test and Evaluation Command, APG, MD; Army Missile Command , Redstone Arsenal, AL; Army Combat Systems Test Activity, APG, MD; Army Yuma Proving Grounds, AZ; Army Dugway Proving Grounds, UT; Army White Sands Missile Range (WSMR), NM; Army Research Lab, WSMR, NM and APG, MD; Army Electronic Proving Grounds, Fort Huachuca, AZ; Army Cold Regions Test Center, Fort Greeley, AK; Army Aviation Technical Test Center, Fort Rucker, AL and Edwards Air Force Base, CA; Army Redstone Technical Test Center, Huntsville, AL; Foreign Science and Technology Center, Charlottesville, VA, and Project Manager for Instrumentation, Targets and Threat Simulators, Orlando, FL.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605602A
PE Title: Army Technical Test Instrumentation

Budget Activity: #6

(U) **RELATED ACTIVITIES:** Tri-services requirements are coordinated and duplication of effort is precluded through the DoD sponsored Reliance process. There is no unnecessary duplication of effort in the Army or DoD. This program is related to:

PE #0605601A Army Test Ranges and Facilities
PE #0604759A Major Test and Evaluation Investments - Army
PE #0604759F Major Test and Evaluation Investments - Air Force
PE #0604759N Major Test and Evaluation Investments - Navy
PE #0604940D DoD Central Test and Evaluation Investment Program

(U) **OTHER APPROPRIATION FUNDS:** Not applicable

(U) **INTERNATIONAL COOPERATIVE AGREEMENTS:** Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605604A
PE Title: Survivability/Lethality Analysis

Budget Activity #6

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DC10	Aviation System Survivability/Lethality/Vulnerability								
	5791	4172	4688	3949	3975	3924	3871	Cont	Cont
D089	Aircraft Certification *								
	3481	2831	3035	2991	2999	3009	3022	Cont	Cont
D181	*Antiradiation Missile Counter-Countermeasures*								
	1316	0	1078	960	942	935	931	Cont	Cont
D190	Integrated Analysis								
	6520	6353	6812	6320	6257	6146	6008	Cont	Cont
D234	Close Combat/Fire Support Survivability/Lethality								
	5370	6826	6981	6510	6629	6558	6491	Cont	Cont
D235	Missile Counter-Countermeasure Technology								
	929	667	680	671	673	675	602	Cont	Cont
D267	Air Defense/Missile Defense Survivability/Lethality								
	6667	6433	8082	7047	7093	7038	7327	Cont	Cont
D462	Technical Vulnerability Reduction								
	2659	0	0	0	0	0	0	0	84389
D626	C4I Survivability								
	5109	5713	6401	5826	5932	5866	5762	Cont	Cont
PE TOTAL	37842	32995	37757	34274	34500	34151	34014		

* FY 1993 and FY 1994 was executed as Project D067, changed to D089 effective FY 1995.

B. (U) BRIEF DESCRIPTION OF ELEMENT: Funds a critical portion of the Army's Survivability/Lethality Analysis Program. An objective is to determine the best means for coping with lethal weapons effects and countermeasures against a system/soldier. The goal is to assist the materiel developer in improving survivability of the system/soldier. The relative severity of all threats and hazards is gauged, and experimental information

is integrated to form a comprehensive prescription for a combat survivable system/soldier. Results are used to predict quantitative requirements for systems under combat conditions, to help the PM translate requirements into system technical specifications and features to develop investment strategies with substantial survivability payoff, and ensure that survivability performance issues are developed for testing. The objectives of this program are to: (1) develop and maintain necessary technology, facilities, and expertise to assess performance of Army systems against current and future threats; (2) conduct theoretical analyses, modeling, simulations, and field experiments to provide a survivability/lethality (S/L) data base; (3) perform actual survivability/lethality analysis to quantify system effectiveness in a realistic environment; and (4) review supporting operational requirements documentation, threat countermeasure (CM) performance, the level of counter-countermeasure/survivability (CCM/SURV) required when encountering threat countermeasures and lethal weapons; and provide technology support for signature measurement, and survivability/lethality/vulnerability (SLV). Activities in progress include assessment of the effects of lasers, high-power microwave, electro-optic/radio frequency (EO/RF) jammers, decoys, conventional ballistic and nuclear/biological/chemical (NBC) effects on Army systems, fuzes and classified programs. Other activities include providing advice and technical support to the material developer and combat developer to apply technology or tactics to mitigate the effects of threat attack on U.S. Army systems and thereby enhance Army system/soldier survivability on the battlefield. Provides technical data and information required for the independent evaluator and DA decision makers for milestone reviews.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) **Project DC10 - Aviation Systems Survivability/Lethality/Vulnerability (SLV).** Project investigates the SLV of Army aviation systems to the full spectrum of battlefield threats to include conventional ballistic, electronic warfare (EW), directed energy, and chemical, biological, and nuclear. Aircraft SLV deficiencies are identified and hardening fixes identified as appropriate. SLV analysis directly supports major decision milestone reviews, acquisition documentation, test and evaluation master plans, and cost/operational effectiveness analyses. Through FY 1995, provides assessment of acoustic technology which might be developed to exploit potential susceptibilities of helicopters. Also funds salaries, travel, equipment/facilities, and general management and administrative support needed to execute program.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Developed EW survivability analysis program for Army aviation systems including Comanche and Apache helicopters.	4Q93	1790
• (U) Developed ballistic vulnerability/lethality analysis program for Army aviation systems.	4Q93	1177
• (U) Expanded the integrated SLV analysis program to include the full spectrum of battlefield threats and address additional Army aviation systems.	4Q93	974
• (U) Conducted successful demonstration of long range acoustic tracking and identification system (as part of a joint U.S./Israeli field exercise) with potential application to helicopters.	4Q93	1850
Total		**5791**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605604A — Budget Activity #6
PE Title: Survivability/Lethality Analysis

(U) FY 1994 Plans:	Complete	Cost
• (U) Through laboratory simulations, computer modeling, and field experiments, conduct EW vulnerability analysis (EWVA) and provide EW support as part of the integrated SLV program for Comanche, Apache Longbow, Chinook helicopters, and Unmanned Aerial Vehicles (UAV).	4Q94	1203
• (U) Through laboratory simulations, computer modeling, and field experiments, conduct ballistic vulnerability investigations/analysis of Comanche, Apache Longbow, and Special Operations helicopters (MH-60K and MH-47E).	4Q94	1083
• (U) Conduct theoretical investigation of Comanche and Apache Longbow vulnerability to low level out-of-band RF countermeasures.	4Q94	200
• (U) Characterize optical/electro-optical devices and IR signatures of Comanche, Kiowa Warrior, Apache Longbow, and Chinook helicopters.	4Q94	200
• (U) Conduct computer modeling and simulation as part of EWVA for Apache Longbow, Comanche, and UAV.	4Q94	117
• (U) Assess advanced tracking and target identification algorithms using Army Research Laboratory (ARL) test bed for helicopter applications.	4Q94	1369
Total		**4172**

(U) FY 1995 Plans:	Complete	Cost
• (U) Through laboratory simulations, computer modeling, and field experiments, conduct EWVA and ballistic vulnerability investigations/analysis, and provide EW support for SLV of Army aviation systems such as Comanche, Apache Longbow, Chinook helicopters, and UAV.	4Q95	2433
• (U) Expand the survivability/lethality integrated analysis program to address improvements/modifications to all Army aviation systems across all battlefield threats.	4Q95	626
• (U) Support development and execution of live fire test and evaluation for Army aviation systems including Comanche and Special Operations (MH-60K and MH-47E) helicopters.	4Q95	416
• (U) Assessment of acoustic technology for use as low cost long range battlefield sensors for exploiting vulnerabilities of helicopters.	4Q95	1213
Total		**4688**

(U) **Project D089 - Aircraft Certification.** Project performs all engineering functions essential for certifying the airworthiness of assigned Army aircraft. Performs safety-of-flight investigations/assessments and issues messages to the field. Manages/executes the Army's Aeronautical Design Standards (ADS) Program. The ADS is a continuous evolving process incorporating revisions for each change to the standard design of an

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0605604A**
PE Title: **Survivability/Lethality Analysis**

Budget Activity **#6**

aircraft system. Manages airworthiness approval of new vendor qualification/testing on field aircraft and material changes, for all assigned Army aircraft systems. Provides airworthiness engineering support to the Aviation Program Executive Office and Aviation and Troop Command Program/Project/Product Manager requirements for major development/modification and any future systems/subsystems. Manages the test and evaluation process to support the airworthiness qualification of developmental and fielded aircraft systems.

(U) **FY 1993 Accomplishments:** (Executed in Project D067)	**Complete**	**Cost**
• (U) Managed/executed technical and airworthiness qualification mission for all assigned aircraft systems.	4Q93	765
• (U) Performed safety-of-flight investigation/assessments for all assigned aircraft systems.	4Q93	610
• (U) Managed/executed Army Aeronautical Design Standards program.	4Q93	152
• (U) Provided continuing engineering support for emerging technology upgrades to PEO Aviation force modernization aircraft systems.	4Q93	1526
• (U) Provided test management capability to PEO Aviation through in-house assets and contractor support.	4Q93	428
Total		**3481**

(U) **FY 1994 Plans:** (Executed in Project D067)	**Complete**	**Cost**
• (U) Manage/execute/technical and airworthiness qualification mission for PEO Aviation force modernization aircraft systems.	4Q94	613
• (U) Continue to ensure safety-of-flight investigations/assessments for PEO Aviation force modernization aircraft systems.	4Q94	491
• (U) Manage/execute the Army Aeronautical Design Standards program.	4Q94	123
• (U) Provide continuing engineering support for emerging technology upgrades to PEO Aviation.	4Q94	1226
• (U) Continue to provide test management capability for PEO Aviation program/project/product managers.	4Q94	378
Total		**2831**

(U) **FY 1995 Plans:**	**Complete**	**Cost**
• (U) Manage/execute technical and airworthiness qualification mission for PEO Aviation force modernization aircraft systems.	4Q95	668
• (U) Manage/execute the Army Aeronautical Design Standards Program.	4Q95	134

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PE Title: Survivability/Lethality Analysis

• (U) Continue to ensure safety-of-flight investigations/assessments for PEO Aviation force modernization aircraft systems.	4Q95	534
• (U) Provide continuing engineering support for emerging technology upgrades to PEO Aviation force modernization aircraft systems.	4Q95	1335
• (U) Continue to provide test management capability for PEO Aviation program/project/product managers.	4Q95	364
Total		**3035**

(U) **Project D181 - Antiradiation Missile Counter-Countermeasures (ARM-CCM).** The ARM-CCM project objectives are to understand the capabilities of threat ARMs and how they work. The project also provides simulation and hardware tools for both proposed and fielded ARM countermeasures as well as techniques and methodologies which support ARM-CCM investigations.

(U) **FY 1993 Accomplishments:**	**Complete**	**Cost**
• (U) Terminated the Advanced Flyable Generic Arm Seeker (AFGAS) program and the ARM-CCM survivability program under the Signals, Sensors, Signatures, and Information Processing (S3I) Directorate of ARL.	4Q93	453
• (U) Transitioned ARM-CCM survivability program to the Survivability/Lethality Analysis Directorate of ARL.	4Q93	863
Total		**1316**

(U) **FY 1994 Plans:**

- (U) Skip year, project unfunded FY 1994 only.

(U) **FY 1995 Plans:**	**Complete**	**Cost**
• (U) Conduct/coordinate EWVA of ARM threats to U.S. and Allied systems in support of the Army ARM Counter-Warfare Program.	4Q95	152
• (U) Provide simulation support to ARM-CCM projects.	4Q95	304
• (U) Provide survivability analysis of proposed and fielded ARM countermeasures.	4Q95	304
• (U) Develop hardware, tools, techniques, and methodologies to support ARM-CCM.	4Q95	318
Total		**1078**

(U) **Project D190 - Integrated Analysis.** This project provides supporting technology and data for the Army's integrated survivability analysis program to conduct survivability/lethality/vulnerability (SLV) analysis on Army systems and funds the investigation of the

Program Element: #0605604A
PE Title: Survivability/Lethality Analysis

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lethality/vulnerability of smart munitions to the full spectrum of battlefield threats. The analysis is integrated across all battlefield threats, i.e. conventional ballistic, electronic warfare, directed energy, nuclear weapons effects, and nuclear and chemical/biological contamination effects. This project supports development of the Army initiative to reduce systems' susceptibility to out-of-band radio frequency (RF) countermeasure effects. This project also includes the Army electronic warfare (EW) signature measurement program and the assessment of laser countermeasure (CM) effects on Army optical/electro-optical (O/EO) systems. This project also supports investigations of new technologies/methodologies required for SLV analyses. Also funds salaries, travel, equipment/facilities, and general management/administrative support needed to execute the program.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Established and managed the integrated survivability/lethality analysis program.	4Q93	1958
• (U) Conducted RF susceptibility investigations and High Power Microwave (HPM) investigations of Javelin, Wide Area Mine (WAM), and Hellfire Longbow Missile.	4Q93	2282
• (U) Provided data and conducted laser CM investigations to support EW CCM hardening of missile systems such as Javelin and Hellfire Longbow.	4Q93	1304
• (U) Conducted EO, IR, UV, and RF signature measurements to support Army development activities and foreign material exploitations.	4Q93	976
Total		6520

(U) FY 1994 Plans:

	Complete	Cost
• (U) Manage the U.S. Army survivability/lethality integrated analysis programs (Air Defense, Aviation Systems, C4I/IEW, Ground Systems, Munitions, and Integrated Soldier System) and participate in the ARL FOCUS programs, Battle Labs and Advanced Technology Demonstration (ATD) initiatives, and special projects for ARL, Army Materiel Command (AMC), and Headquarters, Department of the Army (HQDA).	4Q94	1855
• (U) Through laboratory simulations, computer modeling, and field experiments, conduct electronic warfare and ballistic survivability/vulnerability analysis of U.S. Army munitions systems that are in development, production, or undergoing product improvements. Examples of systems under investigation to support decision milestones are Javelin, Hellfire Longbow, and Wide Area Mine (WAM).	4Q94	2705
• (U) Exploit state-of-the-art computer science and graphics techniques to improve geometry processing and display of materiel systems for ballistics lethality analysis.	4Q94	661
• (U) Establish a computer virus laboratory and analyze security models in operating systems and the effects of malicious electronic attack on imbedded processors.	4Q94	302
• (U) Develop computer control codes, digital simulation models, and methods to increase power spectral density waveforms for EWVA programs.	4Q94	591

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Program Element: #0605604A
PE Title: Survivability/Lethality Analysis

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- (U) Conduct integrated survivability analysis in support of The Enhanced Integrated Soldier System (TEISS). 4Q94 239

Total **6353**

(U) FY 1995 Plans: **Complete** **Cost**

- (U) Manage the U.S. Army survivability/lethality integrated analysis programs (Air Defense, Aviation Systems, C4I/IEW, Ground Systems, Munitions, and Integrated Soldier System) for 38 systems under development or in improvement cycles and participate in the ARL FOCUS programs, Battle Labs and ATD initiatives, and special projects for ARL, AMC, and HQDA. 4Q95 1989
- (U) Through laboratory simulations, computer modeling, and field experiments, conduct the electronic warfare and ballistic survivability/lethality analysis portions of the integrated analysis process for U.S. Army smart munitions including Javelin, Hellfire Longbow, and WAM. 4Q95 3238
- (U) Investigate the effects of new/advanced threat technology on systems in the integrated analysis areas. 4Q95 1585

Total **6812**

(U) Project D234 - Close Combat/Fire Support Survivability/Lethality. Project investigates the survivability and vulnerability of Army ground combat systems to the full spectrum of battlefield threats; and the lethality of Army fire support munitions (smart and conventional). Analysis will support weapon requirements, test and evaluation master plans, cost/operational effectiveness analysis, and major decision milestones. Also funds salaries, travel, equipment, facilities, and general management/administrative support needed to execute the program.

(U) FY 1993 Accomplishments: **Complete** **Cost**

- (U) Established the Ground Combat and Fire Support survivability/lethality integrated analysis programs. 4Q93 1074
- (U) Conducted acoustic, seismic, IR, EO, special electromagnetic interference (SEMI), high power microwave (HPM), etc., susceptibility/lethality investigations/analysis for the Brilliant Antitank Submunition (BAT), Sense and Destroy Armor (SADARM), Advanced Field Artillery System /Field Artillery Resupply Vehicle (AFAS/FARV), Line-of-Sight Antitank (LOSAT) and Smart Target Activated Fire and Forget (STAFF) programs. 4Q93 1611
- (U) Provided upgrades to millimeter wave (MMW), acoustic, seismic, EO, and IR capabilities, improved ballistic vulnerability/lethality methodologies and enlarged data bases. 4Q93 806
- (U) Provided vulnerability/vulnerability reduction and lethality/lethality enhancement analyses to support AFAS/FARV, Armored Gun System (AGS), Armored Systems Modernization (ASM), and BAT. 4Q93 698
- (U) Provided live fire test and evaluation support for Paladin, SADARM, and BAT. 4Q93 644

- (U) Provided nuclear survivability/hardening and nuclear/biological/chemical survivability analysis for PMs and milestone decision reviews. 4Q93 537

Total **5370**

(U) FY 1994 Plans:	Complete	Cost
• (U) Through laboratory simulations, computer modeling, and field experiments, conduct ballistic survivability/lethality investigations/analysis of U.S. Army ground systems including the AFAS/FARV, AGS, Breacher, Bradley Fighting Vehicle System (BFVS), M1 Abrams Main Battle Tank, and M109 Howitzer systems.	4Q94	1785
• (U) Perform in depth comparison of the predictions of the Stochastic Quantitative Analysis of System Hierarchies (SQuASH) probablistic computer models for armored vehicles with the results of the live fire test and evaluations (LFT&E) programs.	4Q94	1137
• (U) Conduct EWVA of the U.S. Army ground systems to include AFAS/FARV and Breacher.	4Q94	1426
• (U) Conduct EWVA investigations on SADARM, STAFF, M829A2, BAT, LOSAT, Tube-Launched Optically-Tracked Wire-Guided Missile (TOW), ITAS, and Army Tactical Missile System (ATACMS) (APAM) munitions.	4Q94	1525
• (U) Provide signature measurements and computer modeling and simulation for EWVA of U.S. Army ground systems and smart munitions.	4Q94	953
Total		**6826**

(U) FY 1995 Plans:	Complete	Cost
• (U) Through laboratory simulations, computer modeling, and field experiments, conduct EWVA and ballistic survivability/lethality investigations/analysis of U.S. Army ground systems such as AFAS/FARV, AGS, Breacher, Bradley, M1 Abrams, and M109 Howitzer systems.	4Q95	3289
• (U) Conduct EWVA investigations on SADARM, STAFF, M829A2, BAT, LOSAT, TOW ITAS, and ATACMS (APAM) munitions.	4Q95	1556
• (U) Provide signature measurements and computer modeling and simulation for integrated survivability/lethality analyses of U.S. Army ground systems and smart munitions.	4Q95	2136
Total		**6981**

(U) **Project D235 - Missile Counter-Countermeasure Technology.** Supports program management offices by development of CM/CCM hardening techniques that missile systems use against laser, radio frequency (RF), and directed energy threats. Supports modeling to investigate vulnerabilities of systems to air defense systems. Supports investigations of missile signatures and exploitability. Investigates technology to harden

optical windows against lasers, RF, and directed energy threats. Also funds salaries, travel, equipment, and general management/ administrative support.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Continued research on surface dissipation coatings and evaluation of patterning techniques.	4Q93	308
• (U) Assessed missile system CM/CCM requirements for current/future system threats and conduct missile performance analysis in CM/CCM environment.	4Q93	310
• (U) Continued testing and analysis on missile systems and subcomponents for radar cross section (RCS), unintentional radiated emissions (URE), high power microwave (HPM), special electromagnetic interference (SEMI) effects in the context of CCM hardening.	4Q93	311
Total		**929**

(U) FY 1994 Plans:	Complete	Cost
• (U) Continue development of surface current dissipation coatings and selective surfaces patterning techniques for CCM applications.	4Q94	208
• (U) Begin testing and analysis of surface current dissipation coatings for hardening of missile systems.	4Q94	198
• (U) Continue testing and analysis on missile systems and subcomponents for RCS, URE, SEMI effects, and HPM in the context of weapon systems hardening.	4Q94	100
• (U) Continue to improve upon existing thin film materials for Army missile systems hardening.	4Q94	50
• (U) Continue to assess missile system CM/CCM requirements for current/future system threats and conduct missile performance studies and analysis in an EW environment.	4Q94	61
• (U) Develop one-on-one simulation for analysis of missile systems against known and projected threats.	4Q94	50
Total		**667**

(U) FY 1995 Plans:	Complete	Cost
• (U) Continue to improve/upgrade hardening techniques, investigate, and develop new technology advanced CCM applications.	4Q95	187
• (U) Continue to conduct test and analysis to determine the susceptibility characteristics of selected weapon systems to specific EW environments and to specify the appropriate CCM techniques and validate the CCM effectiveness.	4Q95	316

- (U) Verify and validate the one-on-one simulation with measured data to determine the region of validity.

	4Q95	177
Total		**680**

(U) Project D267 - Air Defense/Missile Defense Survivability/Lethality. Provides the survivability/lethality analysis of U.S. Army air defense and missile defense systems to the full spectrum of battlefield threats and recommends fixes to improve their battlefield survivability. The results are used by each Project Manager (PM) and the Program Executive Officer (PEO) to direct weapon system development efforts, structure product improvement programs by the user to develop doctrine and tactics, and by decision makers in formulating program/production decisions. Also funds salaries, travel, equipment/facilities, and management/administrative support needed to execute the program.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Established the Survivability/Lethality Analysis Program for U.S. Army air defense and missile defense systems.	4Q93	933
• (U) Provided EW environment generation, monitoring, and validation for missile firing programs and EWVA data base build.	4Q93	1200
• (U) Conducted theoretical studies, field experiments, and analysis of the PATRIOT PDB-4's multimode seeker, and radar/guidance enhancement improvements.	4Q93	1000
• (U) Performed theoretical analysis, field experiments, and validated the missile flight simulation model for Stinger-RMP Block I Mod V IRCCM upgrades.	4Q93	1333
• (U) Conducted EW susceptibility investigations of selected National Missile Defense/Theater Missile Defense (NMD/TMD) systems and Forward Area Air Defense (FAAD) systems.	4Q93	867
• (U) Provided EWVA conclusions and recommendations of the Corps Surface-to-Air (SAM) design concept needed to support a Milestone I decision.	4Q93	800
• (U) Investigated the nuclear survivability/hardening and nuclear and chemical/biological effects on air defense/missile defense systems.	4Q93	534
Total		**6667**

(U) FY 1994 Plans:	**Complete**	**Cost**
• (U) Through laboratory simulations, computer modeling, and field experiments, conduct EWVA of U.S. Army air defense systems including PATRIOT, Stinger-RMP, Avenger, Corps SAM, HAWK, Ground Based Sensor (GBS), and Multi-Role Survivable Radar (MRSR).	4Q94	2470

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0605604A** Budget Activity **#6**
PE Title: **Survivability/Lethality Analysis**

• (U) Conduct EWVA of U.S. Army missile defense systems including the Theater High Altitude Area Defense (THAAD) system, the Extended Range Intercepter (ERINT), and the Ground Based Radar (GBR).	4Q94	1263
• (U) Conduct ballistic susceptibility/vulnerability/lethality analysis of U.S. Army air defense/missile defense systems.	4Q94	638
• (U) Determine the physical relation and functional capabilities of aerospace systems with degraded states due to ballistic damage.	4Q94	1054
• (U) Provide EWVA modeling and simulation support, both hardware-in-the-loop and digital simulations, for U.S. Army air defense/missile defense systems.	4Q94	1008
Total		**6433**

(U) FY 1995 Plans:	**Complete**	**Cost**
• (U) Conduct EWVA of U.S. Army air defense systems including PATRIOT, Stinger-RMP, Avenger, Corps SAM, HAWK, GBS, and MRSR.	4Q95	3070
• (U) Conduct EWVA of U.S. Army missile defense systems including THAAD, ERINT, and GBR.	4Q95	1617
• (U) Conduct ballistic susceptibility/vulnerability/lethality analyses of U.S. Army air defense/missile defense systems.	4Q95	808
• (U) Provide EWVA and ballistic modeling and simulation support for survivability/vulnerability/lethality analysis of U.S. Army air defense/missile defense systems.	4Q95	2030
• (U) Develop necessary SLV analyses, methodologies, capabilities and techniques to ensure soldier survivability.	4Q95	557
Total		**8082**

(U) Project D462 - Technical Vulnerability Reduction. Project develops counter-countermeasure/survivability (CCM/SURV) annexes to Operation Requirements Documents (ORDs) to quantify threat countermeasure performance, and specify the level of CCM/SURV required of U.S. Army systems. Analyze system concepts and proof-of-principle prototypes to ensure new approaches adequately address deficiencies in survivability.

(U) FY 1993 Accomplishments	**Complete**	**Cost**
• (U) Completed plan for transition of work to Army Research Laboratory, Survivability/Lethality Analysis Directorate or other activities. Terminate or transition all tasks to other projects within this program element.	4Q93	2659

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0605604A** Budget Activity **#6**
PE Title: **Survivability/Lethality Analysis**

(U) FY 1994 Plans:
- **(U)** Project not funded.

(U) FY 1995 Plans:
- **(U)** Project not funded.

(U) Project D626 - C4I Survivability. Supports survivability analysis of Army communications and electronic equipment against the full spectrum of friendly and enemy threats. Provides field threat environment support for EWVA. Analyze vulnerabilities of foreign threat weapons and command, control, communications, computers and intelligence (C4I) and Intelligence Electronic Warfare (IEW) systems to U.S. Army EW systems. Provides threat weapon electronic design data to countermeasure developers and technical capability information to the intelligence community. Supports Army initiatives in vulnerability reduction of C4I/IEW systems against the full spectrum of battlefield threats. Also funds salaries, travel, equipment/facilities, and general management/administrative support needed to execute the program.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Established the integrated survivability/lethality analysis (SLA) program for U.S. Army communications and electronic equipment against the full spectrum of friendly and enemy threats.	4Q93	1022
• (U) Conducted the integrated SLA program for the Army Tactical Command and Control System (ATCCS) and the Maneuver Control System (MCS).	4Q93	1533
• (U) Performed Mobile Subscriber Equipment (MSE) network performance and nuclear effects analysis.	4Q93	1277
• (U) Performed survivability analysis of Combat Identification (CID) system.	4Q93	766
• (U) Expanded SLA program to include additional C4I/IEW systems such as Common Hardware/Software (CHS), Command Post Shelters, communications systems - Single Channel Ground and Airborne Radio System (SINCGARS), Single Channel Anti-Jam Man Portable (SCAMP) system, the Secure Mobile Anti-Jam Reliable Terminal (SMART-T) - Global Positioning System (GPS), and the Joint Surveillance and Target Attack Radar System (JSTARS).	4Q93	511
Total		**5109**

(U) FY 1994 Plans	**Complete**	**Cost**
• (U) Through laboratory simulations, computer modeling, and field experiments, perform EWVA and ballistics SLA on Army communications systems including SCAMP, SMART-T, MSE, and SINCGARS.	4Q94	1338
• (U) Through laboratory simulations, computer modeling, and field experiments, perform EWVA and ballistics SLA on Army IEW systems including JSTARS and Battlefield Combat Identification System (BCIS).	4Q94	1062

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0605604A** Budget Activity **#6**
PE Title: **Survivability/Lethality Analysis**

• (U) Conduct integrated SLA for ATCCS and all of its functional area systems.	4Q94	1389
• (U) Enhance techniques for and provide Special Electromagnetic Interference (SEMI) analysis of Army C4I systems.	4Q94	597
• (U) Enhance capabilities to measure target signatures and to perform EWVA of systems to RF countermeasures.	4Q94	1327
Total		**5713**

(U) FY 1995 Plans:	**Complete**	**Cost**
• (U) Conduct integrated SLA for the ATCCS and all its functional area systems and their improvements.	4Q95	2349
• (U) Perform EWVA and ballistics SLA on Army communications systems and their improvements.	4Q95	2260
• (U) Through laboratory simulations, computer modeling, and field experiments, perform EWVA and ballistics SLA on Army IEW systems such as BCIS, JSTARS, and enhanced Firefinder.	4Q95	1792
Total		**6401**

(U) **WORK PERFORMED BY:** In-house work performed by: Army Research Laboratory, U.S. Army Missile Command, Countermeasures/Counter-Countermeasures Center, Huntsville, AL; Aviation Research, Development, and Engineering Center, Aviation and Troop Command, St. Louis, MO. Supporting efforts are provided by: Air Force Avionics Laboratory, Wright-Patterson Air Force Base, OH; Chemical Biological Defense Agency, Aberdeen Proving Ground, MD; Advanced Research Projects Agency, Arlington, VA; Department of Energy, Albuquerque, NM; Foreign Intelligence Office, Adelphi, MD; Letterman Research Institute, San Francisco, CA; Los Alamos National Laboratory, Los Alamos, NM; Naval Weapons Center, China Lake, CA; Pacific Missile Test Center, Point Mugu, CA; Program Manager TRADE, Orlando, FL; Rome Air Development Center, Griffiss Air Force Base, NY; U.S. Army Aviation and Troop Command, Aviation Research, Development, and Engineering Center, St. Louis, MO; and Sandia National Laboratory, Albuquerque, NM. Major contractors are: ASI International, Aberdeen, MD; Battelle Northwest Laboratory, Hanford, WA; BDM Corp., McLean, VA, Huntsville, AL, and Albuquerque, NM; Computer Sciences Corp., Huntsville, AL; Defense Research Technologies, Inc., Rockville, MD; DRT, Rockville, MD; EMI Technologies, Inc., La Union, NM; Georgia Tech Research Institute, Atlanta, GA; Gleason Research Associates, Inc., Columbia, MD; GTE Sylvania, Mountain View, CA; IITRI, Chicago, IL, Dayton, OH, and Huntsville, AL; International Systems, McLean, VA; J.S. Lee Associates, Inc., Arlington, VA; LICA Systems, Arlington, VA; LORAL Systems Company, Orlando, FL; LTV Vought, Dallas, TX; Malibu Research, Santa Monica, CA; Management Assistance Corporation of America, El Paso, TX; Mitre Corporation, McLean, VA; Nichols Research Corporation, Las Cruces, NM and Huntsville, AL; Optometrics, Inc., Las Cruces, NM; Optometrics, Ann Arbor, MI; Orlon, Albuquerque, NM; Pacific Sierra Research Services, Inc., White Sands, NM; Penastar, Fort Worth, TX; Physical Science Laboratory, Las Cruces, NM; Prediction Systems Inc., Manasqua, NJ; Resource Engineering and

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Planning, El Paso, TX; RTA, Arlington, VA; Quantum Research International, Inc., Huntsville, AL; SAIC, Vienna, VA; Sanders Associates, Nashua, NH; SCS Telcom, Port Washington, NY; Sparta, Inc., Huntsville, AL; SRI International, Menlo Park, CA; ST Research, Newington, VA; Syndetix, Las Cruces, NM; System Planning Corp., Arlington, VA; Texas Medical Instruments, Schertz, TX; Tracor Flight Systems, Inc., Mojave, CA; TRW, McLean, VA; TRW Electromagnetic Systems Laboratories, Sunnyvale, CA; Vector Research, Ann Arbor, MI; Westar Corporation, Albuquerque, NM; and Wackenhut Advanced Technologies Corporation, Fairfax, VA.

(U) **RELATED ACTIVITIES:** There is no unnecessary duplication of effort within the Army or DoD. Related efforts include: Tri-Service Signature Working Group, Tri-Service ATR Working Group, EWVA Tri-Service Working Group, Tri-Service Joint Working Group on Electronic Warfare, Tri-Service Joint Technical Coordinating Group for Munitions Effectiveness, NATO Directed Energy Working Group, Laser Hardened Materials-Structures Group (OSD), Battlefield Laser Management Panel (JCG-C-E), and Tri-Service Joint Working Group on Antiradiation Missile Countermeasures. Other related programs include:

PE #0601102A (Defense Research Sciences)
PE #0602120A (Electronic Survivability and Fuzing Technology)
PE #0602303A (Missile Technology)
PE #0602618A (Ballistics Technology)
PE #0602624A (Weapons and Munitions Technology)
PE #0602709A (Night Vision Technology)
PE #0602782A (Command, Control, and Communications Technology)
PE #0603005A (Combat Vehicle and Automotive Advanced Technology)
PE #0603211F (Aerospace Structure)
PE #0603604A (Nuclear Munitions - Advanced Development)
PE #0603742A (Advanced Electronic Devices Development)
PE #0603745A (Tactical Electronic Support Systems - Advanced Development)
PE #0603789F (Command, Control, and Communications Advanced Development)
PE #0604270A (Electronic Warfare Development)

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

(U) **INTERNATIONAL COOPERATIVE AGREEMENTS:** Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605605A
PE Title: DoD High Energy Laser Systems Test Facility (HELSTF)

Budget Activity: #6

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DE97 DoD High Energy Laser Systems Test Facility (HELSTF)	26346	24808	0	0	0	0	0	0	362436

B. (U) BRIEF DESCRIPTION OF ELEMENT: HELSTF provides a unique high energy laser (HEL) RDTE capability at White Sands Missile Range, NM, to support DoD, other government agencies, and commercial HEL research, development, damage, vulnerability, and lethality testing. As the only megawatt class laser system in the U.S., this facility provides unique DoD capabilities for assessing laser weapons concepts and vulnerabilities of U.S. systems to laser weapons. The site is the only fully integrated high energy laser test facility in the world. The principal site components include the Navy's high energy Mid-Infrared Chemical Laser (MIRACL), several lower power laser systems, a large thermal vacuum chamber with a 50 foot diameter door, an array of instrumented test sites, and the Sea Lite Beam Director (SLBD). This multiple use facility can support testing of laser effects at any power level against any type of target, from scaled laboratory up through full scale flying targets and from ground level through the upper atmosphere. Assisted with the command and control link to Army Space Operations Center, any type of engagement scenario may be tested, including integrated kinetic energy (missile) and directed energy (laser) engagements. The primary purpose for the facility is to support RDT&E of HEL technologies and systems including Anti-Satellite (ASAT) and anti-ship missile defense. Funding through FY 1994 provides for facility operations and maintenance. Given the lack of any government or private industry HEL testing requirements beyond FY 1994, and the fact that less costly options are available to accommodate low power tactical laser damage and vulnerability testing, the Army has concluded that it is no longer cost effective or practical to continue HELSTF operations beyond the current fiscal year.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project DE97 - DoD High Energy Laser Systems Test Facility.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Continued operation and maintenance of the High Energy Laser Systems Test Facility.	4Q93	11300
• (U) Completed installation of Laser Demonstration Device (LDD).	3Q93	550
• (U) Completed installation of atmospheric compensation optical components.	4Q93	170

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605605A
PE Title: DoD High Energy Laser Systems Test Facility (HELSTF)

Budget Activity: #6

• (U) Continued to support test programs:	4Q93	14326
- Navy/UK anti-ship missile Point Defense Demonstration (PDD)		
- Advanced Research Projects Agency (ARPA) PEGASUS fairing deployment tests		
- ARPA Taurus fairing deployment tests		
- Tracor Comet payload fairing deployment tests		
- University of Colorado payload tests		
- Army M1 Tank periscope damage and vulnerability tests		
- Army M1 Tank ammunition damage and vulnerability tests		
- ERINT and Navy LEAP tracking tests		
- Navy Standard Missile tracking tests		
- Storm TMD target tracking tests		
Total		**26346**

(U) FY 1994 Plans:

	Complete	Cost
• (U) Continue operation and maintenance of the High Energy Laser Systems Test Facility.	4Q94	10971
• (U) Continue to support test programs:	4Q94	13500
- Navy/UK anti-ship missile Point Defense Demonstration (PDD)		
- Air Force Airborne Laser Target lethality tests		
- Air Force/UK satellite hardening experiments		
- ERINT and Navy LEAP tracking tests		
- STORM TMD target tracking tests		
- Navy Standard Missile tracking tests		
- High Altitude Balloon Experiment Payload tests		
- Explosive testing of Large Blast Thermal Simulator Components		
• (U) Transfer to Small Business Innovative Research/Small Business Technology Transfer Pilot Program (SBIR/STTR)	1Q94	337
Total		**24808**

(U) FY 1995 Plans:

- (U) Current plan is that the facility will be closed.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605605A
PE Title: DoD High Energy Laser Systems Test Facility (HELSTF)

Budget Activity: #6

(U) WORK PERFORMED BY: Major contractors: Aerotherm, Sunnyvale, CA; TRW, Redondo Beach, CA; Hughes Aircraft Company, Los Angeles, CA; UNISYS, Long Island, NY; Science and Technology Corporation, Los Angeles, CA; and Massachusetts Institute of Technology/Lincoln Laboratory, Lexington, MA. In-house: U.S. Army Space and Strategic Defense Command at the High Energy Laser Systems Test Facility, White Sands Missile Range (WSMR), NM. Support efforts are provided by the U.S. Navy Space and Naval Warfare Systems Command (SPAWAR 32) and the Naval Air Warfare Center (NAWC), WSMR, NM.

(U) RELATED ACTIVITIES: There is no unnecessary duplication of effort within the Army or DoD.

(U) OTHER APPROPRIATION FUNDS: Not applicable.

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605702A
PE Title: Meteorological Support to RDT&E Activities

Budget Activity: #6

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D127 Meteorological Support to ARL Activities	9639	9564	4514	0	0	0	0	0	33696
D128 Meteorological Support to TECOM Activities	8421	8383	7920	7065	6915	6790	7038	Cont	Cont
PE TOTAL	18060	17947	12434	7065	6915	6790	7038		

B. (U) BRIEF DESCRIPTION OF ELEMENT: Provides atmospheric information critical in tests of high priority Army weapons and materiel to quantify the effects of the atmosphere on test articles and to assist in the analysis of required modifications to weapons and materiel. Provides automated surface and upper air meteorological data acquisition systems to support Army RDT&E activities.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project D127 - Meteorological Support to Army Research Laboratory Activities. Provides assessment of system design performance parameters operating in realistic environments. Provide critical atmospheric information for tests of high priority Army weapons and materiel to quantify the effects of the atmosphere on test articles and to assist in the analysis of the performance of weapons and material.

(U) FY 1993 Accomplishments:

	Complete	Cost
● (U) Determined atmospheric susceptibility of Brilliant Anti-Armor Submunition (BAT) Smart Sensor, and established Acoustic Meteorological Test Bed for acoustic-propagation testing.	4Q93	850
● (U) Characterized smokes/obscurants and targets/backgrounds from visible through MMW frequencies using imagery, transmissometry, spectroscopy, and mass/particle concentration, distribution and sizing techniques. spectrometer system.	4Q93	3935
● (U) Completed assessment of chemical transport and diffusion models for Theater Missile Defense.	4Q93	167
● (U) Developed horizontal transverse coherence length capability to identify image degradation patterns during both day and night periods.	4Q93	1253

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605702A
PE Title: Meteorological Support to RDT&E Activities

Budget Activity: #6

- (U) Implemented configuration management system for development and transition of battlefield weather intelligence software to the Integrated Meteorological System. 4Q93 684
- (U) Provided atmospheric propagation and toxic corridor advisory support to USASSDC's High Energy Laser System Test Facility. 4Q93 787
- (U) Provided atmospheric measurements and analyses for Program Managers, such as PM BAT and PM Smoke. 4Q93 1711
- (U) Provided high resolution transmittance data on battlefield obscurants, radiance data on inventory munitions. 4Q93 252

Total **9639**

(U) FY 1994 Plans:	Complete	Cost
● (U) Develop technique to remotely measure turbulence and its effects on Army acoustic systems.	4Q94	941
● (U) Develop technology to convert real 2-D obscurant cloud scenes into 3-D time varying scenes based on measured atmospheric diffusion parameters, and continue development of instrumentation and data reduction techniques.	4Q94	2189
● (U) Provide atmospheric transport and diffusion model with variable meteorology to SSDC and DNA, and conduct atmospheric susceptibility tests of Army smart sensors for Program Managers and RDE Centers.	4Q94	1016
● (U) Define high speed variability of turbulent effects using the Atmospheric Profiling Research Facility.	4Q94	1272
● (U) Apply configuration management procedures in developing, testing, and documenting battlefield weather intelligence software for transition to the Integrated Meteorological System Block 2.	4Q94	837
● (U) Provide atmospheric measurements for Smart Weapons Operations Enhancement (SWOE) field trials, and initiate measurements of atmospheric diffusion coefficients above the Planetary Boundary Layer.	4Q94	2054
● (U) Validate the color contrast transmission model in support of Army target acquisition program.	4Q94	724
● (U) Provide near real-time rocket plume signature characterization with the mobile atmospheric spectrometer system in support of air defense programs.	4Q94	531
Total		**9564**

(U) FY 1995 Plans:	Complete	Cost
● (U) Assess and validate acoustic propagation model for determining atmospheric effects on long range acoustic propagation.	4Q95	406
● (U) Complete operational smoke cloud tomography technique, enhance data collection and analysis techniques, and provide field test support.	4Q95	1175
● (U) Complete validation and model acceptance for time variable transport and diffusion model.	4Q95	496
● (U) Characterize diurnal evolution of planetary boundary layer with application to acoustic and electromagnetic propagation and aerosol transport.	4Q95	586

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605702A
PE Title: Meteorological Support to RDT&E Activities

Budget Activity: #6

- (U) Develop interoperability of battlefield weather intelligence software with Army Tactical Command and Control Systems, Louisiana Maneuvers, and TRADOC Battle Labs. 4Q95 406
- (U) Relate measurements of atmospheric diffusion coefficients above the Planetary Boundary Layer to laboratory quality upper atmospheric soundings, for missile intercept studies. 4Q95 904
- (U) Assess techniques to exploit spectral and spatial contrast divergence for long range target acquisition. 4Q95 406
- (U) Develop a portable high resolution spectroscopic system for characterization of chemical agents, obscurants, and rocket plumes. 4Q95 135

Total **4514**

(U) Project D128 - Meteorological Support to Test and Evaluation Command (TECOM) Activities. Provides atmospheric sampling, analysis, consultation forecasting, advisory and warning products, and test reports to satisfy Army/DoD RDTE support requirements. Provide technical support to Army Program Executive Officers (PEOs), Project Managers (PMs) and the Army test ranges. Develop methodologies and acquire instrumentation/systems that allow meteorological teams to support Army/DoD RDTE requirements.

(U) **FY 1993 Accomplishments:**

- (U) Provided weather forecasts, severe weather warnings/advisories, staff meteorological services, and atmospheric measurements in support of Army/DoD tests and projects at 12 Army test sites/ranges. **Complete** 4Q93 **Cost** 6232
- (U) Modernized operational equipment to meet customer requirements for meteorological support. 4Q93 1188
  - Fielded an upgrade to the data handling equipment for the Surface Automated Meteorological System (SAMS) which provides a greater through-put of the data to satisfy evolving Army/DoD requirements.
  - Evaluated latest US Department of Commerce, National Weather Service, Automated Weather Information Processing Systems suitability in meeting range forecast support requirements.
  - Fielded first two Small Portable Transmissometers at Ft. Belvoir to support smoke/obscurant testing.
- (U) Provided program management for meteorological support to RDTE and technical review/assistance to ranges and meteorological teams: 4Q93 1001
  - Evaluated Global Positioning System (GPS) upper air measurement capability for potential resolution improvements.
  - Evaluated follow-on data management systems for analysis and forecast/warning support to test sites and ranges.

Total **8421**

(U) **FY 1994 Plans:**

- (U) Provide weather forecasts, severe weather warnings/advisories, staff meteorological services, and atmospheric measurements in support of Army/DoD tests and projects at 12 Army test sites/ranges. **Complete** 4Q94 **Cost** 6423

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605702A
PE Title: Meteorological Support to RDT&E Activities

Budget Activity: #6

- (U) Modernize operational equipment to meet customer requirements for meteorological support. 4Q94 1510
  - Upgrade selected upper air systems with LORAN-C, in order to improve low level resolution.
  - Upgrade Surface Automated Meteorological System (SAMS) sensors and evaluate improved software systems.
  - Evaluate Mobile Operational Meteorological Support System (MOMSS).
  - Field three Small Portable Transnsometers.
- (U) Provide program management for meteorological support to RDTE and technical review/assistance to range and meteorological teams: 4Q94 450
  - Evaluate prototype GPS upper air system for spatial/temporal resolution improvements.
  - Evaluate follow-on data management systems for analysis and forecast/warning support to test sites and ranges.

Total 8383

(U) FY 1995 Plans:

	Complete	Cost
● (U) Provide weather forecasts, severe weather warnings/advisories, staff meteorological services, and atmospheric measurements in support of Army/DoD tests and projects at 12 Army test sites/ranges.	4Q95	6265
● (U) Modernize operational equipment to meet customer requirements for meteorological support.	4Q95	1550
- Upgrade Surface Automated Meteorological Systems (SAMS).		
- Field Mobile Operational Meteorological Support (MOMSS) at selected ranges.		
- Test operational GPS upper air system at several ranges.		
● (U) Provide program management for meteorological support to RDTE and technical review/assistance to ranges and meteorological teams.	4Q95	105
- Evaluate the Joint DoD/National Weather Service Program "Next Generation Doppler Weather Radar" (NEXRAD) remote display system at WSMR, for possible use at several ranges.		
- Evaluate the prototype Automated Weather Information System, of the National Weather Service, as a possible replacement for the current data services from Zepher Corporation system at all ranges.		
Total		7920

(U) <u>WORK PERFORMED BY:</u> Approximately 95 percent is performed in-house. In-house organizations are located at Aberdeen Proving Ground (APG), MD; White Sands Missile Range, NM; Yuma Proving Ground, AZ; Dugway Proving Ground, UT; also Ft. Greeley, AK; Ft. Belvoir, VA; Hanover, NH; Redstone Arsenal, AL; Ft. Huachuca, AZ; Ft. Hunter Liggett, CA. Primary contractor is Management Assistance Corp., El Paso, TX.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605702A
PE Title: Meteorological Support to RDT&E Activities

Budget Activity: #6

(U) RELATED ACTIVITIES: There is no unnecessary duplication of effort within the Army or the Department of Defense. Related program elements include:

PE #0605601A (Army Test Ranges & Facilities)
PE #0605602A (Army Technical Test Instrumentation and Targets)

(U) OTHER APPROPRIATION FUNDS: ($ in Thousands) Not applicable

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: The Atmospheric Science Laboratory supports NATO and World Meteorological Organization testing.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605706A **Budget Activity: #6**
PE Title: Materiel Systems Analysis

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
D026 Test Design and Evaluation	6634	6412	6105	5419	5281	5188	5384	Cont	Cont
M541 Materiel Systems Analysis	15446	13063	12906	12158	11946	11701	11760	Cont	Cont
PE TOTAL	22080	19475	19011	17577	17227	16889	17144		

B. (U) BRIEF DESCRIPTION OF ELEMENT: The U.S. Army Materiel Systems Analysis Activity (AMSAA), as the Army's center for systems analysis and independent evaluation of major systems, provides the technical capability for the conduct of materiel systems analysis. AMSAA evaluates the performance and combat effectiveness of existing, developmental and conceptual systems to support Department of the Army and other major Army commands in the conduct of cost and operational effectiveness analyses, force structure studies, risk analyses, trade-off analyses, and casualty assessment criteria. AMSAA supports the Army in the development of methodologies, models, simulations, and data bases for use in Army studies and analyses. AMSAA is the Army's technical evaluator of developmental systems, and production tests for all major Defense Acquisition Board, Director Operational Test and Evaluation, and Department of the Army oversight systems, including special access programs. AMSAA provides technical independent evaluations for major milestone decisions, materiel changes, and materiel releases in support of the Army Acquisition Executive (AAE). AMSAA designs technical, developmental, and production tests to address factors pertinent to the decision process such as: technical risk, technical performance, producibility, logistics, etc. AMSAA has a lead role in the planning and execution of the Army live fire tests through its test design, analysis and evaluation responsibilities. As such, AMSAA responds to analyses required by the AAE, Program Executive Officer/Project Manager (PEO/PM), and other decision makers of the Army and the Department of Defense.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project D026 - Test Design and Evaluation: This project provides for developmental, production and product improvement test design and evaluation for Army technical testing in support of major programs. Test design and evaluation is performed independently of the PEO/PM, materiel development command and the testing agencies to complement operational test and evaluation results for the Army acquisition decision

process. Regular system assessments are provided to the AAE between major milestones to highlight emerging issues which can be resolved to minimize program impacts at milestone reviews. This project funds the salaries of civilian employees assigned to the test design and evaluation mission.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Provided test design and evaluation support for 100 systems that are either in development, undergoing major materiel change programs, or have been recently fielded. Examples of evaluations in support of AAE decisions include: All Source Analysis System, Joint Surveillance and Target Acquisition System - Block I Improved Ground Station Module, Bradley Fighting Vehicle System, High Survivability Improvements, 155mm Sense and Destroy Armor, Palletized Loading System and Joint Tactical Information Distribution System. Evaluated results of four live fire tests (including M1A2).	4Q93	4312
• (U) Developed test design and evaluation plans for developmental tests to be conducted in FY 1994 through FY 1998. This effort included test design and evaluation planning for seven systems projected to undergo live fire testing in FY 1995.	4Q93	2322
Total		**6634**

(U) FY 1994 Plans:	Complete	Cost
• (U) Provide test design and evaluation support for 85 systems that are either in development, undergoing major materiel change programs or have been recently fielded. Reduction in systems from prior year are selected lower priority/effort ACAT III and IV systems which represent very small cost savings. Systems evaluations will support a projected 28 program milestone decision reviews during FY 1994. Examples of evaluations in support of AAE decisions include: PAC 3, Advanced Field Artillery System, Armored Gun System, Brilliant Anti-Armor Tank Submunition, Combat Service Support Control System, Future Armored Resupply Vehicle, Enhanced Position Location and Reporting System and Family of Medium Tactical Vehicles.	4Q94	4165
• (U) Develop test design and evaluation plans for developmental tests to be conducted in FY 1995 through FY 1999. This effort includes test design and evaluation planning for seven systems projected to undergo live fire testing in FY 1995.	4Q94	2247
Total		**6412**

(U) FY 1995 Plans:	Complete	Cost
• (U) Provide test design and evaluation support for 76 systems that are either in development, undergoing major materiel change programs, or have been recently fielded. Reduction in systems from prior year are selected lower priority/effort ACAT III and IV systems which represent very small cost savings. System evaluations will support a projected 17 program milestone decision reviews during FY 1995. Examples of evaluations in support of AAE decisions include: 155-mm Sense and Destroy Armor Munition; Forward Area Air Defense Command, Control and Intelligence Ground Based Sensor; Hellfire-Millimeter Wave; Joint Surveillance Target Acquisition System Light Ground Station Module; Joint Tactical Information Distribution System; Joint Unmanned Aerial Vehicle - Short Range; Secure, Mobile,		

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605706A
PE Title: Materiel Systems Analysis

Budget Activity: #6

Anti-Jam Reliable Tactical-Terminal; Single Channel, Anti-Jan Manportable; and Wide Area Mine. Evaluate the results of seven live fire tests. 4Q95 3999

- (U) Develop test design and evaluation plans for developmental tests to be conducted FY 1996 - FY 2000. 4Q95 2106

Total **6105**

(U) Project M541 - Materiel Systems Analysis. This project funds the Army Materiel Systems Analysis Activity (AMSAA) primary mission of independent systems analysis and effectiveness evaluations for major materiel systems. AMSAA evaluates the performance and combat effectivness of existing developmental and conceptual systems in support of Headquarters, Department of the Army (HQDA), Army Materiel Command (AMC), Program Executive Officers (PEOs), Project Managers (PMs), and research and development (R&D) centers to provide a basis for developing acquisition strategies, concept definitions, operational requirement documents and request for proposals. This project also includes the efforts to develop analytical methodologies to characterize the performance of new technologies associated with weapons, smart munitions, sensors, and command and control systems. At the direction of the Deputy Under Secretary for Operations Research, AMSAA certifies the performance data provided for major Army studies to provide confidence in study result and assure a sound basis for acquisition decisions. This project funds the salaries of civilian employees assigned to the materiel systems analysis mission.

(U) FY 1993 Accomplishments: **Complete** **Cost**

- (U) Responded to 32 requests by developing and certifying system performance data of U.S. and foreign systems to be used to support Army Cost and Operational Effectiveness Analyses (COEAs), force structure studies and theater level studies. Included in this was a requirement to support 12 COEAs. Examples of COEAs supported include: Kinetic Energy Anti-Satellite, Corps Surface-to-Air Missile System, Comanche update, Multiple Launch Rocket System - Terminally Guided Warhead update, and the Tactial Unmanned Ground Vehicle. Developed performance data in support of distributed interactive simulators to assure appropriate fidelity for operational planning, training, and research programs. 4Q93 739
- (U) Provided analyses of performance and combat effectiveness of materiel systems and tech base programs in support of HQDA, AMC, PEOs/PMs and R&D Centers. 4Q93 13082
- (U) Developed methodologies to characterize the performance and combat effectiveness of conceptual, developmental, and fielded systems in a variety of scenarios and conditions for support of force-on-force analyses and war games. 4Q93 1625

Total **15446**

(U) FY 1994 Plans: **Complete** **Cost**

- (U) Develop and certify system performance data for U.S. and foreign systems to support 46 Army COEAs, force structure studies and theater level studies. Included in this is the requirement to support 16 major COEAs. Examples of COEAs to be supported include: Joint

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605706A **Budget Activity: #6**
PE Title: Materiel Systems Analysis

Unmanned Aerial Vehicle-Close Range, Advanced Field Artillery System, Future Armored Resupply Vehicle, Maneuver Control System, Forward Area Air Defense Command, Control and Intelligence and the Combat Service Support Control System. 4Q94 668

- (U) Provide analysis of performance and combat effectivness of materiel systems and tech base programs in support of HQDA, AMC, PEOs/PMs and R&D Centers. Included are technical risk, trade-off and requirements analyses. Initial projections identified a potential requirement to provide analytical support for 162 systems/programs. 4Q94 10762
- (U) Develop methodologies to characterize the performance and combat effectiveness of conceptual, developmental, and fielded systems in a variety of scenarios and conditions for support of force-on-force analyses and war games. Will lead development of standards for algorithms portraying physical representation of systems in Distributed Interactive Simulations to support the Training and Doctrine Command (TRADOC) Analysis Center in this HQDA directed effort. 4Q94 1633

Total **13063**

(U) FY 1995 Plans:	Complete	Cost
• (U) Develop and certify system performance data for U.S. and foreign systems to support Army COEAs, force structure studies and theater level studies. Examples of COEAs to be supported include: Joint Unmanned Aerial Vehicle - Short Range, Battlefield Combat Identification System, Theater High Altitude Area Defense and Ground Based Radar for Theater Missile Defense.	4Q95	606
• (U) Provide analysis of performance and combat effectivness of materiel systems and technology base programs in support of HQDA, AMC, PEOs/PMs and R&D Centers. Included are technical risk, trade-off and requirements analyses. Initial projections identified a potential requirement to provide analytical support for 144 systems/programs and 16 Distributed Interactive Simulator projects.	4Q95	10700
• (U) Develop methodologies to characterize the performance and combat effectiveness of conceptual, developmental, and fielded systems in a variety of scenarios and conditions for support of force-on-force analyses and war games.	4Q95	1600
Total		**12906**

(U) WORK PERFORMED BY: In-house work is performed by AMSAA, Aberdeen Providng Ground, MD.

(U) RELATED ACTIVITIES: PE#0605805A (Munitions Standardization, Effectiveness and Safety) relates to materiel systems analysis and technical test and live fire evaluations. There is no duplication of effort within Army or Department of Defense.

(U) OTHER APPROPRIATION FUNDS: Not applicable.

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0605709A (TIARA)**
PE Title: **Exploitation of Foreign Items**

Budget Activity: **#6**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DC28 Acquisition/Exploitation of Threat Items	15153	14722	8120						
D650 Exploitation of Foreign Items	3382	4052	3907						
PE TOTAL	18535	18774	12027						

B. (U) BRIEF DESCRIPTION OF ELEMENT: This is a continuing program for acquisition and exploitation of foreign materiel to support force and materiel development, scientific and technical intelligence needs, operations and training. Primary program objectives are to reduce research and development times for U.S. systems by analyzing innovations and technology in foreign materiel, and to make research and development more efficient by reducing uncertainties concerning potential advanced technology threats to U.S. systems. The program also serves to develop countermeasures and to support operational commanders with items for training the force. This program enables the Army to conserve research and development funds, manhours, enhance and/or improve U.S. designs, and provide realistic testing and training.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) **Project DC28 - Acquisition/Exploitation of Threat Items**. This is a continuing project for acquisition and exploitation of foreign materiel constituting potential advanced technology threats to U.S. systems. The primary aim of this project is to maximize the efficiency of research and development for force and materiel development by reducing the uncertainties concerning these threats. The project also answers general scientific and technical intelligence requirements, aids in the development of countermeasures to threat materiel and threat technology, and provides materiel for realistic testing and training. Acquisitions and exploitations are executed according to an Army Foreign Materiel Program Five Year Plan, which is updated annually. The Five Year Plan can be amended at any time during the execution year on the advice of the Army Foreign Materiel Review Board and with the approval of the Army Deputy Chief of Staff for Intelligence.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Initiated acquisition of two major end items of foreign materiel.	4Q93	3100

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605709A (TIARA)
PE Title: Exploitation of Foreign Items **Budget Activity: #6**

• (U) Initiated and continued exploitation projects on ground systems of Army interest, outlined in the FY 1993 Foreign Materiel Program Exploitation Report.	4Q93	7553
• (U) Initiated and continued exploitation projects on missile systems of Army interest, outlined in the FY 1993 Foreign Materiel Program Exploitation Report.	4Q93	4500
Total		**15153**

(U) FY 1994 Plans:	**Complete**	**Cost**
• (U) Acquire threat systems identified and prioritized in the FY 1994 Army Foreign Materiel Program Five Year Plan.	4Q94	3000
• (U) Initiate, continue or complete exploitation projects on ground systems of Army interest identified in the FY 1994 Army Foreign Materiel Exploitation Plan.	4Q94	8242
• (U) Initiate, continue or complete exploitation projects on missile systems of Army interest identified in the FY 1994 Army Foreign Materiel Exploitation Plan.	4Q94	3480
Total		**14722**

(U) FY 1995 Plans:	**Complete**	**Cost**
• (U) Acquire threat systems identified and prioritized in the FY 1995 Army Foreign Materiel Program Five Year Plan.	4Q95	1640
• (U) Initiate, continue or complete exploitations of foreign ground systems acquired and identified in the FY 1995 Foreign Materiel Exploitation Plan.	4Q95	4880
• (U) Initiate, continue or complete exploitations of foreign missile systems acquired and identified in the FY 1995 Foreign Materiel Exploitation Plan.	4Q95	1600
Total		**8120**

(U) <u>Project D650 - Exploitation of Foreign Items</u>. Acquisition and exploitations of worldwide leading edge technology. Exploitations of foreign technology capabilities are to prevent technological surprise, eliminate or compress the R&D time cycle, contribute to R&D cost avoidance, and enhance U.S. designs.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Continued ongoing evaluations and exploitations identified in previous years.	4Q93	650
• (U) Initiated new FY 1993 acquisitions of foreign materiel and/or technologies.	4Q93	1847
• (U) Initiated new FY 1993 evaluations and exploitations of foreign materiel and/or technologies.	4Q93	885
Total		**3382**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605709A (TIARA)
PE Title: Exploitation of Foreign Items

Budget Activity: #6

(U) FY 1994 Plans:	Complete	Cost
• (U) Continue on-going project evaluations and exploitations identified prior to FY 1994.	4Q94	1318
• (U) Initiate new FY 1994 acquisitions of 27 projects.	4Q94	1646
• (U) Initiate new FY 1994 evaluations and exploitations of foreign materiel and/or technologies.	4Q94	1088
Total		4052

(U) FY 1995 Plans:	Complete	Cost
• (U) Continue on-going evaluations and exploitations identified prior to FY 1995.	4Q95	1100
• (U) Plan new FY 1995 acquisitions of approximately 30 projects.	4Q95	1750
• (U) Plan new FY 1995 project evaluations and exploitations of foreign materiel and/or technologies.	4Q95	1057
Total		3907

(U) **WORK PERFORMED BY:** The Army Deputy Chief of Staff for Intelligence (DCSINT), with the advice of the Army Foreign Materiel Review Board, provides Army Staff management of the Army's Foreign Materiel Program (FMP). In addition, the DCSINT manages the acquisition of foreign materiel for the Army through the Commanding General, Intelligence and Security Command (INSCOM) and the exploitation of foreign materiel through the Commander, Foreign Science and Technology Center (FSTC) for ground systems and the Commander, Missile and Space Intelligence Center (MSIC) for missile systems. The commander of each center is responsible for executing the exploitation programs with the coordination and support from the Army Materiel Command (AMC) and INSCOM. Where Army acts as the Executive Agent, FSTC is responsible for executing the exploitation program to ensure that the objectives and requirements of all Services and agencies are satisfied based on guidance set forth by the DCSINT.

(U) **RELATED ACTIVITIES:**

Coordination is maintained with other government agencies to avoid duplication of effort.

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

(U) **INTERNATIONAL COOPERATIVE AGREEMENTS:** Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0605710A**
PE Title: **Joint Chemical/Biological Point of Contact, Test and Assessment**
Smoke Assessment, Nuclear/Biological/Chemical Survivability

Budget Activity: **#6**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DJ30 NBC Survivability	4344	3033	2999	2925	2874	2852	2834	Cont	Cont
D049 Joint Chemical/Biological Contact Point and Test	2157	1802	1780	1736	1705	1693	1682	Cont	Cont
D204 Field Smoke Assessment	3210	2560	0	0	0	0	0	0	53102
PE TOTAL	9711	7395	4779	4661	4579	4545	4516		

B. (U) BRIEF DESCRIPTION OF ELEMENT: Develop and implement processes for integrating nuclear, biological, and chemical (NBC) survivability analysis into multiple threat (electronic warfare, ballistics, nuclear effects) analysis process. An annual symposium is conducted to disseminate information on policy and implementation procedures including specific examples on NBC contamination survivability enhancement techniques. Supports the direct costs of the joint service project which provides input for U.S. Army Dugway Proving Ground in developing operational procedures and doctrine to employ currently fielded equipment in a chemical-biological (CB) environment; to maintain the repository of CB information (CB technical source books); and to respond to unified and specified commands and all services for CB information. The Army is the executive agent for these efforts. Conducts field tests to observe and measure effects on performance of battlefield obscurants on electro-optical/smart weapons systems. Data gathered by such tests is analyzed, cataloged, and disseminated in support of continued development of these systems.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) **Project DJ30 - Nuclear, Biological, and Chemical (NBC) Survivability.** This project provides for test and analytical methodology, generic material testing, and database for design and analysis support to numerous weapons systems programs to insure that NBC survivability is readily and adequately addressed during the acquisition cycle.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0605710A**
PE Title: **Joint Chemical/Biological Point of Contact, Test and Assessment Smoke Assessment, Nuclear/Biological/Chemical Survivability**
Budget Activity: **#6**

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Completed screening of 50 materials for chemical resistant data. Data included into Chemical Defense Materials Database.	4Q93	500
• (U) Provided NBC survivability support to 20 developing systems.	4Q93	1984
• (U) Completed M109A2/A3 Howitzer Battalion fielded system assessment.	4Q93	810
• (U) Completed study reviewing threat contamination densities.	4Q93	20
• (U) Established 7 American Society for Testing and Materials (ASTM) test standards for surety chemicals against materials.	4Q93	500
• (U) Initiated development of predictive techniques for determining the efforts of agents and decontaminates against materials, using commercial solvent database.	4Q93	50
• (U) Initiated first test case program to collect data to utilize conventional ballistics methodology for weapon systems effects assessments due to NBC degradation.	4Q93	30
• (U) Initiated NBC survivability assessment of Light Infantry Battalion.	4Q93	250
• (U) Initiated development of NBC Contamination Survivability (NBCCS) component database to assist DOD design and assessment community.	4Q93	50
• (U) Developed value-added methodology (VAM) for NBC Defense Systems Integration Initiatives.	4Q93	100
• (U) Hosted second NBCCS Symposium.	4Q93	50
Total		**4344**

(U) FY 1994 Plans:	**Complete**	**Cost**
• (U) Assist Program Executive Officers/Project Managers (PEOs/PMs), Research, Development and Engineering Centers (RDECs), defense decision makers and the Army Battle Labs to meet chemical, biological, and nuclear (CBN) survivability requirements and field sustainable equipment.	4Q94	2437
• (U) Continue development of chemical databases and predictive techniques to determine the effects of agents and decontaminants against material.	4Q94	409
• (U) Expand the database work, including the Nuclear Survivability Status Tracking System to develop an interface between the CBN databases and Army-wide modeling and simulation programs.	4Q94	137
• (U) Host the annual Nuclear, Biological, and Chemical Contamination Survivability symposium.	3Q94	50
Total		**3033**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605710A
PE Title: **Joint Chemical/Biological Point of Contact, Test and Assessment**
Smoke Assessment, Nuclear/Biological/Chemical Survivability
Budget Activity: #6

(U) FY 1995 Plans:	Complete	Cost
• (U) Assist PEOs/PMs, RDECs, defense decision makers and the Army Battle Labs to meet CBN survivability requirements and field sustainable equipment.	4Q95	2824
• (U) Continue development and expansion of CBN databases and predictive techniques to enhance survivability/lethality analysis of Army materiel.	4Q95	125
• (U) Host the annual Nuclear, Biological, and Chemical Contamination Survivability symposium.	3Q95	50
Total		**2999**

(U) **Project D049 - Joint Chemical/Biological Contact Point and Test.** Conducts chemical/biological (CB) tests and maintains repository of CB information for multiple users.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Continued to update CB source book: general models; Coxella Brunetti (LM) and Lewisite (L); change to Mustard (generic) (HL/HN).	4Q93	125
• (U) Executed four field trials, seven laboratory tests and five assessments.	4Q93	1682
• (U) Continued automation of Joint Technical Information Center.	4Q93	350
Total		**2157**

(U) FY 1994 Plans:	Complete	Cost
• (U) Initiate eight studies, two field trials and four laboratory tests evaluating performance and procedure in a chemical environment.	4Q94	1392
• (U) Update CB Source Book for Nitrogen Mustard 1,2,3 (HNX), Oxygen Mustard (0), Sesqui-mustard (T) and decontamination.	4Q94	110
• (U) Continue automation of Joint Technical Information Center.	4Q94	300
Total		**1802**

(U) FY 1995 Plans:	Complete	Cost
• (U) Initiate six assessments, two field trials, and four laboratory tests evaluating performance and procedures in a chemical environment.	4Q95	1363

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605710A
PE Title: Joint Chemical/Biological Point of Contact, Test and Assessment
Smoke Assessment, Nuclear/Biological/Chemical Survivability
Budget Activity: #6

• (U) Continue to update CB source books: Ricin, Chemical Munitions update.	4Q95	113
• (U) Continue automation of Joint Technical Information Center.	4Q95	304
Total		1780

(U) Project D204 - Field Smoke Assessment. Conducts field tests to observe and measure the effects of battlefield obscurants on electro-optical/smart weapon systems.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Conducted Smoke Week 15 at Eglin AFB, FL.	3Q93	2200
• (U) Provided field test support for Hellfire Optimized Missile System (HOMS), JAVELIN, Joint Project Office (JPO) - Camouflage Concealment and Deception, JPO - Smokes and Obscurants, PM Smokes/Obscurants and Edgewood Research, Development and Engineering Center.	4Q93	485
• (U) Supported integrated analyses of system survivability.	4Q93	500
• (U) Provided test plans and visited NATO Smoke and Obscurant Countermeasures Evaluation Tests at Valcartier, CA and Bourge, FR.	4Q93	25
Total		3210

(U) FY 1994 Plans:	Complete	Cost
• (U) Conduct Smoke Week 16 at Eglin AFB, FL.	3Q94	1500
• (U) Provide smoke/obscurants field experiments support for investigations of weapons systems with electro-optical components or subsystems, including Advanced Field Artillery System, Future Armored Resupply Vehicle, Armored Gun System, Future Infantry Fighting Vehicle, Brilliant Anti-Armor Submunition, Javelin, Wide Area Mine, Sense and Destroy Armor, Smart Target Activated Fire and Forget, and Hellfire.	4Q94	660
• (U) Execute the smoke/obscurants part of the integrated survivability/lethality analysis program across the integrated mission areas, i.e.: air defense systems; aviation systems; command, control, communications, computers and intelligence systems, intelligence electronic warfare systems; ground systems, munitions, and integrated soldier systems.	4Q94	300
• (U) Support NATO Research Study Group (RSG) evaluations.	4Q94	100
Total		2560

(U) FY 1995 Plans: Project terminated.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605710A
PE Title: Joint Chemical/Biological Point of Contact, Test and Assessment
Smoke Assessment, Nuclear/Biological/Chemical Survivability

Budget Activity: #6

(U) WORK PERFORMED BY: In-house efforts accomplished by Army Research Laboratory, Adelphi, MD; Aberdeen Proving Ground, MD; White Sands Missile Range, NM; Dugway Proving Ground, UT; and Naval Weapons Support Center, Crane, IN. Major contractor is Science and Technology Corp, Hampton, VA.

(U) RELATED ACTIVITIES: There is no duplication of effort within the Army or DoD.

(U) OTHER APPROPRIATION FUNDS: Not applicable.

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0605712A**
PE Title: **Support of Operational Testing** Budget Activity: **#6**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DV02 Test Directorates	18657	17060	15294	15061	14885	15174	14981	Cont	Cont
DV03 TRADOC P2NBC2	1383	1394	0	0	0	0	0	0	
D001 OPTEC IOTE	39614	30478	7486	43037	30245	25041	28144	Cont	Cont
D985 Concepts Evaluation of Materiel	1781	2221	6089	7684	9022	10063	12124	Cont	Cont
D987 OPTEC Instrumentation Sustainment & Development	0	1011	3048	7993	10446	9437	10623	Cont	Cont
PE TOTAL	61435	52164	31917	73775	64598	59715	65872	Cont	Cont

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program finances the operational testing of developmental materiel systems. Project DV02 provides for the recurring costs of operating the test activities of the U.S. Army Operational Test and Evaluation Command (OPTEC). Funding for each test project varies based on the number of personnel involved and test duration. Project DV03 measures the degradation of crew and individual performance during sustained operations in a nuclear, biological and chemical environment and develops measures to lessen the effects. Project D001 provides for the direct operational test costs incurred by OPTEC. In FY 1995, funding for Acquisition Category (ACAT) I systems is programmed with the PE funding development for each system. Future fiscal years will be realigned as system information becomes available. Project D985 enables US Army Training and Doctrine Command (TRADOC) battle labs and schools to evaluate emerging technologies and other equipment to help define Army mission needs and operational requirements. Projects selected for funding are relatively low cost conceptual evaluations, with high potential for warfighting return on investment. Projects are typically horizontal in nature with potential for broad application across the Army. Project D987 provides for development and acquisition of non-major and sustaining instrumentation necessary to attain and maintain the data collection and analysis capability to conduct credible and robust operational tests as demanded by the DoD and Congress. It

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Program Element: #0605712A
PE Title: Support of Operational Testing
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provides for replacement and improvements of existing obsolete inventory and for the development of new technologies to keep abreast of new weapon advancements. Provides test capability which requires less manpower to operate as necessitated by OPTEC downsizing of personnel.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project DV02 - Test Directorates: This project finances the recurring costs, including civilian pay, support contracts, temporary duty, supplies and equipment, of subordinate elements of the Test and Experimentation Command (TEXCOM): Airborne and Special Operations Test Directorate, Fort Bragg, NC; Air Defense Test Directorate, Fort Bliss, TX; Fire Support Test Directorate, Fort Sill, OK; and the Intelligence and Electronic Warfare Test Directorate, Fort Huachuca, AZ. The following test directorates are located at Fort Hood, TX: Aviation; Close Combat; Engineer/Combat Support; Command, Control, and Communications; and Information Mission Area. The primary mission of these test directorates is to conduct operational testing of developmental materiel, joint testing, and force development test and experimentation (FDTE). Between FY 1990 and FY 1993, OPTEC reduced test and evaluation manpower by 28%. Further reductions are phased consistent with test scheduling and facility availability. Ultimately, OPTEC test directorates will ramp down from 320 civilian spaces in FY 1993 to 208 spaces by the end of FY 1998.

(U) FY 1993 Accomplishments:		Complete	Cost
• (U) Operational costs for test directorates:		4Q93	18657
Fort Hood, TX	6180		
Fort Sill, OK	2818		
Fort Huachuc.., AZ	3221		
Fort Bragg, NC	3125		
Fort Bliss, TX	3313		
Total			**18657**

(U) FY 1994 Planned Program:		Complete	Cost
• (U) Operational costs for test directorates:		4Q94	17060
Fort Hood, TX	5702		
Fort Sill, OK	2466		
Fort Huachuca, AZ	2683		

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PE Title: Support of Operational Testing
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Fort Bragg, NC	3023	
Fort Bliss, TX	3186	
Total		**17060**

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Operational costs for test directorates:	4Q95	15294
Fort Hood, TX 5112		
Fort Sill, OK 2211		
Fort Huachuca, AZ 2405		
Fort Bragg, NC 2710		
Fort Bliss, TX 2856		
Total		**15294**

(U) Project DV03 - TRADOC P2NBC2 (Physiological and Psychological Effects of Nuclear, Biological and Chemical Combat): This project measures the physiological and psychological effects of a nuclear or chemical environment on individuals and crews of systems in sustained combat operations. This unique program, composed of field tests under the concept evaluation program, combined with laboratory research, is oriented toward understanding the effects of this environment on soldiers. The program quantifies the degradation of soldier performance, develops measures to mitigate the effects and incorporates these measures into revised doctrine, training, organizations, leadership methods or materiel as applicable. P2NBC2 results support program management, development of major systems, and doctrine and training development objectives.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Tests conducted for the following systems:		
- Female Soldier Performance in MOPP 4	4Q93	131
- Metabolic Taxonomy of Military Activities in MOPP 4	4Q93	82
- Impact of MOPP on Respiratory Functions	4Q93	136
- Model of Soldier Performance in NBC Operations	4Q93	168
- Support of Dual Purpose Chemical Company Operations Test	4Q93	5
- Dual Purpose Chemical Company Operations Test	4Q93	121
- Effect of Microclimate on Tactical Performance	4Q93	97
- Development of Noninvasive Measure of Physiological/Psychological Stress	4Q93	102

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PE Title: **Support of Operational Testing** Budget Activity: #6

- Support of Physiological/Psychological Stress Monitoring	4Q93	20
- Cardiovascular Hemodynamics & State of Hydration During AUIB Wear	4Q93	125
- Physiological Monitoring Support	4Q93	41
- Support to Physiological Monitoring Support Project	4Q93	150
- Support Heat Stress Model Tactical Decision Aid Extension	4Q93	10
• (U) Project Management	4Q93	195
Total		1383

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Tests planned:		
- Biomedical Field Monitoring System	4Q94	135
- Air Assault Operations Test	4Q94	150
- Modeling of Soldier Performance in NBC Operations	4Q94	220
- Physiological/Psychological Predictors of Performance	4Q94	90
- Intermittent Work Study	4Q94	142
- Patient Decontamination Test	4Q94	200
- High Altitude Study	4Q94	91
- Salivary Amalyse	4Q94	110
- Cardiovascular Hemodynamics	4Q94	169
- Biological Field Monitoring	4Q94	30
• (U) Project Management	4Q94	57
Total		1394

(U) **FY 1995 Planned Program:**
- (U) Project Terminated

(U) **Project D001 - Operational Test and Evaluation Command (OPTEC) Initial Operational Test and Evaluation (IOTE):** This project finances the direct costs of planning and conducting operational testing on major and nonmajor materiel systems. It funds those costs directly attributable to conducting an early user (EUTE), limited user (LUT) or an IOTE on major and nonmajor materiel systems. Operational Test and Evaluation was institutionally funded in this project in FY 1994 and prior years. In FY 1995, and planned for future years, test funding for ACAT I

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systems is programmed with the PE funding development of each system. Operational testing is conducted under conditions, as close as possible, to those encountered in actual combat with typical user troops trained to employ the system. OPTEC provides Army leadership with an independent test and evaluation of effectiveness and suitability of the system.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Tests conducted for the following systems:		
- C17 Aircraft MOTE	4Q93	212
- All Source Analysis System (ASAS) IOTE	4Q93	571
- Army Tactical Command & Control System (ATCCS) EUTE	4Q93	1122
- M1A2 Tank IOTE	4Q93	11593
- Field Artillery Tactical Data System Tapes, Version 10 (FATDS TAPE PKG 10) IOTE	4Q93	776
- Forward Entry Device - Meteorological Survey and Radar (FED MSR) IOTE	4Q93	59
- Ground Station Module Block I (GSM BLK I) (LUT)	4Q93	1428
- Radio Receiving Set, AN/TRQ-32(V)2 Materiel Change (TEAMMATE MC) IOTE	4Q93	479
- Single Channel Ground and Airborne Radio System Integrated COMSEC (SINCGARS ICOM) IOTE	4Q93	4653
- Commander's Tactical Terminal (CTT) LUT	4Q93	406
- 60,000 lb Capacity Low Velocity Airdrop System (60K LVADS) IOTE	4Q93	13
- Improved Recovery Vehicle (IRV) IOTE	4Q93	6
- Multispectral Close Combat Decoy (MCCD) IOTE	4Q93	806
- Ranger Anti-Armor/Anti-Personnel Weapon System High Explosive Dual Purpose Round (RAAWS HEDP) LUT	4Q93	60
• (U) Pre-tests conducted for the following systems:		
- Advanced Anti-Armor Weapons System - Medium (JAVELIN) IOTE	4Q93	5307
- Family of Medium Tactical Vehicles-Phase A (FMTV-A) IOTE	4Q93	307
- Resuscitation Fluids Production and Reconstitution System (REFLUPS) IOTE	4Q93	223
• (U) Test preparation conducted for the following systems:		
- High Frequency Intercept and Direction-Finding System, AN/TSQ-152 (TRACKWOLF) IOTE	4Q93	6
- Army Tactical Command and Control System (ATCCS) EUTE II	4Q93	5813
- NAVSTAR Global Positioning System Precision Receiver (PLGR) IOTE	4Q93	555

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- 155mm Sense and Destroy Armor (155mm SADARM) IOTE	4Q93	577
- Advanced Field Artillery Tactical Data System (AFATDS) IOTE	4Q93	1029
- Guardrail Common Sensor System I (GR/CS (SYS I)) LUT	4Q93	31
- Joint Tactical Information Distribution System (JTIDS) LUT	4Q93	471
- Armored Gun System (AGS) EUTE	4Q93	15
- Force Provider (FP) IOTE	4Q93	236
- Field Medical Oxygen Generating and Distribution System (FMOGDS) IOTE	4Q93	102
- Intelligence and Electronics Warfare Common Sensor (IEWCS) IOTE	4Q93	55
- Multiple Launch Rocket System Sense and Destroy Armor (MLRS SADARM) IOTE	4Q93	10
- Nuclear, Biological and Chemical Reconnaissance System (NBCRS) IOTE	4Q93	43
- XM56 Motorized Smoke System (XM56 MSS) IOTE	4Q93	20
- Laser Countermeasure System (LCMS) IOTE	4Q93	121
- Longbow Apache (LBA) IOTE	4Q93	2220
- All Source Analysis System (ASAS) IOTE	4Q93	287
- Automated Message Switch (AMS) LUT	4Q93	2
Total		**39614**

(U) FY 1994 Planned Program:

• (U) Tests planned:	Complete	Cost
- Advanced Anti-Armor Weapons System - Medium (JAVELIN) IOTE	3Q94	4692
- Family of Medium Tactical Vehicles - Phase A (FMTV-A) IOTE	4Q94	1863
- M1A2 Tank IOTE	3Q94	10249
- Army Tactical Command & Control System (ATCCS) EUTE II	3Q94	3240
- 60,000 lb Capacity Low Velocity Airdrop System (60K LVADS) IOTE	4Q94	3
- Army Tactical Command and Control System (ATCCS) EUTE III	4Q94	3077
- NAVSTAR Global Positioning System Precision Receiver (PLGR) IOTE	3Q94	626
- Resuscitation Fluids Production and Reconstitution System (REFLUPS) IOTE	3Q94	29
- AN/TMQ-41 Meteorological Measuring Set, Follow-On Buy (MMS-FOB) IOTE	4Q94	3
- Battery Computer System ADA Software (BCS-ADA) IOTE	3Q94	108
- Aircrew Microclimate Conditioning System (AMCS) IOTE	1Q94	28

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PE Title: Support of Operational Testing — Budget Activity: #6

- Laser Countermeasure System (LCMS) IOTE	4Q94	132
- Soldier Enhancement Program I (SEP I) IOTE	4Q94	4
- Force Provider (FP) IOTE	4Q94	222
- Nuclear, Biological and Chemical Reconnaissance System (NBCRS) IOTE	4Q94	956
- XM56 Motorized Smoke System (XM56 MSS) IOTE	4Q94	314
- Thermal Weapon Sight AN/PAS-13 (TWS) IOTE	4Q94	2
- Integrated Commercial Intrusion Detection System (ICIDS) IOTE	4Q94	2
- TROJAN Special Purpose Integrated Remote Intelligence Terminal (TROJAN SPIRIT II) LUT	4Q94	35
- Inflatable Body and Head Restraint System (IBAHRS) IOTE	4Q94	285
• (U) Test preparation planned:		
- Avenger Electronic Support Measures, Non-Cooperative Target Recognition (AVGR ESM NCTR-1) IOTE	4Q94	10
- Armored Gun System (AGS) EUTE	4Q94	644
- C-17 Aircraft MOTE	4Q94	133
- Joint Surveillance and Target Attack Radar System (JSTARS) MOTE	4Q94	46
- Intelligence and Electronic Warfare Common Sensor (IEWCS) IOTE	4Q94	11
- Joint Tactical Information Distribution System (JTIDS) LUT	4Q94	616
- All Source Analysis System (ASAS) Block II LUT	4Q94	5
- Forward Area Air Defense Command, Control, Communications and Intelligence (Heavy) (FAAD C3I Heavy) IOTE	4Q94	859
- LONGBOW APACHE (LBA) IOTE	4Q94	2284
Total		30478

(U) FY 1995 Planned Program:	Complete	Cost
• (U) Tests planned:		
- C-17 Aircraft MOTE	4Q95	761
- Intelligence and Electronic Warfare Common Sensor (IEWCS) IOTE	4Q95	2781
- Guard Unit Armory Device Full-Crew Integrated Simulation Trainer for Armor (GUARDFIST I) IOTE	3Q95	455
- Guardrail Common Sensor (GRCS) LUT	4Q95	2171
- AN/TMQ-41 Meteorological Measuring Set, Follow-on Boy (MMS-FOB) IOTE	1Q95	2
- Laser Countermeasure System (LCMS) IOTE	1Q95	12

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- Joint Tactical Ground Station (JTAGS) IOTE	4Q95	939
- Soldier Fighting Cover (SFC) IOTE	3Q95	365
Total		**7486**

(U) Project D985 - Concepts Evaluation of Materiel: The Concepts Evaluation of Materiel Program provides TRADOC battle labs and schools the ability to acquire, lease or fabricate equipment and to conduct evaluations and experiments and data gathering efforts to determine military utility or potential to satisfy Army Doctrine, Training, Leader Development, Organization, Materiel requirements and Soldiers (DTLOMS) needs. Results provide insight into feasibility of concept and/or clarification of requirements and provide a capability to capitalize on emerging technology and new materiel. Funds employed for Concept Evaluation Program permit early, experience based consideration of new technologies and other equipment before large scale commitment in time and funding. Funding growth represents an increased requirement to perform up-front evaluations of emerging technologies and weed out non-viable and low return concepts. Battle labs are to be equipped with reconfigurable simulators and connected to the Defense Simulations Internet (DSI). Program will save materiel developer dollars later in the acquisition process through enhanced requirements definition.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Evaluations and experiments conducted for the following systems:		
- Battle Dress Uniform Thermal Signature	4Q93	3
- Anemometer Comparison Test	4Q93	6
- Small Unit Light Weight Sensors	4Q93	24
- Counter Unmanned Aerial Vehicle	4Q93	25
- Precise Light Weight Ground Positioning Sys	4Q93	15
- Heavy Recovery Vehicle	4Q93	15
- Maneuver Control System Engr/NATO Engr C2	4Q93	112
- Scoop Loader	4Q93	12
- Command and Control on the Move	4Q93	250
- Integrated Meteorological Sys	4Q93	95
- M1A2 Differential Distribution	4Q93	65
- Abrams Fire Control Upgrade	4Q93	16
- Combined Arms Command and Control	4Q93	30
- Mounted Battlespace Battle Lab	4Q93	30

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- National Training Center Rotation	4Q93	443
- Quartermaster School Cbt Svs Spt Battle Lab	4Q93	100
- Maneuver Control Sys/Automated NBC Information	4Q93	182
- Sensor Artificial Intelligence Comm Maint Sys	4Q93	42
- Lubrication Servicing Unit	4Q93	5
- Forward Repair Vehicle	4Q93	119
- Electrical Component Test Stand	4Q93	80
- Powerpack Trailer	4Q93	10
- Laying & Positioning Sys Fld Artillery Phase I	4Q93	53
- Depth & Simultaneous Attack Battle Lab	4Q93	49
Total		**1781**

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Evaluations and experiments planned:		
- Split Operations Concept	2Q94	55
- Heavy Recovery Vehicle	2Q94	57
- Enroute Communications	3Q94	50
- Bradley Fire Spt Vehicle	2Q94	53
- Advanced Precision Airborne Delivery Sys	3Q94	150
- Command Post Bunker	3Q94	100
- Secure Tactical Data Network - Phase V	4Q94	69
- Radio Access Unit on the Move	3Q94	67
- Vehicle Integrated Defense System Phase III	4Q94	290
- M1 2D Generation Thermal Sys	3Q94	184
- Brigade/Battalion Night Fighting Sys	3Q94	310
- Prototype Decision Support Sys	4Q94	345
- Recovery Spt Light & Contingency Forces	2Q94	200
- Misc CEPS	4Q94	291
Total		**2221**

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(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Examples of evaluations and experiments planned:		
- Automated Wargaming Tool	4Q95	190
- Electronic Dissemination of Digitized Graphics	4Q95	220
- M1 Suite of Survivability Enhancement Sys	4Q95	430
- Rear Area Management Tool	4Q95	270
- Heavy Force Deployment	4Q95	225
- Advanced Cannon Assessment	4Q95	225
- Deep Operations Coordination Cell	4Q95	180
- Division Artillery/Brigade Tactical Operations	4Q95	150
- Joint Interoperability Sys	4Q95	100
- Patient Decontamination Ops at Mobile Med Facility	4Q95	170
- High Mobility Artillery Rocket Sys	4Q95	125
- Dynamic Replanning in Btl Cmd Decision Making	4Q95	100
- Future Distribution Platform	4Q95	530
- Automated NBC Info Sys-Army Tactical Cmd&Cntr	4Q95	210
- Validation of Seamless Simulation	4Q95	400
- Datalink Abn C2 Vehicle	4Q95	500
- MISC CEPS	4Q95	2064
Total		**6089**

(U) Project D987 - OPTEC Instrumentation Sustainment & Development: In order to stay abreast of new weapons and communications systems, the tester requires advanced technology insertion into test instrumentation prior to system tests. This project provides a data collection capability to support the materiel acquisition process. Develops non-major instrumentation and modifications to sustain current instrumentation capability, to integrate combat simulators into operational tests and to insert technology advances into OPTEC instrumentation. Supports Real-Time Casualty Assessment (RTCA) providing realistic simulated attrition of forces. FY 1995-1999 funding is essential to providing a test capability which requires less manpower to operate as necessitated by OPTEC 2000 downsizing of personnel. Although OPTEC was established as the Army's operational tester in FY 1991, it was not until FY 1994, when this project received initial funding, that OPTEC was able to acquire non-major instrumentation systems and sustain all existing instrumentation needed to support the operational test mission. FY 1995 is the first year sufficient funds are provided to begin acquiring and upgrading the test instrumentation needed to support the operational test mission, keep abreast of

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technological advancements in weapon systems and conduct credible and robust operational tests, as required by HQDA, OSD, and Congress. The increased funding level starting in FY 1995 supports continued development and sustainment of RTCA and other test instrumentation to support tests for systems such as Comanche, Battlefield Combat Identification System (BCIS), LOSAT, and Stingray beyond FY 1995 which require a continuous level of resourcing.

(U) FY 1993 Accomplishments:
- (U) Not funded.

(U) FY 1994 Planned Program:

	Complete	Cost
• (U) Acquire instrumentation to support the Operational Test Instrumentation Program (OTIP) to conduct tests identified in Projects D001 and D985.	4Q94	380
• (U) Acquire instrumentation to sustain current OPTEC test capability.	4Q94	340
• (U) Provide short response development of instrumentation/support to meet last minute test data requirements mandated by HQDA and DoD.	4Q94	291
Total		**1011**

(U) FY 1995 Planned Program:

	Complete	Cost
• (U) Acquire instrumentation to support the Operational Test Instrumentation Program (OTIP) to conduct tests identified in Projects D001 and D985.	4Q95	1232
• (U) Acquire equipment and software to provide interim RTCA capability to support the LONGBOW APACHE IOTE and other tests requiring RTCA.	4Q95	1100
• (U) Provide short response development of instrumentation/support to meet last minute test data requirements mandated by HQDA and DoD.	4Q95	716
Total		**3048**

(U) Work Performed By: Operational tests and evaluations are primarily conducted at Army installations. A majority of work is performed by OPTEC's test directorates, and assisted by available local support. Another organization which plays a vital role in testing is OPTEC's Test and Experimentation Center (TEC). All organizations are staffed by military and government civilian personnel. Contractors performing work for this program effort include: Planning Research Corporation/ORI Joint Venture, McLean, VA; BDM International Inc., McLean, VA; Science Applications Corporation, San Diego, CA; MADENTECH, Inc., Arlington, VA; DYNCORP, Albuquerque, NM; United International Engineering,

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PE Title: Support of Operational Testing Budget Activity: **#6**

Albuquerque, NM; Veda, Inc., Fort Huachuca, AZ; Martin-Marietta Technical Service Group, Fort Hood, TX; General Electric Co., El Paso, TX; Research Analysis and Maintenance Inc., El Paso, TX; Gutienez Palmenberg, Inc., Phoenix, AZ; Applied Research Laboratory, Austin, TX; LOGICON R & D Associates, Los Angeles, CA; Hughes, West Covina, CA; Vreuls Research Corporation, Thousand Oaks, CA; Mitre Corporation, McLean, VA; and Mentor TECH, Inc., Rockville, MD. Concepts Evaluation of Materiel work is performed primarily by TRADOC schools supplemented by OPTEC test directorates. OPTEC's Instrumentation Sustainment and Development program work is performed by a designated acquisition agency. Major contracts are coordinated by the Program Manager for Instrumentation, Targets and Threat Simulators (PM-ITTS), and by OPTEC for nonmajor programs. This is a continuous program that consolidates acquisition of like items into single contracts. The P2NBC2 program is managed by the U.S. Army Chemical School. A majority of the work is performed by the U.S. Army Research Institute for Environmental Medicine, the Walter Reed Army Institute of Research, the Chemical Research, Development and Experiment Center, the Army Research Laboratory, and the U.S. Army Aeromedical Research Laboratory.

(U) Related Activities: There is no unnecessary duplication of effort within the Army or DoD. The Army staff monitors all tests for materiel development and activities to avoid duplication of effort. The Director, Test and Evaluation, and Director of Operational Test and Evaluation, Office of the Secretary of Defense (OSD), also review planned testing and development of support equipment to ensure integration of testing by the services and to avoid duplicative testing. High-level staff management of resources for user testing is provided by the U.S. Army Test Schedule and Review Committee which is chaired by the U.S. Army Operational Test and Evaluation Command. Unnecessary duplication of like items prevented by coordination with PM-ITTS, the Operational Test & Evaluation Coordinating Council (OTECC), review by the Army Test and Evaluation Committee and by coordination with the Test Scheduling and Review Committee (TSARC). **Other Projects reprogrammed from PE 0605712, Project D001 in FY 1995 are as follow:**

PE/Project Number	Title	FY1995 Estimate
0604645.2AT	AGS Operational Test	2949
0604770.2CT	JSTARS Operational Test	6013
0604816.2DT	LBA Operational Test	24157
0203726.2ET	AFATDS Operational Tet	3125
0604321.2FT	ASAS Operational Test	2996
0603805.2GT	CSSCS Operational Test	92
0203740.2HT	MCS Operational Test	91

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605712A
PE Title: Support of Operational Testing

Budget Activity: **#6**

0604741.2JT FAAD C2I Operational Test 136
0604820.2IT FAAD C3I Operational Test 5018

(U) Other Appropriation Funds: ($ in Thousands)

Appropriation	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate
MA6700 Other Procurement Army Special Equipment for User Testing	6029	2408	3672	3372	3386	3498	3398

(U) International Cooperative Agreements: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0605801A**
PE Title: **Programwide Activities** Budget Activity: **#6**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
M881 RDTE Command/Center/General Administrative Support	92124	83714	77973	55993	51879	51435	50916	Cont	Cont
MAC3 Ozone Depleting Chemicals Elimination	0	9116	24071	2041	322	0	0	0	35550
MAC4 Pollution Prevention in Acquisition	0	0	1218	500	0	0	0	0	1718
TOTAL PE	92124	92830	103262	58534	52201	51435	50916		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program funds the continued operation of non-Army Management Headquarters Activities (AMHA) management and administrative functions at Army Research, Development, Test, and Evaluation (RDTE) commands, centers and activities required to accomplish overall assigned general research and development missions not directly related to specific research and development projects. Also provides funding to develop and implement Army programs for elimination of ozone depleting chemicals in weapon systems and pollution prevention in the acquisition of weapon systems. Project M881 reflects a glide path in response to Army infrastructure drawdown initiatives. Planned increase in FY 1995 reflects Army initiatives to comply with Presidential directive to eliminate ozone depleting chemicals such as: Halon 1301 used in fire extinquishers and fire suppression systems; and chloroflourocarbons (CFCs) used in air conditioners. Project MAC4 (Pollution Prevention in Acquisition) is a new start in response to Presidential directions on reducing use and/or release of hazardous materials on DoD installations.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project M881 - RDTE Command/Center/General Administrative Support. Supports the non-AMHA management and administrative functions at the following Army RDTE commands, centers and activities: U.S. Army Research Institute for the Behavioral and Social Sciences, Alexandria, VA; U.S. Army Armament Research, Development and Engineering (RDE) Center, Picatinny Arsenal, NJ; U.S. Army Aviation RDE Center, St. Louis, MO; U.S. Army Research Laboratory, Adelphi, MD; U.S. Army Missile RDE Center, Redstone Arsenal, AL; U.S. Army Tank-Automotive RDE Center, Warren, MI; U.S. Army Troop Support Command R&D Integration Office, St. Louis, MO; U.S. Army Chemical Biological Defense Command,

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0605801A**
PE Title: **Programwide Activities** Budget Activity: **#6**

Aberdeen Proving Ground, MD; U.S. Army Communications-Electronics Command RDE Center, Ft. Monmouth, NJ; U.S. Army Belvoir RDE Center, Ft. Belvoir, VA; U.S. Army Test and Evaluation Command, Aberdeen Proving Ground, MD; and four international RDTE Standardization Groups located in Australia, Canada, Germany, and United Kingdom. This project also provides continued operations of contracting and acquisition management and related administrative functions performed by the Army Medical Research Acquisition Activity (USAMRAA) in support of the Army Medical Research and Development Command (USAMRDC) RDT&E programs and its tenant organizations at Ft. Detrick, MD, including medical materiel procurement contracts for the U.S. Army Medical Materiel Agency and the Office of the Surgeon General, Army. Requested resources finance salaries and related support costs for authorized civilian personnel. This program is central to efficient management of the total Army RDTE program. Also includes, in FY 1994 only, funds to develop the Medical Diagnostic Imaging Support (MDIS) System. MDIS implements a cost-effective and clinically effective digital imaging system as a model program for U.S. medicine at Madigan Army Medical Center and other DoD medical facilities in the Puget Sound region.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Provided operation of management and administrative functions at a level consistent with mission requirements and support needs at Army non-AMHA RDTE commands, centers and activities.	4Q93	84214
• (U) Continued operation of the five Standardization Groups and AMC representative in France. Funded U.S. share of embassy costs (communications, custodial services, utilities and guard service).	4Q93	3307
• (U) Funded travel of the Army Science Board.	4Q93	336
• (U) Funded quick reaction capability for accident investigations at Aviation Systems Command and unique costs related to tenant support.	4Q93	970
• (U) Provided acquisition management functions in support of USAMRDC, Ft Detrick, MD and its tenant organizations, including medical materiel procurement contracts and procurement of biological defense vaccines.	4Q93	3297
Total		**92124**

(U) FY 1994 Plans:	Complete	Cost
• (U) Provide continued operation of management and administrative functions at a level consistent with mission requirements and support needs at Army non-AMHA RDTE commands, centers and activities.	4Q94	67275
• (U) Continue operation of the five Standardization Groups and AMC representative in France. Funds U.S. share of embassy costs (communications, custodial services, utilities and guard service).	4Q94	3202
• (U) Fund travel of the Army Science Board.	4Q94	350
• (U) Fund quick reaction capability for accident investigations at Aviation Systems Command and unique costs related to tenant support.	4Q94	1008

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605801A
PE Title: **Programwide Activities** Budget Activity: #6

• (U) Continue to provide acquisition management functions in support of USAMRDC RDT&E programs and its tenant organizations, Ft Detrick, MD including medical materiel procurement contracts, and procurement of biological defense vaccines.	4Q94	4879
• (U) Award equipment technology delivery order for the MDIS System to Loral Aerospace for filmless teleradiology and tele-imaging system at DoD facilities in the Puget Sound region.	4Q94	7000
Total		83714

(U) **FY 1995 Plans:**	**Complete**	**Cost**
• (U) Provide continued operation of management and administrative functions at a level consistent with mission requirements and support needs at Army non-AMHA RDTE commands, centers and activities	4Q95	68032
• (U) Continue operation of the five Standardization Groups and AMC representative in France. Funds U.S. share of embassy costs (communications, custodial services, utilities and guard service).	4Q95	3209
• (U) Fund travel of the Army Science Board.	4Q95	350
• (U) Fund quick reaction capability for accident investigations at Aviation Systems Command and unique costs related to tenant support.	4Q95	1039
• (U) Continue to provide acquisition management functions in support of USAMRDC RDT&E programs and its tenant organizations, Ft Detrick, MD including medical materiel procurement contracts, and procurement of biological defense vaccines.	4Q95	5343
Total		77973

(U) Project MAC3 - Ozone Depleting Chemicals (ODC) Elimination. Develop and implement the Army program to eliminate the use of ODC on/for weapon systems. The program has been developed due to International Agreements (Montreal Protocol), Title VI of the Clean Air Act of 1990.

(U) **FY 1993 Accomplishments:** Project not funded.

(U) **FY 1994 Plans:**	**Complete**	**Cost**
• (U) Funds required to meet environmental compliance mandated by International Agreement (Montreal Protocol), Title VI of the Clean Air Act of 1990. Under International Agreement, production of ozone depleting chemicals (ODC) in the US will cease: Halons by 1 January 1994 and chloroflourocarbon (CFCs) by 31 December 1996. Project areas are replacement of Halon 1301 in aviation engine nacelles, engine compartments of ground combat vehicles, watercraft spaces, and replacement of CFCs from air-conditioners.	4Q94	9116

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0605801A**
PE Title: **Programwide Activities** Budget Activity: **#6**

(U) FY 1995 Plans:

	Complete	Cost
• (U) Funds required to meet environmental compliance mandated by International Agreement (Montreal Protocol), Title VI of the Clean Air Act of 1990. Under International Agreement, production of ozone depleting chemicals (ODC) in the US will cease: Halons by 1 January 1994 and chloroflourocarbon (CFCs) by 31 December 1996. Project areas are replacement of Halon 1301 in aviation engine nacelles, engine compartments of ground combat vehicles, watercraft spaces, and replacement of CFCs from air-conditioners.	4Q95	24071

(U) **Project MAC4 - Pollution Prevention in Acquisition.** Develop and implement the Army program to comply with section 3-303 of Executive Order 12856 of 3 August 1993, which requires the elimination/reduction of hazardous materials/processes from acquisition/procurement within the Army. This is a new start.

(U) FY 1993 Accomplishments: Project not funded.

(U) FY 1994 Plans: Project not funded.

(U) FY 1995 Plans:

	Complete	Cost
• (U) Develop an Army Pollution Prevention in Acquisition Plan.	4Q95	156
• (U) Review cognizance documentation to identify hazardous materials.	4Q95	438
• (U) Manage and initiate projects to identify/test/evaluate alternative materials/processes.	4Q95	438
• (U) Initiate changes to documentation to replace hazardous materials with alternatives.	4Q95	110
• (U) Support PEOs/PMs in implementing pollution prevention in the acquisition of weapon systems.	4Q95	76
Total		**1218**

(U) **WORK PERFORMED BY:** U.S. Army Materiel Command (AMC), Alexandria, VA, and AMC's following subordinate commands/activities: U.S. Army Armament Research, Development and Engineering (RDE) Center, Picatinny Arsenal, NJ; U.S. Army Aviation RDE Center, St. Louis, MO; U.S. Army Research Laboratory, Adelphi, MD; U.S. Army Missile RDE Center, Redstone Arsenal, AL; U.S. Army Tank-Automotive RDE Center, Warren, MI; U.S. Army Troop Support Command R&D Integration Office, St. Louis, MO; U.S. Army Chemical Biological Defense Command, Aberdeen Proving Ground, MD; U.S. Army Communications-Electronics Command RDE Center, Ft. Monmouth, NJ; U.S. Army Belvoir RDE Center, Ft. Belvoir, VA; U.S. Army Test and Evaluation Command, Aberdeen Proving Ground, MD; and four international RDTE Standardization Groups located in Australia, Canada, Germany, and United Kingdom. Also, the U.S. Army Medical Research and Development Command and the Medical Research Acquisition Activity, Ft. Detrick, MD; and the U.S. Army Research Institute for the Behavioral and Social Sciences, Alexandria, VA.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605801A
PE Title: Programwide Activities

Budget Activity: #6

(U) RELATED ACTIVITIES: There is no unnecessary duplication of effort within the Army or the DoD.

(U) OTHER APPROPRIATION FUNDS: Not applicable.

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Five Standardization Groups and AMC representative in France are listed as participating establishments/authorities on all bilateral Data Exchange Annexes pertaining to their assigned countries. An integral part of their responsibilities is the monitoring of these programs and the role of fostering an environment in which international cooperative agreements can be established.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605802A
PE Title: **International Cooperative Research and Development** . Budget Activity #6

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
M798 International Cooperative Research and Development- Army Research Institute									
	1815	1861	1638	956	817	808	802	Cont	Cont

B. (U) BRIEF DESCRIPTION OF ELEMENT: The goal of this program is to expand worldwide allied standardization and interoperability through cooperative research and development (R&D) projects and technology sharing. This program partially funds the travel costs and administrative support (studies, analysis, interpretation, equipment, etc.) required to participate in international fora, such as the North Atlantic Treaty Organization (NATO) Army Armaments Group (NAAG), and to pursue new cooperative R&D initiatives and international cooperative agreements such as memoranda of understanding. This program also includes the United States' share of the costs of the NATO Industrial Advisory Group (NIAG) and the Special Fund for Cooperative Planning; partially funds the Four Power Senior National Representatives Army (SNR(A)); the American, British, Canadian, Australian (ABCA) Standardization Program; the Technical Cooperation Program; bilateral staff talks; and Army armaments working groups with many nations.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project M798 - International Cooperative R&D - Army Research Institute

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Funded domestic and international travel linked to scientific and technological exchanges that have military application and mutual benefit for the United States and its allies; funded travel to support cooperative R&D initiatives; and supported regular attendance at meetings of fifteen NATO panels, sixteen ABCA working groups, annual meetings of the SNR(A), staff talks, and numerous sub-panels and working group meetings.	4Q93	972
• (U) Funded the United States' share of the NIAG and special fund for cooperative planning budget.	4Q93	843
Total		**1815**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0605802A**
PE Title: **International Cooperative Research and Development**

Budget Activity **#6**

(U) FY 1994 Plans:

	Complete	Cost
• (U) Continue to fund domestic and international travel linked to scientific and technological exchanges that have military application and mutual benefit for the United States and its allies; fund travel to support cooperative R&D initiatives; and support regular attendance at meetings of eighteen NATO panels, sixteen ABCA working groups, staff talks, numerous sub-panels and working group meetings, and host the annual meeting of the SNR(A).	4Q94	1011
• (U) Funded the United States' share of the NIAG and special fund for cooperative planning budget.	4Q94	850
Total		**1861**

(U) FY 1995 Plans:

	Complete	Cost
• (U) Continue to fund domestic and international travel linked to scientific and technological exchanges that have military application and mutual benefit for the United States and its allies; fund travel to support cooperative R&D initiatives; and support regular attendance at meetings of eighteen NATO panels, sixteen ABCA working groups, staff talks, numerous sub-panels and working group meetings, and host the annual meetings of the SNR(A).	4Q95	788
• (U) Funded the United States' share of the NIAG and special fund for cooperative planning budget.	4Q95	850
Total		**1638**

(U) WORK PERFORMED BY: Principally by the US Army Research Institute, US Army Materiel Command, and the US Army Training and Doctrine Command.

(U) RELATED ACTIVITIES: Attendance at the meetings of these international fora further cooperative research and development efforts and sometimes lead to cooperative research and development projects. Meetings also lead to Memoranda of Understanding and Data Exchange Agreements (with NATO, Korea, Japan and the mid-East countries) to improve combat and logistical effectiveness during wartime. The project defrays, on behalf of the all services, the US support for the NATO Industrial Advisory Group (which produces prefeasibility studies in support of NATO cooperative materiel development projects) and the Special Fund for Cooperative Planning. There is no unnecessary duplication of effort within the Army or DOD.

(U) OTHER APPROPRIATION FUNDS: Not Applicable.

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: This program, as the title indicates, deals entirely with international cooperative research, development, test and evaluation (RDT&E) to include travel costs and required administrative support. See paragraph B.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605803A
PE Title: **Technical Information Activities**

Budget Activity: #6

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DC16	Field Assistance in Science and Technology (FAST)								
	2902	2596	2899	2792	2894	2984	3232	Cont	Cont
DC18	Board on Army Science Technology (BAST)								
	653	664	687	690	707	724	740	Cont	Cont
MZ85	DBOF - Information Analysis Centers (IAC)								
	3697	0	0	0	0	0	0		
MZ86	DBOF - Defense Technical Information Center (DTIC)								
	6561	0	0	0	0	0	0		
M720	Technical Information Functional Activities								
	1212	1368	1712	1653	1689	1782	1826	Cont	Cont
M727	Technical Information Activities								
	2836	2267	2531	2745	2751	2923	2991	Cont	Cont
M729	Youth Science Activities								
	1659	1720	1921	1988	2091	2141	2192	Cont	Cont
D730	Personnel and Training Analysis Activities								
	3209	3077	3019	3053	3178	3312	3399	Cont	Cont
M731	Government/Industry Data Exchange Program/Advisory Group on Electronic Devices (GIDEP/AGED)								
	248	252	282	286	295	305	314	Cont	Cont
M733	Acquisition Technology Act								
	0	0	253	250	251	251	253	Cont	Cont
PE TOTAL	22977	11944	13304	13457	13856	14422	14947		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program is vital to sharing science and technology with US industry and academia and strengthening cooperative research and development between the Army and Industry. This program directly addresses the need to increase the competitiveness and availability of scientific, engineering, and technical skills in the DoD and National workforce. It accomplishes this through

outreach programs such as Women in Science, Army/Navy Washington Summer Apprenticeship, and Science and Engineering fairs as an example. This program also provides for upgrading the accuracy, timeliness, availability, and accessibility of scientific, technical, and management information at all levels of Army research and development (R&D). This includes initiatives to improve information derivation, storage, access, display, validation, transmission, distribution, and interpretation. Funding under this program provides for the conduct of analyses, using behavioral science-based analytic tools, to provide policy and decision makers with soldier oriented recommendations concerning manpower, personnel and training issues. This program also provides for rapid organization and deployment of science advisors and engineering teams to directly solve field Army technical problems. Coordination of this program with other Services is achieved through interservice working groups.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) **Project DC16 - Field Assistance in Science and Technology (FAST):** This program focuses AMC resources to rapidly identify and solve field Army technical problems affecting improved readiness, safety, training and operations, and support (O&S) cost reductions. The Commanding General, AMC institutionalized AMC-FAST in 1988 to plan for and allocate all AMC-FAST program funding for projects to support CINCs and commanders and to operate the director's office. FAST tours provide major professional growth for scientists and engineers. Science advisers are recruited from Army Materiel Command (AMC) engineering centers and the Army Research Laboratory serving Commanders-in-Chief (CINCs) and major Army commanders world-wide and are supported by assigned Quick Reaction Coordinators (QRCs) within each AMC engineering center, Army Research Laboratory, and other Army agencies. Program director reports to Commanding General, AMC. All science adviser salaries are funded by AMC organizations who supply the science advisers for two year tours. Project costs have required below-threshold reprogramming actions at AMC Headquarters because of the high priority and Army wide visibility of FAST projects. FAST is a level of effort type project with most projects recouping many times their cost in O&S cost savings.

(U) FY 1993 Accomplishments:	Completed	Cost
• (U) Provided continuous activity on over 200 projects of major interest to commanders; Defined, tested, and recommended technology solutions to materiel problems identified by CINCs worldwide	*	2052
• (U) Provided science adviser to Special Operations Command (SOCOM); provided science advisor to Training and Doctrine Command (TRADOC) headquarters; assisted Air Force to initiate FAST	*	200
• (U) Provided professional growth opportunity for 19 science advisers on two year tours and 20 FAST-junior scientists and engineers on two to eight-week tours	*	590
• (U) Established policies, responsibilities, procedures for the AMC Scientists and Engineers Field Experience with Soldiers (SEFEWS)program	*	60
Total:		2902

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605803A
PE Title: Technical Information Activities Budget Activity: **#6**

(U) FY 1994 Planned Program:	**Completed**	**Cost**
• **(U)** Provide continuous activity on over 235 FAST projects. Define, test and recommend technology solutions to materiel problems identified by CINCs worldwide	*	1926
• **(U)** Provide professional growth opportunity for 20 science advisers on two year or three year tours and 25 FAST-junior scientists and engineers on two to eight week tours.	*	600
• **(U)** Provide professional growth opportunity for 20 personnel in the Scientists and Engineers Field Experience with Soldiers (SEFEWS) program.	*	65
• **(U)** Provide science advisor to US Transportation Command to serve on the CINC's Initiatives Team to support future contingency actions and develop a direct relationship between organizations for optimum planning and execution	*	5
Total:		**2596**

(U) FY 1995 Planned Program:	**Completed**	**Cost**
• **(U)** Provide continuous activity on over 250 FAST projects. Define, test and recommend technology solutions to materiel problems identified by CINCs worldwide and prepare operational needs statements and test results for the highest priority programs.	*	2174
• **(U)** Provide professional growth opportunity for 29 science advisers on two year to three year tours and 30 FAST-junior scientists and engineers on two to eight week tours	*	650
• **(U)** Provide professional growth opportunity for 50 personnel in the SEFEWS program	*	75
Total:		**2899**

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

(U) Project DC18 - Board on Army Science Technology (BAST): Standing panel of the National Academy of Sciences, initiated by the Under Secretary of Army.

(U) FY 1993 Accomplishments:	**Completed**	**Cost**
• **(U)** Provided support for forecast of Army science and technology needs and opportunities and responded to immediate science and technology requirements	*	350
• **(U)** Provided experts to participate in peer reviews for annual In-House Laboratory Independent Research (ILIR) and Research, Development and Acquisition (RDA) awards	3Q93	40

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605803A
PE Title: Technical Information Activities — Budget Activity: #6

• (U) Provided research and discussions in the areas of Army research metrics, selected advanced technology demonstrations, and other science and technology topics	4Q93	263
Total:		**653**

(U) FY 1994 Planned Program:	**Completed**	**Cost**
• (U) Provide support for forecast of Army science and technology needs and opportunities and respond to immediate science and technology requirements	*	359
• (U) Provide experts to participate in peer reviews for annual ILIR and RDA awards review	3Q94	40
• (U) Provide a study committee to review an assessment of Army Research Laboratory with the objective of recommending alternatives for achieving world class science and technology research status	4Q94	265
Total:		**664**

(U) FY 1995 Planned Program:	**Completed**	**Cost**
• (U) Provide support for forecast of Army science and technology needs and respond to immediate science and technology requirements	*	367
• (U) Provide experts to participate in peer reviews for annual ILIR and RDA awards	3Q95	40
• (U) Provide a study committee to address an assess space-based communications technology for C3I to "win the information war"	4Q95	280
Total:		**687**

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

(U) **Project MZ85 - Information Analysis Centers (IAC):** The Information Analysis Centers (IACs) provide technology transfer activities designed to improve the access to and usage of acquisition-funded Scientific and Technical Information (STI). Established by the Office of the Deputy Director of Defense, Research and Engineering (ODDR&E) as an integral part of the DoD STI program, IACs are R&D activities as well as STI support activities. The 14 IACs funded under this program provide independent assessment of new technology, unbiased analytical review of DoD programs, state-of-the-art STI data collection, corporate DoD technical memory and rapid response analysis and engineering services to hundreds of DoD components and tens of thousands of individuals working within critical DoD technology thrust areas. The need for IACs has been increasing as a result of the DoD strategy which bases U.S. defense posture on technical rather than numerical superiority.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605803A
PE Title: Technical Information Activities

Budget Activity: #6

(U) FY 1993 Accomplishments:	Completed	Cost
• (U) Maintained goal level of IAC services; invested in IAC capability to leverage science and technology; developed DoD-required test result databases; created defense management support resources; networked technical information sources for defense needs.	4Q93	3697
Total		**3697**

(U) FY 1994 Planned Program:
Funded in Defense Agency Account in FY 1994.

(U) FY 1995 Planned Program:
Funded in Defense Agency Account in FY 1995.

(U) Project MZ86 - Defense Technical Information Center (DTIC): DTIC functions as the central collection and dissemination point for DoD technology base information interchange. Customers are the managers, scientists, and engineers of the DoD and DoD contractors. Users include managers in the Office of the Secretary of Defense, the services and RDT&E commands and laboratories. To improve support to the defense acquisition process, DTIC was transferred from the Defense Logistics Agency, to operational control of the Office of the Under Secretary of Defense (Acquisition), Deputy Director of Management Systems, Acquisition Policy and Program Integration.

(U) FY 1993 Accomplishments:	Completed	Cost
• (U) Provide services in support of defense acquisition community information needs; provided DoD networked information services to leverage science and technology; created defense management support resources and began implementation of Electronic Document System	4Q93	6561
Total		**6561**

(U) FY 1994 Planned Program:
Funded in Defense Agency Account in FY 1994.

(U) FY 1995 Planned Program:
Funded in Defense Agency Account in FY 1995.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605803A
PE Title: Technical Information Activities **Budget Activity: #6**

(U) Project M720 - Technical Information Functional Activities: Technology transfer activities support acquisition, storage, and utilization of technical information for both military and domestic applications. Activities supported are: (1) Army participation in the Defense Technical Information Center (DTIC) Work Unit Information Summary (WUIS) database; (2) Army support for the Federal Laboratory Consortium (FLC); (3) the Army Science Board; (4) administration of the Army's Small Business Innovative Research (SBIR) and Small Business Technology Transfer Pilot Program (STTR) in accordance with the "Small Business Innovation Research Program Enhancement Act of 1992". These costs are funded here because the Act prohibits use of PE #0605502 for funding administrative costs; and (5) studies and analyses to support the Acquisition Corps acquisition and retention of scientists and engineers and improvement of productivity of laboratories and centers. Technology transfer activities make technical information available to both the public and private sectors to reduce duplication in R&D programs and to increase competitiveness in the U.S. business community.

(U) FY 1993 Accomplishments:	Completed	Cost
• (U) Continued managerial, programming, data base, clerical and personnel support to process, store, control and report the WUIS, 1498s	*	377
• (U) Provided the Army funding for the annual data collection and printing of the DoD Tri-Service RDT&E Facilities Report"	*	26
• (U) Provided Army funding support for FLC as required by Public Law 99-502	*	200
• (U) Provided administrative and contractual support for the Army Science Board(ASB)	*	259
• (U) Supported OSD laboratory management study	2Q93	350
Total:		1212

(U) FY 1994 Planned Program:	Completed	Cost
• (U) Continue managerial, programming, data base, clerical and personnel support to process, store, control and report the WUIS, 1498's	*	435
• (U) Provide the Army funding for the annual data collection and printing of the DoD Tri-Service In-House RDT&E Facilities Report"	*	27
• (U) Provided Army funding support for FLC as required by Public Law 99-502	*	200
• (U) Provided administrative and contractual support for the Army Science Board(ASB)	*	300
• (U) Provide Army Science and Technology reports/studies	*	406
Total:		1368

(U) FY 1995 Planned Program:	Completed	Cost
• (U) Continue managerial, programming, data base, clerical and personnel support to process, store, control and report the WUIS, 1498's	*	464

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605803A
PE Title: Technical Information Activities — **Budget Activity: #6**

• (U) Provide the Army funding for the annual data collection and printing of the DoD Tri-Service In-House RDT&E Facilities Report"	*	28
• (U) Provide Army funding support for FLC as required by Public Law 99-502	*	200
• (U) Provide administrative and contractual support for the Army Science Board(ASB)	*	310
• (U) Provide administrative support for SBIR/STTR programs	*	500
• (U) Provide Army Science and Technology Reports	*	210
Total:		1712

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

(U) Project M727 - Technical Information Activities: This project supports development of decision aids, databases, and automation support for the management and execution of the Army Research, Development, Test and Evaluation (RDTE) Appropriation. It includes the hardware, software and contractor support required to develop and implement a set of management decision aids, databases, and hardware/software tools to support technical and budgetary decisions at the Office, Secretary of Defense (OSD), Department of the Army (DA) and Army Materiel Command (AMC) levels. Starting in FY 1994, this project includes resources to institutionally fund annual Army Science and Technology's strategic planning including the Army Science and Technology Master that previously were funded from reprogramming of other RDTE,A resources.

(U) FY 1993 Accomplishments:	**Completed**	**Cost**
• (U) Continued the Science and Technology (S&T) Data Base computer engineering support contract	*	1285
• (U) Provided support to Army S&T strategic planning, analysis and prioritization	*	550
• (U) Provided support to Army leadership for DoD Thrust #5, Advanced Land Combat	2Q93	150
• (U) Provided contract support for the AMC O&S cost savings initiative	3Q93	250
• (U) Maintained/updated AMC/JDL database	*	186
• (U) Provided technical staff support for the Acquisition Management System Review Committee	*	415
Total:		2836

(U) FY 1994 Planned Program:	**Completed**	**Cost**
• (U) Continue the Science and Technology Data Base computer engineering support contract	*	1050
• (U) Continue support to Army S&T strategic planning, analysis, and prioritization	*	800
• (U) Continue support AMC/JDL database	*	150

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605803A
PE Title: Technical Information Activities — Budget Activity: #6

• (U) Provide guidance and policy relative to the content, utilization, and requirements of current and future acquisition management systems	*	267
Total:		**2267**

(U) FY 1995 Planned Program:	Completed	Cost
• (U) Continue the Science and Technology Data Base computer engineering support contract	*	1200
• (U) Continue support to Army S&T strategic planning, analysis, and prioritization.	*	850
• (U) Continue support to AMC/JDL database	*	200
• (U) Provide guidance and policy relative to the content, utilization, and requirements of current and future acquisition management systems	*	281
Total:		**2531**

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

(U) **Project M729 - Youth Science Activities:** Supports science activities to encourage over 60,000 high school youths to develop interest and achieve higher levels in science, engineering, and mathematics. These activities are consolidated within this program to "present the Army" to a potential pool of technical talent to fill future Army needs. No other program fulfills this long-range Army goal. The joint Army/Navy Washington regional area Summer Apprenticeship Program (SEAP) has been included into the overall effort. This provides an eight week hands-on learning experience for high school students working with bench level scientists within Army laboratories to learn what science is really about in hopes of encouraging more of them to enter scientific fields of study in the future. This program enhances the National Laboratory Science and Engineering Pool that in turn support Defense industry and laboratory needs.

(U) FY 1993 Accomplishments:	Completed	Cost
• (U) Continued to foster high school student interest in science, mathematics, engineering and computer science, nationally, through programs such as International Science and Engineering Fair (ISEF), Junior Science and Humanities Symposia (JSHS)	*	1129
• (U) Continued the Joint Army/Navy Washington Regional Area Summer Apprenticeship Program.	*	280
• (U) Special tutorial programs for Native Americans, African Americans and Spanish-speaking Americans designed to increase their chances of attending and completing engineering and/or science curriculum at the university level	*	250
Total:		**1659**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605803A
PE Title: Technical Information Activities Budget Activity: #6

(U) FY 1994 Planned Program:	Completed	Cost
• (U) Continue to foster high school student interest in science, mathematics, engineering and computer science, nationally, through: ISEF, JSHS, REAP, UNITE and the IMO and increase participation by minorities	*	1170
• (U) Continue the Joint Army/Navy Washington Regional Area Summer Apprenticeship Program and increase Army Laboratory/RDE Center sponsorship of students	*	300
• (U) Special tutorial programs for Native Americans, African Americans and Spanish-speaking Americans designed to increase their chances of attending and completing engineering and/or science curriculum at the university level	*	250
Total:		**1720**

(U) FY 1995 Planned Program:	Completed	Cost
• (U) Continue to foster high school student interest in science, mathematics, engineering and computer science, nationally, through: SEAP, ISEF, JSHS, REAP, UNITE and the IMO and increase minority participation	*	1250
• *(U) Continue the Joint Army/Navy Washington Regional Area Summer Apprenticeship Program*	*	350
• (U) Special tutorial programs for Native Americans, African Americans and Spanish-speaking Americans designed to increase their chances of attending and completing engineering and/or science curriculum at the university level	*	321
Total		**1921**

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

(U) Project M730 - Personnel & Training Analysis Activities: This project provides for the application of behavioral science-based analytical technologies by the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) to current and near-term soldier-related issues. The program is focused on policy issues designated to enhance soldier performance and provides the Army a unique capability for addressing such issues as the effects of training on individual and unit readiness, the personnel costs of alternative force structures and the effects of a smaller Army on retention and readiness of quality soldiers. Requirements for studies and analyses for critical personnel and training issues of immediate importance are solicited on an annual basis.

(U) FY 1993 Accomplishments:	Completed	Cost
• (U) Evaluated current leader assessment and development programs	1Q93	178
• (U) Assessed differences in the predictive utility of the Armed Services Vocational Aptitude Battery (ASVAB) by racial and gender subgroups	4Q93	348
• (U) Analyzed how to recruit, manage, and retain sufficient numbers of high quality soldiers at a minimum cost	4Q93	1629

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605803A
PE Title: Technical Information Activities
Budget Activity: #6

(U) FY 1993 Accomplishments:	Completed	Cost
• (U) Complete information data exchange between industry and government and complied technical information for engineering design handbooks	*	248
Total		248

(U) FY 1994 Planned Program:	Completed	Cost
• (U) Continue information exchange of data between industry and government and expansion of the program covering Army elements (industry and government) not currently participating	*	100
• (U) Improve the turn-around-time and concurrently reduce the unit cost of Engineering Design handbooks and focus the efforts of the Engineering Design handbook Program (EDHP) on documenting design information for Military Critical Technologies	*	152
Total		252

(U) FY 1995 Planned Program:	Completed	Cost
• (U) Continue information exchange of data between industry and government and expansion of the program covering Army elements (industry and government) not currently participating	*	130
• (U) Improve the turn-around-time and concurrently reduce the unit cost of Engineering Design handbooks and focus the efforts of the Engineering Design handbook Program (EDHP) on documenting design information for Military Critical Technologies	*	152
Total		282

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

(U) **Project M733 - Acquisition Technology Activities (ATA):** This project provides an environment for the analysis and evaluation of new information technologies, concepts and applications in support of the Army acquisition community's dynamic information management (IM) requirements. It allows for the migration of validated information systems through the use of system engineering and rapid prototyping methodologies. This project will not fund minor construction and is critical to the validation and selection of information technology solutions to meet future Army acquisition community IM requirements. This is a new start.

(U) **FY 1993 Accomplishments:**
- (U) Project not funded.

(U) **FY 1994 Planned Program:**
- (U) Project not funded.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605803A
PE Title: Technical Information Activities

Budget Activity: #6

(U) FY 1995 Planned Program:	Completed	Cost
• (U) Provide knowledge based design, tool sets, and prototype support of Executive and Exper. Information Systems which support the Army Acquisition Community; improve Information Technology component of a strategic IM process	*	129
• (U) Develop a simulation and logical modeling test and environment that provides a prototype development tool in support of technology based initiatives	*	124
Total:		253

* This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

(U) **Work Performed By:** Contractors include: Information Systems and Networks Corporation, Bethesda, MD; Universal Hightech Development, Rockville, MD; Institute for Defense Analyses, Arlington, VA; Human Research Organization (HumRRO), Alexandria, VA; Consortium of Universities of the District of Columbia, Alexandria, VA; Systems Research and Applications, Arlington, VA; Statcom, McLean, VA; Gallup Organization, Rockville, MD; Research Triangle Institute, Research Triangle Park, NC; Battelle Memorial Institute, Columbus, OH. Georgia Institute of Technology, Atlanta, GA and George Washington University, Washington, DC. DoD controlled, contractor-operated IACs are located in Maryland, Michigan, Ohio, Texas, New York, Illinois, California, Indiana, Mississippi, New Hampshire, New Jersey and Virginia. In-house efforts primarily performed by: Army Materiel Command, Alexandria, VA; Army Research Laboratory, Adelphi, MD; Army Research Institute for the Behavioral and Social Sciences, Alexandria, VA; and Defense Technical Information Center, Alexandria, VA.

(U) **Related Activities:** The Army participates in the DTIC and Federal Information Managers Forums, and maintains liaison with the National Commission on Libraries and Information Services. Regular liaison with all DoD and other government technical information representatives is maintained to assure that no duplication of effort exists and that maximum transfer of information occurs. This program also cooperates with the National Library of Medicine Research Program in automatic storage and retrieval of technical information. There are nine other IACs funded by other DoD components. This program adheres to Tri-Service Reliance Agreements on Manpower and Personnel and Training Systems with oversight and coordination provided by the Armed Services Training and Personnel Systems Science and Technology Evaluation and Management (TAPSTEM) Committee. Work in this Program Element contains no unwarranted duplication of effort among the Military Departments.

(U) **Other Appropriation Funds:** ($ in Thousands) Not applicable.

(U) **International Cooperative Agreements:** Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0605805A
PE Title: Munitions Standardization, Effectiveness and Safety **Budget Activity: #6**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DC38 CHICKEN LITTLE Follow-On	4545	3791	0	0	0	0	0	0	8341
DF21 North Atlantic Treaty Organization (NATO) Small Arms Evaluation	310	326	319	284	283	280	279	Cont	Cont
DF24 Conventional Ammunition Demilitarization	1851	10939	761	750	752	754	758	Cont	Cont
D293 Field Artillery Ammunition (NATO) Engineering Development	278	285	283	275	272	269	269	Cont	Cont
D620 DOD Munitions Effectiveness	8038	8159	5022	6210	6133	6078	6384	Cont	Cont
M857 Explosive Safety Standards	814	475	653	624	608	591	575	Cont	Cont
PE TOTAL	15836	23975	7038	8143	8048	7972	8265		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program supports a continuing technology investigation. It provides a coordinated Tri-Service mechanism for the collection and free exchange of technical data on the performance and effectiveness of all non-nuclear munitions and weapon systems in a realistic operational environment. It provides for NATO artillery interchangeability testing; joint munitions effectiveness manuals used by all Services; follow-on testing and studies in support of CHICKEN LITTLE; development of Standardization Agreements (STANAGs) and associated Manuals of Proof and Inspection (MOPI); operation of the North American Regional Test Center (NARTC); evaluation of demilitarization methods for existing conventional ammunition; and safety and hazard evaluation and quantification of DoD munitions via the DoD Explosives Safety Board.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0605805A
PE Title: Munitions Standardization, Effectiveness and Safety — Budget Activity: #6

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1995:

(U) Project DC38 - CHICKEN LITTLE Follow-On: This project is a joint munitions test and evaluation program executed by the Army and the Air Force. Evaluates developmental smart munitions and components against mobile ground vehicles and strategic relocatable targets using actual threat vehicles and realistic countermeasures. The project serves as a center for target signature data collection/exploitation and assists in the testing and evaluation of U.S. vehicle system countermeasures.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Continued development and operation of primary signature measurement facility for DoD.		
• (U) Conducted and conduct captive flight tests to support smart weapons producers.		
• (U) Evaluated effects of advanced warheads against ceramic laminate armors to refine spall models.		
• (U) Upgraded signature database through use of common standardized format in concert with Army laboratories and the intelligence community.		
• (U) Continued assessment of EFP warhead technologies.		
Total	4QFY93	4545

(U) FY 1994 Planned Program:		
• (U) Continue signature exploitation of rest of the world (ROW) targets to support development and intelligence communities.		
• (U) Plan and conduct captive flight tests to evaluate target sensing systems and system algorithm improvements of advanced smart weapons.		
• (U) Continue evaluation of advanced warhead designs against advanced targets.		
• (U) Develop innovative techniques to reduce warhead and seeker/sensor test and evaluation costs.		
• (U) Acquire and maintain expendable test assets to leverage costs of full live fire assessments of advanced smart weapons.		
Total	4QFY94	3791

(U) FY 1995 Planned Program:
- (U) Not funded; program terminated.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0605805A
PE Title: Munitions Standardization, Effectiveness and Safety **Budget Activity: #6**

(U) Project DF21 - North Atlantic Treaty Organization (NATO) Small Arms Evaluation: Assures complete interchangeability of small caliber and automatic cannon-caliber ammunition and weapons among all NATO countries with all of the associated logistic, strategic, and tactical advantages. This project involves development, maintenance, and testing compliance of NATO Standardization Agreements (STANAGs) and staffing of the North American Regional Test Center (NARTC).

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Staffed, equipped, and maintained the NARTC.	Cont	100
• (U) Maintained standardization of previously qualified calibers.	Cont	85
• (U) Drafted STANAG and MOPI for 12.7mm ammunition.	3QFY93	25
• (U) Initiated efforts to replace the NATO pressure transducer.	4QFY93	40
• (U) Completed Reference Ammunition Assessment for 7.62mm and 25mm ammunition.	4QFY93	35
• (U) Completed first NATO production test of 5.56mm M855 ball ammunition.	3QFY93	25
Total		310

(U) FY 1994 Planned Program:		
• (U) Staff, equip, and maintain the NARTC.	Cont	100
• (U) Relocate the NARTC from Ft. Dix, NJ to Lake City Army Ammunition Plant in MO.	2QFY94	25
• (U) Draft STANAGs and MOPIs for 40mm high velocity ammunition.	2QFY94	15
• (U) Complete STANAG and MOPI for 12.7mm ammunition.	3QFY94	25
• (U) Continue replacement of NATO pressure transducer.	4QFY94	30
• (U) Other activities.	4QFY94	131
Total		326

(U) FY 1995 Planned Program:		
• (U) Staff, equip, and maintain the NARTC.	Cont	100
• (U) Complete NATO qualification testing os US 5.56mm M856 ammunition.	2QFY95	35
• (U) Complete STANAG and MOPI for 40mm high velocity ammunition.	3QFY95	45
• (U) Initiate qualification testing of 12.7mm ammunition.	4QFY95	25
• (U) Other activities.		114
Total		319

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0605805A
PE Title: Munitions Standardization, Effectiveness and Safety

Budget Activity: #6

(U) Project DF24 - Conventional Ammunition Demilitarization: This project supports a continuing technology evaluation of demilitarization methods for existing conventional ammunition. It will complete the development and demonstration of new, safe, and environmentally acceptable demilitarization/recycling equipment and processes to reduce the extremely large stockpile of munitions.

	Complete	Cost
(U) FY 1993 Accomplishments:		
• (U) Completed feasibility studies of supercritical water oxidation technology for smoke/dye compositions.	4QFY93	270
• (U) Continued evaluation of plasma arc furnace for pyrotechnic materials.	4QFY93	580
• (U) Initiated design of a pilot supercritical water oxidation system.	4QFY93	304
• (U) Completed development of a pilot process for recycling red phosphorus/butyl rubber materials.	4QFY93	412
• (U) Complete design and fabrication of a carbon dioxide blastout system for removal and recovery of pressable explosives.	1QFY94	285
Total		1851
(U) FY 1994 Planned Program:		
• (U) Implement the new line for recovery/recycling red phosphorus/butyl rubber materials and complete production of 160,000 L8A3 grenades utilizing these recovered materials.	4QFY94	125
• (U) Complete fabrication and initiate evaluation of a prototype system for removal/recovery of pressed explosives.	1QFY95	575
• (U) Complete the design and initiate the fabrication of prototype supercritical water oxidation system.	1QFY95	2467
• (U) Complete design of pilot recycling system for recovered energetic materials from cast-load munitions.	4QFY94	647
• (U) Conduct evaluation testing in existing cryofracture demil facility.	4QFY94	925
• (U) Prepare concept designs for advance energetic materials removal system.	4QFY94	200
• (U) Complete demonstration of effectiveness and practicality of plasma arc technology in demilitarization of pyrotechnic materials. Implement this technology into a demilitarization facility.	1QFY95	6000
Total		10939
(U) FY 1995 Planned Program:		
• (U) Complete fabrication and initiate testing/operational verification of production model supercritical water oxidation system.	4QFY95	761
Total		761

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0605805A
PE Title: Munitions Standardization, Effectiveness and Safety — Budget Activity: #6

(U) Project D293 - Field Artillery Systems (NATO) Engineering Development: Project supports US/NATO howitzer and ammunition compatibility and interoperability.

	Complete	Cost
(U) FY 1993 Accomplishments:		
• (U) Prepared NATO ammunition interchangeability firings with French, German, Italian and United Kingdom munitions.	4QFY93	278
(U) FY 1994 Planned Program:		
• (U) Continue NATO ammunition interchangeability firings.	4QFY94	285
(U) FY 1995 Planned Program:		
• (U) Continue NATO ammunition interchangeability firings.	4QFY95	283

(U) Project D620 - DoD Munitions Effectiveness: Develops Joint Munitions Effectiveness Manuals (JMEM) per Joint Chiefs of Staff direction which provide weapon/munitions effectiveness predictions for operational non-nuclear ordnance employed by the services. Manages joint service efforts to improve the analytical methodology and data base used to determine the effectiveness of non-nuclear weapons systems. Promotes standardized procedures for parameters associated with munitions effectiveness. Conducts special studies to determine the effectiveness of non-nuclear munitions systems as directed by Joint Logistics Commanders (JLC). Air-to-surface, surface-to-surface, and anti-air weapons effectiveness, environmental effects, and target vulnerability for all types of munitions are developed. Collection, collation, storage and dissemination of combat data are part of the project.

	Complete	Cost
(U) FY 1993 Accomplishments:		
• (U) Began computerization of Joint Technical Coordinating Group for Munitions Effectiveness (JTCG/ME) manuals.	4QFY93	170
• (U) Completed update of JMEMs of and JTCG computer models with DESERT STORM data.	4QFY93	450
• (U) Supported Defense Nuclear Agency Conventional Weapons Effects Program.	4QFY93	550
• (U) Maintained and updated a library of over 450 JMEMs and technical reports for the JLC and other commands.	4QFY93	6868
Total		8038

(U) FY 1994 Planned Program:

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0605805A
PE Title: Munitions Standardization, Effectiveness and Safety — **Budget Activity: #6**

• (U) Develop prototype CD/ROM system for automation of JMEMs.	4QFY95	350
• (U) Initiate methodology improvement programs for hardened targets, aircraft, and crew casualties.	4QFY97	975
• (U) Expand Joint Live Fire/Live Fire database and provide weaponeering inputs to Service force studies.	4QFY96	375
• (U) Maintain and update a library of over 450 JMEMs and technical reports for the JLC and other commands.	4QFY94	6459
Total		8159

(U) FY 1995 Planned Program:

• (U) Standardize development of CD/ROM system for automation of JMEMs.		
• (U) Develop methodologies and models for assessment of damage to hardened bunker targets, aircraft targets, and crew casualties.	4QFY95 4QFY97	425 622
• (U) Develop data for Smart Weapon Analysis Workstation, Special Operations Planning and Requirements System, and Aircraft Loading and Target Attack Planning system.	4QFY97	900
• (U) Maintain and update a library of over 450 JMEMs and technical reports for the JLC, CINCs, Unified, Specified and MACOMs.	4QFY95	3075
Total		5022

(U) Project M857 - Explosive Safety Standards: Supports explosives effects research and testing to quantify hazards and to develop techniques to mitigate these hazards in all DoD manufacturing, testing, transportation, maintenance, storage, and disposal of ammunition and explosive operations. Results are essential to the development and improvement of quantity-distance standards, hazard classification procedures, cost-effective explosion-resistant facility design procedures, and personnel hazard/protection criteria.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Developed debris scale-model and prepared debris data for hardened aircraft shelters.	4QFY93	239
• (U) Completed analysis of Hazard Division 1.2 105mm fragment/airblast data.	4QFY93	125
• (U) Completed scanning DDESB minutes for text-based retrieval system and updated database on NATO standardization agreements for weapons testing.	4QFY93	115
• (U) Conducted other hazard analyses and prepared DOD guidelines for munitions storage facilities.	4QFY93	335
Total		814

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0605805A
PE Title: Munitions Standardization, Effectiveness and Safety — **Budget Activity: #6**

(U) FY 1994 Planned Program:	4QFY94	225
• (U) Conduct Hazard Division 1.2 tests with 105mm projectiles in open; plan tests for 81mm mortars in open and structures.	4QFY94	100
• (U) Develop improved computer codes and conduct workshop to develop rule-based explosives safety and environmental management system.	4QFY94	150
• (U) Conduct other hazard analyses and prepare DOD guidelines for munitions storage facilities.		475
Total		
(U) FY 1995 Planned Program:	4QFY95	242
• (U) Collect and analyze data for revising tri-service and NATO hazards interpretation of Hazard Division 1.2 ammunition outside and inside structures.	4QFY95	225
• (U) Develop improved tri-service design procedures for explosion-resistant structures.	4QFY95	186
• (U) Conduct other hazard analyses and prepare DOD guidelines for munitions storage facilities.		653
Total		

(U) Work Performed By: In-house work is accomplished by the following: Army Materiel Systems Analysis Activity, Ballistic Research Laboratory, and Chemical Research, Development and Engineering Center, Aberdeen Proving Ground, MD; Army Missile Command, Redstone Arsenal, AL; Army Armament Research, Development and Engineering Center, Picatinny Arsenal, NJ; Dugway Proving Ground, UT; Yuma Proving Ground, AZ; the Air Force Armament Laboratory, Wright-Patterson Air Force Base, OH; Air Logistics Center, Tinker Air Force Base, OK; Naval Surface Weapons Center, White Oak, MD and Dahlgren, VA; Pacific Missile Test Center, Pt. Mugu, CA; Eglin AFB, FL; Army Large Caliber Weapons Systems Laboratory, Picatinny Arsenal, NJ; Waterway Experimental Station, Vicksburg, MS. Contractors include: Oklahoma State University, Stillwater, OK; Armament Systems, Inc., Anaheim, CA; Denver Research Institute, Denver, CO; Service Engineering Company, Aberdeen, MD.

(U) Related Activities: PE #0603619A (Landmine Warfare and Barrier Advanced Development). There is no unnecessary duplication of effort within the Army or Department of Defense.

(U) Other Appropriation Funds: ($ in Thousands) Not applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605810A
PE Title: RDT&E Support for Non-Developmental Items (NDI)

Budget Activity: #6

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
DE65 NDI Testing	5283	4918	2536	2500	2289	1768	1754	Cont	Cont
D125 NDI Market Investigation	849	956	988	1001	1004	1006	1011	Cont	Cont
PE TOTAL	6132	5874	3524	3501	3293	2774	2765		

B. (U) BRIEF DESCRIPTION OF ELEMENT: Funding of the Army's Non-Developmental Item (NDI) program directly supports the Army's initiatives in dual-use technology and defense conversion. An NDI is any materiel available from a variety of sources for use in the Army with little or no development effort. This program uses materials/items that are available from the commercial marketplace, other government agencies, or other foreign countries. The NDI program saves RDTE dollars by recommending these commercially available items, thereby avoiding the cost and time necessary to field a system developed through the normal research and development (R&D) process. The market investigation portion (Project D125) is the conduct of surveys and analyses of those commercial items which are either to be a replacement item or the finalization of a new equipment. The operational testing and evaluation portion (Project DE65) is the conduct of operational testing and evaluation of commercial items identified by the NDI market investigation as satisfying a new requirement or replacement for standard items in the Army inventory. These efforts directly support procurement.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project DE65 - NDI Testing. The operational testing portion conducts evaluation of production items identified by NDI market investigations. These investigations seek to satisfy new requirements or replacements for standard items in the Army inventory when that standard item is no longer available to meet the need and/or significant savings can be realized by precluding an R&D effort. The evaluation typically includes minor engineering modifications and testing of an item leading to development of performance specifications. Examples of tasks are as follows:

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605810A
PE Title: RDT&E Support for Non-Developmental Items (NDI) Budget Activity: #6

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Ultra Lightweight Camouflage Net System (ULCANS) - Completed pre-production qualification tests, prepared test report and convened the Test Integrated Working Group (TIWG), and finalized purchase description.	4Q93	1982
• (U) Containerized Kitchen - Successfully tested an electric and fuel-fired commercially available containerized kitchen with the 82nd I.D. at Ft. Bragg, NC. Purpose of test was to validate operational performance to include day/night operations, mobility, set-up/tear down, and cooking/serving characteristics.	4Q93	328
• (U) Tactical Propulsion System - Completed testing on several truck components using the truck demonstrator II. Truck components that were successfully tested and specified in the Family of Medium Tactical Vehicle (FMTV) acquisition include the 290 HP turbo diesel engine, seven-speed automatic transmission with integral single speed transfer case, differential gears and wheel-end reduction gears, and the Michelin XML self cleaning tread super single radial tires.	4Q93	1982
• (U) High Density Microcircuit Assembly - Completed testing of commercially available and advanced microprocessor. Tests indicated these devices to be usable in military electronic systems and single board computers.	4Q93	991
Total		5283

(U) FY 1994 Plans:

	Complete	Cost
• (U) Gun Laying and Positioning System (GLPS) - Complete testing, evaluation and preparation of test reports on the GLPS.	4Q94	1217
• (U) Water Chiller Components - Complete testing and evaluation of commercial diesel engines with water chiller. Update technical data package to incorporate changes in engine, type of refrigerant used (one that will not harm the ozone layer) and associated components.	4Q94	455
• (U) Tactical Propulsion System - Complete testing and evaluation of truck components using truck demonstrator II. These truck components will end up being incorporated in the FMTV, Palletized Loading System (PLS), and Family of Heavy Tactical Vehicle (FHTV) buys. Examples of these components are: anti-lock braking system and traction control, suspension arm bushing, and air starter.	4Q94	1623
• (U) Combat Propulsion System - Start of dynamometer testing of (2) medium integrated propulsion systems - a Detroit Diesel engine with an Allison transmission and a Mack engine with General Electric transmission. These powerpacks have potential use in the Advanced Field Artillery System (AFAS), Future Armored Resupply Vehicle (FARV), Bradley and repower of the M109 Self Propelled Howitzer.	4Q94	1623
Total		4918

991

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605810A
PE Title: RDT&E Support for Non-Developmental Items (NDI) Budget Activity: #6

(U) FY 1995 Plans:	Complete	Cost
• (U) Countermine System - Complete test and evaluation of metal detectors that have the ability to electronically identify both type and depth of mines, while disregarding scrap metal. Prepare purchase description for use in procurement.	4Q95	634
• (U) Axles - Complete dynamometer and in-vehicle testing, evaluation and preparation of report on tested axles and drivetrain components that will be used in the FMTV and the Heavy Expanded Mobility Tactical Truck (HEMTT)	4Q95	1902
Total		2536

(U) Project D125 - NDI Market Investigation. Funding is for the conduct of surveys and analyses of production items (commercial, other military or government) which are either to be a replacement item or to meet a new requirement or to replace an item which can no longer be cost-effectively supported in the field. These tasks include a variety of applications including but not limited to: hydraulic crane attachments, pusher tug, crane barge and cold weather sleeping systems. Examples of tasks are as follows:

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Hydraulic Crane Attachments - Prepared and staffed questionnaire, selected candidate items for lease, conducted literature search and initiated user input on hydraulic operated scrap grapple and clamshell bucket compatible with new all terrain cranes. Existing cable operated attachments are obsolete, overaged and insupportable.	4Q93	212
• (U) Pusher Tug - Reviewed Mission Needs Statement, prepared builder's survey questionnaire and conducted the survey. The mission of the pusher tug is to move non-powered craft -- barges, floating cranes and causeway sections.	4Q93	212
• (U) Crane Barge - Reviewed Mission Needs Statement, prepared builder's survey questionnaire and conducted the survey. The mission of the crane barge is to load and discharge heavy cargo (MI tank) from ships to shore.	4Q93	212
• (U) Cold Weather Sleeping Systems - Conducted market investigation on cold weather sleeping systems resulting in the identification of three candidate insulations which will be used in a pre-planned product improvement program for combat soldier's sleeping system.	4Q93	107
• (U) 40 Ton Crane - Identified potential sources of supply. This crane is a track-mounted, lattice boom crane for heavy lifts, dragline, and pile driving operations.	4Q93	106
Total		849

(U) FY 1994 Plans:	Complete	Cost
• (U) Construction Equipment - Prepare questionnaire, conduct market investigation and prepare technical reports for the 25 ton all terrain cranes and high mobility mobile handler.	4Q94	319

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605810A
PE Title: RDT&E Support for Non-Developmental Items (NDI) Budget Activity: #6

• (U) Tactical Propulsion Systems - Conduct market investigation of advanced technology components to improve mobility, performance and transportability of heavy tactical vehicles.	4Q94	319
• (U) Coastal Harbor and Inland Waterways (CHI) Boat - Conduct a complete market investigation and prepare technical data and program management documentation needed for type classification. A CHI boat carries personnel and cargo between anchored shipping and shore facilities.	4Q94	318
Total		**956**

(U) FY 1995 Plans:	Complete	Cost
• (U) Countermine Systems - Conduct market survey of countermine systems and identify new developments that meet the Army's requirements.	4Q95	297
• (U) Combat Propusion Systems - Conduct market investigation and prepare technical reports for power train components for combat vehicles.	4Q95	691
Total		**988**

(U) WORK PERFORMED BY: These projects provide for performance of technical tasks and acquisition of related materiel by contract utilizing both private and Government agency contractors. The following Army Material Command major subordinate commands are actively involved in the program: Belvoir Research Development and Engineering Center, Ft. Belvoir, VA; Tank-Automotive Command Warren, MI; Communications-Electronics Command, Ft. Monmouth, NJ; Natick Research, Development and Engineering Center, Natick, MA; and Electronics and Power Sources Directorate, Army Research Laboratory, Ft. Monmouth, NJ. Contractors are selected on a competitive basis.

(U) RELATED ACTIVITIES: Since this program is an alternative to full scale research and development, there are no equivalent RDTE programs. These tasks are related to future equipment buys planned for the procurement appropriation; however, there is no unnecessary duplication of effort within the Army or the DoD.

(U) OTHER APPROPRIATION FUNDS: Not applicable.

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0605856A**
PE Title: **Environmental Compliance - RDT&E** Budget Activity: **#6**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
MOVV	Environmental Compliance - AMC Test Ranges								
	22819	31454	34387	39713	29261	26889	25331	Cont	Cont
M1VV	Environmental Compliance - AMC Major Subordinate Commands/Laboratories								
	13225	12504	15520	16754	8632	6475	5933	Cont	Cont
M6VV	Environmental Compliance - Landfill Remediation								
	0	2750	0	0	0	0	0	0	2750
PE TOTAL	36044	46708	49907	56467	37893	33364	31264		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program ensures that resources are available to fund legally mandated environmental compliance activities at U.S. Army RDTE installations, laboratories and test ranges. Increase in FY 1995 reflects Army requirements to fund Class I and II environmental compliance on Army RDTE installations. No Operation and Maintenance, Army (OMA) appropriation funds are budgeted for environmental compliance efforts at RDTE facilities. It finances environmental staff salaries, minor construction, repair and upgrade of facilities to meet environmental standards, including waste treatment and disposal; asbestos and radon abatement; repair and clean up of underground storage tank hazards; management of hazardous waste storage and disposal; permits and licensing fees; environmental training, plans and studies; and environmental monitoring and audits. It finances procurement of pollution control equipment. Funds cost of complying with Federal Facility Compliance Agreements (FFCA) and other environmental agreements, and correcting notices of violation. It does not finance construction or repairs unrelated to environmental compliance or Defense Environmental Restoration Account (DERA) funded environmental restoration. In summary, this program provides for environmental quality control of current defense operations and disposal of hazardous waste incident to defense operations funded by the RDTE appropriation - no OMA dollars are provided for RDTE facilities. Army defines environmental effort as: Class I - support compliance with legally binding agreements or judgements under applicable Federal, State, local or host nation environmental law; correct deficiencies cited in an inspection or notice of violation by a regulatory agency, or host nation equivalent; correct deficiencies where a statutory or regulatory deadline has passed; and execute Class II requirements which will become Class I by the end of the budget year. Class II - projects required to comply with an established standard, and deadline for compliance is in the future; Class III - salaries and training for environmental personnel and projects required to maintain/improve environmental quality, but where non-compliance is not imminent.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605856A
PE Title: Environmental Compliance - RDT&E
Budget Activity: #6

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project MOVV - Environmental Compliance - Army Materiel Command (AMC) Test Ranges. Resources in this project ensure an adequate level of funding for legally mandated environmental compliance requirements, as discussed in paragraph B, at Yuma Proving Ground (YPG), AZ; Aberdeen Proving Ground (APG), MD; Dugway Proving Ground (DPG), UT; and White Sands Missile Range (WSMR), NM. These operations are critical to the infrastructure of the Army testing mission.

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Funded Class I, Class II, and other environmental compliance programs such as underground storage tank program, above ground tank testing - repairs and upgrades, sewage system upgrade to correct violation, support of closures and Environmental Impact Statements, base support of asbestos hazards management program and environmental analysis contract.	4Q93	20962
• (U) Funded remaining compliance requirements such as Hazardous Waste Material Removal Program and program management.	4Q93	1857
Total		22819

(U) FY 1994 Plans:

	Complete	Cost
• (U) Fund Class I, Class II, and other environmental compliance programs such as underground storage tank program, above ground tank testing - repairs and upgrades, Environmental Impact Statements, automotive test course sediment/erosion control, agent contaminated soil program, base support of asbestos hazards, toxic release inventory/pollution prevention, stormwater management, archaeological inventory, and ozone depleting chemicals.	4Q94	30000
• (U) Fund remaining compliance requirements such as Hazardous Waste Material Removal Program and program management.	4Q94	1454
Total		31454

(U) FY 1995 Plans:

	Complete	Cost
• (U) Fund Class I, Class II, and other environmental compliance programs such as underground storage tank program, Environmental Impact Statements, automotive test course sediment/erosion control, inflow/infiltration reduction, effluent pipe treatment, base support of asbestos hazards, archaelogical inventory, and waste water compliance program.	4Q95	33000
• (U) Fund remaining compliance requirements such as Hazardous Waste Material Removal Program and program management.	4Q95	1387
Total		34387

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0605856A**
PE Title: **Environmental Compliance - RDT&E**

Budget Activity: **#6**

(U) Project M1VV - Environmental Compliance - Army Materiel Command (AMC) Major Subordinate Commands/Laboratories. Resources in this project ensure an adequate level of funding for legally mandated environmental compliance requirements, as discussed in paragraph B, at Army Research Laboratory (ARL), Adelphi, MD; Armament Research, Development and Engineering Center (ARDEC), Picatinny Arsenal, Dover, NJ; Natick Research, Development and Engineering Center (NRDEC), Natick, MA; and Army Research Laboratory Materials Technology Directorate (ARLMTD), Watertown, MA.

(U) **FY 1993 Accomplishments:**

	Complete	Cost
• (U) Funded Class I, Class II, and other environmental compliance programs such as installation of post back flow and replacement of post condenser water system at NRDEC; hazardous waste closure and underground storage tank removal/replacement at ARDEC; and replacement of PCB transformers and upgrade of underground storage tanks at ARL.	4Q93	12000
• (U) Funded remaining compliance requirements such as Hazardous Waste Material Removal Program and program management.	4Q93	1225
Total		**13225**

(U) **FY 1994 Plans:**

	Complete	Cost
• (U) Fund Class I, Class II, and other environmental compliance programs such as upgrading climatic chambers cooling system and replacing post condenser water system at NRDEC; sanitary sewer rehab and underground storage tank removal/replacement at ARDEC; and replacement of PCB transformers and underground storage tank removal/replacement at ARL.	4Q94	11000
• (U) Fund remaining compliance requirements such as Hazardous Waste Material Removal Program and program management.	4Q94	1504
Total		**12504**

(U) **FY 1995 Plans:**

	Complete	Cost
• (U) Fund Class I, Class II, and other environmental compliance programs such as Waste Water System Toxic Pollutant Survey and upgrading of climatic chambers cooling system at NRDEC; environmental restoration of contamination explosive and underground storage tank removal/replacement at ARDEC; and environmental program management and administration at ARL.	4Q95	14000
• (U) Fund remaining compliance requirements such as Hazardous Waste Material Removal Program and program management.	4Q95	1520
Total		**15520**

(U) Project M6VV - Environmental Compliance - Landfill Remediation. Congress appropriated funds to facilitate the development of new technologies for more effective and expeditious remediation of landfill sites at military installations.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605856A
PE Title: Environmental Compliance - RDT&E

Budget Activity: #6

(U) FY 1993 Accomplishments:
- (U) Program not funded.

(U) FY 1994 Plans:

	Complete	Cost
• (U) Participate in a cooperative demonstration project at the landfill at Fort Ord, CA.	4Q94	2750

(U) FY 1995 Plans:
- (U) Program not funded.

(U) WORK PERFORMED BY: Yuma Proving Ground, AZ; Aberdeen Proving Ground, MD; Dugway Proving Ground, UT; White Sands Missile Range, NM; Army Research Laboratory, Adelphi, MD; Armament Research, Development and Engineering Center, Dover, NJ; Natick Research, Development and Engineering Center, Natick, MA and Army Research Laboratory Materials Technology Directorate, Watertown, MA.

(U) RELATED ACTIVITIES: There is no unnecessary duplication of effort within the Army or DoD. The following programs fund all other activities related to operating and maintaining Army RDTE installations:

PE #0605876A (Minor Construction - RPM)
PE #0605878A (Maintenance & Repair - RPM)
PE #0605896A (Base Operations - RDTE)

(U) OTHER APPROPRIATION FUNDS: ($ in Thousands)

	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate
DERA: APG, MD	49798	66367	86141
DERA: DPG, UT	13714	5550	2000
DERA: ARDEC, NJ	9530	21623	31798
DERA: NRDEC, MA	1529	2040	2590
DERA: WSMR, NM	2170	810	0
DERA: YPG, AZ	0	250	0

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605876A
PE Title: Minor Construction - (RPM) RDTE

Budget Activity #6

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
MOWW	Minor Construction - Test Ranges								
	4870	-0-	2942	2906	2855	2832	2817	Cont	Cont
M1WW	Minor Construction - AMC Major Subordinate Commands and Laboratories								
	978	1282	2249	2199	2151	2582	3835	Cont	Cont
M4WW	Minor Construction - Corps of Engineers								
	1303	589	554	527	506	502	499	Cont	Cont
PE TOTAL	7151	1871	5745	5632	5512	5916	7151		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element finances activities and functions necessary to provide facility related minor construction for U.S. Army RDTE installations, laboratories and test ranges. Minor construction includes: erection, installation, or assembly of a new real property facility; expansion, extension, alteration, conversion, relocation or replacement of an existing real property facility. Includes design costs directly associated with accomplishing a designated project undertaking. These projects substantially prolong the useful life of the facility, and are all actually facility investments. FY 1995 funding increase reflects Army recognition of and intent to rectify severe underfunding in FY 1994. FY 1994 funding constraints have caused a skip year in TECOM minor construction at the Army test ranges, and minimum support at the AMC major subordinate commands and laboratories and Corps of Engineers RDTE laboratories. FY 1995 resumes support at a minimum level.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project MOWW - Minor Construction - Test Ranges. Finances RDTE minor construction projects (as described in paragraph B) for U.S. Army Materiel Command (AMC) technical test ranges assigned to Test and Evaluation Command (TECOM), i.e., Yuma Proving Ground, AZ; Aberdeen Proving Ground, MD; Dugway Proving Ground, UT; and White Sands Missile Range, NM. In addition, project provides common service host support for over 100 tenants and satellites located on these four TECOM ranges: including U.S. Army Chemical Biological Defense Agency; and beginning with FY 1993 Ballistics Research Laboratory, Human Engineering Laboratory, and Vulnerability Assessment Laboratory reorganized under the Army Research Laboratory; etc. Facility assets managed include over 3.6 million acres of land, over 23 million square feet of building space, 3 thousand miles of roads,

and 2 thousand miles of utility lines. FY 1994 budget constraints caused a skip year in minor construction at the Army TECOM test ranges. FY 1995 restores funding and resumes minor construction support at a minimum level.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Funded minor construction projects at Aberdeen Proving Ground, MD.	4Q93	1740
• (U) Funded minor construction projects at Dugway Proving Ground, UT.	4Q93	778
• (U) Funded minor construction projects at White Sands Missile Range, NM.	4Q93	1232
• (U) Funded minor construction projects at Yuma Proving Ground, AZ.	4Q93	1120
Total		**4870**

(U) FY 1994 Plans:

- (U) *Minor construction* projects at U.S. Army Materiel Command test ranges not funded in FY 1994.

(U) FY 1995 Plans:	Complete	Cost
• (U) Fund minor construction projects at Aberdeen Proving Ground, MD.	4Q95	1547
• (U) Fund minor construction projects at Dugway Proving Ground, UT.	4Q95	218
• (U) Fund minor construction projects at White Sands Missile Range, NM.	4Q95	848
• (U) Fund minor construction projects at Yuma Proving Ground, AZ.	4Q95	329
Total		**2942**

(U) Project M1WW - Minor Construction - AMC Major Subordinate Commands and Laboratories. This project finances minor construction projects (described in paragraph B) for U.S. Army Materiel Command major subordinate command RDT&E installations and laboratories, i.e., Army Research Laboratory (ARL), Adelphi, MD; Armament Research, Development and Engineering Center (ARDEC), Picatinny Arsenal, Dover, NJ; and Natick Research, Development and Engineering Center (NRDEC), Natick, MA. Also provides common service host support to 36 tenants located at these installations. Facilities managed include 8,996 acres of land and 6.4 million square feet of building space. FY 1995 increase provides minor construction support at a minimum level.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Funded minor construction projects at ARDEC, Picatinny Arsenal, NJ.	4Q93	505
• (U) Funded minor construction projects at ARL, Adelphi, MD.	4Q93	332
• (U) Funded minor construction projects at NRDEC, Natick, MA.	4Q93	141
Total		**978**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605876A
PE Title: Minor Construction - (RPM) RDTE

Budget Activity #6

(U) FY 1994 Plans:	Complete	Cost
• (U) Fund minor construction projects at ARDEC, Picatinny Arsenal, NJ.	4Q94	783
• (U) Fund minor construction projects at ARL, Adelphi, MD.	4Q94	322
• (U) Fund minor construction projects at NRDEC, Natick, MA.	4Q94	177
Total		**1282**

(U) FY 1995 Plans:	Complete	Cost
• (U) Fund minor construction projects at ARDEC, Picatinny Arsenal, NJ.	4Q95	1754
• (U) Fund minor construction projects at ARL, Adelphi, MD.	4Q95	320
• (U) Fund minor construction projects at NRDEC, Natick, MA.	4Q95	175
Total		**2249**

(U) Project M4WW - Minor Construction - Corps of Engineers. Project finances those minor construction projects (described in paragraph B) for U.S. Army Corps of Engineers RDTE laboratories located at Waterways Experiment Station (WES), Vicksburg, MS; Cold Regions Research and Engineering Laboratory (CRREL), Hanover, NH; Construction Engineering Research Laboratory (CERL), Champaign, IL, and Topographic Engineering Center (TEC), Ft Belvoir, VA.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Funded minor construction projects at CERL, Champaign,IL.	4Q93	182
• (U) Funded minor construction projects at CRREL, Hanover, NH.	4Q93	534
• (U) Funded minor construction projects at TEC, Ft. Belvoir, VA.	4Q93	326
• (U) Funded minor construction projects at WES, Vicksburg, MS.	4Q93	261
Total		**1303**

(U) FY 1994 Plans:	Complete	Cost
• (U) Fund minor construction projects at CERL, Champaign,IL.	4Q94	122
• (U) Fund minor construction projects at CRREL, Hanover, NH.	4Q94	278
• (U) Fund minor construction projects at WES, Vicksburg, MS.	4Q94	189
Total		**589**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605876A
PE Title: Minor Construction - (RPM) RDTE

Budget Activity #6

(U) FY 1995 Plans:	Complete	Cost
• (U) Fund minor construction projects at CERL, Champaign,IL.	4Q95	113
• (U) Fund minor construction projects at CRREL, Hanover, NH.	4Q95	260
• (U) Fund minor construction projects at WES, Vicksburg, MS.	4Q95	181
Total		**554**

(U) **WORK PERFORMED BY:** Subordinate Commands and other activities of AMC and COE.

(U) **RELATED ACTIVITIES:** There is no duplication of effort within the Army or DoD. Related program elements include:
PE #0605896A (Base Operations-RDT&E)
PE #0605856A (Environmental Compliance RDT&E)
PE #0605878A (Maintenance & Repair - RPM)

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

(U) **INTERNATIONAL COOPERATIVE AGREEMENTS:** Not applicable

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0605878A**
PE Title: **Maintenance and Repair - (RPM) RDTE** Budget Activity: **#6**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
MOYY	Maintenance and Repair - AMC Test Ranges								
	60668	47262	69612	26034	30040	33596	45736	Cont	Cont
M1YY	Maintenance and Repair - AMC Major Subordinate Commands/Laboratories								
	13219	11424	19259	13110	15848	14548	19187	Cont	Cont
M4YY	Maintenance and Repair - U.S. Army Corps of Engineers								
	2693	2688	3099	2950	3167	3209	3713	Cont	Cont
PE TOTAL	76580	61374	91970	42094	49055	51353	68636		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element finances activities and functions necessary for maintenance and repair of real property at U.S. Army RDTE installations, laboratories and test ranges. Maintenance and repair of real property includes applicable expenses of cyclic and preventive maintenance and annual recurring repair incurred by building trade shops, construction units, grounds and pavement units, machine shops and contracts. These projects substantially prolong the useful life of the facility, and are all actually facility investments. FY 1995 funding increase reflects Army recognition of and intent to rectify severe underfunding in FY 1994. FY 1994 funding constraints have caused increased deterioration and delays in critical maintenance and repair projects. FY 1995 increase remediates some of the worst deterioration of facility assets, especially at the TECOM test ranges.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project MOYY - Maintenance and Repair - AMC Test Ranges. Maintenance and Repair - Army Materiel Command (AMC) Test Ranges: Finances functions for maintaining and repairing infrastructure (see paragraph B) for U.S. Army Materiel Command (AMC) technical test ranges assigned to Test and Evaluation Command (TECOM), i.e., Yuma Proving Ground, Arizona; Aberdeen Proving Ground, Maryland; Dugway Proving Ground, Utah; and White Sands Missile Range, New Mexico. In addition, provides common service host support for over 100 tenants and satellites located on these four TECOM ranges, including U.S. Army Chemical Biological Defense Command; and beginning with FY 1993, Ballistics Research Laboratory, Human Engineering Laboratory, and Vulnerability Assessment Laboratory reorganized under the Army Research Laboratory, etc. Facility assets managed

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605878A
PE Title: Maintenance and Repair - (RPM) RDTE
Budget Activity: #6

include over 3.6 million acres of land, over 23 million square feet of building space, 3 thousand miles of roads, and 2 thousand miles of utility lines. Because of funding shortfalls and emphasis on environmental compliance in recent years, backlog of maintenance and repair (BMAR) has grown, resulting in deterioration of facility assets. FY 1994 budget constraints caused drastically reduced funding level in this program for the TECOM test ranges. FY 1995 restores funding and resumes support of maintenance and repair of real property at a minimum level.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Funded maintenance and repair projects at Aberdeen Proving Ground, MD.	4Q93	27286
• (U) Funded maintenance and repair projects at Dugway Proving Ground, UT.	4Q93	8320
• (U) Funded maintenance and repair projects at White Sands Missile Range, NM.	4Q93	16232
• (U) Funded maintenance and repair projects at Yuma Proving Ground, AZ.	4Q93	8830
• (U) BMAR increased to $278 million.		
Total		**60668**

(U) FY 1994 Plans:	Complete	Cost
• (U) Fund maintenance and repair projects at Aberdeen Proving Ground, MD.	4Q94	21980
• (U) Fund maintenance and repair projects at Dugway Proving Ground, UT.	4Q94	6000
• (U) Fund maintenance and repair projects at White Sands Missile Range, NM.	4Q94	12990
• (U) Fund maintenance and repair projects at Yuma Proving Ground, AZ.	4Q94	6292
• (U) BMAR continues to grow.		
Total		**47262**

(U) FY 1995 Plans:	Complete	Cost
• (U) Fund maintenance and repair projects at Aberdeen Proving Ground, MD.	4Q95	33500
• (U) Fund maintenance and repair projects at Dugway Proving Ground, UT.	4Q95	6800
• (U) Fund maintenance and repair projects at White Sands Missile Range, NM.	4Q95	19000
• (U) Fund maintenance and repair projects at Yuma Proving Ground, AZ.	4Q95	10312
• (U) BMAR continues to grow.		
Total		**69612**

(U) Project M1YY - Maintenance and Repair - AMC Major Subordinate Commands/Laboratories. This project finances those maintenance and repair activities and functions necessary for maintaining and repairing infrastructure (see paragraph B) for the U.S. Army Materiel Command major

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605878A
PE Title: Maintenance and Repair - (RPM) RDTE

Budget Activity: #6

subordinate command RDTE installations and laboratories, i.e. Army Research Laboratory, Adelphi, Maryland; Armament Research, Development and Engineering Center, Picatinny Arsenal, Dover, New Jersey; and Natick Research, Development and Engineering (RDE) Center, Natick, Massachusetts. Also provides common service host support to 36 tenants located at these installations. Facilities managed include 8,996 acres of land and 6.4 million square feet of building space with necessary utilities and road systems. Funding shortfalls and emphasis on environmental compliance in recent years has resulted in deterioration of facility assets. FY 1994 budget constraints caused reduced funding level in this program for the AMC RDTE subordinate commands and laboratories. FY 1995 restores funding and resumes support of maintenance and repair of real property at a minimum level.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Funded maintenance and repair projects at Picatinny Arsenal, NJ.	4Q93	7898
• (U) Funded maintenance and repair projects at Army Research Laboratory, Adelphi, MD.	4Q93	3469
• (U) Funded maintenance and repair projects at Natick RDE Center, Natick, MA.	4Q93	1852
• (U) BMAR reported at $31 million.		
Total		13219

(U) FY 1994 Plans:	Complete	Cost
• (U) Fund maintenance and repair projects at Picatinny Arsenal, NJ.	4Q94	3899
• (U) Fund maintenance and repair projects at Army Research Laboratory, Adelphi, MD.	4Q94	4688
• (U) Fund maintenance and repair projects at Natick RDE Center, Natick, MA.	4Q94	2837
• (U) BMAR continues to grow.		
Total		11424

(U) FY 1995 Plans:	Complete	Cost
• (U) Fund maintenance and repair projects at Picatinny Arsenal, NJ.	4Q95	11313
• (U) Fund maintenance and repair projects at Army Research Laboratory, Adelphi, MD.	4Q95	5278
• (U) Fund maintenance and repair projects at Natick RDE Center, Natick, MA.	4Q95	2668
Total		19259

(U) Project M4YY - Maintenance and Repair - U.S. Army Corps of Engineers (COE). This project finances those maintenance and repair activities and functions necessary for maintaining and repairing infrastructure for the U.S. Army Corps of Engineers RDTE laboratories located at Waterways Experiment Station (WES), Vicksburg, MS; Cold Regions Research and Engineering Laboratory (CRREL), Hanover, NH; Construction Engineering Research Laboratory (CERL), Champaign, IL, and Topographic Engineering Center (TEC), Ft Belvoir, VA.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0605878A**
PE Title: **Maintenance and Repair - (RPM) RDTE**

Budget Activity: **#6**

(U) FY 1993 Accomplishments:

	Complete	Cost
• (U) Funded maintenance and repair projects at CERL, Champaign, IL.	4Q93	497
• (U) Funded maintenance and repair projects at CRREL, Hanover, NH.	4Q93	1351
• (U) Funded maintenance and repair projects at TEC, Ft. Belvoir, VA.	4Q93	411
• (U) Funded maintenance and repair projects at WES, Vicksburg, MS.	4Q93	434
Total		**2693**

(U) FY 1994 Plans:

	Complete	Cost
• (U) Fund maintenance and repair projects at CERL, Champaign, IL.	4Q94	568
• (U) Fund maintenance and repair projects at CRREL, Hanover, NH.	4Q94	1154
• (U) Fund maintenance and repair projects at TEC, Ft. Belvoir, VA.	4Q94	317
• (U) Fund maintenance and repair projects at WES, Vicksburg, MS.	4Q94	649
Total		**2688**

(U) FY 1995 Plans:

	Complete	Cost
• (U) Fund maintenance and repair projects at CERL, Champaign, IL.	4Q95	558
• (U) Fund maintenance and repair projects at CRREL, Hanover, NH.	4Q95	1580
• (U) Fund maintenance and repair projects at TEC, Ft. Belvoir, VA.	4Q95	465
• (U) Fund maintenance and repair projects at WES, Vicksburg, MS.	4Q95	496
Total		**3099**

(U) WORK PERFORMED BY: Subordinate commands and other activities of AMC and COE.

(U) RELATED ACTIVITIES: There is no duplication of effort within the Army or DoD. Related program elements include:
PE #0605896A (Base Operations-RDT&E)
PE #0605856A (Environmental Compliance RDT&E)
PE #0605876A (Minor Construction - RPM)

(U) OTHER APPROPRIATION FUNDS: Not applicable.

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0605896A**
PE Title: **Base Operations - RDT&E**

Budget Activity: **#6**

A. **(U) RESOURCES:** ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
M0ZZ	Base Operations - Army Materiel Command (AMC) Test Ranges								
	200855	176256	184826	182581	187250	183049	185932	Cont	Cont
M1ZZ	Base Operations - AMC Major Subordinate Commands and Laboratories								
	93684	74268	93230	83708	80498	81305	78736	Cont	Cont
M4ZZ	Base Operations - Corps of Engineers								
	18062	18637	19027	18951	16871	16704	15160	Cont	Cont
PE TOTAL	312601	269161	297083	285240	284619	281058	279828		

B. **(U) BRIEF DESCRIPTION OF ELEMENT:** The Base Operations (BASEOPS) program finances those activities and functions necessary for operating and maintaining U.S. Army RDTE installations, laboratories, and test ranges. BASEOPS activities and functions include: (1) operation of post supply functions; (2) direct and general maintenance activities; (3) operation and maintenance of transportation equipment and local transportation; (4) operation of laundry and dry cleaning plants and contractual services where Army-owned plants are not operated; (5) Army food service program; (6) support to military and civilian personnel; (7) operation and administration of unaccompanied personnel housing; (8) command element activities required for commanding all Army units assigned or attached to the installation; (9) automation activities; (10) reserve component support; (11) development and administration of morale, welfare and recreation facilities and activities along with quality of life initiatives for the military and their families; (12) police and security services and counterintelligence: (13) resource management operations; (14) contracting operations; (15) records management and publications; (16) operation of utilities; and (17) other engineering support, including fire prevention, refuse collection, and custodial services. This is a labor intensive program, providing salaries and related personnel benefits for authorized civilian personnel and associated administrative support functions outlined above. FY 1995 funding increase reflects Army recognition of and intent to rectify severe underfunding in FY 1994. FY 1994 funding constraints have reduced RDTE Base Operations to a barely sustainable level of basic operational support. Increase in FY 1995 funding restores RDTE Base Operations support at a minimum essential level.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605896A
PE Title: Base Operations - RDT&E

Budget Activity: #6

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project M0ZZ - Base Operations - Army Materiel Command (AMC) Test Ranges: Finances installation management for operating and maintaining technical test ranges assigned to the U.S. Army Test and Evaluation Command (TECOM), i.e., Yuma Proving Ground, AZ; Aberdeen Proving Ground, MD; Dugway Proving Ground, UT; and White Sands Missile Range, NM. Provides for the test infrastructure base support along with common service base support to over 100 tenants and satellites served by the four TECOM Major Range & Test Facility Bases (MRTFB). Tenants include: U.S. Army Chemical Biological Defense Command; Ordnance Center and School; Army Material Systems Analysis Activity; and Army Research Laboratory. This project supports a combined population in excess of 40,000 military, civilians, contractors, and military dependents. The Army senior leadership has made a commitment to operate the four major test ranges under the Tri-service Reliance inititative (ground vehicles and gun munitions at APG/YPG; surface-to-air missiles and nuclear efforts at WSMR; and chemical/biological at DPG). Internal base operations functions and services have been reviewed and resulted in consolidation of functions, curtailment of services, and a planned reduction of over 200 civilians consistent with projected downsizing of workload. Fifty percent of the RDTE base operations budget for the Test and Evaluation Command supports organizations other than testing. Consolidation and mission transfers to TECOM R&D installations will result in over 1 million square feet of new tenant facilities and increased population between FY 1994 and FY 1997. Along with these new facilities comes the additional requirements on TECOM R&D installations to provide host services (utilities, engineering services, i.e., refuse; custodial; fire protection; Civilian Personnel Office support; logistics; maintenance, shipping/receiving). Instead of declining, TECOM's base operations support requirements are growing in response to reductions elsewhere in the Army. FY 1995 increase restores funding for Base Operations support at the TECOM test ranges to a minimum essential level.

(U) FY 1993 Accomplishments:		Complete	Cost
• (U) Funded BASEOPS activities and functions for TECOM Test Ranges and tenant/satellite activities as described in paragraph B as follows:	Aberdeen Proving Ground Support Activity, MD	4Q93	100450
	Dugway Proving Ground, UT	4Q93	22146
	White Sands Missile Range, NM	4Q93	54576
	Yuma Proving Ground, AZ	4Q93	19514
• (U) Funded specific security projects on TECOM RDTE installations.		4Q93	542
• (U) Absorbed functions previously performed by USA Information Systems Command-TECOM (i.e., communications, visual information, library services, records management, and automation).		4Q93	3627
Total			200855

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0605896A**
PE Title: **Base Operations - RDT&E**

Budget Activity: **#6**

(U) FY 1994 Plans:

		Complete	Cost
• (U) This project funds BASFOPS activities and functions for TECOM Test Ranges and tenant/satellite activities as described in paragraph B. Base Operations infrastructure continues to provide support for technical testing, diverse Army R&D tenants, and a principal training mission at the Ordnance Center and School, as follows:	Aberdeen Proving Ground Support Activity, MD	4Q94	89815
	Dugway Proving Ground, UT	4Q94	18814
	White Sands Missile Range, NM	4Q94	47760
	Yuma Proving Ground, AZ	4Q94	17229
• (U) Fund specific security projects on TECOM RDTE installations.		4Q94	627
• (U) Fund specific security projects at Army Research Laboratory and Chemical Biological Defense Command.		4Q94	237
• (U) Absorb base operations support for 610th Ordnance Battalion, previously located at Ft Belvoir, VA.		4Q94	1774
Total			**176256**

(U) FY 1995 Plans:

		Complete	Cost
• (U) This project funds BASEOPS activities and functions for TECOM Test Ranges and tenant/satellite activities as described in paragraph B. Base Operations infrastructure continues to provide support for technical testing, diverse Army R&D tenants, and a principal training mission at the Ordnance Center and School, as follows:	Aberdeen Proving Ground Support Activity, MD	4Q95	93154
	Dugway Proving Ground, UT	4Q95	18872
	White Sands Missile Range, NM	4Q95	48577
	Yuma Proving Ground, AZ	4Q95	17640
• (U) Fund specific security projects on TECOM RDTE installations.		4Q95	584
• (U) Fund Civilian Illness and Injury Compensation Costs and locality pay for a full year.		4Q95	5999
Total			**184826**

(U) <u>Project M1ZZ - Base Operations - AMC Major Subordinate Commands and Laboratories:</u> Finances installation management for operating and maintaining other U.S. Army Materiel Command RDTE installations and laboratories, i.e., Army Research Laboratory (ARL), Adelphi, MD (previously known as Harry Diamond Laboratories), Armament Research, Development and Engineering Center (ARDEC), Picatinny Arsenal, NJ, and Natick Research, Development and Engineering Center (NRDEC), MA. Provides for the infrastructure base support along with common service base support to tenants and satellites. FY 1994 funding guidance drastically reduced RDTE Base Operations at the AMC RDTE major subordinate commands and laboratories. FY 1995 funding restores program to minimum essential level.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0605896A**
PE Title: **Base Operations - RDT&E** Budget Activity: **#6**

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Funded the BASEOPS activities and functions for the AMC RDTE Major Subordinate Command installations, laboratories and tenant/satellite activities as described in paragraph B, as follows:		
ARL, Adelphi, MD (FY 1993 RDTE BASEOPS funding level for ARL is misleading. For FY 1993 and prior, the ARL BASEOPS program was partially funded in Operations and Maintenance, Army (OMA) for some support functions, primarily the purchasing and contracting functions. OMA function transferred to RDTE effective FY 1994.)	4Q93	28111
ARDEC, Picatinny Arsenal, NJ	4Q93	53640
NRDEC, Natick, MA	4Q93	11933
Total		**93684**

(U) FY 1994 Plans:	**Complete**	**Cost**
• (U) Continues to fund the BASEOPS activities and functions for the AMC RDTE Major Subordinate Command installations, laboratories and tenant/satellite activities as described in paragraph B, as follows:		
ARL, Adelphi, MD (Effective FY 1994, OMA funds ($4.8 million) were transferred to the ARL RDTE BASEOPS program to centralize funding for all ARL support functions. Subsequent to that, FY 1994 RDTE funding guidance drastically reduced the RDTE BASEOPS program at the AMC RDTE major subordinate commands and laboratories, including ARL.)	4Q94	31024
ARDEC, Picatinny Arsenal, NJ (The FY 1994 RDTE funding guidance drastically reduced the RDTE BASEOPS program at ARDEC, Picatinny Arsenal, NJ, below the minimum essential requirements level. This was a one-time reduction. Army recognizes the severe underfunding and rectifies in FY 1995.)	4Q94	31563
NRDEC, Natick, MA	4Q94	11681
Total		**74268**

(U) FY 1995 Plans:	**Complete**	**Cost**
• (U) Continues to fund the BASEOPS activities and functions for the AMC RDTE Major Subordinate Command installations, laboratories and tenant/satellite activities as described in paragraph B. The FY 1995 program reflects a restoral of minimum essential funding. As indicated by the outyear profiles, the workforce and infrastructure support will be reduced in line with the Army's downsizing plans. Funding by installation as follows:		
ARL, Adelphi, MD (FY 1995 funding level restores ARL BASEOPS to minimum essential level, including minimal "open door" support costs for the Materials Directorate at Watertown, MA. Watertown facility is scheduled to close 4th Qtr, FY 1995. FY 1995 level funds essential items that were deferred from FY 1994 because of funding shortage.)	4Q95	34922

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605896A
PE Title: Base Operations - RDT&E

Budget Activity: #6

ARDEC, Picatinny Arsenal, NJ (The FY 1994 RDTE funding guidance drastically reduced the RDTE BASEOPS program at ARDEC, Picatinny Arsenal, NJ, below the minimum essential level, as a one-time reduction. The FY 1995 funding level partially restores the ARDEC BASEOPS program to cover minimum essential level requirements and efforts deferred from FY 1994 because of funding shortages).		4Q95	44762
NRDEC, Natick, MA		4Q95	13546
Total			**93230**

(U) Project M4ZZ - Base Operations - Corps of Engineers: Finances BASEOPS activities and functions necessary for operating and maintaining the following U.S. Army Corps of Engineers RDTE laboratories: Waterways Experiment Station (WES), Vicksburg, MS; Cold Regions Research and Engineering Laboratories (CRREL), Hanover, NH; Construction Engineering Research Laboratory (CERL), Champaign, IL; and Topographic Engineering Center (TEC), Ft. Belvoir, VA.

(U) **FY 1993 Accomplishments:**

- (U) Funded BASEOPS activities and functions for the U.S. Army Corps of Engineers RDTE,A Laboratories as described in paragraph B, as follows:

	Complete	Cost
WES, Vicksburg, MS	4Q93	4269
CRREL, Hanover, NH	4Q93	4562
CERL, Champaign, IL	4Q93	4250
TEC, Ft Belvoir, Va	4Q93	4981
Total		**18062**

(U) **FY 1994 Plans:**

- (U) Continues to fund the BASEOPS activities and functions for the U.S. Army Corps of Engineers RDTE,A Laboratories as described in paragraph B, as follows:

	Complete	Cost
WES, Vicksburg, MS	4Q94	4476
CRREL, Hanover, NH	4Q94	4730
CERL, Champaign, IL	4Q94	4383
TEC, Ft Belvoir, VA	4Q94	5048
Total		**18637**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605896A
PE Title: Base Operations - RDT&E
Budget Activity: #6

(U) FY 1995 Plans:

- (U) Continues to fund the BASEOPS activities and functions for the U.S. Army Corps of Engineers RDTE,A Laboratories as described in paragraph B, as follows:

WES, Vicksburg, MS	4Q95	4585
CRREL, Hanover, NH	4Q95	4843
CERL, Champaign, IL	4Q95	4517
TEC, Ft Belvoir, Va	4Q95	5082
Total		**19027**

(U) WORK PERFORMED BY: Subordinate commands and other activities of the U.S. Army Materiel Command and the U.S. Army Corps of Engineers RDTE,A activities.

(U) RELATED ACTIVITIES: There is no unnecessary duplication of effort within the Army or the DoD. Related program elements include:
PE #0605856A (Environmental Compliance-RDT&E)
PE #0605876A (Minor Construction - RPM)
PE #0605878A (Maintenance & Repair - RPM)
PE #0605301A (Army Kwajalein Atoll)

(U) OTHER APPROPRIATION FUNDS: Not applicable

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0605898A**
PE Title: **Management Headquarters (Research and Development)** Budget Activity: **#6**

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	To Complete	Total Program
MM03 Command Headquarters - MRDC	5159	3873	3872	3717	3685	3667	3640	Cont	Cont
MM65 Army Research Laboratory	8984	8068	7807	4861	4721	4674	4610	Cont	Cont
M831 AKAMAI	6695	12000	0	0	0	0	0	0	18695
PE TOTAL	20838	23941	11679	8578	8406	8341	8250		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program funds the Research, Development, Test and Evaluation (RDTE) Army Management Headquarters Activities (AMHA) for the U.S. Army Research Laboratory (ARL), Adelphi, MD, and the U.S. Army Medical Research and Development Command (USAMRDC), Ft Detrick, MD. This program provides for (1) the development of policy and guidance, (2) long-range planning, (3) programming and budgeting, (4) management of resources (manpower and dollars), and (5) review and evaluation of program performance. Provides salaries and related personnel benefits for authorized civilian personnel and the associated administrative support (travel, supplies and equipment). Congress provided funding in FY 1993 and FY 1994 for the AKAMAI health project at Tripler Army Medical Center, HI. Program reflects a glide path in response to Army infrastructure drawdown initiatives.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project MM03 - Command Headquarters, Medical Research and Development Command (MRDC): This project provides the funding for management headquarters activities at the U.S. Army Medical Research and Development Command (USAMRDC), Ft Detrick, MD, to (1) develop medical RDTE program policy and guidance; (2) perform long range planning, programming and budgeting; (3) provide the management of resources; and (4) conduct program performance review and evaluation for the RDTE appropriation. This project provides salaries and related personnel benefits for authorized civilian personnel and the administrative support (temporary duty travel, operating supplies and equipment). The program is heavily dependent on civilian salaries and associated support contractor operations.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605898A
PE Title: **Management Headquarters (Research and Development)** Budget Activity: #6

(U) FY 1993 Accomplishments: Complete Cost

- (U) Funded the operation of the USAMRDC headquarters activities which administers the medical research, development and acquisition program to sustain military medical technological superiority. 4Q93 5159

(U) FY 1994 Plans: Complete Cost

- (U) Fund the operation of the USAMRDC headquarters activities which administers the medical research, development and acquisition program to sustain military medical technological superiority. 4Q94 3873

(U) FY 1995 Plans: Complete Cost

- (U) Fund the operation of the USAMRDC headquarters activities which administers the medical research, development and acquisition program to sustain military medical technological superiority. 4Q95 3872

(U) Project MM65 - Army Research Laboratory (ARL): This project provides the funding for management headquarters activities at the U.S. Army Research Laboratory (ARL), Adelphi, MD, to (1) develop RDTE program policy and guidance; (2) perform long range planning, programming and budgeting; (3) provide for the management of resources; and (4) conduct program performance review and evaluation. This project provides for the salaries and related personnel benefits for the authorized civilian personnel and the administrative support (temporary duty travel, operating supplies and equipment). The program is heavily dependent on civilian salaries and associated administrative support.

(U) FY 1993 Accomplishments: Complete Cost

- (U) Funded the operation of ARL headquarters activities which administers the Army laboratory research and development program to sustain technological superiority. 4Q93 8984

(U) FY 1994 Plans: Complete Cost

- (U) Fund the operation of ARL headquarters activities which administers the Army laboratory research and development program to sustain technological superiority. 4Q94 8068

(U) FY 1995 Plans: Complete Cost

- (U) Fund the operation of ARL headquarters activities which administers the Army laboratory research and development program to sustain technological superiority. 4Q95 7807

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0605898A**
PE Title: **Management Headquarters (Research and Development)** Budget Activity: **#6**

(U) **Project M831 - AKAMAI:** This is a state-of-the-art tele-imaging advanced development effort over 5 years to implement the medical diagnostic imaging support (MDIS) system at Tripler Army Medical Center, HI, for tele-imaging throughout the Pacific Rim and to further the proliferation of clinically effective time and distance independent medicine techniques through the use of state-of-the-art telecommunications.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Conducted concept validation demonstration between Tripler DoD medical facilities in Korea and Georgetown University in which diagnostic medical images were telecommunicated for clinical diagnosis.	2Q93	1000
• (U) Conducted design and site preparation for the Tripler Tele-imaging Systems Center, Oahu, HI.	4Q93	1000
• (U) Awarded collaborative research contract to Georgetown University for tele-imaging research support for advanced development and state-of-the-art technology using high bandwidth telecommunications.	4Q93	3000
• (U) Awarded government contract to Loral Aerospace, the MDIS System contractor for in depth AKAMAI site planning for DoD facilities on Oahu, HI.	4Q93	1695
Total		**6695**

(U) FY 1994 Plans:	Complete	Cost
• (U) Award equipment technology contract to Loral based on FY 1993 site planning effort.	2Q94	8000
• (U) Have the Korea portion of the AKAMAI project in full operation for filmless tele-imaging.	3Q94	2000
• (U) Implement phase 2 of Georgetown research support effort - technology assessment for critical mass digital capability.	2Q94	2000
Total		**12000**

(U) **FY 1995 Plans:** No planned program.

(U) **WORK PERFORMED BY:** The U.S. Army Research Laboratory, Adelphi, MD, the U.S. Army Medical Research and Development Command, Ft Detrick, MD and Tripler Army Medical Center, HI.

(U) **RELATED ACTIVITIES:** There is no duplication of effort within the Army or DoD.

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

(U) **INTERNATIONAL COOPERATIVE AGREEMENTS:** Not applicable.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0708045A
PE Title: **Manufacturing Technology**

Budget Activity: #7

A. (U) RESOURCES: ($ in Thousands)

Project Number / Title	FY 1993 Actual	FY 1994 Estimate	FY 1995 Estimate	FY 1996 Estimate	FY1997 Estimate	FY1998 Estimate	FY1999 Estimate	To Complete	Total Program
DE71 Single Issue Tasks	3900	2200	0	0	0	0	0	Cont	Cont
DE74 Chemical Processes	1924	2620	0	0	0	0	0	Cont	Cont
DE77 Electronics Manufacturing	0	922	0	0	0	0	0	Cont	Cont
DE87 Manufacturing Process Control	681	1818	0	0	0	0	0	Cont	Cont
DE99 Environmentally Acceptable Processes	15213	20500	0	0	0	0	0	Cont	Cont
DF03 Optics/Electro-Optics	0	5350	0	0	0	0	0	Cont	Cont
DF04 Non-Metallic Materials	2781	3690	0	0	0	0	0	Cont	Cont
DF05 Metals	8382	6100	0	0	0	0	0	Cont	Cont
PE TOTAL	32881	43200	0	0	0	0	0		

B. (U) BRIEF DESCRIPTION OF ELEMENT: Supports the Army Manufacturing Science and Technology (MS&T) Program. The goals of the program include: development of advanced manufacturing processes, equipment and systems, enhanced quality and reduced cost of Army materiel, and transfer of this technology to the industrial base. In the current environment, the MS&T program is even more important than in past years because of the large decline in weapon system production investments where much manufacturing technology was accomplished within individual production programs. Beginning in FY 1990, the program was restructured to focus resources on a fewer number of technology Thrust Areas and leverage Army resources with private and other government efforts. The technologies selected have the potential for high payoff across the spectrum of Army weapon systems as well as significant impact on national manufacturing issues and the U.S. industrial base. The Army MS&T Strategic

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0708045A
PE Title: **Manufacturing Technology** Budget Activity: #7

Plan definitizes projected requirements, objectives and technical approaches. Effective FY 1995, funding was transferred to and consolidated in the Office, Secretary of Defense (OSD) program.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project DE71 - Single Issue Tasks. Supports tasks that are not part of established thrust areas but offers opportunity for significant advances in manufacturing processes and reduced cost of Army equipment. The material testing technology task supports a wide variety of quick reaction, low cost efforts with significant paybacks to the Army in reduced inspection costs and lower product variability.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Material testing technologies: telemetry test system (complete), uncooled focal plane arrays (sensors), semiconductor device tester (complete), process testing of lithium manganese batteries, electrodynamic test filters, engine compression tester, laser imaging test system, aerosol penetrability test process.	4Q93	654
• (U) Continue development of technology required for troop uniform manufacture and advanced food processing.	4Q93	189
• (U) Continued development of automated tools to analyze designs for potential production problems of new equipment.	4Q93	354
• (U) Develop manufacturing processes for missile seekers.	4Q93	1120
• (U) Complete development of sputtering process to extend cannon tube life.	4Q93	302
• (U) Complete initial Army MS&T strategic plan.	2Q93	587
• (U) Continue development of assembly process for night vision sensor DEWARs.	4Q93	472
• (U) Completed process development for all bonded landing mat.	4Q93	222
Total		**3900**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Material testing technologies: uncooled focal plane arrays (complete), process testing of lithium manganese batteries (complete), electrodynamic test filters (complete), engine compression tester (complete), laser imaging test system (complete), aerosol penetrability test process (complete).	4Q94	975
• (U) Conduct advanced planning and program support.	4Q94	525
• (U) Continue educational partnerships to advance small business and minority manufacturing technology.	4Q94	400
• (U) Continue development of technology required for troop uniform manufacture and advanced food processing.	4Q94	159
• (U) Assess Army remanufacture and reclamation technology requirements.	4Q94	141
Total		**2200**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0708045A**
PE Title: **Manufacturing Technology** Budget Activity: **#7**

(U) FY 1995 Planned Program:
- **(U) OSD has consolidated the MS&T program into a single DoD managed program. Army will receive an allocation of those funds.**

(U) Project DE74 - Chemical Processes. Develops chemical process technologies for high energy density materials (explosives and propellants) and chemical defense materials (sorbents and detectors). Processes are scaled up from the laboratory environment to industrial manufacturing level. Conventional as well as biotechnology processes will be applied to manufacturing processes for new insensitive munitions, chemical defense systems and other materials which rely on chemical processes for manufacture.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• (U) Demonstrate non-organic and non-polluting process for extruded and molded energetic materials including nitramine propellant using inert ingredients.	4Q93	1237
• (U) Develop processes for enzymes used in protection and detection systems against chemical weapons.	4Q93	99
• (U) Develop process for chemical defense antibodies.	4Q93	588
Total		**1924**

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• (U) Develop biotechnological process for enzymes for detection systems.	4Q94	500
• (U) Develop non-organic and non-polluting process for extruded and molded energetic materials.	4Q94	1720
• (U) Develop process for manufacturing chemical defense antibodies.	4Q94	400
Total		**2620**

(U) FY 1995 Planned Program:
- **(U) OSD has consolidated the MS&T program into a single DoD managed program. Army will receive an allocation of those funds.**

(U) Project DE77 - Electronics Manufacturing. Applies emerging, science-based, process technology to the manufacture of high quality, reliable electronic components, assemblies and systems, and improves surface and through-hole mounting soldering processes used in printed circuit boards. Of special interest are processes which are affordable to lower tier and small businesses which provide parts for system assembly and repair.

(U) FY 1993 Accomplishments:
- **(U) Language in the Defense Appropriation moved the tasks from this project under Defense Conversion.**

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0708045A
PE Title: **Manufacturing Technology**

Budget Activity: #7

(U) FY 1994 Planned Program:

	Complete		Cost
• (U) Complete development of manufacturing processes for packaging micro-circuits.	4Q94		75
• (U) Complete fluxless solder development and demonstrate to industry.	4Q94	800	
• (U) Document 20 Kg gallium arsenide boule manufacturing process.	4Q94	47	
Total			922

(U) FY 1995 Planned Program:

- (U) OSD has consolidated the MS&T program into a single DoD managed program. Army will receive an allocation of those funds.

(U) Project DE87 - Manufacturing Process Control. Develops advanced technologies in non-destructive evaluation, machine tool control, advanced integrated manufacturing systems, advance machine sensors and manufacturing processes for food and fabric used in individual soldier systems. The objective is to use these technologies to identify defective parts early in the manufacturing cycle and control variability of manufacturing operations.

(U) FY 1993 Accomplishments:

	Complete		Cost
• (U) Complete development of a system for dimensional gauging of engine components to automate in-process inspection of physical features.	4Q93		152
• (U) Complete development of automated inspection/part recognition to digitize optical images for reverse engineering and inspection.	4Q93		340
• (U) Continue application of novel sensors to evaluating bond quality of adhesive joints during manufacture and in field operations.	4Q93		147
• (U) Continue assessment of Vanzetti machine in advanced soldering and printed wiring boards.	4Q93	42	
Total			681

(U) FY 1994 Planned Program:

	Complete		Cost
• (U) Continue developing process to evaluate the quality of high cost infrared detector array materials and electronic modules.	4Q94		978
• (U) Develop neural network computer assisted inspection technology.	4Q94	350	
• (U) Continue assessment of Vanzetti machine in advanced soldering and printed wiring boards.	4Q94	100	
• (U) Continued development of automated tools to analyze designs for potential production problems of new equipment.	4Q94		390
Total			1818

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0708045A**
PE Title: **Manufacturing Technology**
Budget Activity: **#7**

(U) FY 1995 Planned Program:
- **(U)** OSD has consolidated the MS&T program into a single DoD managed program. Army will receive an allocation of those funds.

(U) Project DE99 - Environmentally Acceptable Processes. Validate or ensure environmental regulatory compliance, and increase worker safety while maintaining current industrial capability.

(U) FY 1993 Accomplishments:	**Complete**	**Cost**
• **(U)** Congressionally directed funding for the National Defense Center for Environmental Excellence and the Army in-house technical support.	4Q93	15213

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• **(U)** Congressionally directed funding for the National Defense Center for Environmental Excellence and the Army in-house technical support.	4Q94	20500

(U) FY 1995 Planned Program:
- **(U)** OSD has consolidated the MS&T program into a single DoD managed program. Army will receive an allocation of those funds.

(U) Project DF03 - Optics/Electro Optics. Supports a cooperative venture with industry, academia and other government agencies to introduce computer integrated manufacturing into the optics used by both defense and commercial equipment, develops manufacturing processes for standardized components of night vision and passive sensor systems, and the new processes for manufacturing emerging photonic devices and assemblies.

(U) FY 1993 Accomplishments:
- **(U)** Language in the Defense Appropriation moved the tasks from this project under Defense Conversion.

(U) FY 1994 Planned Program:	**Complete**	**Cost**
• **(U)** Continue development of a computer aided manufacturing machine for the manufacture of precision optics, lenses and prisms.	4Q94	1382
• **(U)** Complete the assembly processes for second generation Focal Plane Array Detectors (Staring class compact class DEWAR).	4Q94	1280
• **(U)** Complete development of manufacturing processes for Compact Class DEWAR.	4Q94	980

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0708045A
PE Title: Manufacturing Technology
Budget Activity: #7

• (U) Complete process development for magneto-optical mapper for quality verification of materials used in night vision sensors.	4Q94		125
• (U) Continue development of missile seeker manufacturing processes in cooperation with private sector partners and other services.	4Q94		1583
Total			**5350**

(U) FY 1995 Planned Program:
- (U) OSD has consolidated the MS&T program into a single DoD managed program. Army will receive an allocation of those funds.

(U) Project DF04 - Non-Metallic Materials. Develops advanced bonding technologies for joining organic, ceramic, and metallic materials for prolonged use under several environmental conditions; improves process control parameters for adhesive bonding systems; and develops process for manufacturing plastics and composite materials to meet military requirements.

(U) FY 1993 Accomplishments:	**Complete**		**Cost**
• (U) Continue development of manufacturing processes for advanced composite structures used in aircraft.	4Q93		1585
• (U) Complete development of process to automatically apply adhesive to fiber optic for guided missiles.	4Q93	283	
• (U) Continue to develop processes, controls and materials for adhesive bonding problems in military applications of joining problems.	4Q93		125
• (U) Demonstrate process for molding composite sabots for ammunition.	4Q93	788	
Total			**2781**

(U) FY 1994 Planned Program:	**Complete**		**Cost**
• (U) Continue to develop processes, controls and materials for adhesive bonding problems.	4Q94		333
• (U) Continue development of manufacturing processes for advanced composite structures used in aircraft.	4Q94		650
• (U) Complete development of process for molding composite sabots for ammunition.	4Q94	190	
• (U) Initiate development of advanced manufacturing processes for composites in land vehicles	4Q94	2517	
Total			**2517**

(U) FY 1995 Planned Program:
- (U) OSD has consolidated the MS&T program into a single DoD managed program. Army will receive an allocation of those funds.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0708045A
PE Title: **Manufacturing Technology** Budget Activity: #7

(U) Project DF05 - Metals. Develops joining, forming and machining technologies including: materials, processes, process control, and automation of equipment having wide applications in defense, electronics, aerospace, and automotive industries. Reduced cost and enhanced quality of finished product can be expected from applying science-based understanding of emerging technical breakthroughs to classical manufacturing processes. Of particular concern is the deve'opment of processes to economically use high performance materials in the design of engines, structural components and other high stress applications.

(U) FY 1993 Accomplishments:	Complete	Cost
• (U) Perform Congressionally directed effort in developing Flexible Computer Integrated Manufacturing (FCIM) processes for Scranton Army Ammunition Plant.	4Q93	7392
• (U) Complete modification of broaching machines for UDIMET.	4Q93	189
• (U) Continue manufacturing process modification for intricate missile transceivers at the 94GHz range.	4Q93	801
Total		**8382**

(U) FY 1994 Planned Program:	Complete	Cost
• (U) Continue development of powder metallurgy processes for engine parts as directed by language in the Defense Appropriation.	4Q94	985
• (U) Support the Instrumented Factory for Gears, INFAC, as directed by language in the Defense Appropriation.	4Q94	4725
• (U) Provide required Army in-house support to complete directed efforts in austempered ductile iron process development.	4Q94	390
Total		**6100**

(U) FY 1995 Planned Program:

- (U) OSD has consolidated the MS&T program into a single DoD managed program. Army will receive an allocation of those funds.

(U) WORK PERFORMED BY: U.S. Army Materiel Command (AMC) has the responsibility for managing the Manufacturing Technology Program. In-house work performed by the following: Aviation Systems Command, St. Louis, MO; Armament, Munitions, and Chemical Command, Dover, NJ; Aberdeen Proving Ground, MD; Rock Island, IL; Watervliet, NY; Communications-Electronics Command, Ft. Monmouth, NJ; Depot System Command, Chambersburg, PA; Laboratory Command, Adelphi, MD; Watertown, MA; Ft. Belvoir, VA; Missile Command, Huntsville, AL; Tank-Automotive Command, Warren, MI; Troop Support Command, St. Louis, MO; and Natick, MA. Private contractors will be selected on a competitive basis.

FY 1995 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0708045A
PE Title: Manufacturing Technology

Budget Activity: #7

(U) RELATED ACTIVITIES:

- (U) There is no unnecessary duplication of effort within the Army or DOD.
- (U) The Air Force, Navy, and Defense Logistics Agencies have PE# 0708045 MS&T programs that are coordinated with this program and with the Office of the Secretary of Defense Program.
- (U) Individual weapons systems program executive officers do manufacturing research specifically related to their weapons systems and these efforts and requirements are coordinated with Army Thrust Area managers to maximize implementation of MS&T tasks.
- (U) Other government agencies like NASA, the Defense Advanced Research Projects Agency, the Strategic Defense Initiative, and the National Institute of Standards and Technologies pursue manufacturing technology development which are coordinated through OSD through the National Manufacturing Technology Plan.
- (U) The Army carries out other industrial preparedness and productivity activities like Production Base Support, and the Industrial Modernization Incentives Program that are funded with procurement appropriations.

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

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

APPENDIX A

RDT&E CONGRESSIONAL DESCRIPTIVE SUMMARIES MAILING LIST

PRINT	ADDRESS
1	USD (Policy), DUSD(R&P), Pentagon, Room 1C469, Washington, DC 20301-2100
2	DOD Compt, MS, DMI, Pentagon, Room 1B728, Washington, DC 20310-1100
2	OSD, ATTN: DOT&E, Pentagon, Room 3E318, Washington, DC 20310
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1	HQDA (SAFM-CAZ-A), 5611 Columbia Pike, Falls Church, VA 22041-5050
1	HQDA (SFIS-API), Hoffmann 1, Room 1012, Alexandria, VA 22331-0302
6	HQDA (DACS-DPD), Pentagon, Room 3C738, Washington, DC 20310
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2	BMDO, Pentagon, Room 1E1037, Washington, DC 20310
1	OASN (RES), Pentagon, Room 5E779, Washington, DC 20310
1	DOD, ATTN: AMRAD, Room 2C330, Pentagon, Washington, DC 20310
2	HQ, U.S. European Command, ATTN: ECCM-B, APO New York 09128
2	HQ, PACOM, R&D Requirements (J531), Box 15, USPACOM Staff, Camp H. M. Smith, Hawaii 96861

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2	Commander, US Army Medical R&D Command, ATTN: SGRD-PR, Fort Detrick, Frederick, MD 21701-5012
35	Commander, US Army Training and Doctrine Command, ATTN: ATCD-E, Fort Monroe, VA 23651-5000
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3	Commander, US Army Materiel Command, ATTN: AMCAQ-PM-TILO, 5001 Eisenhower Avenue, Alexandria, VA 22333-0001
1	Commander, US Army Research Institute for the Behavioral and Social Sciences, ATTN: PERI-POP, 5001 Eisenhower Avenue, Alexandria, VA 22333-5600
2	Commander, US Army Armament, Munitions and Chemical Command, ATTN: AMSMC-RT, Rock Island, IL 61299-6000
2	Commander, US Army Troop Support Command, ATTN: AMSTR-CG, St. Louis, MO 63120-1798
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5	Commander, US Army Missile Command, ATTN: AMSMI-AS (Library), Bldg 5250, RMC-147, Redstone Arsenal, AL 35898-5000
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2	Program Executive Officer, Global Protection Against Limited Strikes, ATTN: SFAE-GPL-HSV-R, P.O.Box 1500, Huntsville, AL 35807-3801
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4	Commander, 902d MI Group, ATTN: IAGPA-OPOP, Ft. Meade, MD 20755-5910
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2	Commander, US Army Research Office, ATTN: SLCRO-AO (Security Officer), P.O. Box 12211, Research Triangle Park, NC 27709

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3	Director, Harry Diamond Laboratories, ATTN: DELHD-PO-P, 2800 Powder Mill Road, Adelphi, MD 20783-1197
2	Director, AIRMICS, 1150 O'Keefe Boulevard, Georgia Institute of Technology, Atlanta, GA 30332-0800
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3	Executive Office of the President, Office of Management and Budget, National Security Division, Room 10001, Washington, DC 20503
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1	SAF/AQXR, Pentagon, Room 4C347, Washington, DC 20330-6010
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1	Institute for Defense Analyses, 1801 North Beauregard Street, Alexandria, VA 22311
1	Headquarters, National Aeronautical and Space Administration, Code ID, ATTN: Deputy DOD Affairs, Washington, DC 20546
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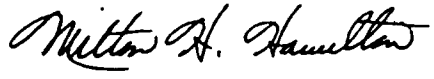
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