*DA PAM 5-6-1

Supporting Data FY 1994
Budget Estimates

Submitted to Congress - April 1993

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, January 1992

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	April 1993	April 1993 - January 1994

4. TITLE AND SUBTITLE
Supporting Data FY 1994 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

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
720

16. PRICE CODE

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

FY 1994 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 1994 Budget to the Amended FY 1992/FY 1993 Biennial 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
0303142/D455	Ground Command Post	0303142/D383
0303142/D455	SMART-T	0303142/D384
0303142/D455	SCAMP	0303142/D386
0602123/AC14	TRACTOR ROSE	0602104/DB79
0603102/D071	Materials	0602105/AH84
0602120/AH16	Ground Combat Identification Technology	0602120/AH15
0602782/AH93	Sensors, Signatures, Signal & Information Processing Tech	0602120/AH16
0603005/D444	Tank & Automotive Technology	0603005/D441
0603742/DF32	Electronic & Electronic Devices	0602705/AH94
0603007/D796	Human Factors Engineering Systems Development	0602716/AH70
0605502/ALL	Small Business Innovation Research	0602790/ALL
0603004/D439	Advance Weaponry Technology Demonstration	0603004/D43A
0603007/A794	Training Systems and Education	0603007/A793
0603806/DE80	Training Systems and Education	0603007/A793
0603322/DB93	TRACTOR ROSE	0603020/AB77
0603772/D289	Joint ALS PS Demonstration	0603238/D177
0603012/DC24	TRACTOR HOLE	0603238/D182
0604270/D540	STINGRAY Technology Program	0603270/DK18
0603612/D096	LOSAT Technology	0603654/D460
0604810/DC26	Non-Line of Sight Missile	0603617/D095
0603645/DB83	Component Development	0603645/DB98
0604630/DB80	Advanced Tank Armament System	0603653/DB99
0604630/DB81	Advanced Tank Armament System	0603653/DB99
0203802/D050	Multiple Launch Rocket System (MLRS)	0603778/D050
0203802/D054	Extended Range Rocket	0603778/D054
0603772/D243	Ground Combat Identification Demonstrations	0603772/D281
0603806/D483	Radiac Equipment-Advanced Development	0603806/D601
0603806/DE80	Chemical Biological Protective Concepts	0603806/D601
0604223/D397	Comanche	0604223/D327
0605603/D976	Army Threat Simulator Program (ATSP)	0604256/D976
0605602/D238	Aerial Targets	0604258/D238

OLD PE/PROJECT	TITLE	NEW PE/PROJECT
0605602/D459	Ground Targets	0604258/D459
0604270/DL12	High Value Asset Defense System	0604270/DL18
CLASSIFIED	Tri-Service Standoff Attack Missile (TSSAM)	0604315/DF08
0603774/D131	Night Vision Systems Advanced Development	0604710/DL69
0605604/DC55	Distributed Developmental Simulation Technology	0604759/DC55
0605301/D614	Major Test & Evaluation Investment-US Army Kwajalein Atoll	0604759/D983
0605602/D453	Major Technology Test Instrumentation	0604759/D984
0605603/D986	Major User Test Support Instrumentation	0604759/D986
0604766/D909	Tactical Electronic Surveillance System	0604766/D113
0604715/D574	Combined Arms Tactical Trainer	0604780/D571
0604805/D488	Tactical Net Radio Communications	0604805/D097
0604806/D019	Chemical/Biological Individual Protection Materiel	0604806/D017
0604806/D517	Radiac Equipment-Engineering Development	0604806/D020
0604816/DC27	HELLFIRE Seeker	0604816/DC13
OMA	C3I Interoperability Test Suite	0604818/DC36
0605601/DE93	Redstone Technology Test Center	0605601/M63?
0605803/MZ85	DBOF-Information Analysis Centers	OSD
0605803/MZ86	DBOF-Defense Technical Information Center	OSD
0708011/ALL	Industrial Preparedness	OSD
0604801/D275	Synthetic Flight Training System	Various
0602782/D780	Lightweight Tactical Are Comm Satellite	ARPA

B. Developmental Transitions of Major Programs

OLD PE/PROJECT	TITLE	NEW PE/PROJECT
0602785/ABB2	Life Science Technology	0602716/AH70
0602813/DC48	TRACTOR PULL	0603019/DB94
0602303/A214	Missile Technology	0603313/D486
0602303/A214	Missile Technology	0603313/D493
0602303/A214	Missile Technology	0603313/D496
0603013/DC25	TRACTOR DIRT	0603647/DC47
0602709/DH95	Night Vision & Electro-Optic Technology	0603710/DK70
0603053/DG23	Future Command & Control Vehicle Development	0604640/DG27
0603004/DL05	Bunker Defeat Munition	0604802/D290
0603746/D555	SINCGARS Advanced Development	0604805/D282

C. Establishment of New Program Elements/Projects

TITLE	NEW PE/PROJECT
Standard Theater Army Command & Control System	0203740/DC49
AH-64 Product Improvement Program	0203744/D423
ATACMS P3I	0203802/D304
Environmental Research	0601102/BH67

TITLE	NEW PE/PROJECT
Environmental Research-Corps of Engineers	0601102/BT25
Cooperative Explosive Safety	0603001/D544
Global Grid Communication	0603006/D257
MK-19 Improvements	0603802/DXXB
Aircraft Avionics	0604201/DC97
Army Threat Simulator	0604256/D976
Target Systems Development	0604258/ALL
Semi-Trailer Van	0604622/DE43
Light Tactical Wheeled Vehicle	0604642/DE41
Major Test and Evaluation Investment	0604759/ALL
NAVSTAR Global Positioning System Equipment	0604778/D168
Redstone Technical Test Center	0605601/M632
OPTEC Instrumentation Sustainment/Development	0605712/D987
ODC Elimination	0605801/MAC3
Contract Administration/Audit	0901600/MM70

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

0602104A
0602122A
0602123A
0602788A
0602813A
0603003A, Project DB38
0603009A
0603012A
0603013A
0603017A
0603018A
0603019A
0603020A
0603238A, Projects D182 & D189
0603322A
0603639A
0603647A
0604328A
0604767A
0102814A
0203744A, Project DB75
0203806A
0203808A
0301359A
0305127A

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

5. **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.

TABLE OF CONTENTS

BUDGET ACTIVITY
PROGRAM ELEMENT

#1 - TECHNOLOGY BASE

#2 - ADVANCED TECHNOLOGY DEVELOPMENT

TABLE OF CONTENTS - Continued

BUDGET ACTIVITY
PROGRAM ELEMENT

#2 - ADVANCED TECHNOLOGY DEVELOPMENT - Continued

#3 - STRATEGIC PROGRAMS

#4 - TACTICAL PROGRAMS

TABLE OF CONTENTS - Continued

BUDGET ACTIVITY
PROGRAM ELEMENT

#4 - TACTICAL PROGRAMS - Continued

TABLE OF CONTENTS - Continued

BUDGET ACTIVITY
PROGRAM ELEMENT

#4 - TACTICAL PROGRAMS - Continued

#5 - INTELLIGENCE AND COMMUNICATIONS

TABLE OF CONTENTS - Continued

BUDGET ACTIVITY
PROGRAM ELEMENT

#5 - INTELLIGENCE AND COMMUNICATIONS - Continued

#6 - DEFENSEWIDE MISSION SUPPORT

ALPHABETICAL LISTING

ALPHABETICAL LISTING

ALPHABETICAL LISTING

ALPHABETICAL LISTING

FY 1994 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: #4

HTU

POPULAR NAME: **AFATDS**

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

SCHEDULE	FY 1992	FY 1993	FY 1994		
Program Milestones		Begin Version 2 10/92	FDTE 10-11/93 ASARC III 6/94		
Engineering Milestones	CDR 6/92				
T&E Milestones		V1 SST 7/93 FQT 4/93	V1 IOTE 2/94		
Contract Milestones		V2 Option 10/92	V2.1 Start 4/94		
BUDGET ($000)	FY 1992	FY 1993	FY 1994		
Major Contract	27171	29319	32942		
Support Contract	11078	4597	6997		
In-House Support	4250	2924	4913		
GFE/ Other	6644	2541	1433		
Total	49143	39381	46285		

FY 1994 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: #4

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 1992 Accomplishments:
- (U) Completed Version 1 preliminary design phase
- (U) Started critical design review Version 1
- (U) Started code and integration of Version 1

(U) FY 1993 Planned Program:
- (U) Complete Version 1 critical design reviews
- (U) Complete code and integration of Version 1
- (U) Conduct Version 1 formal qualification test and system software test
- (U) Award of Version 2

(U) FY 1994 Planned Program:
- (U) Conduct Initial Operational Test and Evaluation of Version 1
- (U) AFATDS Army Systems Acquisition Review Committee (ASARC) III
- (U) Version 1 test unit equipped
- (U) Force Development Test and Experimentation (FDTE) of Version 1 system
- (U) Start Preliminary Design Review of Version 2

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0203726A** Project Number: **D322**
PE Title: **Advanced Field Artillery Tactical Data System** Budget Activity: **#4**
Project Title: **Advanced Field Artillery Tactical Data System**

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 Program Executive Office, Command and Control Systems, Ft Monmouth, NJ.

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY: NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** None
2. **SCHEDULE CHANGES:** Award of Version 2 option slipped to FY 1993. FDTE of Version 1 will slip one month into FY 1994.
3. **COST CHANGES:** None

F. (U) PROGRAM DOCUMENTATION:

Mission Element Need Statement	03/81
Letter of Agreement	12/84
Approved Operational & Organizational Plan	01/89
Approved Required Operational Capability (ROC)	01/91
AFATDS Test Evaluation Master Plan (TEMP)	06/91
System specification	06/92

G. (U) RELATED ACTIVITIES: USMC AFATDS Program, PM Common Hardware/Software and Standardized Integrated Command Post System (SICPS) Program. Forward Entry Device., PE #0604818A (Army Tactical Command and Control Hardware and Software), AFATDS is part of the overall 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 1992 Actual**	**FY 1993 Estimate**	**FY 1994 Estimate**
OPA2 (B28600)	0	0	24892

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 Aug 93. A Force Development Test and Experimentation will be conducted on Version 1 in Oct/Nov 93 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 Feb/Mar 94 with a III Corps unit.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **0203735A**
PE Title: **Combat Vehicle Improvement Program** Budget Activity: **#4**

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

Project Number / Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D280 Recovery Vehicle Improvement Program (IRV)	1880	10194	11403
D330 M1A1 Block Improvement Program	70814	2363	12605
D332 M2/M3 Fighting Vehicle Improvement Program	0	14939	45964
D359 Inter Vehicular Information System (IVIS)	0	8717	0
PE TOTAL	72694	36213	69972

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 production vehicles. The Inter-Vehicular Information System (IVIS) program will demonstrate the functionality of the IVIS developed under the M1A2 full scale development program in a more complete combined arms battlefield environment. 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 1994:

(U) D359 Inter Vehicular Information System (IVIS) Demonstration: This program addresses a Congressional directive to demonstrate the capabilities, current and future of the M1A2 Abrams (IVIS) Stated desired capabilities include interoperability with other Command and Control (C2) systems and or weapon systems, anti-fratricide through improved identification of targets, and target handoff whereby air and ground weapons can exchange target information. Key to the effort is a technical de tration of tactical C2 centered around the M1A2 tank that focuses on interoperability, anti-fratricide, and . .i handoff. The demonstration program plan will be accomplished in two phases. Phase 1 consists of a Mar.n 1993 technical demonstration of digital tactical communications using modified M1A2 IVIS software (incorp ting TACFIRE messages), a BFVS modified with an applique IVIS, an OH-58D Kiowa with ATHS and its resident TACFIRE system, an IVIS equipped Tactical Operations Center (TOC), and two Fire Direction Centers [one artillery (TACFIRE), one mortar (IVIS)]. Phase 2, APR 93 - SEP 94, supports continued modification of IVIS software and hardware to enhance its Identification Friend or Foe (IFF) and C2 capabilities and horizontally and vertically expand IVIS integration with Army C2 systems. Phase 2 will culminate with an excursion to test an updated M1A2, BFVS, and TOC in 1994.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **0203735A**
PE Title: **Combat Vehicle Improvement Program** Budget Activity: **#4**

(U) PROGRAM ACCOMPLISHMENTS :

(U) FY 1992 Accomplishments: Not Applicable

(U) FY 1993 Planned Program:
- (U) Develop IVIS - TACFIRE Interface
- (U) Demo test of Software Version 2.1.1X
- (U) Battlefield Synchronization Demo at Ft. Knox
- (U) Contract to interface IVIS with other C2 systems
- (U) Contract to interface IVIS with weapon systems
- (U) Software Version 3X excursion in Abrams Tank

(U) FY 1994 Planned Program: Not Applicable

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 and Communications & Electronics Command, Ft. Monmouth, NJ.

E. (U) RELATED ACTIVITIES: PE #0602601A (Combat Vehicle and Automotive Technology) and PE #0603005A (Combat Vehicle and Automotive Advanced Technology) - There is no unnecessary duplication of effort within the Army or Department of Defense.

F. (U) OTHER APPROPRIATION FUNDS: None

G. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Progra· Element: #0203735A
PE Tit Comba· :le Improvement Program

Project Number: D280
Budget Activity: #4

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

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Improved Recovery Program	1880	10194	11403

B (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The M88A1E1 is intended to replace and/or augment the existing M88A1 in the recovery of heavy combat vehicles, to include the M1 series tanks and future heavy combat vehicles. The M88A1E1 is an improved version of the M88A1 and consists of an upgraded power pack, improved winch, hoist, and tow capabilities and increased armor protection. It also has increased vehicle weight, an upgraded suspension system, an auxiliary winch, and improved hydraulic system.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- (U) Baseline Testing Completed (Sep 92)

(U) FY 1993 Planned Program:
- (U) PPQT Test (Jan 92 - Apr 93)
- (U) Reliability, Availability, Maintainability (RAM) Test (Jan 93 - Sep 93)
- (U) Ballistic Hull Test (Mar 93 - May 93)
- (U) Operational Test (Jul 93 - Sep 93)
- (U) Ride Test (Apr 93 - May 93)
- (U) Full Load Cooling at Yuma (Sep 93 - Dec 93)
- (U) Contract modification with BMY to increase logistics, publications and Technical Data Packages (TDP)

(U) FY 1994 Planned Program:
- (U) LRIP Contract Award (Oct 93 - Dec 93)
- (U) LLI Solicita· n/Award (Oct 93 - Mar 94)
- (U) Logistics Demonstration (Jan 94 - Mar 94)

D. (U) WORK PERFORMED BY: The Program Executive Officer 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) is BMY Combat Systems, York, PA.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0203735A** Project Number: **D280**
PE Title: **Combat Vehicle Improvement Program** Budget Activity: **#4**

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY: NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** None
2. **SCHEDULE CHANGES:** Program milestones have been adjusted to support a June 95 MS III decision.
3. **COST CHANGES:** FY 92/93 program requirements were less than anticipated.

F. (U) PROGRAM DOCUMENTATION:

Test Evaluation Master Plan (TEMP) 10/92
Required Operational Capability (ROC) 8/86 modified on 1/92

G. (U) RELATED ACTIVITIES: The United States Marine Corps (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.

H. (U) OTHER APPROPRIATION FUNDS:

		($ in Thousands)	
Appropriation	**FY 1992 Actual**	**FY 1993 Estimate**	**FY 1994**
Procurement: SSN GA0570	0	0	
Military Construction: None			

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

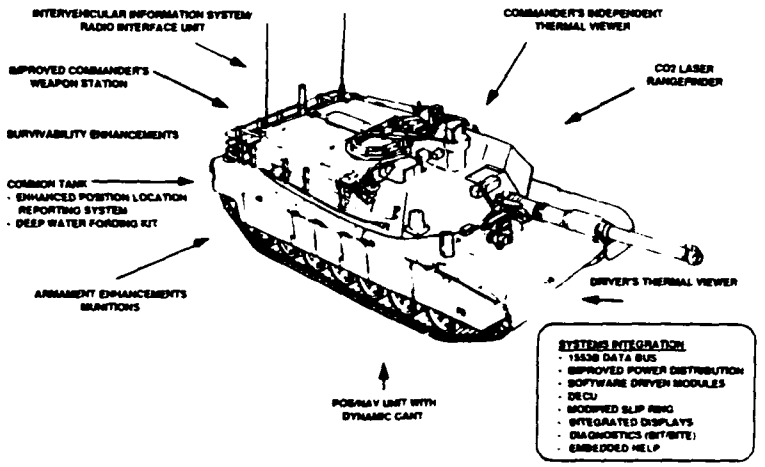
J. (U) TEST AND EVALUATION SCHEDULE:

Milestones	Dates
Teardown/Analysis/Fixes	Sep 91 - Sep 92
Baseline Test	Jun 92 - Sep 92
Go/No-Go Decision	24 Sep 92
Order Long Lead Items/Refurbish vehicles and spares	15 Nov 91 - 30 Sep 92
PPQT User Test	Jan - Sept 93
Milestone III	Jun 95

FY 1994 RDT&E DESCRIPTIVE SUMMARY

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

Project Number: **D330**
Budget Activity: **#4**



POPULAR NAME: Abrams Tank

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

SCHEDULE	FY 1992	FY 1993	FY 1994		
Program Milestones	M1A2 MSIIIA 3/92	PRR 3Q93	MS III 4/94		
Engineering Milestones	M1A2 TDP 12/91				
T&E Milestones	C/T Test 4Q92	Live Fire 3Q93 IOT&E 4Q93			
Contract Milestones		Prod Planning LLM/EXT FSD 2Q93	Prod Cont 3Q93		
BUDGET ($000)	FY 1992	FY 1993	FY 1994		
Major Contract	66136		10528		
Support Contract	1435		420		
In-House Support	2036	1309	1417		
GFE/ Other	1207	1054	240		
Total	70814	2363	12605		

FY 1994 RDT&E DESCRIPTIVE SUMMARY

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

Project Number: D330
Budget Activity: #4

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) provided 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 upgrade. The FY 1985-1994 block improvement (M1A2) includes a Commander's Independent Thermal Viewer, Improved Commander's Weapons Station (ICWS), Position Navigation Unit and Core Vetronics Architecture. These improvements will enhance lethality, fightability and survivability. In the M1A2, performance of these enhanced components is integrated via a digital data and power bussed architecture which, because of its modular design, can accommodate additional components without major hardware changes while increasing system survivability. This BIP will significantly enhance the Abram's overall effectiveness on the battlefield throughout the 1990's and into the 21st century.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- (U) Achieved Milestone IIIA (03/92)
- (U) Early User Test and Evaluation
- (U) Delivery of 4 Pilot Vehicles
- (U) Customer Test and National Training Center Validation
- (U) Continue Qualification Testing
- (U) Kuwait In-Country Demonstration
- (U) Saudi In-Country Demonstration

(U) FY 1993 Planned Program:
- (U) Delivery of 5th Pilot Vehicle
- (U) Continue Qualification Testing
- (U) Sweden In-Country Demonstration
- (U) Begin Live Fire
- (U) Begin Initial Operational Test & Evaluation (IOT&E)

(U) FY 1994 Planned Program:
- (U) Complete M1A2/Training Device Development
- (U) MS III Decision
- (U) Commence upgrade of previously procured Abrams Tanks to M1A2

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.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

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

Project Number: D330
Budget Activity: #4

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY:
NARRATIVE DESCRIPTION OF CHANGES

1. TECHNICAL CHANGES: Added live fire and company ITOE.
2. SCHEDULE CHANGES: 8/92 Upgrade Program Proposed. 12/92 Upgrade approved. MS III established for 4/94.
3. COST CHANGES: To Be Determined.

F. (U) PROGRAM DOCUMENTATION:

Mission Need Statement	May 87
Conventional Systems Committee	Nov 92
Acquistion Strategy	Dec 92
Test and Evaluation Master Plan	3Q93
Integrated Logistics Support Plan	4Q93
Integrated Program Strategy	2Q94

G. (U) RELATED ACTIVITIES: PE #0602601A (Combat Vehicle and Automotive Technology) and PE #0603005A (Combat Vehicle and Automotive Advanced Technology) - There is no unnecessary duplication of effort within the Army or Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
WEAPONS, TRACKED COMBAT VEHICLES (Procurement)			
SSN G82917 M1A1 Abrams Tank	106568	31712	26067
SSN GA0700 M1 Abrams Tank (MOD)	79343	25120	53898
SSN GA0750 Abrams Tank Upgrade	225771	160476	79701

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.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

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

Project Number: **D330**
Budget Activity: **#4**

J. (U) TEST AND EVALUATION DATA:

Milestones	Dates
Army Program Review (DUSA(OR))	7/89
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
Initial Operational Test & Evaluation (IOT&E)	9/93

FY 1994 RDT&E DESCRIPTIVE SUMMARY

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

Projec Number: D332
Budget Activity: #4

POPULAR NAME: M2/M3 Fighting Vehicle

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

SCHEDULE	FY 1992	FY 1993	FY 1994		
Program Milestones		MSIII TBD			
Engineering Milestones		Begin/Complete Tech Integration of ODS Fix	Begin A3		
T&E Milestones		Initiate A3 Planning	Begin A3 T&E		
Contract Milestones					
BUDGET ($000)	FY 1992	FY 1993	FY 1994		
Major Contract		12158	43622		
Support Contract					
In-House Support		200	1120		
GFE/ Other		2581	1222		
Total		14939	45964		

FY 1994 RDT&E DESCRIPTIVE SUMMARY

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

Project Number: D332
Budget Activity: #4

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.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments: Not Applicable

(U) FY 1993 Planned Program:
- (U) Integration and Testing of Driver's Thermal Viewer, GPS with compass, Combat Identification, and Laser Range Finder
- (U) Preparation of LRF RFP
- (U) Perform Operation Desert Storm Improvement Integration
- (U) Initiate Testing of Operation Desert Storm Improvements

(U) FY 1994 Planned Program:
- (U) Begin Technology Integration for A3 configuration
- (U) EMD Award to prime contractor
- (U) Begin design engineering effort on core electronics/software/vehicle integration
- (U) TAS RFP preparation
- (U) Development Reviews (PDR/CDR)
- (U) Begin Production TDP (Draft Spec/DWG)

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 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.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

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

Project Number: **D332**
Budget Activity: **#4**

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY: NARRATIVE DESCRIPTION OF CHANGES

1. TECHNICAL CHANGES: A3 configuration
2. SCHEDULE CHANGES: Operation Desert Storm (ODS) improvements funded in FY93 in lieu of FY94/95.
3. COST CHANGES: Due to need to expedite lessons learned from ODS, RDT&E funds will incorporate Laser Ranger Finder and GPS with compass into the M2/M3 Bradley.

F. (U) PROGRAM DOCUMENTATION: Requirements documentation for M2A3 Bradley is currently in staffing.

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.

H. (U) OTHER APPROPRIATION FUNDS:

		($ in Thousands)	
Appropriation	**FY 1992 Actual**	**FY 1993 Estimate**	**FY 1994 Estimate**
GZ2400 Bradley Mods	106791	34347	29894
G80716 Bradley Base Sustainment		124593	192437
Military Construction	None		

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. (U) TEST AND EVALUATION DATA: None

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **# 0203740A**
PE Title: **Maneuver Control System** Budget Activity: **#4**

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

Project Number / Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D484 Maneuver Control System	36793	26951	16293
DC49 Standard Theater Army Command and Control System	0	0	13409
PE TOTAL	36793	26951	29702

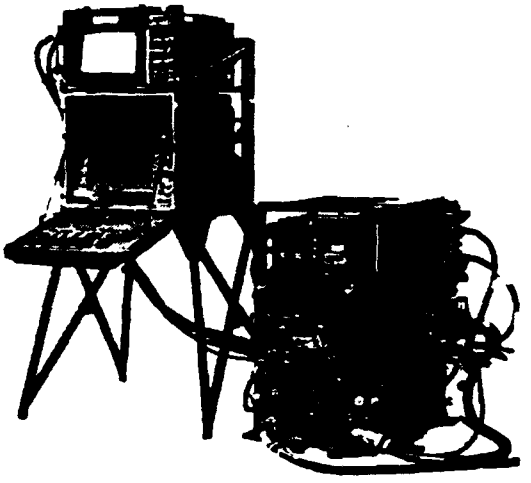
B. (U) BRIEF DESCRIPTION OF ELEMENT: Project D484, Maneuver Control System (MCS) automates command and control (C2) functions previously performed manually. It provides secure, automated assistance to the G3/S3 and other key staff to meet the information needs of commanders for quicker decisions and application of battlefield resources. MCS provides standardized message sets, acquires commander's critical information requirements, and displays status screens and battlefield graphics. Project DC49, Standard Theater Army Command and Control System (STACCS) is a theater level secret high C2 system for USAREUR, ARCENT, USARSO, and 8th U.S. Army and their major sub-commands. STACCS provides force reception, logistics, intelligence, and other support from theater army commanders through an automated system that forecasts capabilities, gathers and distributes information and analyzes and plans unit support mission. This is a new start in FY94.

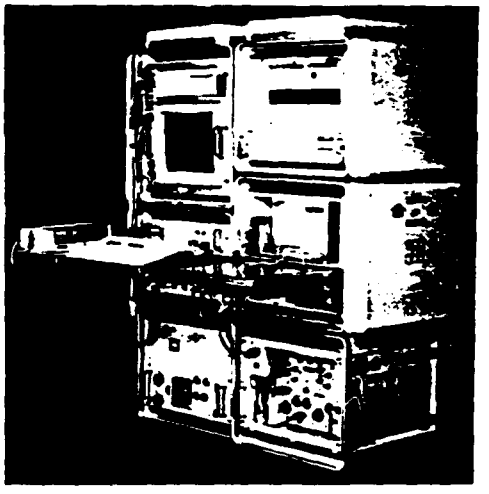
C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:
Not Applicable

FY 1994 RDT&E DESCRIPTIVE SUMMARY

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

Project Number: **#D484**
Budget Activity: **#4**





POPULAR NAME: Maneuver Control System (MCS)

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

SCHEDULE	FY 1992	FY 1993	FY 1994		
Program Milestones					
Engineering Milestones		RECOVER SALVAGEABLE V11 3-9/93			
T&E Milestones			OPERATIONAL ASSESSMENT 3Q94		
Contract Milestones		RELEASE BLOCK IV RFP, 9/93	BLOCK IV AWARD 7/94		
BUDGET ($000)	FY 1992	FY 1993	FY 1994		
Ma- Contract	30,439	18,256	7,510		
Support Contract	1,279	2,145	2,274		
In-House Support	5,075	4,250	4,509		
GFE/ Other	0	2,300	2,000		
Total	36,793	26,951	16,293		

FY 1994 RDT&E DESCRIPTIVE SUMMARY

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

Project Number: #D484
Budget Activity: #4

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 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:

FY 1992 Accomplishments:
- (U) Delivered Adaptable Programmable Interface Unit Software Version 1.0, formally tested and accepted by Office Program Manager, Operations Tactical Data Systems (OPM OPTADS).
- (U) Delivered Upper and Lower Level Protocol (ULP/LLP) Software Version 2.1, formally tested and accepted by OPM OPTADS
- (U) Continued system integration/engineering for the objective MCS and transition to the Army Tactical Command and Control System (ATCCS) common hardware provided by Project Manager, Common Hardware/Software (CHS)

FY 1993 Planned Program:
- (U) Replan MCS program based on Common ATCCS Support Software (CASS) foundation
- (U) Salvage VII for reuse
- (U) Continue evolutionary software development
- (U) Release Block IV Request for Proposal (RFP) for System Engineering and Integration (SE&I) and software development

FY 1994 Planned Program:
- (U) Conduct MCS Operational Assessment on Common Hardware Software
- (U) Competitively award a contract for System Engineering ad Integration (SE&I) and software development with options covering the next five years.
- (U) Begin subsystem engineering, integration and test for the Maneuver functional areas.
- (U) Continue development of common software architecture modules.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

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

Project Number: **#D484**
Budget Activity: **#4**

WORK PERFORMED BY: Project Manager, Operations Tactical Data Systems, Program Executive Office, Command and Control Systems, Fort Monmouth, NJ. Support services are provided by SA contract Modern Technologies Corporation, 4032 Linden Ave., Dayton OH 45432-3015. The RFP is in process for software development and SE&I - contractor to be determined.

E. COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY: NARRATIVE DESCRIPTION OF CHANGES

1. TECHNICAL CHANGES: The MCS software development contractor (Loral) was formally notified by the Contracting Officer that the Government would not be providing any additional funding for software development. As a result, MCS has restructured the program and the new strategy is to utilize Common ATCCS Support Software (CASS) as the new MCS infrastructure building blocks, and integrate the appropriate common application software and the salvageable Version 11 software.

2. SCHEDULE CHANGES: MCS software integration will take place in FY93 and FY94. In a parallel effort, a MCS prototype team has been established to expedite the integration of mature prototype application software to the new MCS "CASS based" software. The MCS software capability is planned for demonstration in 3QTR FY94. The MCS recompete RFP is planned to be released in September 1993 with a 4QTR FY94 award.

3. COST CHANGES: None

F. PROGRAM DOCUMENTATION:

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
Operational Requirements Document	10/92

G. 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 that no unnecessary duplication exists within the Army or DOD.

H. OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Other Procurement, Army			
BA9320	8000	16780	0
BA9710	0	0	1377

I. INTERNATIONAL COOPERATIVE AGREEMENTS:

There are Memoranda of Agreement with United Kingdom, Federal Republic of Germany, and France.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

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

Project Number: #D484
Budget Activity: #4

J. 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
Operational Assessment (CHS-1)	3Q94		

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0203740A** Project Number: **DC49**
PE Title: **Maneuver Control System (MCS)** Budget Activity: **#4**

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

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
STACCS	0	0	13409

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
STACCS is a theater level secret high command and control (C2) network for USAREUR, ARCENT, USARSO, and 8th U.S. Army and their respective major sub-commands. STACCS provides automated briefing and reporting systems to commanders and decision support capability, update and query of twelve functionally oriented data bases for theater army commanders through an automated system that forecasts capabilities, gathers and distributes information and analyzes and plans unit support missions. Utilizes Common Hardware with Army Tactical Command and Control System (ATCCS) and Non Development Items (NDI) for gateways, packet switches and fiber optic local area networks. Utilizes an open architecture and interfaces Mobile Subscriber Equipment (MSE) packet switches, Joint Operational Planning and Execution System (JOPES), and Maneuver Control System (MCS) V10.0.3 by electronic mail. Databases are replicated and distributed and data distribution is based on transaction processing. This is a new start program in FY1994.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- (U) Not funded.

(U) FY 1993 Planned Program
- (U) Not funded.

(U) FY 1994 Planned Program:
- (U) Develop incremental enhancements to V1.1 and start new applications for V1.2 software release.
- (U) Pilot fielding of STACCS V1.2, five theaters.

D. (U) WORK PERFORMED BY:
Project Manager, Operations Tactical Data Systems, Program Executive Office, Command and Control Systems, Fort Monmouth, N. Contractor to be competitively selected in FY94.

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY:
NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES**: None
2. **SCHEDULE CHANGES**: Award of recompete contract changed from 4QTR FY93 to 3QTR FY94
3. **COST CHANGES**: None

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0203740A** Project Number: **DC49**
PE Title: **Maneuver Control System (MCS)** Budget Activity: **#4**

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	Aug 92
Baseline Documentation - Currently in development	
Acquisition Plan - In final Program Executive Officer (PEO) coordination	

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 1992 Actual**	**FY 1993 Estimate**	**FY 1994 Estimate**
Other Procurement, Army BA8250	1645	2701	5744

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. (U) MILESTONE SCHEDULE:

Milestones	Dates
Established STACCS V1.0 baseline, Reforger 92	1QFY93
In Process Review Materiel Acquisition Integrated System Review Council	3QFY93
New Systems Engineering and Integration Contract	3QFY94

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203744A
PE Title: Aircraft Modifications/Product Improvement Pr rams Budget Activity:#4

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
DB75 Tractor Check	5845	7421	14253
D423 AH-64 PIP	0	0	5157
PE TOTAL	5845	7421	194

B. (U) BRIEF DESCRIPTION OF ELEMENT: This PE includes the classified project TRACTOR CHECK and funds the AH-64 Product Improvement Program (PIP). The PIP will develop, test and integrate the Alternate Laser Code (ALC) to the Apache and is a new start in FY94. Impacted hardware includes the Laser Electronics Unit, Remote Hellfire Electronics, Fire Control Computer, Back-up BUS Controller, and Data Transfe: ystem. The addition of the ALC will ensure optimum Hellfire performance on a modern battlefield with known countermeasures and will allow optimal use o' planned Electro-Optic Countermeasures (EOCM) on the Hellfire missile.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

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

(U) Project D423 - AH-64 PIP: This PIP is a new start in FY94 for the development, testing and integration of 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) c the Hellfire II missile.

(U) FY 1992 Accomplishments:
- (U) Project not funded

(U) FY 1993 Planned Program:
- (U) Projec not funded

(U) FY 1994 Planned Program:
- (U) Initiate ALC design and integration effort
- (U) Initiate necessary design for hardware/software/wiring changes
- (U) Prepare ALC test plans

(U) Work Performed By: McDonnell Douglas Helicopter Compan, Mesa, AZ; Martin ' rietta Corporation, Orlando, FL; Rockwell International Corporation, Cedar Rapids, Ia.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0203744A**
PE Title: **Aircraft Modifications/Product Improvement Programs** Budget Activity:**#4**

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

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

Appropriation:	**FY1992 Actual**	**FY1993 Estimate**	**FY1994 Estimate**
Procurement (AA6605) Apache Mods	74971	64924	46392

(U) International Cooperative Agreements: None

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0203752A** Budget Activity: **#4**
PE Title: **Aircraft Engine Component Improvement Program**

A. (U) RESOURCES: ($ in Thousands)
Project Title: Aircraft Engine Component Improvement Program (CIP)

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D106 Aircraft Component Improvement Program (CIP)	6285	6318	6567

B. (U) BRIEF DESCRIPTION OF ELEMENT: Aircraft Engine Component Improvement Program (CIP) develops, tests, 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 LESS THAN $10.0 MILLION IN FY 1994:

(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 is included in the RDT&E vice procurement appropriations in accordance with Congressional direction.

(U) FY 1992 Accomplishments:
- (U) T700 Engine: Qualified & improved compressor rub coating; started ceramic shroud durability improvement program; qualified an improved No. 4 bearing; increased usable case volume of the hydromechanical control unit; conducted engine/component life analysis; and developed repair techniques for engine components.
- (U) T55 Engine: Initiated development of composite inlet housing (cost/readiness); redesigned No. 4/5 bearing package oil tubes/fittings (reliability/readiness); designed and bench tested improved diagnostic oil filter housing (readiness/maintainability); and investigated relocation of power turbine chip detector (reliability/readiness).
- (U) T53 Engine: Completed redesigned composite front cover; completed qualification of hot section parts redesigned in new material; and completed redesign gearbox torquemeter.
- (U) GTCP36 Auxiliary Power Unit (APU): Completed inlet particle separator study for AH-64 (readiness/cost); began development of improved power takeoff (PTO) clutch for AH-64 (safety/readiness); and developed improved planet bearing for AH-64 (safety/readiness).

(U) FY 1993 Planned Program:
- (U) T700 Engine: Engine evaluation, test, assembly, disassembly, and support (safety/readiness); qualify improved life blower bearing (readiness/reliability); qualify improved digital electronic control unit (reliability/readiness); and qualify increased durability ceramic shrouds (reliability/readiness).
- (U) T55 Engine: T_2 sensor relocation evaluation & redesign (reliability/readiness); continue

development of composite inlet housing (cost/readiness); and initiate development of cast 4th nozzle (cost/reliability/safety).

- (U) T53 Engine: Redesign accessory drive carrier to improve service life (safety/reliability); redesign exhaust diffuser (readiness/durability/cost savings); and redesign pin reduction gear bearing to prevent turning (readiness/durability/cost savings).
- (U) GTCP36 APU: Continue development of improved PTO clutch for AH-64 (safety/readiness); and continue development of improved planet bearing for AH-64 (safety/readiness).

(U) **FY 1994 Planned Program:**

- (U) T700 Engine: Engine evaluation, test, assembly, disassembly, and support (safety/readiness); investigate field safety problems as/when they occur (safety/reliability/durability); improved "A Sump" pressurization (readiness/reliability); and develop fix for compressor/diffuser flange bolt breakage (readiness/cost savings).
- (U) T55 Engine: Continue development of composite inlet housing (cost/readiness); continue development of cast 4th nozzle (cost/reliability/safety); initiate program to eliminate D979 materiel (cost/readiness); redesign machined combustor liner (cost/reliability); and redesign power turbine lock cap (reliability/durability/safety).
- (U) T53 Engine: Develop thermo-barrier combustor liner (readiness/cost savings); turbine TIP clearance improvement (readiness/cost); and alternate vendor qualification (readiness/cost savings).
- (U) GTCP36 APU: Complete development and qualification of improved PTO clutch for AH-64 (safety/readiness); complete qualification of improved planet bearing for AH-64 (safety/readiness); and begin development of full authority digital electronic control (FADEC) for AH-64, UH-60, and LONGBOW (readiness/cost).

(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 authorized for all three military services in DoD Manual 71101-M. 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:** Not applicable.

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

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203801A
PE Title: Missile/Air Defense Product Improv. ent Program — Budget Activity: # 4

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

Project Number / Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D036 PATRIOT Product Improvement Program	37864	36336	37674
D038 AVENGER Product Improvement Program	2462	11823	7385
D303 STINGER RMP Product Improvement Program	4020	12221	14719
D690 HAWK Product Improvement Program	14502	7559	0
PE TOTAL	58848	67939	59782

B. (U) BRIEF DESCRIPTION OF ELEMENT: Threat forces modernization require an evolutionary product improvement program to maintain the effectiveness of ground based anti-air and 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 1994:

(U) Project D038 - AVENGER Product Improvement Program (PIP): The AVENGER PIP maximizes the effectiveness and performance of the AVENGER by developing pre-planned product improvements (P3I) to develop and integrate the Environmental Control Unit/Prime Power Unit (ECU/PPU); interface the AVENGER fire control system with the Forward Area Air Defense Command, Control and Intelligence (FAAD C2I) system; develop and integrate the Fire Control System 1 (FC-1), allowing AVENGER to select and upload specific missile software based on target and environmental conditions, enhancing missile performance without missile hardware changes; develop and integrate integrated training devices, and accomplish new mission to keep current with evolving threat. Review candidate missiles for an adjunct or complementary missile on AVENGER, BRADLEY, and LAV-AD air defense platforms.

(U) FY 1992 Accomplishments:
- (U) Initiated ECU/PPU design and development
- (U) Developed initialization, acquisition, engagement, and management software algorithms

(U) FY 1993 Planned Program:
- (U) Continue ECU/PPU design, development and test
- (U) Define command, control and intelligence (C2I) interfaces and initiate development of C2I manual
- (U) Initiate development of Integrated Weapons C rol System (IWCS)
- (U) Initiate development of integrated training de s
- (U) Review candidate missiles for an adjunct or complementary missile on AVENGER, BRADLEY, and LAV-AI r defense platforms

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203801A
PE Title: **Missile/Air Defense Product Improvement Program** Budget Activity: # 4

(U) FY 1994 Planned Program:
- (U) Continue development of, and integrate, C2I manual
- (U) Initiate FC-1 design and development
- (U) Integrate IWCS and incorporate test findings
- (U) Develop integrated training devices
- (U) Conduct technical subsystem tests
- (U) Conduct test programs and assess system performance through technical and operational tests

(U) Project D690 - HAWK Product Improvement Program (PIP): HAWK is a medium range surface to air guided missile system designed specifically to defend against low and medium altitude aircraft. The system has been in the U.S. Army since 1960, and has been upgraded by a series of product improvements to improve reliability, integrate current technology, reduce operating cost, and improve performance against the advancing tactical aircraft threat. Product improvement in budget year is an upgrade to the training system. Lessons learned during Operation Desert Storm have further confirmed the need for this integrated trainer. The training system provides integrated training for all HAWK systems for institutional use.

(U) FY 1992 Accomplishments:
- (U) Completed Field Maintenance Equipment (FME) upgrade development
- (U) Continued mobility enhancement development

(U) FY 1993 Planned Program:
- (U) Complete Mobility Enhancement Development
- (U) Continue Development Effort

(U) FY 1994 Planned Program:
- (U) Project terminated

(U) Work Performed By:
AVENGER: In-house technical efforts performed by Program Executive Officer for Tactical Missiles, Project Manager AVENGER at Redstone Arsenal, AL, U. S. Army Air Defense School, Ft. Bliss, TX, U. S. Army Missile Command and Research and Development Engineering Center at Redstone Arsenal, AL. Boeing Aerospace of Huntsville, AL, is the prime contractor for the AVENGER.

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 Air Defense School, Ft. Bliss, TX.

(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. The Air-to-Air Missile Project Manager is also the Executive Officer for the procurement of all STINGER missiles within DoD.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0203801A**
PE Title: **Missile/Air Defense Product Improvement Program** Budget Activity: **# 4**

(U) Other Appropriation Funds:

Appropriation	($ in Thousands) FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
AVENGER:			
MISSILE PROCUREMENT, ARMY			
AVENGER MOD (CE8710)	84	4117	9318
HAWK:			
MISSILE PROCUREMENT, ARMY			
BUDGET ACTIVITY 2			
Other Missile Support (A0275)	596	1353	0
HAWK (C25400)	1631	1675	2762
BUDGET ACTIVITY 5			
Modifications (C35200)	9843	1498	0

(U) International Cooperative Agreements: A memorandum of agreement was signed 19 June 1987 between the U.S. and the Netherlands concerning joint research and development of HAWK mobility enhancements.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

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

Project Number: **#D036**
Budget Activity: **#4**

POPULAR NAME: **PATRIOT**

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

SCHEDULE	FY 1992	FY 1993	FY 1994		
Program Milestones					
Engineering Milestones	Start Generator, EWCC end, TNG dev upgrade end, cont CDI Ph I	End generator, Start commo upgrade Ph I, end POSID Ph I, start POSID Ph II	Cont POSID Ph II, cont commo upgrade Ph I, start commo Ph II		
T & E Milestones	Eng & Prod Tests	Eng & Prod Tests	Eng & Prod Tests		
Contract Milestones					
BUDGET ($000)	FY 1992	FY 1993	FY 1994		
Major Contract	25411	28146	29478		
Support Contract	1059	1100	1200		
In-House Support	9523	5400	5400		
GFE/ Other	1871	1690	1600		
Total	37864	36336	37678		

FY 1994 RDT&E DESCRIPTIVE SUMMARY

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

Project Number: #D036
Budget Activity: #4

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 (P3I) 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:

(U) FY 1992 Accomplishments:
- (U) Continued Positive ID Phase I
- (U) Continued communications upgrade concept analyses
- (U) Completed development and integration of Enhanced Weapons Control Computer (EWCC) upgrade
- (U) Finalized development of training device upgrade
- (U) Fielded final version of Post Deployment Built (PDB) 3
- (U) Continued analysis of threat as it responds to PATRIOT product improvements
- (U) Initiated gene - interface development

(U) FY 1993 Planned Program:
- (U) Complete Positive ID Phase I
- (U) Initiate development of Positive ID Phase II sensor
- (U) Initiate development of communications upgrade Phase I
- (U) Continue analysis of threat as it responds to PATRIOT product improvements
- (U) Complete generator interface development

(U) FY 1994 Planned Program:
- (U) Continue development of Positive ID Phase II sensor
- (U) Continue design of communications upgrade Phase I
- (U) Continue analysis of threat as it responds to PATRIOT product improvements
- (U) Initiate development of communications upgrade Phase II

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 Program Executive Office (PEO), Global Protection Against Limited Strikes (GPALS), PATRIOT Project Office, U.S. Army Missile Command, Redstone Arsenal, Al, and U.S. Army Air Defense School, Ft. Bliss, TX.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

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

Project Number: #D036
Budget Activity: #4

E. (U) COMPARISON WITH FY 1993 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 (SDIO Programs). There is no unnecessary duplication of effort within the Army or DoD.

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

Appropriation	FY1992 Actual	FY1993 Estimate	FY1994 Estimate
Missile Procurement, Army			
Budget Activity 2 - PATRIOT (C49100)	162953	24851	40611
Budget Activity 3 - PATRIOT Modifications (C50700)	35150	9987	18526
Military Construction	0	0	0

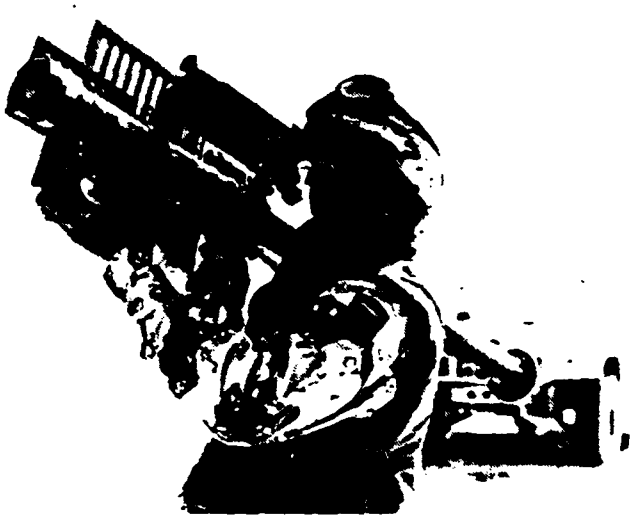
I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Under the cooperative agreements with NATO countries (Federal Republic of Germany, Netherlands and Italy) and other non-NATO Countries (Saudi Arabia, Japan, and Israel) product improvements are available to those countries.

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

FY 1994 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: #4



POPULAR NAME: STINGER-RMP

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

SCHEDULE	FY 1992	FY 1993	FY 1994
Program Milestones	Initiate Blk 1 Dev BSFV:In Turret Stdy	Finalize RS Integ BSFV: Make Conc Sel	Finalize Blk 1 Hdw
Engineering Milestones	Dev Blk 1 Hdw	CDR 1QFY93; S/W Dev; BSFV-Conc Eval	Initiate S/W Design
T&E Milestones	Int. POP on P.type	Comp POP on P.type BSFV: Certify Sim	Initial Dev Tests
Contract Milestones	Awd Con 3QFY92	BSFV: P.type RFP & Awd Con 4QFY93	
BUDGET ($000)	FY 1992	FY 1993	FY 1994
Major Contract	3000	7700	10089
Support Contract	846	1713	
In-House Support	174	2808	4630
GFE/ Other			
Total	4020	12221	14719

FY 1994 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: #4

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The STINGER-Reprogrammable Microprocessor (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 accommodate 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. Effort continues toward resolution of the hidden target problem and system deficiencies in target characterization. This project 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 Air Defense Anti-Tank System 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 most operationally effective turret.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
RMP:
- (U) Finalized Planning for the Block I Program
- (U) Developed Block 1 Hardware Design
- (U) Initialed Proof of Principal Flights with Prototype Block I Hardware
- (U) Awarded Contract to Start Block I Development

BSFV:
- (U) Initiated Planning Strategy for BSFV Improvement Study
- (U) Initiated Growth Study to Identify Most Technically Feasible and Cost Effective Near-term Improvements

(U) FY 1993 Planned Program:
RMP:
- (U) Finalize Roll Sensor Design
- (U) Block 1 Hardware Critical Design Review
- (U) Initiate Software Development
- (U) Complete Proof of Principal Prototype Flight Tests

BSFV:
- (U) Initiate Turret Survey & Select Virtual Prototype Integration Concepts
- (U) Initiate Combined Arms Simulation
- (U) Initiate Battlefield Distributed Integration Simulations

FY 1994 RDT&E DESCRIPTIVE SUMMARY

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

Project Number: D303
Budget Activity: #4

- (U) Develop BSFV Crew Stations
- (U) Perform Simulation Certification
- (U) Complete Virtual Prototype Integration RFP
- (U) Government Evaluation of Virtual Shootoff
- (U) Award Contract for Virtual Prototype Integration
- (U) Complete Concept Evaluation and Make Concept Selection

(U) FY 1994 Planned Program:
RMP:

- (U) Finalize Design for Block I Hardware and Documentation
- (U) Initiate Software Design
- (U) Begin Development Tests

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

BSFV: In-house technical efforts are provided by Director of Combat Development, USAADASCH; and Battlefield Distributed Integrated Simulation Battle Labs. Contractors for the BSFV studies are Nichols Research Corporation and Sigmatech, Inc.

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY:
NARRATIVE DESCRIPTION OF CHANGES

1. TECHNICAL CHANGES: Development of alternative sources and phasing the technical program is in process to accomplish the requirements within the current funding profile.
2. SCHEDULE CHANGES: STINGER-RMP: Restructuring of the schedule is in process based on technical realignment to accomplish the program.
3. COST CHANGES: None

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 Air-to-Air Missile Project Manager is the Executive Agent for the procurement of all STINGER missiles within DoD.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0203801A** Project Number: **D303**
PE Title: **Missile/Air Defense Product Improvement Program** Budget Activity: **#4**
Project Title: **STINGER-RMP Product Improvement Program**

H. (U) OTHER APPROPRIATION FUNDS:

Appropriation	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
	($ in Thousands)		
Missile Procurement, Army			
Budget Activity 2-STINGER			
Missile (C18500)	25763	34652	8356

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 conducted in FY 94. Flight tests for clutter and night engagements will be conducted in FY 95.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203802A
PE Title: Other Missile Product Improvement Programs (PIP) Budget Activity: #4

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D045 HELLFIRE Product Improvement Program	21298	4729	3138
D051 ALT TOW2 Warhead	4994	0	0
D304 Army TACMS Preplanned Program (P3I)	0	0	25759
D336 TOW Product Improvement Program	28128	0	37541
PE TOTAL	54420	4729	66438

B. (U) BRIEF DESCRIPTION OF ELEMENT: Threats from expanding regional powers require an evolutionary improvement program to maintain the effectiveness of the HELLFIRE and TOW 2/TOW 2B systems. The HELLFIRE PIP, consisting of the HELLFIRE II (formerly HELLFIRE Optimized Missile System (HOMS)) and the Insensitive Munitions (IM) development program, provides a seeker hardened against countermeasure threats, a robust warhead which will defeat evolving threat armor, and development of warhead and rocket motors that meet tri-service requirements for high resistance to external stimuli. The TOW Material Changes (MC) provide advances in the launcher, warhead, motors, day/night sight improvements and fire control improvements. The MCs continue warhead testing/qualification, enhancements that maintain the Army/USMC capability to defeat evolving threat armor, countermeasures, and includes other future improvements to TOW 2B design such as sensors, improved lethality, and improved aerodynamics.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994 :

(U) Project #D045, HELLFIRE Product Improvement Program: The HELLFIRE II (formerly HOMS) 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 optimized program also will provide a missile bus that is compatible with the LONGBOW HELLFIRE missile system requirements. The insensitive munitions effort is to develop a motor and warhead that are highly resistant to external stimuli that could cause unsafe detonation. Funding will provide for development and qualification of main and precursor warheads at the component level.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0203802A**
PE Title: **Other Missile Product Improvement Programs (PIP)** Budget Activity: **#4**

(U) FY 1992 Accomplishments:
- (U) Continued HELLFIRE II development.
- (U) Initiated Congressionally Directed Training Missile Program

(U) FY 1993 Planned Program:
- (U) Initiate Insensitive Munitions (main and precursor warheads)
- (U) Complete Training Missile Program
- (U) Complete development of HELLFIRE II (Optimized Missile).

(U) FY 1994 Planned Program:
- (U) Complete insensitive warhead qualification testing at component level

(U) Work Performed By: The prime contractor for the HELLFIRE II (optimized missile) is Martin Marietta Corporation, Orlando, FL. The Iowa Army Ammunition Plant and Conventional Munitions Systems, Tampa Florida are potential vendors for the insensitive warheads. In-house effort for the HELLFIRE II missile and insensitive munitions will be conducted by the Research, Development, and Engineering Center, U.S. Army Missile Command, Redstone Arsenal, AL.

(U) Related Activities:
PE #0604816 (Longbow)
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)

(U) Other Appropriation Funds:

	($ in Thousands)		
Appropriation	**FY 1992 Actual**	**FY 1993 Estimate**	**FY 1994 Estimate**
Missile Procurement, Army	11689	82903	92535
HELLFIRE (C70000)			
Military Construction	0	0	0

(U) International Cooperative Agreements: Not applicable

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0203802A** Project Number: **D304**
PE Title: **Other Missile PIP** Budget Activity: **#4**
Project Title: **Army Tactical Missile System (Army TACMS)-Preplanned Product Improvement (P3I)**

POPULAR NAME: **Army TACMS-P3I**

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

SCHEDULE	FY 1992	FY 1993	FY 1994
Program Milestones	N/A	N/A	Milestone IV-Dec FY 94
Engineering Milestones	N/A	N/A	Army Participation In JPS Demo-Aug FY 94
T&E Milestones	N/A	N/A	
Contract Milestones	N/A	N/A	-JPSD-Nov FY 94 -P3I APAM EMD-Feb FY 94
BUDGET (S000)	**FY 1992**	**FY 1993**	**FY 1994**
Major Contract			16554
Support Contract			1760
In-House Support			4380
GFE/ Other			3065
Total	o	o	25759

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0203802A** Project Number: **D304**
PE Title: **Other Missile PIP** Budget Activity: **#4**
Project Title: **Army Tactical Missile System (Army TACMS)-Preplanned Product Improvement (P3I)**

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This new start 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. The inherent GPS accuracies will be achievable independent of range, thereby enhancing system performance. These funds will also support participation by P3I APAM prototype missiles in the Joint Precision Strike Demonstration. A P3I Engineering, Manufacturing, and Development (EMD) program will initially incorporate the improved APAM warhead capability and will be followed by EMD to integrate Brilliant Anti-Armor Submunitions-P3I (BAT-P3I) with the missile. 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 1992 Accomplishments: Not applicable.

(U) FY 1993 Planned Program: Not applicable.

(U) FY 1994 Planned Program:
- (U) "GPS Integration/Interface preliminary design support
- (U) Technology demonstration in conjunction with JPSD
- (U) Initiate EMD for P3I APAM program
- (U) Continue studies, development and validation of future improvement programs

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.

E. (U) COMPARISON WITH FY 1993 AMENDED 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) (updated and forwarded to TRADOC)	5/85
Sec of Def Decision Memo (SDDM)	3/86
Decision Coordinating Paper (DCP) (now Intg Prog Sum to be updated 10/93)	5/86
Test and Evaluation Master Plan (TEMP) (to be updated 12/93)	5/91

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0203802A** Project Number: **D304**
PE Title: **Other Missile PIP** Budget Activity: **#4**
Project Title: **Army Tactical Missile System (Army TACMS)-Preplanned Product Improvement (P3I)**

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 potential 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:

	($ in Thousands)		
Appropriation	**FY 1992 Actual**	**FY 1993 Estimate**	**FY 1994**
Missile Procurement,Army			
ATACMS (C98510)	172389	190606	152559
Military Construction	5500	0	0

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Date Exchange Agreement-France, and Information Exchange Agreement-United Kingdom.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203802A
PE Title: OTHER MISSILE PRODUCT IMPROVEMENT PROGRAMS

Project Number: #D336
Budget Activity: # 4

A. (U) RESOURCES: ($ in Thousands)
Project Title: TOW PRODUCT IMPROVEMENT PROGRAMS

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
TOW PIP	28128	0	37541

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 defeat continually expanding regional power threats and countermeasures environments. Included in this project are warhead improvements, other future improvements to TOW 2B design, improved aerodynamics, TOW flight motor, launchers, day/night sight improvements, improved fire control and target acquisition, warhead qualification testing, and upgrade of TOW 2 and TOW 2A missiles. FY92 carryover funds are used to complete accomplishments in FY93.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- (U) Critical Design Review (CDR) for missile case improvement providing Electromagnetic Environmental Effects (E3).
- (U) Completed Version III Sensor Software Preliminary Design Review (PDR).
- (U) Completed 4 kilometer wire bobbin improvement resulting in completion of CDR and near completion of missile assembly, flight testing and ECP.
- (U) Completed Phase 2 design of 2B enhanced lethality warhead.
- (U) Completed last Phase of 2A enhanced lethality development and testing.

(U) FY 1993 Planned Program:
- (U) TOW Improved Target Acquisition System (ITAS) projected contract award - third quarter 93.
- (U) Extended Phase 1, additional warhead liner metallurgy and design studies for TOW 2B.
- (U) Continue TOW improvements.
- (U) Continue enhanced lethality warhead Phase 3 development validation and qualification tests.

(U) FY 1994 Planned Program:
- (U) TOW ITAS Engineering and Manufacturing Development (EMD) continues.
- (U) TOW ITAS emphasis on detail planning for pilot production line.
- (U) Initiate studies of missile and fire control target acquisition system improvements to completely satisfy Qualitative Material Requirements (QMR).
- (U) Continue warhead threat development validation and qualification tests.

D. (U) WORK PERFORMED BY: Contractor to be determined. Army management of all TOW programs is performed by Project Manager, TOW and Program Executive Officer, Tactical Missile, Redstone Arsenal, AL.

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY:

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203802A
PE Title: OTHER MISSILE PRODUCT IMPROVEMENT PROGRAMS
Project Number: #D336
Budget Activity: # 4

NARRATIVE DESCRIPTION OF CHANGES

The Army received approval from all four Congressional Committees to convert TOW to the Improved Target Acquisition (ITAS).

1. **TECHNICAL CHANGES:** TOW ITAS is a target acquisition and fire control sub system upgrade that will result in an integrated unit modification kit compatible with M-966 HMMWV and TOW Ground Launcher Platforms.
2. **SCHEDULE CHANGES:** RDT&E TOW ITAS program will be from FY 93 through FY 97 utilizing FY 92 funding for FY 93 requirement.
3. **COST CHANGES:** None.

F. (U) PROGRAM DOCUMENTATION:

TOW ITAS support from Assistant Secretary of the Army, 29 Jan 92
TOW ITAS material change #1-89-03-3028
TOW 2B user requirements message - 6/85
(PIP 1-86-03-3026) TOW 2B - 12/85
Product improvement management information report - 12/86
(PIP 1-88-03-3027) TOW 2 to TOW 2A retrofit - 5/88
TOW 2 retrofit user requirements and message - 7/88

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
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 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Missile Procurement, Army			
Budget Activity 2, TOW 2 (C59300)	200607	182023	25282
Budget Activity 3, TOW MODs (C61700)	8263	14849	7250
Military Construction	0	0	0

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

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0203802A
PE Title: OTHER MISSILE PRODUCT IMPROVEMENT PROGRAMS
Project Number: #D336
Budget Activity: # 4

J. (U) MILESTONE SCHEDULE:

Milestones (T&E)	Dates
TOW 2B	
Development test/operational test completed	Oct 90
PEO level IPR	Nov 90
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	
Expected flight test	Sep 93
ITAS	
IPR with AAE	Jan 92
PEO Tactical Missiles appointed milestone decision authority	Jan 92
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 at DA delivered to OSD	Mar 93
Proposals received	Jan 93

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0208010A** Project Number: **D107**
PE Title: **Joint Tactical Communications Program (TRI-TAC)** Budget Activity: **#4**

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

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
EAC Communications	4966	7178	16529

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: A requirement exists to automate Signal units' 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 Systems (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), Army Key Management (AKMs), and Material Changes to transmission equipment.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- (U) Completed the Source Selection Evaluation Board (SSEB) for ISYSCON
- (U) ISYSCON software development (Block 1) contract awarded Sep 92

(U) FY 1993 Planned Program:
- (U) Continue ISYSCON Block I software development
- (U) Initial design team is preparing the System Segment Specification
- (U) Conduct Systems Requirements Review

(U) FY 1994 Planned Program:
- (U) Continue ISYSCON Block I software development
- (U) Accomplish preliminary software design tasks
- (U) Complete Software Design Document
- (U) Initiate Software Development Folders (technical information software describing the design and development of software objects)
- (U) Conduct System Specification Review
- (U) Conduct Preliminary Design Review
- (U) Initate hardware design tasks

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0208010A
PE Title: **Joint Tactical Communications Program (TRI-TAC)**
Project Number: D107
Budget Activity: #4

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, Multi-Service Communications Systems (PM, MSCS).

E. (U) COMPARISON WITH FY 1993 AMENDED 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 (TEMP)	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 Marine Corps))
- 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 or DoD.

H. (U) OTHER APPROPRIATION FUNDS:

Appropriation	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
		($ in Thousands)	
Other Procurement, Army ISYSCON (SSN BX0007)	0	0	958

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
AN/TYC-39 Memory Materiel Changes (MC)	
Complete Security Improvements	1Q93
Complete Testing	1Q94
First Hardware Applied	2Q94

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303140A
PE Title: Communications Security (COMSEC) Equipment Budget Activity: #5

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D491 Communications Security Equipment Technology	6615	6118	7122

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 ensure our data network integrity. The Army's Research, Development, Testing & Evaluation (RDT&E) ISS program objective is to implement National Security Agency (NSA) developed security technology in Army information systems. The thrust of the program is to ensure total signals and data security of all Army information systems, to include any operational enhancements and specialized Army configurations. The management of cryptographic keys and radio Signal Operating Instructions to reduce human intelligence threat while assuring useability on the battlefield is the Army's first priority. NSA develops the basic technology such as standard chips, modules, and algorithms which the Army embeds into its information equipment and systems; for example, the Army Multilevel Secure Network System, and the all digital multiband, multimode radios. The Army ISS RDT&E program provides the Army funding required to apply the NSA technology to Army Command, Control, Communications, Computers and Intelligence (C4I) 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.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) D491 Communications Security Equipment Technique:

(U) FY 1992 Accomplishments:

- (U) Continued engineering and manufacturing phase of the Automated COMSEC Management and Engineering System (ACMES) in support of Mobile Subscriber Equipment (MSE), Tri-Service Tactical Communications (TRI-TAC), Single Channel Ground and Airborne Radio (SINCGARS), and Enhanced Position Location and Reporting System (EPLRS).

- (U) Awarded task to develop the Key Management workstation, the element responsible for planning the cryptonet structures and assignments of radio frequencies and keys for network members.

- (U) Completed prototype models of Communications Security (COMSEC) in a cable for low cost solution for securing company and below radios.

- (U) Continued evaluation of non-developmental COMSEC products such as Network Encryption System and Trusted Interface Unit for use in securing local area networks, a part of the Survivable Adaptable System (SAS) Advanced Technology Transition Demonstration (ATTD).

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303140A
PE Title: Communications Security (COMSEC) Equipment **Budget Activity: #5**

- (U) Completed prototype model of secure electronic mail (E-Mail) module based upon use of TEPACHE COMSEC for use within personal computers.

(U) FY 1993 Planned Program:

- (U) Continue Engineering Development Manufacturing (EDM) of the Army Key Management System (AKMS) focusing on software development for Data Transfer Device (DTD) and network planning workstation software, incorporating battlefield electronic SOI and Electronic Countermeasures (ECCM) frequency hop sets for SINCGARS. The AKMS has the highest priority within INFOSEC due to its generic application for all encrypted communication systems. All the Services and NSA are fielding the improved, common standards based electronic key management systems which requires synchronizing the RDT&E and production phases of the program.

- (U) Award of the Strategic/Tactical End-to-End Device (STEED) prototypes, first element of the Army's Multilevel Security Initiative (ASTI), will lead to global multilevel secure seamless connectivity. ASTI will provide the capability for information of various classifications to transparently transverse through robust backbone switched radio systems providing responsive and accurate data to the tactical Commander.

- (U) Continue evaluation of INFOSEC Non-Developmental Items (NDI) such as AT&T secure video telephones, and COMSEC/TRANSEC Integrated Circuit (CTIC) module to match their use within Army systems.

- (U) Redesign STU-III conference bridge and interfaces to other types COMSEC for improved producibility to lower manufacturer cost and provide connectivity between secure radio and STU-III garrison telephone networks. Field interim designed models within CINCPAC.

(U) FY 1994 Planned Program:

- (U) Provide system engineering guidance to various PM offices and directorates on embedded COMSEC, TRANSEC, Computer Security (COMPUSEC) mechanisms, and network security plans. Also develop enhanced operational features between the data devices, stand-alone COMSEC equipment, and the radio systems.

- (U) Continue to build upon technical base of COMSEC and COMPUSEC information and applications by evaluating commercially available products under the NDI evaluations contract.

- (U) Concentrate on software development of the key management workstation to include Army's Tier 1 and CINC regional controllers. Automation of the cryptonets is needed to adjust network structure based upon changes to battlefield forces and the addition of complex secured systems such as MSE, SINCGARS and EPLRS to the networks. Proceed with system testing of the DTD containing Army user's application software with C3I systems terminals.

- (U) Continue with prototype development of the STEED for achieving multilevel security of the global communications networks. Prepare for testing of prototypes within battle labs and DoD testbeds.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303140A
PE Title: Communications Security (COMSEC) Equip..ent **Budget Activity: #5**

- (U) Prepare procurement packages for FY 95 awards of ASTI user authentication systems and trusted network base elements. Areas will include protection of switches and user workstations from software tampering, trusted information labeling, user authentication to the terminals. Network management to include key management, access controls, and audits will also be added.

- (U) Continue evaluation of INFOSEC NDI equipments such as Advanced Key Management Module (AKMM), RADIANT MERCURY trusted guard, STICKPIN COMSEC chip, and Cypress programmable module.

- (U) Initiate new version of SMART cable containing a narrowband voice only encryption for lower echelon combat net radios. This will provide a less costly COMSEC solution to secure single channel combat radios from signal interception.

(U) **Work Performed By:** The primary contractors perf ıing work in this program are: Group Technology Corp., Tampa, FL; Motorola, Scottsdale, AZ, ɔeneral Electric, Camden, NJ; Engineering Professional Services, Tinton Falls, NJ; Booz, Allen, and Hamilton, Bethesda, MD; 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 Multi Service Communications Systems (MSCS), Fort Monmouth, NJ; US Army Test and Evaluation Command (TECOM), Aberdeen Proving Ground, MD; US Army Signal Center, Fort Gordon, GA; and the National Security Agency (NSA), Fort Meade, MD.

(U) **Related Activities:**

PE #0203726A	Advanced Field Artillery Tactical Data System
PE #0604805A	Command, Control, Communications Systems - Engineering Development
PE #0603713A	Army Data Distribution System (ADDS)
PE #0604741A	Air Defense Command, Control, and Intelligence - Engineering Development
PE #0604818A	Army Tactical Command & Control Hardware and Software
PE #0603746A	Single Channel Ground & Airborne Radio System - Adv Dev
PE #0208010A	Joint Tactical Communications Program (TRI-TAC)

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/NS ' working groups exist to avoid duplication and to assure interoperability between all services' system include standards and testing. For the emerging multi-level network security area, the Defense Information Systems Agency (DISA) Multi-level Security (MLS) working group coordinates the services' different technology efforts. The NSA reviews each service's RDT&E programs to avoid duplication between the services' programs 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.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303140A
PE Title: Communications Security (COMSEC) Equipment **Budget Activity: #5**

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

Appropriation	FY 1992	FY 1993	FY 1994
Other Procurement Army	Actual	Estimate	Estimate
TA0500	12918	6637	0
T90600	7082	6723	0
BZ8950	4439	1813	0
T54000	1290	8280	0
BL5264	4924	5889	0
BQ0200	1000	959	0
BA1201	7187	7175	0
TA0600	0	0	57108

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303142A
PE Title: **Satellite Communications Ground Environment** Budget Activity:#5

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D253 Defense Satellite Communications System-Defense Communications System (DSCS-DCS)(PHASE III)	24832	31906	49172
D383 Ground Command Post (Part of D455 thru FY93)	0	0	732
D384 SMART-T (Part of D455 thru FY93)	0	0	56075
D386 SCAMP (Part of D455 thru FY93)	0	0	35225
D455 Tactical Satellite Objective Terminal (Includes all four Army MILSTAR Terminal Programs thru FY93)	64260	71421	4784
D456 Tactical Satellite Communications (TACSATCOM) System	13056	9002	7943
PE TOTAL	102148	*112329	153931

*The funding value stated here is accurate. It is inconsistent with the value reflected in the R-1 due to administrative error.

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 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 extremely high frequency (EHF) Military Strategic/Tactical Relay (MILSTAR) 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 Deputies (MILDEPS); Department of State; and other Departments and Agencies of the government.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994 :

(U) Project Number and Title: 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 fourth quarter, FY93. 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 seven terminals into the Army Force Structure. Program was restructured from Project 455.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303142A
PE Title: **Satellite Communications Ground Environment** Budget Activity:#5

(U) FY 1992 Accomplishments:
See Project D455

(U) FY 1993 Planned Program:
See Project D455

(U) FY 1994 Planned Program:
- (U) Procure initial EHF and UHF spares
- (U) First Army Transportable Terminal Delivered
- (U) Army Field 2 terminals
- (U) Army accepts 1 Fixed and 1 Transportable Terminal from Air Force

(U) Project Number and Title: 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 truck towing a trailer with generator. The terminals are available because a recent reduction in the Non-Strategic Nuclear Forces (NSNF) and Army downsizing led to canceling the tactical satellite objective terminal production phase. Consequently, the development effort associated with 15 Full Scale Engineering Development (FSED) terminals has been reevaluated and redefined to capitalize on the opportunity to exploit these valuable assets.

(U) FY 1992 Accomplishments:
- (U) Accepted delivery of 13 FSED terminals
- (U) Completed Technical Test
- (U) Completed fourth successful Joint Service Interoperability Demonstration
- (U) Participated in USAF Provisioning Conferences concerning GNDCP
- (U) Procured initial EHF spares for GNDCP
- (U) Designed transportable configuration - supported Air Force in site design reviews for GNDCP
- (U) Request for Proposals (RFP) released on Electronic Bulletin Board (EBB) for SMART-T and SCAMP
- (U) Army Selected Acquisition Review Committee (ASARC) MS II Approval for SMART-T and SCAMP - 18 May 92
- (U) Source Selection Evaluation Board proposal review conducted for SMART-T and SCAMP
- (U) Award Engineering and Manufacturing Development (EMD) for Block I SCAMP - Sep 92

(U) FY 1993 Planned Program:
- (U) Completed successful MILSTAR Information Defense Acquisition Board (DAB) review - Oct 92
- (U) Establish memorandum of understanding (MOU) with Air Force for Transition of GNDCP Terminals to other services
- (U) Acquire government furnished equipment for GNDCP
- (U) Establish Memo of Agreement with United States Army Informations Systems Command (USAISC) who will operate and maintain Army GNDCP sites

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303142A
PE Title: Satellite Communications Gr: :nd Environment Budget Activity:#5

- (U) Procure initial EHF and UHF Spares for GNDCP
- (U) First Army fixed GNDCP Terminal delivered
- (U) Complete Site Preparation for Fort McPherson GNDCP Terminal
- (U) Continue feasibility efforts for SCAMP Block II terminal
- (U) Conduct limited First Article Test (FAT) on MET
- (U) Completed MST-6000 test (Joint Service Satellite Payload Test before launch)
- (U) Conduct MILSTAR IV Test (software compatibility with MILSTAR satellite)
- (U) Receive contract depot support of the FSED MET terminals
- (U) Continue development of the Medium Power Transmitter, critical to the SMART-T program
- (U) Participate in Milstar Joint Interoperability Testing
- (U) Awarded SMART-T development contracts - Nov 92
- (U) Conduct SMART-T and SCAMP Preliminary Design Reviews
- (U) MET Participate in MST-8000 test (Joint Service Test of Launched Satellite)

(U) FY 1994 Planned Program:
- (U) Complete MST-8000 test (Joint Service Test of Launched Satellite)

(U) Project Number and Title: 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, comr :ications and intelligence (C3I) requirements for tactical commanders and Commanders-in-Chief (CINC).

(U) FY 1992 Accomplishments:
- (U) Completed technical specifications for Enhanced Manpack UHF Terminals (EMUT) PSC-3 and PSC-3/VSC-7
- (U) Completed Phase III TSC-173 functional/operational tests
- (U) Delivered 2 each Phase III TSQ-173 prototypes
- (U) Delivered 1 each stand alone TSQ-173
- (U) Commenced TSQ-173 conceptual testing at Ft. Detrick

(U) FY 1993 Planned Program:
- (U) UHF Control Bid Sample Test Evaluator for sample hardware completed
- (U) Evaluate bid samples for Non-Developmental Item (NDI) PSC-5 EMUT
- (U) Start Anti-Jam Control Modem (AJCM) T1 prototypes

(U) FY 1994 Planned Program:
- (U) Start First Article Test Evaluator for UHF program
- (U) Investigate EMUT paging requirements
- (U) Continue AJCM T1 prototypes development

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303142A
PE Title: **Satellite Communications Ground Environment** Budget Activity:#5

(U) Work Performed By:

(GNDCP) - Terminals developed and provided by USAF utilizing two (2) contractors, Raytheon Company, Massachusetts and Rockwell International, Texas. PM MILSTAR (Army) is integrating these terminals into the Army Force Structure.

(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 and Rockwell, Tx; Raytheon Corp., Marlborough, MA; Lincoln Laboratories, Bedford, MA.

(TACSATCOM) - In house efforts will be accomplished by the PM Satellite communications and US Army Communications Electronics Command (CECOM) Center for Space Systems, Ft. Monmouth, NJ. Major contractors are Harris Corp., Melborne, FL; Martin Marietta Corp., Orlando, FL; GE Corp., Camden, NJ; Applied Physics Laboratory, Laurel, MD; Tobyhanna Army Depot, Tobyhanna, PA; MITRE, Boston, MA.

(U) Related Activities:

(GNDCP) - Joint MILSTAR Program. Tri-Service effort.

(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) Other Appropriation Funds:

	($ in Thousands)		
Appropriation	**FY 1992 Actual**	**FY 1993 Estimate**	**FY 1994 Estimate**
OPA 2			
BB8417 (TACSAT)	10686	9110	9873
K49500 (TACSAT)	1100	1138	0
K77200 (TACSAT)	0	10699	7940
K23700	13389	13696	0
BC4001	0	0	12158

(U) International Cooperative Agreements: None

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0303142A** Project Number: **D253**
PE Title: **Satellite Communications Ground Environment** Budget Activity: ***#5***

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

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
DSCS/DCS	24832	31906	49172

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This program element provides funds required to develop strategic and tactical Ground Subsystem equipment to support JCS validated unique and vital 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 1992 Accomplishments:
- (U) Continued Engineering and Manufacturing Development (EMD) on the Universal Modem (UM)
- (U) Competitive solicitation on EMD for DSCS Training Devices restructured program
- (U) Continued support and upgrades of the Integrated Research Facility (IRF) and System Engineering Technical Assistance (SETA) efforts.

(U) FY 1993 Planned Program:
- (U) Continue EMD on the Universal Modem
- (U) Contract award on EMD for DSCS Training Devices
- (U) Award AN/USC-28 Conferencing Modification
- (U) Continue support and upgrade of the IRF and SETA efforts

(U) FY 1994 Planned Program:
- (U) Continue development, design review and testing for DSCS Training Devices
- (U) Continue EMD and conduct Technical Test for the UM
- (U) Award contract for modifications of AN/USC-28 Power Supply
- (U) Solicitation for the Replacement Satellite Configuration Control Element (RSCCE)
- (U) Develop Testbed for RSCCE
- (U) Continue support and upgrades of the IRF and SETA efforts

D. (U) WORK PERFORMED BY: In-house efforts will be accomplished by the PM Satellite Communications under the management of Program Executive Office (PEO) Communications Systems, Fort Monmouth, NJ. Major contractors are Magnavox, Torrance, CA; Loral Corp, Colorado Springs, CO; Stanford Telecommunications, Inc., Santa Clara, CA and Colorado Springs, CO; Harris Corporation, Melbourne, FL; Johns Hopkins University/Applied Physics Laboratory, Laurel, MD; and PM Training Devices, Orlando, FL.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303142A
PE Title: Satellite Communications Ground Environment
Project Number: D253
Budget Activity: #5

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY: NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** Termination of UM program in FY94
2. **SCHEDULE CHANGES:** Termination of UM program in FY94
3. **COST CHANGES:** None

F. (U) PROGRAM DOCUMENTATION: Defense Information Systems Agency (DISA) DSCS Program Plan approved annually by the Military Departments, validated by JCS and concurred in 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 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Other Procurement, Army			
BA9728	0	15801	19670
BA8300	5098	5893	4352
BB8416	24186	49969	29371
BB8501	7422	19986	28261
BB8504	141	2052	4349
BB8509	10258	16823	18755

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.

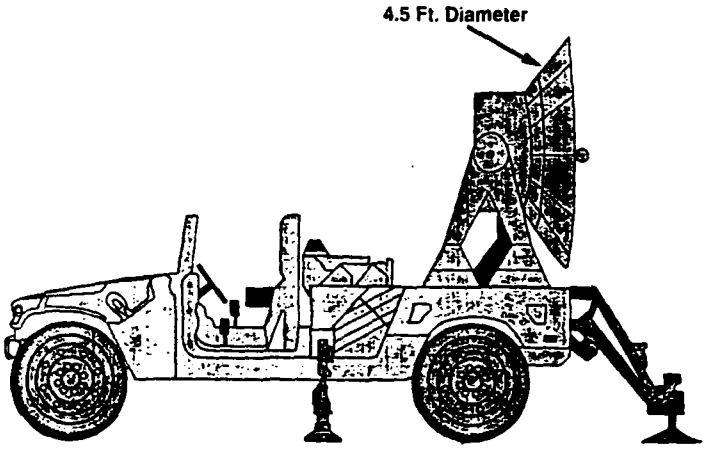
J. (U) MILESTONE SCHEDULE:

Milestones	Dates
DSCS TRAINING DEVICES	
Competitive Solicitation	FY92
Contract Award and Implementation in EMD	FY93
Development/Design Review and Testing	FY94
UNIVERSAL MODEM	
EMD Phase	FY91/94
Technical Test	FY94
REPLACEMENT SATELLITE CONFIGURATION CONTROL ELEMENT (RSCCE)	
Develop Testbed	FY94
Solicitation and Evaluation	FY94
AN/USC-28	
Award Conferencing Modification	FY93
Award Power Supply Modification	FY94

FY 1994 RDT&E DESCRIPTIVE SUMMARY

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

Project Number: **D384**
Budget Activity: **#5**



POPULAR NAME: SMART-T

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

SCHEDULE	FY 1992	FY 1993	FY 1994		
Program Milestones	Obtained ASARC MSD II	Conducted Successful Milstar Info DAB Review			
Engineering Milestones		Conduct PDR Conduct DAMA Study	Conduct CDR Continue DAMA Study		
T&E Milestones			Begin Technical Test		
Contract Milestones	Released Dev RFP	Awd Dev Contract			
BUDGET ($000)	FY 1992	FY 1993	FY 1994		
Major Contract			40377		
Support Contract			7778		
In-House Support			1286		
T&E/ Other			6634		
Total	•	•	56075		

• FY 92/93 funding is in PE0303142, PROJECT D455, MILSTAR (broken out into separate projects in FY94 (D383,D384,D386 and D455))

FY 1994 RDT&E DESCRIPTIVE SUMMARY

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

Project Number: D384
Budget Activity: #5

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This is not a 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. Project Number D384 for the Secure Mobile Anti-jam Reliable Tactical Terminal (SMART-T) is briefly described below:

The SMART-T will provide a range extension capability for the Army's Mobile Subscriber Equipment (MSE) to support the Airland Operations Concept. 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 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. The service requirements as reflected in the approved Joint Operational Requirements document (4 Sep 92) include: 208 Army, 97 Air Force, 42 Marine Corps, 20 Joint Communications Support Element, 4 Navy, and 5 to other DoD Special Users.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Planned Program: (See Project D455)

(U) FY 1993 Planned Program: (See Project D455)

(U) FY 1994 Planned Program:

- (U) Continue development
- (U) Continue DAMA Study
- (U) Conduct Critical Design Review
- (U) Begin Technical Testing on Engineering Development Model (EDM) terminals
- (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

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0303142A** Project Number: **D384**
PE Title: **Satellite Communications Ground Environment** Budget Activity: **#5**
Project Title: **SMART-T**

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 1993 AMENDED DESCRIPTIVE SUMMARY:
NARRATIVE DESCRIPTION OF CHANGES

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: Technical Testing will begin earlier (FY94) based upon contractor development
schedules.
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 05/92
- Acquisition Decision Memorandum (ADM) 05/92
- Joint Operational Requirements Document (JORD) 09/92

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: None

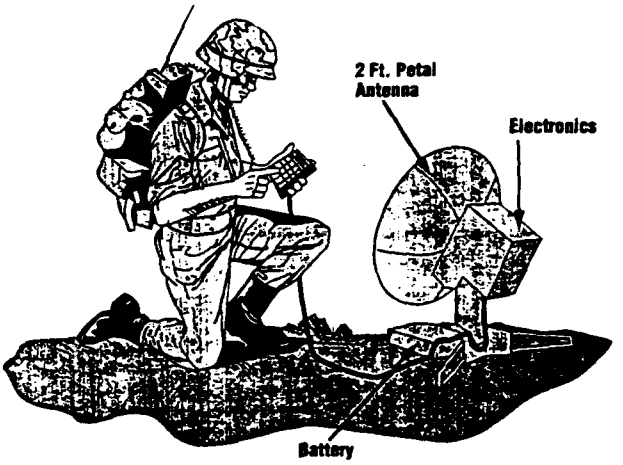
I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable

J. (U) TEST AND EVALUATION DATA:

	Dates
Technical Testing	FY94/5

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303142A **Project Number: D386**
PE Title: Satellite Communications Ground Environment **Budget Activity: #5**
Project Title: SCAMP



POPULAR NAME: SCAMP

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

SCHEDULE	FY 1992	FY 1993	FY 1994		
Program Milestones	Obtain ASARC MSD II	MILSTAR Info DAB Review			
Engineering Milestones	Initiated Block II Feasibility Engr Efforts	Begin Blk I Dev Continue Feasibility Efforts for Blk I	Continue Block I Dev Continue Block II Feas Efforts		
T&E Milestones			Begin Blk I Tech Testing		
Contract Milestones	Release Dev RFP Awd Blk I EMD				
BUDGET ($000)	FY 1992	FY 1993	FY 1994		
Major Contract			22316		
Support Contract			7738		
In-House Support			2671		
GFE/ Other			2500		
Total	*	*	35225		

* FY92/93 funding is shown in PE0303142, PROJECT 455, MILSTAR (broken out into separate projects in FY94 (D383,D384,D386, and D455)).

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303142A **Project Number: D386**
PE Title: Satellite Communications Ground Environment **Budget Activity: #5**
Project Title: SCAMP

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This is not a 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. Project Number D386 for the Single Channel Anti-Jam Manportable (SCAMP) Terminal is briefly described below:

The 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. It will provide extended data rates from 75 2400 bits per second (bps). The SCAMP must 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 will be awarded in Sep 92 for a SCAMP Block I with a weight limitation 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. The SCAMP Block II production is planned for after the turn of the century. 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.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments: (See Project D455)

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

(U) FY 1994 Accomplishments:
- Continue development of Block I terminal
- Continue Block II feasibility engineering efforts
- Begin Contractor Technical Testing

D. (U) WORK PERFORMED BY: In-house: PM MILSTAR (Army) Program Office, 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 contractors: Lockheed Missiles & Space Company, Inc., Sunnyvale, CA and General Electric Aerospace, Camden, NJ for Competitive Development Contract.

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY:
NARRATIVE DESCRIPTION OF CHANGES

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

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0303142A **Project Number: D386**
PE Title: Satellite Communications Ground Environment **Budget Activity: #5**
Project Title: SCAMP

F. (U) PROGRAM DOCUMENTATION:

- Joint Integration Logistics Support Plan (JILSP) - Jan 92
- Operational Requirements Document (ORD) - 12 Mar 92
- Acquisition Strategy Report (ASR) - 8 Apr 92
- Test and Evaluation Master Plan (TEMP) - 17 Apr 92
- Integrated Program Summary (IPS) - 22 May 92
- Acquisition Decision Memorandum (ADM) - 26 May 92
- Joint Operational Requirements Document (JORD) - 4 Sep 92

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.

H. (U) OTHER APPROPRIATION FUNDS: None

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

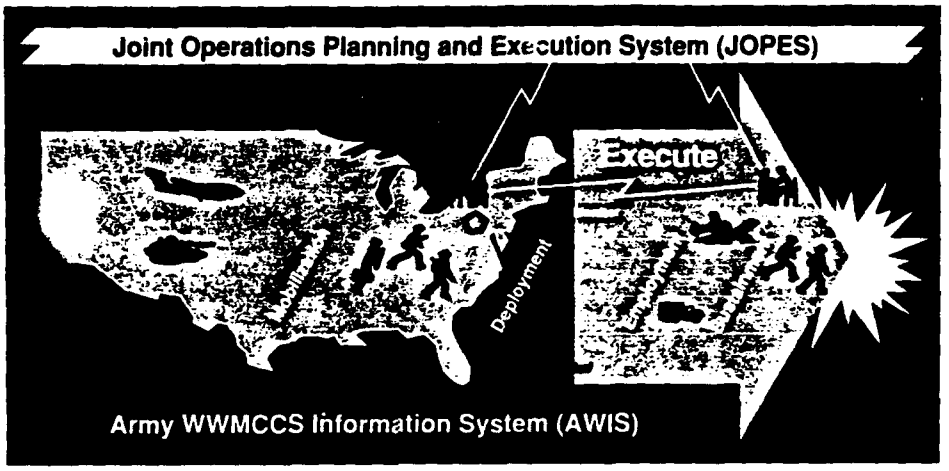
J. (U) TEST AND EVALUATION DATA:

	Date
• SCAMP-Block I Technical Test	FY94/95

FY1994 RDT&E DESCRIPTIVE SUMMARY

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

Project Number: **#DH86**
Budget Activity:**#3**



POPULAR NAME: AWIS

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

SCHEDULE	FY 1992	FY 1993	FY 1994		
Program Milestone					
Engineering Milestones					
T&E Milestones					
Contract Milestones					
BUDGET ($000)	**FY 1992**	**FY 1993**	**FY 1994**		
Major Contract					
Support Contract					
In-House Support					
GFE/ Other					
Total					

FY1994 RDT&E DESCRIPTIVE SUMMARY

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

Project Number: #DH86
Budget Activity:#3

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 implementation of the WWMCCS Automatic Data Processing (ADP) which includes supporting 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 WWMCCS system for command and control. AWIS 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 1992 Accomplishments:
- (U) Developed and fielded Core Block software (logistics, mobilization, personnel, and ASORTS {formerly Unit Status}) to the lead sites and export modules to other primary AWIS sites.
- (U) Initiated the maintenance phase of Core Block software.
- (U) Initiated detailed design for Block 1 software modules.

(U) FY 1993 Planned Program:
- (U) Complete detailed design and validate Block 1 software modules.
- (U) Field Core Block (logistics, mobilization, personnel, and ASORTS) software to secondary sites.
- (U) Complete development of Block 1 software for primary sites.
- (U) Field Block 1 software modules to primary sites.

(U) FY 1994 Planned Program:
- (U) Complete development and field Block 1 software modules to secondary sites.
- (U) Initiate Block 3 software development.
- (U) Update previous block software

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

FY1994 RDT&E DESCRIPTIVE SUMMARY

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

Project Number: #DH86
Budget Activity:#3

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY: NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None

2. (U) SCHEDULE CHANGES: The FY93 level of effort on the AWIS software development has been reduced, resulting in delayed fielding of some items and deferred development of others:

a. Logistics software replacement/upgrade for the current Logistics Network (LOGNET) system, previously scheduled for September 9[illegible] has been delayed until March 93.

b. ASORTS, previously scheduled for August 92, will be released in March 93.

c. The Logistics Munitions and End Items releases, previously scheduled for September 93, have been re-prioritized. LOG Planning is now scheduled for September 93. Personnel subsequent releases, have been delayed to beyond September 94.

3. (U) COST CHANGES: The schedule delays resulted in some cost increases because existing site-unique computer program lines of code will have to continue to be maintained and upgraded.

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 Need Statement (MNS) (Revalidation IPR)	11/92
AWIS Test & Evaluation Master Plan	03/93

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)

Appropriation	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Other Procurement, Army			
OPA2 (BE4102)	9845	6698	7501

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

FY1994 RDT&E DESCRIPTIVE SUMMARY

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

Project Number: **#DH86**
Budget Activity:**#3**

J. (U) TEST AND EVALUATION DATA:

Event	Date
MAISRC In Process Review (IPR)	2Q FY93
Block 1 Technical Testing and Site Testing	3Q FY93
AWIS Core + Block 1	4Q FY93
Major Design Review III	3Q FY94

FY 1994 RDT&E DESCRIPTIVE SUMMARY

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

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
A91A	In-House Laboratory Independent Research - Army Materiel Command		
	5379	5362	5567
A91C	In-House Laboratory Independent Research - Medical Research and Development Command		
	2506	5396	378
A91D	In-House Laboratory Independent Resea..n - Corps of Engineers		
	835	829	862
A91E	In-House Laboratory Independent Research - Army Research Institute of Behavioral and Social Sciences		
	87	142	147
PE TOTAL	8807	11729	10954

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Army ILIR program provides discretionary funds to laboratory and center Directors for supporting in-house, innovative and entrepreneurial research projects. Funds are allocated to Directors of laboratories and centers by the Office of the Assistant Secretary of the Army (Research, Development and Acquisition) and are not subject to reallocation by intervening echelons. The amount of the allocation is based on independent reviews of concluded ILIR projects undertaken by the laboratories and centers in the preceding years. Annual ILIR reviews are conducted by a committee comprised of members from (but not limited to) the Army Science Board, the National Research Council's Board on Army Science and Technology, the Army Research Office, and the Advanced Research Projects Agency. The committee's ratings determine the relative funding allocation to each participating activity. The program serves to foster creativity, strengthen scientific and engineering competence, aid in recruitment and retention of talented scientific and technical personnel, generate scientific recognition, encourage collaboration between Army laboratory and university researchers and influence the performance and cost effectiveness of Army systems. Most projects represent unique opportunities for low dollar investments with potential for high payoff. Successful projects advance into the laboratory core research and development programs. Examples of ILIR projects that resulted in developing novel technology with military applications include optics for eye protection from fielded lasers, mechanisms for remote piloting of rotorcraft, improved kinetic energy penetrators, and light weight structural materials for combat vehicles. Work in this program element is consistent with the resource constrained Army Science and Technology Master Plan (ASTMP), Science and Technology Objectives (STOs) milestones for the Army's key technologies therein, and Army modernization plans.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project A91A - In-House Laboratory Independent Research (ILIR) - Army Materiel Command: Represents the initial FY 1992 ILIR allocation for the laboratories and Research, Development and Engineering Centers in the Army Materiel Command (AMC).

FY 1994 RDT&E DESCRIPTIVE SUMMARY

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

(U) Project A91C - In-House Laboratory Independent Research (ILIR) - Medical Research and Development Command: Represents the initial FY 1992 ILIR allocation for the laboratories in the Medical Research and Development Command.

(U) Project A91D - In-House Laboratory Independent Research (ILIR) - Corps of Engineers: Represents the initial FY 1992 ILIR allocation for the laboratories in the Army Corps of Engineers.

(U) Project A91E - In-House Laboratory Independent Research (ILIR) - Army Research Institute of Behavioral and Social Sciences: Represents the initial FY 1992 ILIR allocation for the Army Research Institute for Behavioral and Social Sciences.

(U) FY 1992 Accomplishments:

- (U) Developed techniques for chronic implantation of blood flow probes in visceral organ beds for evaluation of hyperthermia
- (U) Started enzyme markers as an index of level of exposure to chemical warfare agents
- (U) Studied if anaphylactic reactions are contributors of lethality for chemical warfare nerve agents
- (U) Established experimental model to define the role of mucosal immunity for protection against ricin
- (U) Demonstrated that vasoconstrictive additives to local anesthetic reduces cardiovascular system toxicity
- (U) Demonstrated that recombinant vaccinia virus expressing Interleukin 4 can be used to modify the growth and replication of intracellular parasites *in vivo*, providing an entirely new approach to the to the site-specific delivery of anti-infective cytokines
- (U) Characterized the IpaR protein of Shigella bacteria responsible for severe diarrhea among deployed Service members, and demonstrated its role in regulation of the invasive phenotype, suggesting new methods for attenuating Shigella species for vaccine development
- (U) Demonstrated the presence of unique Interleukin-6 producing lymphocytes in the liver tissues of hepatitis A infected monkeys, suggesting a possible immune mediator of hepatitis pathogenesis toxicity
- (U) Developed bioreactor capable of aerobic microbial degradation of volatile organic compounds
- (U) The results of the research performed in FY 1991 were evaluated by the ILIR Evaluation Committee, and the ILIR allocation for FY 1993 for each laboratory was determined by the results of this evaluation. The laboratory directors will select the projects to be funded in FY 1993. This procedure is designed to reward those laboratory directors who best utilize their ILIR investment
- (U) Electric field effects on nonlinear optical polymers
- (U) Mach-scaled remote-controlled rotorcraft research vehicle
- (U) Polarization effects for vehicle visual signatures
- (U) Eye-point-of-regard: Insight for the man-machine interface
- (U) Insensitive munition solid fuel generator/oxidizer gel propulsion
- (U) Nonlinear stress and failure analysis of composite material/structures
- (U) Constitutive models for soils in the analysis of buried hardened structures
- (U) Engineered peptides for use as ligands in biosensors
- (U) Correlation length as a tool for camouflage development

FY 1994 RDT&E DESCRIPTIVE SUMMARY

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

(U) FY 1993 Planned Program:

- (U) Provide laboratory and center Directors/Commanders essential latitude to select and exploit promising and highly innovative research programs that address either novel military-relevant technologies or chronic systemic problems. Projects will be directed toward research on materiel, environmental and terrestrial research, medical and behavioral research
- (U) Facilitate recruitment and retention of highest quality scientists and engineers in the areas of medical and behavioral, materiel, environmental and terrestrial research
- (U) Focus direction of future scientific studies and support prevention of technological surprise

(U) FY 1994 Planned Program:

- (U) The results of the research performed in FY 1993 will be evaluated by the Army Science Board, and the ILIR allocation for FY 1995 for each laborator will be based on the results of the evaluation. The laboratory directors will select the projects to be funded in FY 1994. This procedure is designed to reward those laboratory directors who best utilize their ILIR investment
- (U) Facilitate recruitment and retention of highest quality scientists and engineers in the areas of medical and behavioral, materiel, environmental and terrestrial research
- (U) Focus direction of future scientific studies and support prevention of technological surprise

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

FY 1994 RDT&E DESCRIPTIVE SUMMARY

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

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
A305 Automatic Target Recognition Research	0	0	1799
A31B Night Vision and Electro-Optics Research	5135	5207	2698
B52C Mapping and Remote Sensing	2705	2728	2526
B53A Atmospheric Sciences	5311	6420	5562
A71A Research in Chemical Warfare/Biological Warfare Defense	4643	6565	4[illegible]
B74A Human Engineering	3357	2556	2647
B74F Personnel Performance and Training	3370	3549	3076
A751 Department of Defense Dependent Schools	0	18909	0
AF20 Research in Vehicle Propulsion	0	0	2482
AF22 Research in Vehicular Mobility	931	951	3137
BH27 Research in Munitions Science	2488	4145	2164
AH40 Signals Warfare Laboratory	847	865	708
DH41 Neuroscience Center	9875	0	0
AH42 Materials and Mechanics	2941	2871	5781
AH43 Research in Ballistics	5238	6752	5435
AH44 Sensor Systems Research	2475	2710	2771
AH45 Air Mobility	7078	7232	2934
AH47 Electronic Device Research	4349	4680	8559
AH48 Communications Research	2188	2235	1907

FY 1994 RDT&E DESCRIPTIVE SUMMARY

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
AH49	Research in Missiles and High-Energy Lasers		
	4721	5334	4574
AH51	Combat Support		
	1113	1136	984
AH52	Equipment for the Soldier		
	2996	4641	2586
BH57	Scientific Problems with Military Applications		
	58742	57063	64821
AH60	Research in Armaments		
	2132	2181	1855
AH61	Research in Close Combat Weaponry		
	1578	1614	1374
AH66	Air Mobility		
	0	0	1456
BH67	Environmental Research - Army Materiel Command		
	0	0	7548
AH68	Processes in Pollution Abatement Technology		
	508	1225	463
BS04	Military Pollutants and Health Hazards		
	829	863	788
BS11	Science Base/Medical Chemical Defense		
	7431	7317	8106
BS12	Science Base/Medical Biological Defense		
	16121	15685	17334
BS13	Science Base/Medical Research Infectious Disease		
	9204	8201	9490
BS14	Science Base/Combat Casualty Care Research		
	3395	2969	3335
BS15	Science Base/System Health Hazards Research		
	8485	8080	8483
BS16	Science Base/Combat Dentistry Research		
	1103	1087	1199
BS17	Molecular Biology/Military HIV Research		
	987	945	1042
AT22	Soil and Rock Mechanics		
	2062	2131	1990
AT23	Basic Research/Military Construction		
	922	965	1853
AT24	Snow, Ice and Frozen Soil		
	1305	2161	1260

FY 1994 RDT&E DESCRIPTIVE SUMMARY

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
BT25	Environmental Research - Corps of Engineers		
	0	0	4807
PE TOTAL	186565	201973	203695

B. (U) BRIEF DESCRIPTION OF ELEMENT: This is the US Army core research program to sustain the science and engineering base required to exploit new opportunities in rapidly advancing technological fields. The program supports theoretical and experimental research in the physical, mathematical, biological, environmental, terrestrial and behavioral sciences. This research is focused on the Army's key goals for effectiveness in the Airland Battle environment and the Army 21 concept to provide a lethal, integrated, supportable, highly mobile force with enhanced soldier effectiveness. Research areas are determined and prioritized in order to meet Army needs as stated in mission area analyses and in Army 21, and to exploit scientific opportunities. This core research program is complemented by the inter-disciplinary research performed under the University Research Initiative (URI) program. The work in this program element is consistent with the resource constrained Army Science and Technology Master Plan (ASTMP), Science and Technology Objectives (STOs) milestones for the Army's key emerging technologies, and Army force modernization plans.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project A305 - Automatic Target Recognition (ATR) Research: This project supports research in ATR algorithms. Current thrusts include developing a Multi-Spectral Scene Generation Program for producing realistic synthetic scenes for use in testing and evaluating weapon systems, new sensors, and ATR designs. Other thrusts are relational template matching for laser radar ATR algorithms and algorithms to enable smart focal planes for ATR.

(U) FY 1992 Accomplishments:
- (U) New in FY 1994. Elements of this project were previously under Poject A31B.

(U) FY 1993 Planned Program:
- (U) New in FY 1994. Elements of this project were previously under Project A31B.

(U) FY 1994 Planned Program:
- (U) Validate Multi-Spectral Scene Generation Model with Field data
- (U) Develop Multi-Sensor algorithms (8 target class) for FLIR/Laser Radar
- (U) Develop foveal system simulator

(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. The research is focused upon new dual-use materials/techniques relative to infrared focal plane array lasers, advanced algorithms, advanced optics and tunable filters/power limiters. Emphasis is placed on research in Mercury Cadmium Telluride for high performance, high yield focal plane array (FPAs) supporting next generation thermal imaging systems.

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

Other critical elements include new tunable laser materials for Army countermeasure applications and civilian uses such as improved night driving/flying/sailing capability; improved "thermal leak detection" for surveying energy efficient structures and for police surveillance; investigation of novel algorithms for single and multi-sensor target acquisition; and research of materials suitable for filters and broad band limiters for Army countermeasure applications.

(U) FY 1992 Accomplishments:
- (U) Expanded the operational envelope of the most promising model based on neural net algorithms
- (U) Fabricated brassboard sacrificial mirror for laser eye protection in direct view optics
- (U) Demonstrated 2X improvement in efficiency of ytterbium-doped materials over neodymium: yttrium aluminum garnet (ND:YAG)

(U) FY 1993 Planned Program:
- (U) Transition model based and neural net algorithms to advanced processor developments
- (U) Demonstrate image processing function in silicon readout integrated circuits
- (U) Demonstrate quantum well laser diodes for efficient high power 1.5 micron source

(U) FY 1994 Planned Program:
- (U) Prototype multi-sensor algorithm (8-class) for Forward Looking Infrared (FLIR)/laser radar
- (U) Identify algorithms to investigate
- (U) List foveal formats to investigate

(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 1992 Accomplishments:
- (U) Implemented rigorous geodetic frame-of-reference to register terrain data deriv:)m diverse sensors and sources
- (U) Demonstrated limited cases of dynamic terrain model within a distributed heterogeneous system
- (U) Demonstrated application of artificial intelligence and other processing techniques to identify terrain features from digital elevation data and imagery

(U) FY 1993 Planned Program:
- (U) Develop fundamental issues in terrain knowledge representation and scene generation to support real-time vision modules
- (U) D)nstrate the integrati n of feature extraction from di l data with hyperspectral imagery to enhanc. .rrain reasoning and analysis employing neural netw s
- (U) Investigate/assess implications of high-resolution terrain data on military applications using interferometric synthetic aperture radar

FY 1994 RDT&E DESCRIPTIVE SUMMARY

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

(U) **FY 1994 Planned Program:**
- (U) Develop high quality database of arid area patterns for military terrain utilization
- (U) Investigate generation and exploitation of high-resolution digital elevation data to support small-unit simulation and modeling
- (U) Demonstrate classification of synthetic aperture radar and hyperspectral imagery data using neural networks

(U) **Project B53A - Atmospheric Sciences:** Provide 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, acoustics, smoke deployment, and target designators. This project will support Project BH67 during FY 1993.

(U) **FY 1992 Accomplishments:**
- (U) Developed scene visualization algorithms for haze
- (U) Completed Wind In Non-uniform Domain (WIND) Project and reviewed micrometeorology (MICROMET) model
- (U) Performed field evaluation of laser/millimeter wave obscurant propagation effects for optimized millimeter wave screener
- (U) Developed microphysics model for fog

(U) **FY 1993 Planned Program:**
- (U) Complete field evaluation of techniques for mitigation of optical turbulence effects
- (U) Develop interim MICROMET model with variable land use
- (U) Develop variable-scale transport and diffusion methods applicable to pollution control (e.g., for Halon alternatives) as well as battlefield aerosols and obscurants (support from Project BH67)
- (U) Develop new generalized atmospheric models and tools based upon first principle physics to replace current scenario specific models. These new models will provide realistic simulation/visualization of battlefield atmospheric processes applicable to any given battlefield scenario
- (U) Develop neural network algorithm for calculating radiometric temperature inversion algorithms

(U) **FY 1994 Planned Program:**
- (U) Develop spectral models for propagation changes and realistic computer simulation of the atmosphere, and compare model output with ground truth data
- (U) Determine effects of optical turbulence-induced "shimmer" on imaging performance and compare theoretical results with artificial turbulence created using optical techniques
- (U) Develop methods to determine the internal structure of layered and inhomogeneous particles for bio-chemical agent applications
- (U) Design and train neural network for retrieval of vertical profiles of atmospheric temperature from combined satellite-derived and ground-based sensor temperature data
- (U) Develop acoustic propagation model including anisotropic turbulence scattering

(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

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

defensive systems for chemical threat agents; an innovative basic research program in aerosol and obscuration sciences to support the Army smoke program; new concepts in decontamination methods; and innovative basic research on environ-mental fate and impact of militarily unique processes. This project will support Project BH67 during FY 1993.

(U) **FY 1992 Accomplishments:**

- (U) Identified and purified a new bacterial enzyme with the highest catalytic activity against all known G-type agents
- (U) Established very high resolution, mass spectrometer based research facility for conducting research on biopolymers. Demonstrated methods for characterization and detection of large molecular weight proteinaceous toxins
- (U) Developed and demonstrated capability to trap bacterial cells at high vacuum in an ion trap-type structure marking a critical success in the development of methodology to analyze and identify bacterial particles using mass spectrometry
- (U) Identified and synthesized a new series of very short acting fentanyls with improved safety margins which are of interest as potential new threat agents and less-than-lethal applications
- (U) Obtained preliminary results, through microbial enrichment studies, potential for application of biodegradation for the disposal of DS2

(U) **FY 1993 Planned Program:**

- (U) Provide the microorganisms and/or naturally produced surfactants to conduct demonstration bioremediation project for the cleanup of soil at the Stratford Army Engine Plant (support from Project BH67)
- (U) Demonstrate long-term stability of microbial enzymes to be used in nerve agent decontamination
- (U) Demonstrate capability to vaporize and analyze single bacterial particles using laser vaporization in particle trap mass spectrometer as part of an effort to identify advanced biodetection concepts
- (U) Calculate the ground and excited state geometries of dipicolinic acid and clarify the role of dipicolinic acid in the resistance of bacterial spores to heat and ultraviolet light. Information is pivotal to understanding the decomposition of bacterial spores in mass spectral based detection systems
- (U) Initiate study of the chemistry and toxicology of epibatidine, a newly discovered, potent analgesic for less-than lethal applications

(U) **FY 1994 Planned Program:**

- (U) Utilize genetically engineered enzymes to demonstrate efficient and catalytic decontamination of VX and related nerve agents
- (U) Conduct laboratory scale-up studies to determine feasibility of DS2 disposal through microbial biodegradation
- (U) Apply techniques developed in house for the simultaneous desorption and detection of microencapsulated toxins and agents of biological origin, higher molecular weight molecules and bioengineered polymers
- (U) Complete study of particle trap mass spectrometer concept and provide evaluation of its potential for augmentation or replacement of established point biodetection methodologies
- (U) Demonstrate at least one rapid optical method for detecting microencapsulated aerosol particles (biologicals or protected chemicals)

FY 1994 RDT&E DESCRIPTIVE SUMMARY

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

(U) **Project B74A - Human Engineering:** This project supports research in soldier performance, sensor/information processing and other elements of soldier-machine interface critical to design of Army weapons systems.

(U) **FY 1992 Accomplishments:**
- (U) Conducted several human factors experiments providing information on the effects of clutter and target resolution on search and target acquisition
- (U) Conducted several experiments on noise localization/identification in time varying backgrounds for the development of a detection model
- (U) Completed development of a metric to assess acute combat-like stress in a variety of military operations and settings

(U) **FY 1993 Planned Program:**
- (U) Extend previous research on allocation of visual attention in displayed scenes and develop a model of visual search and target acquisition performance in static scenes
- (U) Continue to evaluate acoustic factors that affect the character of sound at the sensors location given various backgrounds, atmospheric conditions and ground surfaces
- (U) Develop visual, auditory and tracking subsystems for a high fidelity simulation which will recreate the battlefield environment by presenting various signature scenarios to soldiers like those experienced in the vicinity of impacting munitions

(U) **FY 1994 Planned Program:**
- (U) Determine the effects of hemispheric processing of spatial frequencies on soldiers performance of target detection and identification tasks
- (U) Validate the detection model with greater distances and diverse weather and environmental conditions
- (U) Integrate and synchronize all elements (visual, auditory and tracking subsystems and platform) of the battlefield environment simulation

(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; (2) factors that determine effective, low error human performance in decision making and complex equipment operation in stressful military environments; and (3) principles for technology-based instructional methods that promote the learning of cognitive, perceptual-motor, and unit-performance tasks by individuals and groups.

(U) **FY 1992 Accomplishments:**
- (U) Research on the consequences of downsizing and varied types of organizational design was documented in "Organizational Change"
- (U) A critical evaluation of techniques for the enhancement of human performance was documented in "In the Mind's Eye"
- (U) Completed a theoretical and empirical analysis of differential assignment theory, which, if successful, could save the Army millions in improved soldier-job matching
- (U) Developed a computerized test for measuring sensitivity to stress and the disruptive effects of emotional stimuli on individual performance

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

- (U) Developed a model of group decision making using non-metric, multidimensional scaling techniques (facet analysis) which has been successfully used for study of serial crimes and hi-jacking

(U) **FY 1993 Planned Program:**
- (U) Conduct a behavioral and sociological analysis of peacekeeping
- (U) Empirically examine parameters of leader experience for their relative contribution to effective leadership
- (U) Conduct experimental analysis of joint influence of motivation, personality, and effort on cognitive performance
- Examin tors determining effectiveness of groups in formulating strategies to achieve goals
- Continu pirical analysis of human communicative behavior in Army-relevant environments
-) Analyze contribution of linguistic, sociocultural and behavioral variables to effective foreign language learning

(U) **FY 1994 Planned Program:**
- (U) Conduct research on the acquisition and maintenance of collective skills
- (U) Determine how patterns of commitment develop and affect performance
- (U) Continue research in peacekeeping, leadership, motivation, group performance, and language acquisition
- (U) Develop and test new "informational" theory of skill transfer

(U) **Project A751 - Department of Defense Dependent Schools (DoDDS):** Per Congressional action, the Army has provided $18.909M of funds for this program in FY 1993. The funding will support the DoDDS Director's Fund for Excellence (DFE). The DFE is to enable students to gain skills and interest which will encourage them to initiate careers in science, math, and engineering. State-of-the-art technology and telecommunication systems will be utilized to create "super data highways" for inter-regional communication and CONUS-Overseas communication.

(U) **FY 1992 Accomplishments:** Project not funded.

(U) **FY 1993 Planned Program:**
- (U) Initiate teacher workshops for implementing a hands-on, experiential science program for grades K through 9
- (U) Expand math workshops for teachers, grades K through 12, to implement innovative teaching strategies into the mathematics curriculum
- (U) Initiate programs to prepare and encourage students to enter college and pursue scientific and technical careers
- (U) Increase the number of sites for advanced placement courses via telecommunications
- (U) Increase the variety of courses to be offered through long-distance education
- (U) Initiate a Community Learning project with a telecommunication system between schools and home
- (U) Upgrade current data telecomunications infrastructure to include students and teachers
- (U) Provide capabilities for video telecommunications at selected schools
- (U) Implement computerized Instructional learning System (ILS) at five sites for students taking Algebra I

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

- (U) Initiate microcomputer-based science labs at 56 secondary schools
- (U) Increase the number of elementary and secondary students competing in national academic competitions
- (U) Expand the implementation of the National Council of Teachers in mathematics standards for students in grades K through 12

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

(U) **Project AF20 - Research in Vehicle Propulsion:** This project contains research in the following areas: tracked and wheeled vehicle systems, structures, and dynamics; control algorithms; and man-in-the-loop control issues.

(U) **FY 1992 Accomplishments:** Project not funded.

(U) **FY 1993 Planned Program:** Project not funded.

(U) **FY 1994 Planned Program:**
- (U) Continued research on symbolic and numerical methods to improve modeling and stimulation efficiency
- (U) Interface real-time soldier and man-in-the-loop vehicle dynamic models with stationary crew stations
- (U) Develop theory and procedures necessary to interface real-time vehicle dynamic models with Crew Station/Turret Motion Base Simulator (CS/TMBS) and Image Generation Systems (IGS) in passive control environment
- (U) Support University Research Initiative (automotive technologies)

(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 for design, acquisition, evaluation and improvement. 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 by $3M in FY 1994 to continue the effort to support the National Automotive Center which was started under PE #0602601A, Project AH77 in FY 1993. This increase has been specified for university research to improve the linkage between the U.S. Army Tank-Automotive Research Development and Engineering Center (TARDEC), a university recognized for excellence in critical areas of automotive research. and industry research programs.

(U) **FY 1992 Accomplishments:**
- (U) Simulated the dynamics of multiple rigid-body vehicle systems with arbitrary topological structure
- (U) Developed target acquisition criteria which utilize clutter, shape, color, and motion
- (U) Developed high resolution photoacoustic imagery of ceramic engine coatings
- (U) Completed platinum silicide focal plane array camera for short integration time thermal imaging

FY 1994 RDT&E DESCRIPTIVE SUMMARY

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

(U) FY 1993 Planned Program:
- (U) Develop high resolution real-time tracked and wheeled vehicle dynamics capability on high-end workstations
- (U) Develop the capability to implement existing gun-turret drive, platform stabilization and fire control algorithms into real-time vehicle dynamics models
- (U) Develop soldier graphical display and control interfaces with real-time vehicle and weapon systems models
- (U) Demonstrate real-time soldier-controlled tracked and wheeled vehicle dynamics on high-end workstations

(U) FY 1994 Planned Program:
- (U) Continued research on symbolic and numerical methods to improve modeling and stimulation efficiency
- (U) Interface real-time soldier and man-in-the-loop vehicle dynamic models with stationary crew stations
- (U) Develop theory and procedures necessary to interface real-time vehicle dynamic models with Crew Station/Turret Motion Base Simulator (CS/TMBS) and Image Generation Systems (IGS) in passive control environment
- (U) Support University Research Initiative (automotive technologies)

(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. A new area of emphasis in FY 1993 is dedicated to research in pollution prevention and degradation of energetic materials. This research will result in improved performance of chemical/kinetic energy warheads, bio-synthesis/biodegradation of energetics, increased manufacturing safety and improved battlefield survivability.
This project will support Project BH67 during FY 1993.

(U) FY 1992 Accomplishments:
- (U) Calculated *ab initio* force constants for trinitroazedoquanidine
- (U) Developed new parameters from molecular orbit calculations to predict sensitivity
- (U) Conducted parametric study of liquid propellant (LP) 1846 with LP Combustor
- (U) Synthesized new nitro/amino azine derivatives
- (U) Investigated controlling parameters for optimum properties in tantalum explosively formed penetrators (EFP) preforms

(U) FY 1993 Planned Program:
- (U) Continue studies to determine rate controlling chemistry in energetic materials
- (U) Design Controlled Ullage Environment (CUE) stepped chamber) LP 40mm gun fixture
- (U) Continue synthesis of polynitrocubanes with four or more nitrogroups
- (U) Characterize the collapse process in wrought and PM tantalum blanks to form the EFP
- (U) Initiate ...matic synthesis of nitramines (i.e., cyclotrimethylenetrinitramine (RDX), and cyclotetrime...enetetranitramine (HMX) for pollution prevention
- (U) Investigate methods for waste stream treatment (support from Project BH67)

FY 1994 RDT&E DESCRIPTIVE SUMMARY

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

(U) **FY 1994 Planned Program:**
- (U) Develop methods to desensitize explosives
- (U) Attempt synthesis of new super energetic heterocyclic strained ring and cage explosives
- (U) Establish optimum thermomechanical process parameters for grain size and texture control in tungsten penetrators
- (U) Investigate the use of novel concepts to concentrate heavy metals during demilitarization

(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 both sorting and fusing at the sensor itself.

(U) **FY 1992 Accomplishments:**
- (U) Developed a technique for high frequently (HF) skywave signal geolocation that does not require separate ionospheric sounding measurements but rather estimate the necessary ionospheric data along with the source location directly from source transmissions received simultaneously at multiple stations
- (U) A case study was completed on a new set of functions which transform raster-formatted spatial data into a provable robust and economical form. This new representation has provided the basis for the development of an automated, multi-agent, spatial and temporal problem solver. Initial laboratory test and evaluation of the algorithm was begun
- (U) Robust interferometry-based methods for application to channelized direction-finding in dense interference environments were developed. In this application, the frequency (Fourier) channelized outputs from multiple antenna elements are utilized to estimate the direction of arrivals of signals in designated frequency channels. Channelization is used to mitigate the effects of co-channel interference
- (U) Developed a technique for the recovery of timing information from constant-modulus signals. The necessary and sufficient conditions were determined which guarantee the existence of a signal baud timing component in the mean envelope of one-dimensional and two-dimensional bauded transmissions
- (U) Determined that by exploiting a signal's spectral correlation, the basic accuracy bound (Cramer-Rao) for jointly estimating a signal's angle of arrival and its correlation frequency can be substantially less than otherwise. This comes at the expense of significantly increased computation requirements
- (U) Determined that by exploiting waveform characteristics prior to Line of Bearing determination via super-resolution techniques, substantially better resolution performance can be obtained. This multipath mitigating copy/direction finding (DF) approach significantly outperforms other techniques

(U) **FY 1993 Planned Program:**
- (U) A technique will be investigated for performing coherent detection of wideband emitters which avoids the normal output signal to noise ration losses associated with non-coherent detectors

FY 1994 RDT&E DESCRIPTIVE SUMMARY

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

- (U) Continue development of the multi-actor, temporal problem solving algorithm. This theory provides a robust, domain independent and extensible threat recognition and assessment technique. Laboratory test and evaluation of the initial threat assessment system will be completed and results used to refine the algorithms
- (U) The hybrid database manager completed previously will undergo laboratory test and evaluation. Investigations will begin into fast spatial queries
- (U) The investigations of advanced algorithms for multi-sensor integration will continue with the addition of electronic intelligence (ELINT) reports. Laboratory evaluation of the algorithms will be conducted using artificial data
- (U) A practical design of the copy/DF technique for interference mitigation will be established and evaluated via computer simulation
- (U) Development of a decision-theoretic signal classifier based on the quasi-log likelihood ratio theory will begin. This approach is applicable to phase modulated signals and is substantially more robust than other known approaches
- (U) Begin development of the theory of applying higher-order cumulants (statistics) to signal/noise reduction, as well as time delay/phase difference computations for radio frequency/intermediate frequency (RF/IF) signals

(U) **FY 1994 Planned Program:**

- (U) The technique for performing coherent detection of wideband emitters will undergo laboratory evaluation
- (U) The multi-actor, temporal problem solving algorithm will be completed and transitioned for evaluation and extension
- (U) The hybrid database manager will be extended to include results of the laboratory tests to include incorporating fast spatial queries capabilities
- (U) A practical design of the copy/DF technique for interference mitigation will be established and evaluated via computer simulation
- (U) Development of a decision-theoretic signal classifier based on the quasi-log-likelihood ratio theory will continue. Performance evaluations and tradeoffs will be established
- (U) Continue development of the theory of higher order cumulants with development of optimal and practical algorithms. Computational requirements will be determined and theoretical as well as practical implementations will be investigated

(U) **Project DH41 - Neuroscience Center:** Funds for this project were appropriated for the Neuroscience Center of Excellence to provide DOD additional critical medical research capabilities.

(U) **FY 1992 Accomplishments:**

- (U) Solicited proposals for collaborative, multidisciplinary research in infectious disease and biological defense vaccines and drugs, vision, neurotxins, neurochemistry, molecular neurobiology, neurodegenrative diseases, and trauma and combat casualty care

(U) **FY 1993 Planned Program:** Project not funded.

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

FY 1994 RDT&E DESCRIPTIVE SUMMARY

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

(U) **Project AH42 - Materials and Mechanics:** This project provides the Army with basic scientific research in materials and mechanics related to structural materials. 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.

(U) **FY 1992 Accomplishments:**
- (U) Paper presented at "International Conference on Metallurgical Coatings"
- (U) Conducted stress corrosion tests on ion implemented steels
- (U) Test facility for measuring KIscc when an imposed fatigue cycle is completed
- (U) Oxynitride glass fiber processing improvements have increased fiber strength from 1900 Mega Pascal (MPa) to nearly 3000 Mpa
- (U) Bond durability assessment for Silicon carbide (SIC) completed

(U) **FY 1993 Planned Program:**
- (U) Optimize synthesis techniques for improved adhesives
- (U) Investigate mechanisms for galvanic action between metallic and nonmetallic materials (graphite/composites)
- (U) Optimize structural polymeric materials with inherent laser resistant properties
- (U) Continue predictive methodology for absorption/desorption of chemical agents in organic materials
- (U) Complete Round Robin decontaminant test program and final report
- (U) Publish report on reliability and weight of simple redundant structures

(U) **FY 1994 Planned Program:**
- (U) Select and optimize Rapid Solidification Process (RSP) for ballistically tolerant components
- (U) Develop algorithms to represent plasticity induced anisotropy in metals
- (U) Continue the development of dual use (Armor and low signature) ceramics
- (U) Characterize tungsten alloys, define shearband initiation orientation
- (U) Use electrochemical principles and solid state chemistry to design high strength steel with reduced hydrogen embrittlement susceptibility
- (U) Develop reliability model for damage tolerance life predictions
- (U) Develop advanced comp tational models for rubber viscoelasticity

(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, and computer networking. This project will receive support during FY 1993 from Project AH67.

(U) **FY 1992 Accomplishments:**
- (U) Used computer evaluation capabilities enhanced in FY 1992, screen energetic liquid propellant (LP), electrothermal (ET), and low vulnerability ammunition (LOVA) materials
- (U) Identified promising mechanisms for defeat of both kinetic energy (KE) and chemical energy (CE) threat to armor.
- (U) Completed 10-20 tests on oriented polycrystalline tungsten penetrators.
- (U) Identified preferred binary pair for an insensitive explosive.

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

- (U) Incorporated 3-D scientific visualization techniques into interior ballistics
- (U) Completed synthetic aperture millimeter wave (MMW) imaging software for 2D imaging of projectiles
- (U) Published new, one-step decoding algorithm for Bose-Chauduri, Hocquenghem (BCH) codes

(U) **FY 1993 Planned Program:**
- (U) Determine optimal propulsion materials for use in gun systems
- (U) Optimize extended-range wrap-around fin-stabilized artillery round using Computational Fluid Dynamics Models
- (U) Complete special materials optimization against both KE and CE
- (U) Identify promising polycrystalline tungsten penetrator candidates
- (U) Characterize decomposition/combustion products and environmental effects of halogenated hydrocarbon (HALON) alternatives (support from Project AH67)
- (U) Study solubility of energetic materials in modified supercritical fluids for future recycling techniques for pollution prevention
- (U) Eliminate environmental pollution associated with depleted uranium penetrators and armors via research on metallurgical and ballistic properties of alternative high density alloys
- (U) Initiate MMW background measurement program using synthetic aperture radar techniques
- (U) Design passive frequency scanned antenna system
- (U) Develop codes to permit a subset of simultaneous users to access collision channel without error

(U) **FY 1994 Planned Program:**
- (U) Exploit the shaped-charge jet necking phenomenon toward creation of segmented shaped-charge penetrator
- (U) Computationally simulate gun malfunctions involving grain fracture
- (U) Design HICAP folding fins and test in a computational wind tunnel using Computational Fluid Dynamics techniques on Army supercomputers
- (U) Measure and model species and temperature profiles of burner flames fueled by formaldehyde and hydrogen cyanide
- (U) Implement and test in a hydrocode a brittle/ductile damage model valid for high-pressure, small-elastic-distortion ballistic environments
- (U) Generalize and improve the speed of BCH decoder to decode non-binary codes

(U) **Project AH44 - Sensor Systems Research:** This project exploits new opportunities in the basic sciences underpinning the technological areas of signal processing radar, fuzes for smart munitions, and nuclear survivability. Research involves fundamental science and engineering principles that support survivable sensor systems for target recognition. Optoelectronic concepts for gallium arsenide-based multiple quantum well and superlattice structures are investigated for integrated sensors and processors. Hybrid optoelectronics in lithium niobate addresses novel signal and radar processing. Radiation physics theory and experiments are applied to harden microelectronic devices. Electromagnetic sensing and imaging is conducted with synthetic aperture radar (SAR), millimeter-wave inverse synthetic aperture radar, and wideband radar methods.

(U) **FY 1992 Accomplishments:**
- (U) Developed algorithms that use higher order statistics for detection and estimation on one-and two-dimensional signals

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

- (U) Implemented an acousto-optical morphological processor for pattern recognition
- (U) Developed design techniques for diffractive optical elements that include array generators and optical correlation filters for pattern recognition
- (U) Analyzed the thermal properties of diffractive lenses
- (U) Developed and tested a gallium arsenide (GaAs) optical neuron constructed using quantum well technology and Molecular Bean Epitaxy (MBE) growth techniques
- (U) Grew GaAs-type materials by molecular beam epitaxy

(U) FY 1993 Planned Program:

- (U) Investigate the applications of wavelet transforms to pattern recognition
- (U) Develop more sophisticated algorithms that use higher order statistics for signal reconstruction
- (U) Analyze system performance of an acousto-optic morphological processor and an optical shadow-casting morphological processor and implement a shadow-casting morphological processor
- (U) Investigate the application of partially coherent and incoherent optical systems to pattern recognition
- (U) Design and fabricate hybrid refractive-binary phase diffractive lenses and test their thermal and optical properties

(U) FY 1994 Planned Program:

- (U) Develop optical systems for implementing pattern recognition algorithms that use wavelet transforms and higher order statistics
- (U) Construct a compact optical morphological processor for pattern recognition that uses hybrid refractive-diffractive optical elements
- (U) Design and fabricate hybrid refractive-continuous phase diffractive lenses and test their thermal and optical properties
- (U) Integrate components such as lenses, gratings, and modulators into modules for integrated photonic systems
- (U) Develop novel methods and/or materials for growth of improved semiconductor optoelectronic devices. Investigate new physical mechanisms for modulating the optical response of thin-layered semiconductor structures
- (U) Investigate options for monolithic integration of optoelectronic devices such as lasers, modulators, switches, and detectors
- (U) Develop improved SAR automatic target recognition (ATR) algorithms in-house and initiate evaluation of impulse techniques for foliage penetration SAR

(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.

(U) FY 1992 Accomplishments:

- (U) Developed Computational Fluid Dynamics (CFD) free wake hover performance code
- (U) Completed forward-slotted airfoil designs in support of Helicopter Active Control Rotor (HACR)
- (U) Validated dynamic stall analysis and inflow predictions with unique measurements
- (U) Conducted advanced dynamic model prototype blade bench testing

FY 1994 RDT&E DESCRIPTIVE SUMMARY

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

- (U) Validated dynamic stall analysis with forward flight model data
- (U) Developed interferometry technique to support aeromechanics research
- (U) Advanced Dynamic Model (ADM) rotor rig completed
- (U) Completed 3D Laser Velocimeter (LV) system to measure rotor wake vortices in 14X22 wind tunnel
- (U) Investigated compressibility effects on dynamic stall
- (U) Developed and validated the Full Potential Rotor/Comprehensive Analysis Model for Rotor Aerodynamics-Johnson Aeronautics (FPR/CAMRAD-JA) code to predict Blade Vortex Interaction (BVI) phenomena
- (U) Completed advanced computer aided geometrical modeling techniques for automated input to electromagnetic analysis codes
- (U) Continued electromagnetic analysis of non-perfectly conducting materials for helicopters

(U) **FY 1993 Planned Program:**

- (U) Validate CFD Code rotor performance prediction methods
- (U) Fabricate high coefficient of lift slotted airfoil
- (U) Test new blade concepts for reduced detection
- (U) Develop aeroelastic stability theory and analysis techniques
- (U) Investigate application of smart materials
- (U) Develop active stall control technology
- (U) Perform in-vacuum testing of ADM blades
- (U) Develop an improved understanding of vortex loading
- (U) Develop an improved solution-adaptive unstructured grid methodology for rotor wakes
- (U) Utilize real-time interferometric technique to obtain on-line unsteady flowfield
- (U) Design and fabricate dynamic-stall free airfoils
- (U) Conduct hover performance studies of UH-60, AH-64 and RAH-66 helicopters
- (U) Develop/validate performance and acoustic codes for Higher Harmonic Control (HHC) techniques
- (U) Complete airload and acoustic data for advanced rotor tests in Deutsch Niederlandicher Windkanal (DNW) wind tunnel
- (U) Develop analysis techniques and fabricate helicopter scale models for antenna pattern
- (U) Establish feasibility of pictorial display augmentation by imaging sensor based information

(U) **FY 1994 Planned Program:**

- (U) Improve multi-element airfoils and prediction capability
- (U) Design and fabricate smart airfoil demonstrator models
- (U) Design and fabricate smart material model rotor
- (U) Design, fabricate and initiate tests of dynamic stall free airfoils
- (U) Incorporate improved turbulence models into Navier-Stokes codes
- (U) Utilize unique experiments to validate interactional aerodynamic analyses
- (U) Fabricate advanced dynamic model hub and blades
- (U) Develop composite beam element for General Rotorcraft Aeromechanics Stability Analysis Program (GRASP)
- (U) Perform the rotor test at DNW wind tunnel with HHC techniques using BO-105 rotor system
- (U) Test 2-D high-lift airfoil concepts

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

- (U) Perform forward flight performance analysis of RAH-66, UH-60, AH-64 helicopters
- (U) Perform aeroacoustic tests with advanced rotor systems in 40X80 wind tunnel
- (U) Investigate new design and blade control concepts for low noise
- (U) Investigate advanced blade concepts for BVI phenomena
- (U) Initiate development analysis techniques and fabrication of non-perfectly conducting helicopter models for antenna pattern validation
- (U) Initiate effort to develop an integrated set of design and evaluation tools for fault tolerant parallel processing architecture

(U) **Project AH47 - Electronic Device Research:** Perform research on critical dual-use electronic components and technologies vital to supporting Army requirements in 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 technology for mini-radars (motor vehicle collision warning devices); missile seekers (thermal heat leakage from homes/factories), and secure communications (business/banking file transfer); and tactical power sources for a wide variety of manportable electronic equipment (ultra long-life batteries for civilian use). Reason for growth in FY 1994 budget is to establish a university research partner for the Army Research Laboratory.

(U) **FY 1992 Accomplishments:**
- (U) Designed and fabricated 10-micron, double super-lattice IR detector
- (U) Designed and fabricated heterojunction waveguide modulator, low-threshold, high-speed quantum well lasers, and low-noise, high-sensitivity receivers with phototransistors, positive-intrinsic-negative (PIN), or avalanche photo-diode (APD) detectors
- (U) Developed and fabricated High Temperature Super Conductivity (HTSC) films for large-area integrated receiver and radar front ends and for ultrawide-band sensors and detectors for MMW and IR front-end devices
- (U) Developed high efficiency, low-mass focusing structure for UV/X-Ray space telescope
- (U) Invented new, picosecond optical characterization techniques (sweeping photoreflectance; time-resolved photoreflectance)

(U) **FY 1993 Planned Program:**
- (U) Fabricate and test devices based on indium gallium arsenide pseudomorphic heterostructures
- (U) Fabricate second-generation lateral quantum-well arrays and evaluate performance at room temperature
- (U) Investigate and design high efficiency permanent-magnet rotor for a three-phase motor and perform experimental analysis
- (U) Fabricate array of multicolor IR detectors
- (U) Fabricate and test optical switches for on-wafer testing at terahertz frequencies

(U) **FY 1994 Planned Program:**
- (U) Design, fabricate, and test 128x128 focal plane array (FPA) MMW IR detectors
- (U) Design, fabricate, and test integrated lasers, modulators and applications
- (U) Develop an annealing process for heavily carbon doped gallium arsenide/aluminum gallium arsenide (GaAs/AlGaAs) device that increases the cutoff frequency

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

- (U) Develop a complete microanalytical, electrical, and optical test procedure for characterizing thin layer device structures
- (U) Develop a single type of ohmic contacting procedure for bipolar devices

(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 perform, in cooperation with the Army Research Laboratory (ARL), the basic research necessary to meet Army needs in the development and improvement of survivable tactical C3 equipment and systems. Specifically, S&T Comm addresses research issues in the areas of network management and control, antennas and propagation, and fiber optics and photonics. C2SI conducts research in the fields of artificial intelligence and modeling of C2 systems.

(U) FY 1992 Accomplishments:
- (U) Developed numerical analysis techniques needed for accurate characterization of printed circuit antennas and arrays, including their feed systems
- (U) Continued development of interconnection models and strategies; work on formal protocol proof techniques, and on smart protocols that learn from network environment
- (U) Completed report on using fuzzy expert systems for terrain analysis
- (U) Started investigation on broadbanding techniques for high frequency/very high frequency (HF/VHF) antennas operating with spread-spectrum (frequency hopping) radios
- (U) Tested and evaluated the D-shaped optical fiber transceiver and determined performance parameters

(U) FY 1993 Planned Program:
- (U) Continue investigation of printed circuit antennas. Develop numerically-efficient synthesis procedure for planar arrays of these antennas with EM-coupled feed systems embedded in substrate
- (U) Investigate innovative broadbanding techniques for HF/VHF antennas
- (U) Continue investigation on ionospheric response to wideband HF signals
- (U) Participate in the European Communications Analysis Program (EUROCAP) program on characterization of the ionospheric HF propagation conditions over a wide geographical area
- (U) Continue participation in cooperative research (fiber optics/integrated optics) at Rutgers University and Princeton University

(U) FY 1994 Planned Program:
- (U) Continue development of printed antenna numerical analysis methods
- (U) Develop computationally-efficient synthesis procedure for planar arrays of these antennas with EM-coupled feed systems embedded in substrates
- (U) Design loosely-coupled network of processors for efficient multi-processing interactions
- (U) Fabricate and test a Fabry-Perot Laser and Semiconductor Optical Amplifier in InP
- (U) Develop formal methods of multimedia protocol composition/decomposition for network management and control
- (U) Design an integrated decision-aids demonstration program

FY 1994 RDT&E DESCRIPTIVE SUMMARY

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

(U) **Project AH49 - Research in Missiles and High-Energy Lasers:** This project provides the science base for future technology development in missiles and high energy lasers. Work is currently focused on integrated and guided-wave optics, optical pattern recognition, correlator development, theoretical quantum optics, neural networks in signal processing and analysis, and optical materials research.

(U) **FY 1992 Accomplishments:**

- (U) Completed and published a complete Maxwell-Block formulation of electromagnetic field coupling and propagation in dense media such as semiconductors and metal vapors
- (U) Devised models and developed theoretical foundations for photonic band-gap materials
- (U) Developed a new neural network algorithm with ultrafast training properties for nonlinear time series analysis
- (U) Successfully demonstrated optical correlator terminal guidance in missile field tests
- (U) Completed extensive lab tests and evaluation of all known commercially available image forming light modulators for optical correlators application
- (U) Devised several new fabrication techniques for low loss optical waveguides and transferred technology to industry

(U) **FY 1993 Planned Program:**

- (U) Continue study of novel quantum optical phenomena in solids that exhibit photonic band structure
- (U) Continue research to understand instabilities in nonlinear guided-wave structures with the goal to computationally predict new electro-optic device performance
- (U) Continue efforts to exploit neural networks in applications such as ATR, sensor data fusion, adaptive control systems, and resource allocation problems
- (U) Continue development of optical correlator technology for smart weapons applications in ATR, target cueing, and missile terminal guidance
- (U) Continue a broad effort in integrated and guided wave optics focused on developing prototype devices for signal processing, optical gyroscopes, and optical computing
- (U) Investigate laser photo-induced synthesis and purification methods of unique optical materials
- (U) Extend Faraday Rotation method of screening preprocessed detector materials to include PiSi

(U) **FY 1994 Planned Program:**

- (U) Conduct a broad based theoretical effort in quantum and nonlinear optics covering all areas pertinent to sensors and optical computing
- (U) Continue investigations of novel synthesis and quality assessment techniques for optical and electronic materials
- (U) Continue efforts to exploit neural networks in applications such as ATR, sensor data fusion, adaptive control systems, and resource allocation problems
- (U) Continue program to develop optical correlator technology for smart weapons applications in ATR, target cueing and missile terminal guidance
- (U) Continue a broad effort in integrated and guided wave optics focused on device development for signal processing, optical gyroscopes, and optical computing

(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 research in fuels and lubricants has been transferred to the Air Force 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 will be starting a program of basic research in elastomers.

(U) FY 1992 Accomplishments:

- (U) Determined the feasibility of utilizing rough RF scatter materials to provide enhanced radar attenuation coupled with a decrease in the weight and volume of the camouflage screen
- (U) Completed sensor parametric dependency quantification of electromagnetic data for separated aperture. The results will be integrated into the FY 1993 Close-In Man-Portable Mine Detector Program
- (U) Completed X-Ray Photon Backscatter research on plastic detectors
- (U) Initiated development of computer models for design of "Hairy Nets" utilizing electrically thick physically low volume materials
- (U) Completed defining mechanism of deposit formation on fuel-wetted hot surfaces involving different metallurgy, surface treatments, fuel compositions, and additive ingredients

(U) FY 1993 Planned Program:

- (U) Investigate the effect of frictional forces on abrasion measurements between an elastomer and a substrate
- (U) Develop fatigue test procedures for evaluating new joint designs and adhesives currently under development for aluminum and organic composites
- (U) Develop a database to track emerging technologies in elastomeric materials and systems
- (U) Develop materials and processing techniques for extending the service life of pads, bushings, and roadwheels for tracked vehicles
- (U) Develop a methodology for predicting shelf and service life of elastomeric urethane materials

(U) FY 1994 Planned Program:

- (U) Continue evaluation of new emerging elastomeric materials for military applications
- (U) Complete study on abrasion of elastomeric materials, to include various end items, e.g., fuel hoses and collapsible storage tanks
- (U) Continue the development and initiate field testing of optimized elastomeric components for tank track systems
- (U) Initiate program to guarantee quality control of elastomeric materials
- (U) Preliminary microwave/ultra wideband measurements from existing facility and development of plan for objective facility

(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, and 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.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

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

(U) FY 1992 Accomplishments:

- (U) Derived and investigated the solution of low-dimensional model that properly models flutter and divergence for initial opening phase of parachutes
- (U) Prepared and tested a family of metal-substituted tetrabenzporphyrins with promising non-linear optical (NLO) properties in tunable laser eye protection devices
- (U) Modelled structural protein molecules for electromagnetic responses and architecture to assist in the design of genes for bioengineered materials and coatings, for signature reduction properties, and for controlled pore size for membranes
- (U) Developed a model relating functional behavior and stability of starch or protein based food matrices to their composition and/or structure based on polymer science principles applied to food materials
- (U) Synthesized new copolymers and completed spinning trials of fibers tailored specifically for ballistic impact resistance

(U) FY 1993 Planned Program:

- (U) Develop numerical solution techniques for treatment of large deformations of the parachute membrane in the coupled aeroelastic problem
- (U) Demonstrate correlation between intrinsic chemical marker yield and microbial lethality as a means of validating food thermal processing
- (U) Optimize biodegradable polymer structures to meet storage stability and field degradation needs and to meet environmental standards for international treaties and for ground exercises
- (U) Initiate investigations into heavy metal recovery with bioengineered polymers
- (U) Initiate organic solvent based catalysis of waste streams (support from Project BH67)
- (U) Evaluate the interactions of variables affecting fluid intake
- (U) Transition enhanced prototype non-linear optical polymers (NLOP) materials to 6.2 for use in development of eye protection devices. Optimize design of goggles for incorporation of these materials into a functional device. (e.g. goggles)
- (U) Conduct laboratory and field tests to determine sensitivity of performance to backpack type and load to measure mobility of the soldier
- (U) Determine effect of moisture and natural plasticizers on texture and storage stability of carbohydrate food natures
- (U) Transfer silk gene to CRDA partner for start up

(U) FY 1994 Planned Program:

- (U) Improve the initial opening model by including the effect of parachute porosity two dimensional effects
- (U) Exploit liquid crystalline phase to spin protein fibers from silk for ballistic protection applications
- (U) Conduct field tests to determine sensitivity of soldier performance to nutrient and equipment variations
- (U) Identify a new generation of materials with improved nonlinear optical properties and synthesize a series of them for evaluation. (Still higher chi-3 values are needed to effect an optimal protective system.) Experiment with manipulation of local field effects as an adjunct to NLOP performance
- (U) Determine limit of degree of substitution to maintain biodegradability of starch based materials
- (U) Determine cellular metabolism and growth kinetics of food spoilage microorganisms as influenced by temperature and selected humectants

FY 1994 RDT&E DESCRIPTIVE SUMMARY

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

- (U) Establish an experimental and theoretical framework for the characterization of the viscoelastic behavior of the components of high performance fibrous material systems to predict and optimize their ballistic impact resistance for personnel armor

(U) **Project BH57 - Scientific Problems with Military Applications:** This project seeks to capture and exploit new scientific opportunities, primarily at universities, to improve Army operational capabilities of the future. Research efforts in such basic disciplines as mathematics and the physical, engineering and biological sciences are supported primarily at outstanding universities, historically black colleges and universities, and to a lesser extent at research institutes and industrial laboratories with the objective of providing a base for emerging and future Army technologies. Assessment of foreign capabilities is the responsibility of overseas liaison offices in Europe and the Far East.

(U) **FY 1992 Accomplishments:**
- (U) Enzymes have been genetically engineered to increase the yield, stability and broaden the range of toxic compounds that can be degraded to demilitarize chemical agents and munitions manufacture waste
- (U) A higher harmonic control system to suppress rotor blade vibrations has been tested on a bearingless smart rotor model
- (U) Metal-matrix composites have been improved by introducing macroscopic surface layers which more evenly distribute the maximum stresses thereby retarding crack initiation and corrosion
- (U) Novel variation reduction techniques have been applied to importance sampling in the simulation of rare events leading to a highly reliable and faster computer simulation methodology

(U) **FY 1993 Planned Program:**
- (U) Research in quantum heterostructures will demonstrate a three terminal quantum-well tunnel-barrier transistor which will allow control of the tunneling current
- (U) A new diagnostic technique will be demonstrated to simultaneously determine fuel and oxygen concentrations in an evaporating fuel spray
- (U) Heavy alkaline earth cations will be introduced into reactions under controlled conditions leading to interesting superconductors and other electronic materials
- (U) Quantitative profiles of temperature and species concentrations in the flame zone of a burning solid propellant will lead to benchmark measurements for future combustion models
- (U) Nanofabrication techniques fabricated the world's fastest metal-semiconductor-metal photodiodes, leading to improved phased-array radar systems
- (U) Major improvements in aluminum weldability, with potential for commercial applications, have been made by adding alloys to form new solidifying weld metal grains
- (U) Development of "3D-IMPACT" computer code has led to a model which predicts impact damage to laminated composite plates, thereby improving vehicle survivability
- (U) A patent has been awarded for a process to prepare vinyl ethers which triggers a light when encountering materials including chemical agents

(U) **FY 1994 Planned Program:**
- (U) New techniques to control the incorporation of dopants in optical glasses will improve fabrication of lasting structures for future targeting and optical communication systems

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

- (U) Results of K-nearest neighbor statistical techniques for decisions in object classification will be applied to simpler and more robust machine vision systems
- (U) The behavior of natural and Ion implanted materials under high temperature will be used as a moderate load bearing thermal actuator for smart systems
- (U) Multipath communication interference problems will be overcome thereby leading to the development of more robust mobile radio systems

(U) **Project AH60 - Research in Armaments:** This project contains research in the following areas: smart projectiles/mines, autonomous launchers, fire control, and laser protection.

(U) **FY 1992 Accomplishments:**
- (U) Investigated bacteriorhodopsin (BR) substitute chromphores for improved spectral response of laser protection devices
- (U) Determined learnirg efficiency and rapidity of new target recognition architectures
- (U) Studied effects of microstrip loss on meander-line phased array antenna
- (U) Completed real-time algorithms for terrain reasoning and route-planning for commander decision support module

(U) **FY 1993 Planned Program:**
- (U) Define waveguide outcoupling grating specifications as an input to optical processor development (ARL and FSAC)
- (U) Implement and test a prototype common module controller as standard intelligent interface between human users and Army automated systems
- (U) Investigate utility of meander-line phased array antenna for application to millimeter wave components for smart munitions
- (U) Initiate transition of Project AH60 responsibility to ARL

(U) **FY 1994 Planned Program:**
- (U) Explore alternate, high-speed waveguide signal processing architectures
- (U) Explore waveguide photodetectors for the Ultra-High-Speed/Integrated Optical Processors
- (U) Initiate design of shape-growing algorithms to increase recognition confidence for Intelligent Gunner/Tracker
- (U) Complete development of language primitives for multisensory oricessing for the Common Module Robotic Controller

(U) **Project AH61 - Research in Close Combat Weaponry:** This effort addresses the physical phenomena associated with weapon 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 of high strength refractory metals and alloys and characterization of weapon system failure mechanics. This project supports Science & Technology Thrusts for Advanced Land Combat.

(U) **FY 1992 Accomplishments:**
- (U) Investigated the viability of mechanical alloying process for armament materials
- (U) Performed experimental tests for martensite and bainite transformation theories

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

- (U) Developed methodology for measuring muzzle brake forces with strain gages and accelerometers
- (U) Optimized processes for plating tantalum and tantalum alloys inside cylinders from a molten salt bath
- (U) Conducted theoretical studies on failure mechanisms of composite gun structure

(U) **FY 1993 Planned Program:**
- (U) Investigate implications of non-linearities in models of martensite transformations
- (U) Investigate the resistance of refractory and ceramic coatings to plasma erosion
- (U) Apply multifractal analysis advances to fracture and microstructural morphology problems
- (U) Establish procedure to test molten salt isothermal bainite process to simulated gun bore structur
- (U) Develop measurement procedur s to monitor strain in smart materials

(U) **FY 1994 Planned Program:**
- (U) Clar[illegible] role of c[illegible]rge density waves in the martensitic transformation of thermoplastic martensite
- (U) Dev[illegible]p neural network architecture for image analysis using multifractal analysis
- (U) Optimize process for co-deposition of carbide-reinforced refractory metal alloys from molten salt electrolytes
- (U) Develop predictive models of mechanical failure of armament steels
- (U) Evaluate dynamic strains in hypervelocity gun tubes from projectiles approaching the speed of dilational waves in steel

(U) **Project AH66 - Air Mobility:** This project is a realignment of a portion of the structures work previously performed under Project AH45. The purpose of this project is to perform basic and applied research in structures, as applied to rotorcraft and ground vehicles. Particular emphasis is placed on integrated structural integrity for composite materials in these vehicles.

(U) **FY 1992 Accomplishments:** Not applicable.

(U) **FY 1993 Planned Program:** Not applicable.

(U) **FY 1994 Planned Program:**
- (U) Develop 3D Finite Element Analysis to predict onset of delamination in tapered laminates under combined loadings
- (U) Incorporate reliability analysis into fracture mechanics total life predictive methodology
- (U) Apply neural network approaches to refine thermal image processing science
- (U) Install and evaluate/validate new comprehensive methods in rotor aeroelasticity and loads analysis
- (U) Continue collaborative work in composite structures crashworthiness analyses under an MOU with Germany
- (U) Complete design of high speed advanced rotor model for the Transonic Dynamics Tunnel (NASA cooperative research)

FY 1994 RDT&E DESCRIPTIVE SUMMARY

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

(U) **Project BH67 - Environmental Research - Army Materiel Command:** This project focuses on basic research on technologies for pollution abatement and reduction of pollution threats related to AMC weapon systems efforts. Emphasis is placed on prevention measures to reduce manufactured or generated pollutants. Approaches include the degradation of energetic materials and chemical/biological warfare agents, using biodegrading microorganisms and enzymes. Other projects include thermal, supercritical, and biocatalytic approaches to degrade persistent toxic substances. Further, sensor development for environmental monitoring comprises an important research area for the detection and assessment of research of threat agents and other environmental pollutants. In FY 1993, this program was funded in AMC Projects B53A, A71A, BH27, AH43, AH52, and AH68, and in the Corps of Engineers Projects AT24 and AT25. Beginning in FY 1994, funding will be consolidated under AMC Project BH67 and COE Project AT25.

(U) **FY 1992 Accomplishments:** Project not funded.

(U) **FY 1993 Planned Program:**
- (U) Biodegradation of military unique hazardous compounds (under Project A71A)
- (U) Environmentally degradable materials for pollution abatement (under Projects BH27 and AH68)
- (U) Investigation of Atmospheric reactivity of Halon alternative compounds (under Projects B53A and AH43)
- (U) Organic solvent based catalysis to remove pollution threats (under Projects AH52 and AH68)

(U) **FY 1994 Planned Program:**
- (U) Biodegradation and Synthesis of energetic materials for alternatives to OB/OD
- (U) Biodegradation and genetic constructs for military unique hazardous compounds
- (U) Pollution abatement and reduction of pollution threats
- (U) Physical processes in transport and diffusion

(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 of future hazardous waste generation (support from project BH67). Wastes of concern include explosives, propellants, chemical agents and smokes. Basic research in support of environmental quality was enhanced via funding from Project BH67 in several projects starting in FY93. This enhanced program was reorganized into BT25 starting in FY94 at OSD's request. Also, additional funding has been obtained from the Strategic Environmental Research and Development Program (SERDP) to enhance the research conducted under this project. This project supports exploratory development efforts in Program Element #0602720A, Projects AF25 and D048.

(U) **FY 1992 Accomplishments:**
- (U) Determined optimum substrate ration for efficient trinitrotoluene (TNT) biological degradation
- (U) Developed a wet air oxidation reactor vessel that allows identification of chemic l species within the reactor (at high temperature and pressure using laser spectroscopy)
- (U) Identified importance of light and dark reactions in photocatalytic reductions of nitroaromatic compounds

- (U) Investigated biotransformation of nitrated toluenes under reducing conditions to determine fundamental degradation mechanisms

(U) FY 1993 Planned Program:
- (U) Perform validation of screening protocol and isolation procedure for explosives degrading bacteria
- (U) Evaluate environmental factors controlling degradation rates and products
- (U) Establish operating parameters and wastewater constituents concentration requirements for optimal treatment of dinitrotoluene
- (U) Define mechanism of wet air oxidation treatment on redwater and its intermediates

(U) FY 1994 Planned Program:
- (U) Determine survival and activity of microorganisms in soils and biotreatment systems
- (U) Identify adsorption and fouling phenomena on polymer and ceramic membranes for removal on nitrocellulose fines
- (U) Define the factors affecting application of biotreatment for industrial wastewater treatment at Army facilities
- (U) Characterize the fundamental factors influencing supercritical fluid interactions with energetic materials
- (U) Define factor which influence contaminant transport and ion diffusion mechanisms

(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 1992 Accomplishments:
- (U) Completed identification of candidate non-mammalian carcinogenicity test systems
- (U) Initiated evaluation of candidate non-mammalian immunotoxicity test methods
- (U) Initiated evaluation of candidate non-mammalian neurotoxicity model

(U) FY 1993 Planned Program:
- (U) Complete identification of candidate test methods for screening water samples for acute toxicity
- (U) Complete test protocols for non-mammalian carcinogenicity screening tests
- (U) Complete test protocols for non-mammalian developmental toxicity screening tests

(U) FY 1994 Planned Program:
- (U) Complete identification of candidate immunotoxicity test systems
- (U) Complete identification of candidate microbial fate methods for inclusion in hazard estimation model

(U) **Project BS11 - Science Base/Medical Chemical Defense:** Basic studies are performed to delineate mechanisms and sites of action of identified and emerging chemical threats to thereby generate required information for initial design and synthesis of medical countermeasures. In addition, these studies are further

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

designed to maintain and extend a science base to prevent technologic surprises. Army has been designated as the Department of Defense (DOD) Executive Agent for medical 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 1992 Accomplishments:**
- (U) Determined role of calcium as a mediator of vesicant-induced cellular inflammation
- (U) Produced enzymatically active human acetylcholinesterase using recombinant DNA techniques
- (U) Identified cholinergic and non-cholinergic aspects of nerve agent-induced seizures
- (U) Clarified mechanism of fluorocarbon-induced lung injury

(U) **FY 1993 Planned Program:**
- (U) Characterize the time-course, and mechanism of vesicant lesions (blisters)
- (U) Develop sensitive laboratory assay techniques for vesicant-induced cellular damage
- (U) Complete studies on respiratory stimulants in nerve agent-induced respiratory depression
- (U) Determine cellular interactions of potential cyanide pretreatments
- (U) Continue to study effects of respiratory agents on cell permeability
- (U) Expand efforts to identify biological scavengers of nerve agents and sulfur mustard
- (U) Continue studies to identify mechanisms of nerve agent-induced seizure, and to identify more effective anticonvulsants

(U) **FY 1994 Planned Program:**
- (U) Continue studies on the mechanisms of vesicant-induced cellular damage
- (U) Identify cellular and biochemical markers for vesicant damage
- (U) Continue to explore biological scavengers against sulfur mustard and nerve agents
- (U) Initiate studies to explore the role of neuroprotectant drugs to ameliorate seizures and other central nervous system effects of chemical warfare agents

(U) **Project BS12 - Science Base/Medical Biological Defense:** Classical, naturally occurring disease agents, adapted to biological warfare systems coupled with the proliferation of biological warfare (BW) threat capabilities, continue to constitute significant threats to US forces. This project funds the medical/biological science base to study basic mechanisms and modes of action necessary to develop adequate medical countermeasures against agents of biological origin, both natural and synthetic. Objectives of this project are to identify mechanisms of action of validated threat agents, study genetics, physiology, pharmacology and structure of threat agents, and the pathology and immunology of threat agents in host systems.

(U) **FY 1992 Accomplishments:**
- (U) Developed drug sensitivity profiles against isolates of Bacillus anthracis
- (U) Isolated Bacillus anthracis variants containing the genes that regulate virulence
- (U) Developed model systems which express a variety of biochemical effects in response to Botulinum toxin exposure
- (U) Demonstrated potential for protection against the lethal effects of aerosol ricin challenge with intratracheally administered antibodies
- (U) Established role of arachidonic acid cascade in Staphylococcal enterotoxin B (SEB) intoxication

FY 1994 RDT&E DESCRIPTIVE SUMMARY

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

- (U) Completed initial characterization and mapping of 10 monoclonal antibodies to the edema factor component of anthrax toxin
- (U) Discovered that myocardial tissue exhibits greater sensitivity to perturbation by saxitoxin than to tetrodotoxin
- (U) Developed procedure for identification of essential virulence factors of Yersinia pestis the causative agent of plague

(U) FY 1993 Planned Program:
- (U) Investigate the genetics and physiology of Yersinia pestis, Brucella Sp., Q-fever, Vibrio cholerae, Francisella tularensis and Bacillus anthracis
- (U) Conduct studies on the molecular pathogenesis of Yersinia pestis, Brucella Sp., and Bacillus anthracis
- (U) Identify the mechanisms of immunity to Yersinia pestis and Francisella tularensis, Q-fever and Venezuelan equine encephalitis virus
- (U) Investigate the sites and mechanisms of action of inhaled Staphylococcal enterotoxins, ricin, Clostridium perfringens toxins, venom toxins and Botulinum toxins
- (U) Conduct studies on the mechanism of action of neurotoxins and physiologically active compounds
- (U) Investigate mechanisms of action in order to develop medical countermeasures against other validated biological threat agents

(U) FY 1994 Planned Program:
- (U) Continue basic studies on the genetics and physiology of validated microbiological threat agents
- (U) Continue to determine the mechanisms of immunity for biological threat agents
- (U) Continue to conduct basic research leading to the development of technologies for rapid diagnosis of biological threat agents
- (U) Continue to investigate mechanisms of action of physiologically active compounds and toxin threat agents

(U) Project BS13 - Science Base/Medical Research Infectious Disease: This project funds the basic research on infectious diseases of military importance. These are naturally occurring diseases which have the potential to influence military operations, deployment, mobilization, and training of US forces. Prevention and control of these diseases through immunization is the primary objective. Infectious diseases accounted for more hospital admissions in World War II, Korea, Vietnam, and Operation Desert Shield/Storm than combat injuries and nonbattle injuries combined.

(U) FY 1992 Accomplishments:
- (U) Molecularly cloned and characterized epithelial cell invasion systems from enterotoxigenic Escherichia coli (ETEC), common causative agent of diarrhea in service members deployed to southwest Asia
- (U) Identified specific point mutations in the malaria p-glycoprotein gene, pfmdr1, which may be associated with chloroquine resistance
- (U) Demonstrated evidence of Hepatitis E virus (HEV) infection in Belize
- (U) Designed rapid, accurate, highly sensitive polymerase chain reaction (PCR) assay for rapid diagnosis of meningococcal meningitis

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

- (U) Demonstrated that the protective antigen of all typhus group rickettsiae is modified by methylation and this methylation is altered in a live vaccine strain, suggesting that methylation may affect the virulence of rickettsiae and may also account for the instability of the attenuation of the vaccine strain
- (U) Designed an in vitro test system to test repellency of infected insect vectors
- (U) Demonstrated that antimony resistance in leishmaniasis existed worldwide

(U) FY 1993 Planned Program:

- (U) Acquire additional probes or known sequences of DNA for potential use in the rapid diagnosis of infectious diseases including diarrheas and malaria
- (U) Determine etiologic factors in septic shock
- (U) Characterize virulence factors for shigella and ETEC strains causing diarrheal diseases
- (U) Determine biochemical mechanism of parasite drug resistance
- (U) Develop methods for the culture and identification of hepatitis C and E viruses and antigen preparation for diagnostic assays
- (U) Develop convenient diagnostic assay for Leishmania tropica
- (U) Produce dengue antigens with recombinant expression vectors
- (U) Develop expression vector for hantavirus causing hemorrhagic fever and renal syndrome
- (U) Evaluate new approaches for insect repellents to replace or supplement DEET
- (U) Continue to investigate the use of molecular technology to simultaneously identify infectious disease agents and their insect vectors
- (U) Characterize basic immune mechanisms against diarrheal disease
- (U) Determine the epidemiological patterns of acute respiratory disease in military populations
- (U) Develop improved methods of identification of infectious agents arthropod vectors
- (U) Characterize DNA sequences as basis for improved diagnostics for schistosomiasis, rickettsial diseases, and campylobacter

(U) FY 1994 Planned Program:

- (U) Adapt DNA probes for improved diagnostic capability for malaria and diarrheal diseases
- (U) Continue to evaluate pathogenesis of septic shock
- (U) Identify compounds with potential efficacy against biochemical targets in drug-resistant malaria
- (U) Characterize virulence factors for shigella and ETEC strains causing diarrheal diseases
- (U) Develop methods for the culture and identification of hepatitis C and E viruses and antigen preparation for diagnostic assays
- (U) Produce dengue antigens with recombinant expression vectors
- (U) Continue to investigate the use of molecular technology to simultaneously identify infectious disease agents and their insect vectors
- (U) Continue evaluation of distribution of respiratory diseases
- (U) Assess technologies for rapid identification of etiological agents in arthropod vectors
- (U) Determine the molecular mechanisms in the pathophysiology of malaria, rickettsial diseases, schistosomiasis, and diarrheal disease caused by campylobacter
- (U) Initiate an in-vitro culture system for vivax malaria to support drug testing assays and antigen characterizations
- (U) Study basic mechanisms by which insect stage (merozoite) target and invade liver cells

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

- (U) Clone and sequence hepatocyte receptor responsible for attachment and invasion of possible target for malarial vaccines
- (U) Determine basic mechanisms of host-parasite relationship of enterogenic E coli (ETEC) in-vitro cultured human colon epithelial cells
- (U) Construct Shigella strain in which auto-reactive epitopes are genetically engineered to delete genes responsible for virulence
- (U) Initiate validation of laboratory models for screening meningococcal vaccines
- (U) Determine cytotoxic lymphocytes role in development of immunity to dengue vaccine in monkeys
- (U) Evaluate correlation of mouse and monkey model to human immunity to dengue virus vaccines

(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 of fundamental importance as the basis for development of trauma treatment and surgical procedures to "extend the golden hour," enhance survival and minimize military personnel losses from duty.

(U) **FY 1992 Accomplishments:**
- (U) Identified potential scavengers for iron mediated free radical for ion for use in new therapeutic strategies to prevent radial mediated tissue and organ damage
- (U) Assessed efficacy of several compounds including kappa-opioids to facilitate recovery from ischemic injury
- (U) Defined causes of bacterial translocation in shock
- (U) Determined the effect of hemoglobin in the distribution of endotoxin into cellular and acellular components of human plasma
- (U) Constructed a passive mathematical model of the cardiovascular system in response to hemorrhage and resuscitation

(U) **FY 1993 Planned Program:**
- (U) Utilize cognitive behavioral tests to characterize the effects of CNS injury
- (U) Study pharmacological and immunological suppression of abnormal neutrophil activation and adhesion in shock
- (U) Identify non-invasive or minimally invasive methods to detect tissue injury following ischemia
- (U) Study the deleterious consequences of altered vascular reactivity of head injury using cranial window preparations
- (U) Evaluate a system for the application of direct current to a burn wound to control infection and accelerate healing
- (U) Explore applications of buffers and neutrophil antibodies as adjunct therapies following ischemia

(U) **FY 1994 Planned Program:**
- (U) Continue appraisal of physiological responses to drug therapies following ischemic induced injury
- (U) Continue to study optimal resuscitation strategies for hemorrhagic injuries
- (U) Assess microvascular responses to injury and resuscitation and determine how tissue damage can be minimized
- (U) Identify the importance of replacement fluid quantity, composition, and concentration on hemodynamic changes following shock

FY 1994 RDT&E DESCRIPTIVE SUMMARY

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

(U) Project BS15 - Science Base/System Health Hazards Research: The scientific and technical objectives for this project focus on physiological and psychological factors limiting soldier effectiveness, and the characterization of health hazards generated by military systems and 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 directed energy, impulse noise, and toxic chemicals are also investigated under this project.

(U) FY 1992 Accomplishments:
- (U) Demonstrated new, more rapid, and sensitive non-mammalian testing method for assessing the toxicity of Army relevant chemicals, and validated a non-mammalian teratogenicity assay using a frog embryo model
- (U) Investigated candidate pharmacological treatment procedures to treat eye injuries resulting from laser exposures
- (U) Expanded capabilities for nutritional neuroscience research
- (U) Expanded the empirical data base on non-auditory effects of blast overpressure

(U) FY 1993 Planned Program:
- (U) Characterize the metabolic processes that predict performance degradation during prolonged sleep deprivation
- (U) Investigate the relation of mixed intensity noise exposure to hearing loss
- (U) Investigate cellular mediators of acute lung injury
- (U) Initiate a study of hearing protection efficacy as a function of impulse noise frequency content
- (U) Assess efficacy of treatment regimens for laser induced retinal scarring

(U) FY 1994 Planned Program:
- (U) Evaluate the efficacy of interventions that support cellular function under conditions of environmental extremes
- (U) Evaluate strategies for thermoregulatory enhancement using vasoactive compounds
- (U) Define the electrophysiological and neurochemical mechanisms underlying tyrosine's performance enhancing effects

(U) Project BS16 - Science Base/Combat Dentistry Research: Biomedical research directed toward understanding biological mechanisms of repair of military relevant maxillofacial injuries. This research is of fundamental importance for the development of treatments which enhance survival and duty retention rates. The Army has been designated by Congress as lead agency for Combat Dentistry research.

(U) FY 1992 Accomplishments:
- (U) Examined the effects of growth factors on bone cells
- (U) Completed studies on the effect of bone morphogenic protein on bone healing with promising results
- (U) Completed studies on the efficacy of fibrinogen as a carrier for growth factors in wound healing

(U) FY 1993 Planned Program:
- (U) Determine the optimum delivery system and doses of bone morphogenic protein that will stimulate healthy bone ingrowth into bone defects

- (U) Submit a patent application for a new copolymer that will degrade in a controllable, predictable manner. This will become a key component of a future biodegradable bone graft material
- (U) Report findings on the ability of platelet derived growth factor and transforming growth factor B to enhance bone growth

(U) FY 1994 Planned Program:
- (U) Further define effects of bone morphogenic protein on bone healing
- (U) Explore new polymers for their ability to biodegrade and release growth factors
- (U) Design an optimal carrier for bone inductive proteins and conduct the necessary animal studies to document efficacy
- (U) Report findings as to the ability of higher species to respond to bovine osteogenin implanted in a site

(U) **Project BS17 - Molecular Biology/Military HIV Research:** This project funds the basic research towards development of medical countermeasures directed against the spread of the human immunodeficiency virus (HIV) in military populations. The establishment of this Task in FY 92 is not a new start, but a continuation of the existing Military HIV Program and is critical to initiating basic research for the prevention of disease progression and spread.

(U) FY 1992 Accomplishments:
- (U) Demonstrated that secondary structure stabilized by cysteine bonds is important for the binding of antibodies to immunodominant epitopes in the V3 loop of the HIV viral envelope
- (U) Demonstrated that the role of an HIV regulatory protein R (VPR) is critical for productive infection of human monocytes

(U) FY 1993 Planned Program:
- (U) Characterize HIV-2 virus strains for potential impact on the vaccine development program
- (U) Evaluate the immune response stimulated by synthetic peptides derived from the virus envelope glycoprotein for possible inclusion in future protective vehicles
- (U) Characterize self-antigens and their impact on the development of immunity to the HIV
- (U) Characterize cellular mechanisms of cytotoxicity as it relates to suppression of HIV infections

(U) FY 1994 Planned Program:
- (U) Continue studies to evaluate immunity and suppression of HIV infections
- (U) Continue evaluation of peptides and HIV antigens for their impact on stimulating a protective immune response against HIV

(U) **Project AT22 - Soil and Rock Mechanics:** This project will develop governing inter-relationships between environment processes, terrain factors, and the wheel/track/ground interactions which affect vehicle mobility and maneuverability; define the constitutive behavior and penetration mechanics associated with complex geologic/structural materials; develop mathematical models needed for first principle analyses of explosive-induced ground shock and high- velocity projectile impact; and provide for determination and prediction of multispectral electromagnetic and mechanical wave signatures against terrain backgrounds. These 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.

(U) FY 1992 Accomplishments:
- (U) Developed total stress models to simulate behavior of soil backfill materials surrounding hardened structures
- (U) Conducted high-pressure laboratory tests defining stress-strain and strength of new high-strength concrete mixtures characteristics
- (U) Developed analytical relationships quantifying the relative and interactive effects of climate and weather on soil moisture-strength relations
- (U) Determined active response of materials (e.g., thin film polymers) for camouflage, concealment and deception applications

(U) FY 1993 Planned Program:
- (U) Investigate effectiveness of high-strength Portland cement, fiber-reinforced Portland cement, and slag cement concretes against penetration by armor piercing (AP) projectiles
- (U) Analyze airblast propagation of a non-planar, non-normal shock-wave in buildings
- (U) Determine fundamental soil properties (e.g., chemical bonds and mineralogy) contributing to moisture migration which precipitates failure under pavements.

(U) FY 1994 Planned Program:
- (U) Conduct laboratory analysis of advanced high-strength structural materials for potential use in anti-penetration shields
- (U) Determine fundamental relationships describing the behavior of partially saturated soils during large nonlinear hysteretic deformations affecting mobility
- (U) Develop discontinuous analytical procedure for pavement structures

(U) **Project AT23 - Basic Research/Military Construction:** This project supports development of fundamental knowledge essential to the exploratory development of solutions to problems in the planning, programming, design, construction, operation and maintenance of permanent military facilities. The project includes basic research support to energy systems, energy conservation and environmental quality.

(U) FY 1992 Accomplishments:
- (U) Defined electromagnetic properties of high critical temperature semiconductors
- (U) Developed algorithm that provides self tuning capability for multi-input, multi-output, pseudo gradient controller in robotic welder

(U) FY 1993 Planned Program:
- (U) Test Integrated Facility Model (IFM) for adaptive focus and conflict resolution
- (U) Develop predictive models of biodiversity determinants in selected ecosystems and present analytical/quantitative basis for characterization
- (U) Participate in the development of an experimental database schema, SEQUOIA 2000, and Integrated Systems Language Environment (ISLE) for spatial and aspatial data with several CA universities, the CA Department of Water Resources, the United States Geological Society (USGS) and Digital Equipment Corporation

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

- (U) Establish advanced collaborative systems laboratory, and define software architecture for integrated systems
- (U) Model Cognitive Processes for Concurrent Engineering

(U) FY 1994 Planned Program:
- (U) Develop novel spatial analysis techniques using parallel processing machines for training land management
- (U) Develop modeling language for "Spatial, Ecological/Economic Modeling" using techniques borrowed from finite element analysis, cellular automata simulations, and modeling theory
- (U) Prototype integration of collaborative work, knowledge-based software engineering and Integrated Systems Language Environment (ISLE) environments
- (U) Develop practical correlator array methods for low frequency, impulsive acoustic sources.
- (U) Develop Virtual teaming approach to Concurrent Engineering

(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 1992 Accomplishments:
- (U) Measured and modeled propagation of acoustic surface wave over a snow cover
- (U) Developed model of freeze-thaw effects on soil/water equilibria of trace organics
- (U) Developed model of effect of convection in snow covers on surface thermal and electromagnetic signatures
- (U) Developed interrelationship of optical properties, radiative transfer and physical state of snow and ice covers

(U) FY 1993 Planned Program:
- (U) Determine influence of low temperatures on biotransformations of chemical compounds
- (U) Develop model of effectiveness and limitations of soil freezing for containment of contaminants in soils
- (U) Develop model of frozen fringe behavior in frozen soil
- (U) Develop inverse model of electro-optic (E-O) propagation as affected by turbulence over snow covers

(U) FY 1994 Planned Program:
- (U) Develop model for millimeter wave interaction with an evolving snow cover
- (U) Experimentally verify capability of measuring turbulent fluxes using propagation statistics
- (U) Integrate soil chemical processes into physical models of freezing-thawing
- (U) Validate an acoustic method to determine snow permeability

FY 1994 RDT&E DESCRIPTIVE SUMMARY

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

(U) Project BT25 - Environmental Research - Corps of Engineers: This project focuses upon basic research for technologies to clean up the Army's contaminated sites; address technological gaps in the solution of problems resulting from the mission-essential operation of the Army's industrial installations; discovering the underlying mechanisms which govern pollution control processes applicable to Army non-industrial installations; maintain and enhance DoD capability to perform its operational, training, and testing missions free of adverse noise impacts; examine advance capabilities for natural and cultural resource characterization with the intent to improve modeling and management applications; and to evaluate advance techniques to mitigate and manage selected critical environmental impacts to natural resources as a result of military activities. The FY 1993 program is in Projects AH68 and AT24. The project supports exploratory development efforts in Program Element #0602720A, Projects AF25, D048 and A896; and products are directly input to PE #0602784A, Project AT42 as well as specific Navy and Air Force science and technology efforts.

(U) FY 1992 Accomplishments: Executed under AH68 and AT24.

(U) FY 1993 Planned Program:
- (U) Complete mass balance studies on degradation of TNT by Cyanobacteria Mats (under Projects AT24 and AH68)
- (U) Evaluate degradational kinetics of explosives using chemical oxidation (under Project AH68)
- (U) Develop instrumentation for bench spectral signatures for contaminated soils (under Project AH68)
- (U) Develop correlator array method for blast sound direction finding (under Project AT24)
- (U) Determine solubilities and freezing point depression due to calcium, magnesium, potassium, and sodium (under Project AT24)

(U) FY 1994 Planned Program:
- (U) Complete kinetic studies on degradation of TNT by Cyanobacteria Mats
- (U) Define hydroxyl radical formation mechanisms for chemical oxidation of explosives contaminated media
- (U) Complete data base on spectral signatures of waste compounds
- (U) Evaluate simulation and modeling protocals for threatened and endangerd species
- (U) Mechanisms of photocatalytic destruction of aromatic compounds

(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
A31B - Night Vision and Electro-Optics Directorate (NVEOD), Fort Belvoir, VA
B52C - Topographic Engineering Center , Fort Belvoir, VA
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

FY 1994 RDT&E DESCRIPTIVE SUMMARY

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

AF20 - U.S. Army Research Laboratory
AF22 - Tank-Automotive Command, Warren, MI
BH27 - Armament Engineering Directorate, Dover, NJ
AH40 - Center for Signals Warfare, 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
AH60 - Fire Support Armaments Center, Dover, NJ
AH61 - Close Combat Armaments Center, Dover, NJ
AH66 - Army Research Laboratory
BH67 - Army Materiel Command Laboratories and Centers
AH68 - Contractors include: Cornell University, Ithaca, New York; Clark College, Atlanta, Georgia; and University of Colorado-Denver, Denver, Colorado. The Primary in-house developing agency (for this portion) is the 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
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

FY 1994 RDT&E DESCRIPTIVE SUMMARY

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

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 to eliminate duplication is accomplished by 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 unnecessary duplication of effort in the Army or DOD.

(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 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0601104A
PE Title: **Federally-Funded Research and Development Center Electromechanics and Hypervelocity Physics**
Budget Activity: #1

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
BH62 Electromechanics and Hypervelocity Physics	2922	3686	3712

B. (U) BRIEF DESCRIPTION OF ELEMENT: The objectives of this element are to: (1) Conduct long-term and applied research to improve the state of the art of pulsed power technology for electrically powered hypervelocity guns, high power microwave applications, lasers, field power supplies for radar and communications, electric vehicles, and related manufacturing processes; (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 resource constrained Army Science and Technology Master Plan (ASTMP), DOD Science and Technology Objectives (STOs) and the Army Modernization P

C. (U) JUSTIFICATION FOR PROJECTS:

(U) **Project BH62 - Electromechanics and Hypervelocity Physics:** Tactical demands on the future battlefield will require more mobile and lethal weapons systems having greater range and accuracy, higher sustainability and operational flexibility. Combat vehicles, weapons and other tactical systems must utilize technologies beyond the current state of the art in propellants, materials and electromechanical d ces to achieve major technical and operational breakthroughs for future generations of military systems. Through FY 1993, this project funds the Army's Federally-Funded Research and Development Center (FFRDC), the Institute for Advanced Technology (IAT), for Electromechanics and Hypervelocity Physics which supports critical Army research and development relating to electromechanical systems for application to electromagnetic (EM) and electrothermal-chemical (ET-C) guns, as well as, to such areas as electric power for vehicles, microwave and laser based systems. Additionally, this project provides for research, testing and computer modeling of advanced hypervelocity projectiles. These focused efforts will serve as catalysts for technological innovation and will 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 intends to transition the IAT to a non-FFRDC organization.

(U) FY 1992 Accomplishments:

- (U) Briefed industry on new concepts for rotating machines and integrated pulseforming networks
- (U) Developed, proposed and initiated a high energy/hypervelocity physics program to focus the understanding of material and structural behavior involved in hypervelocity flight
- (U) Developed a new 3-dimensional, finite element computer code to address problems of rotating fields with uniform and non-uniform speeds
- (U) Formulated a hypervelocity projectile program that will lead to development of advanced projectiles compatible with electric guns

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0601104A
PE Title: **Federally-Funded Research and Development Center Electromechanics and Hypervelocity Physics** Budget Activity: #1

(U) FY 1993 Planned Program:

- (U) Initiate a comprehensive education and training program for Army military and civilian personnel in the high technology science and engineering disciplines
- (U) Perform critical technical reviews of ongoing projects in fabricating electric gun components or subsystems and hypervelocity projectiles
- (U) Initiate tests and experiments in electromechanics and hypervelocity physics
- (U) Provide technical expertise to industry team members working on the development of electric gun advanced demonstrators

(U) FY 1994 Planned Program:

- (U) Act as Army's Technical Agent for designated Army E-gun projects and programs. Continue to perform independent technical assessments of critical technologies for e-gun systems
- (U) Conduct long term advanced technology research program by experimentation, modeling, simulation, and analytical studies regarding development of e-guns in hypervelocity and electromechnics
- (U) Continue analytical efforts developing models and simulations to enable inclusion of electric weapon systems and hypervelocity projectiles in the virtual prototyping and Louisiana Maneuvers
- (U) Continue the comprehensive education and training program for Army military and civilian personnel in the high technology science and engineering disciplines

(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).

(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 #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 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602105A
PE Title: Materials Technology

Budget Activity: #1

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

Project Number / Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
AH84 Materials	14440	17436	11288

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program is the technical foundation for providing necessary materials technology in metals, ceramics, plastics, 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. This Program Element/Project has been restructured to include "Components Scale-Up". The work in this program element is consistent with the resource constrained Army Science and Technology Master Plan and Science and Technology Objectives (STOs) therein. PE/Project 0603102A/D071 was restructured in FY 1994 into this PE.

C. (U) JUSTIFICATION FOR PROJECT:

(U) FY 1992 Accomplishments:
- (U) Developed improved tungsten alloy powders for penetrators
- (U) Established life cycle management tracking system for composites
- (U) Evaluated prototype signature reducing designs for vehicles
- (U) Developed processing technology for toughened silicon nitride (SiN) engine parts
- (U) Corrosion resistant Aluminum-Zinc (Al-Zn) coating for depleted uranium penetrators has been developed and implemented

(U) FY 1993 Planned Program:
- (U) Fabricate and test full scale optimized armor appliques
- (U) Design components for silicon nitride slip casting processing
- (U) Continue corrosion science efforts
- (U) Design and fabricate lightweight missile components
- (U) Continue analysis methods for design of adhesive joints
- (U) Develop processing and manufacturing technology for lightweight composites for application to lightweight Army systems, such as the High Capacity Artillery Projectile (HICAP) and the Composite Armored Vehicle (CAV)
- (U) Complete development of robotic ultrasonic sensor system
- (U) Complete Non destructive evaluation (NDE) test to evaluate critical defects in composite panels
- (U) Complete full-scale tests to measure penetrator erosion rates
- (U) Complete ballistic tests on in house designed armor panels

(U) FY 1994 Planned Program:
- (U) Prototype ceramic-composite breast plate for ground troops
- (U) Smartweave concept demonstration

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602105A
PE Title: **Materials Technology** Budget Activity: #1

- (U) Thin, reliable barrier coatings for diesel applications
- (U) Test and evaluate laser protection with abrasion resistant coatings
- (U) Initiate integrated structural integrity program for thick composites
- (U) Improve analytical models for multibody kinematics and dynamics
- (U) Develop composite/metal hybrid armor concept for CAV
- (U) Establish CRDA with ground vehicle industry in composite structures

(U) Work Performed By: Work primarily performed in-house by: US Army Research Laboratory (ARL), Materials Directorate, Watertown, MA; ARL, Vehicle Structures Directorate, Langley, 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) 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) Other Appropriation Funds: ($ in Thousands) Not applicable.

(U) International Cooperative Agreements: The Technical Cooperation Program (TTCP) and Data Exchange Agreements (DEA) with the Republic of Korea and France, and Japan.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602120A**
PE Title: **Electronic Survivability and Fuzing Technology** Budget Activity: **#1**

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

Project Number / Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
A140 High Power Microwave (HPM) Technology	7787	7582	6161
AH15 Ground Combat Identification (ID) Technology	0	9455	4727
AH16 Sensors, Signatures, Signal and Information Processing (S3I) Technology	7378	4453	12516
AH25 Nuclear Effects Survivability Technology	6174	6283	5389
PE TOTAL	21339	27773	28793

B. (U) BRIEF DESCRIPTION OF ELEMENT: The objectives of this program are: first, to provide sensor, signal and information processing technology for ground Combat Identification (ID), advanced Reconnaissance, Intelligence, Surveil[illegible]e, and Target Acquisition (RISTA), and fire control systems as well as the fuzing and guidance integratec [illegible]ng functions in future munitions and second, to determine and reduce the susceptibility and vulnerabi[illegible]y of Army equipment and systems to Nuclear and Radio Frequency (RF)/High Power Microwav[illegible] (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 resource constrained Army Science and Technology Master Plan (ASTMP), Science and Technology Objectives (STOs) and Army Force Modernization Plan. It supports the Precision Strike and Advanced Land Combat Science and Technology thrust areas. The increase in funding in FY94 results from the addition of (1) Project AH15 (Ground Combat Identification Technology) to the program element, (2) the merger of PE/Project #0602782A/AH93 (Combat Surveillance and Target Acquisition) into AH16 Fuzing to create a realigned Project AH16 (Sensors, Signature, Signal and Information Processing Technology), and (3) the addition of $3M to AH16 for the development of Real Aperture Radar Stationary Target Identification Technology.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project A140 - High Power Microwave (HPM) Technology: The objective of this project is to develop the tools, technique 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, to identify and evaluate the technology required to and protect/harden U.S. equipment and systems against postulated threat weapons and to develop and evaluate technology required to conduct a R[illegible]/HPM weapon proof-of-principle demonstration.

(U) FY 1992 Accomplishments:
- **(U)** Conducted susceptibility/vulnerability assessments of critical systems
- **(U)** Designed a compact pulsar suitable for utilization in tactical HPM systems

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602120A
PE Title: **Electronic Survivability and Fuzing Technology** Budget Activity: #1

- (U) Extended microwave source evaluations to include phased arrays and repetitive pulse capabilities
- (U) Continued evaluations of new technologies (e.g., Micro/Millimeter Wave Monolithic Integrated Circuits (MIMIC)
- (U) Continued efforts to identify critical narrow-band RF waveform parameters
- (U) Conducted countermine field demonstration program

(U) **FY 1993 Planned Program:**
- (U) Transition hardening technology to system developers and provide technical support to Program Executive Officers (PEOs)/Project Managers (PMs)
- (U) Continue evaluation of microwave weapon system components
- (U) Develop tools, techniques and methodology to enable vulnerability assessments performed within PE #0605604A (Survivability and Lethality Analysis)
- (U) Extend source development efforts to higher powers and higher pulse repetition rates
- (U) Initiate High Power Microwave (HPM) Amplifier development
- (U) Provide technical support in the areas of test facilities, and hardening design as part of the Army Electromagnetic Environmental Effects (E3) Program, fully integrated with efforts executed under Project AH25 of this PE
- (U) Begin upgrade of S3I anechoic chamber with microwave sources and auxiliary equipment

(U) **FY 1994 Planned Program:**
- (U) Continue to develop tools, techniques and methodologies for HPM susceptibility/vulnerability assessments of foreign/domestic assets
- (U) Complete upgrade of RF injection facility to 1kw continuous coverage from 1-18 GHz
- (U) Continue HPM Amplifier Development
- (U) RF-directed energy weapon (DEW) engagement model for airborne targets
- (U) Continue hardening demos and technology development
- (U) Initiate development of High Power Microwave/Ultra-Wide Band (HPM/UWB) predictive capabilities
- (U) Support development of a multispectral data acquisition system under Project AH16

(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 both situational awareness and target identification of ground vehicles and dismounted soldiers. Advanced components and techniques will be investigated which provide increased effectiveness, reliability, survivability and affordability. The technology will be developed to support 6.3A Advance Technology Demonstrations (ATD). This project is a restructure from PE #0602120, Project AH16 and PE #0602782, Project AH93.

(U) **FY 1992 Accomplishments:** Not applicable

(U) **FY 1993 Planned Program:**
- (U) Participate in combat ID architecture study to select candidate technologies for target ID and situational awareness

FY 1994 RDT&E DESCRIPTIVE SUMMARY

rogram Element: **#0602120A**
E Title: **Electronic Survivability and Fuzing Technology** Budget Activity: **#1**

- (U) Build an active cooperative millimeter wave emulator to aid in assessment of extension of near term Battlefield Combat Identification System (BCIS) to address: (1) soldier transponder, (2) combined target ID/hit scoring/data link, and (3) an interrogator for projectiles, smart weapons a 1 mines
- (U) Conduct research and evaluation of passive coded cooperative and non-cooperative ID technology

(U) FY 1994 Planned Program:
- (U) Develop advanced components and subsystems for 6.3A target ID and situational awareness demonstration
- (U) Assess the combat ID system vulnerabilities and develop counter-countermeasures

(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 nder PE #0602782A/AH93 (Combat Surveillance and Target Acquisition) to provide for the synergistic velopment of sensor, signal and information processor technology for RISTA, Fire Control, Smart nitions and Guidance-Integrated Fuzing (GIF) systems. In the RISTA and Fire Control area, the project ll develop and demonstrate: (1) the technology and system concepts to enable the Army to field low cost, ghtweight survivable tactical low flying helicopters in an intense clutter environment and (2) the advanced optical processing techniques to automatically process, at the sensor, the received signals to target information which is at a low enough bandwidth to be compatible with Army communication systems. Project goals in the smart munitions and GIF sensor arena include: (1) improving sensor performance in high countermeasure (CM) and clutter environments, (2) sensing low-observable targets, (3) optimizing burst point to enhance weapon effectiveness, and (4) integrating the fuzing function into the seeker hardware software for guided munitions. In FY92 and FY93 there are Fuze Technology accomplishments only. Radar and Optical Processing accomplishments are reported under PE/Project #0602782A/AH93 (Combat Surveillance and Target Acquisition). 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 ARL. That work includes developing an algorithm that synergistically uses outputs of Foward Looking Infrared (FLIF and Millimeter Wave (MMW) sensor to ID combat vehicles and performing signature predictions in many bands (IR, visible, MMW and Laser Radar (LADAR)) from targets and backgrounds at specified times, weather conditions and locations.

(U) FY 1992 Accomplishments:
- (U) Completed a successful field test demonstration of electrostatic fuzes on M830E1 120mm High Explosive Anti-Tank (HEAT) rounds for tank self-defense against helicopter threats
- (U) Completed a successful field test of the proof-of-concept phase Global Positioning System (GPS) artillery registration round and computed the ballistic trajectory actually flown by the projectile
- (U) Developed generic, high-resolution angle and range tracking and target backscatter models for air-target Guidance Integrated Fuzing
- (U) Built initial mine fuze sensors and verified performance using the signature database obtained in FY 1991
- (U) Completed a breadboard signal processor for the Low Cost Advanced Target Sensor I (LCATS I) for artillery and mortar fuze applications; continued model development for sensor simulation
- (U) Initiated design for a 95 GHz anti-armor target detector for integration with a submunition seeker

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602120A
PE Title: **Electronic Survivability and Fuzing Technology** Budget Activity: #1

(U) FY 1993 Planned Program:

- (U) Develop simulation of end-game aim-point selection by Millimeter Wave (MMW) anti-armor seekers
- (U) Build, evaluate, and field test a ruggedized model of the sensor system for anti-armor and air-target smart mines
- (U) Develop discriminants to allow radio frequency fuze sensors to detect helicopter targets in foliage clutter
- (U) Begin integration of the LCATS I fuze signal processor circuits into electronic integrated circuit (IC) chips that are suitable for insertion into low-cost fuzing systems

(U) FY 1994 Planned Program:

- (U) Demonstrate moving target indicator radar concepts and algorithms for the detection, classification and recognition of moving ground targets in clutter from helicopters and ground combat vehicles
- (U) Demonstrate an optical Synthetic Aperture Radar (SAR) image formation processor that is capable of forming images in real time; requiring significantly less power than conventional digital processors
- (U) Investigate robust stationary target algorithms for autonomously identifying different categories of clutter and providing insight into alternate target/clutter discriminants, which can impact the Longbow Apache Initial Operation Test and Evaluation (IOT&E)
- (U) Integrate range-doppler optical processor into the U.S. Army Missile Command (MICOM) "Quiet Radar" testbed
- (U) Design hybrid optical Automatic Target Recognition (ATR) co-processor for implementation of selected computationally intensive algorithms
- (U) Construct and demonstrate an ultra wide bandwidth testbed
- (U) Develop and demonstrate the proof-of-principle version of the GPS fuze for artillery registration projectiles; transition GPS fuze to Full-Scale Development (FSD)
- (U) Complete system design of a countermeasure resistant target detector to enhance the effectiveness of anti-armor munitions; transition technology to the Research, Development and Engineering Centers (RDECs) for development of autonomous anti-armor munitions
- (U) Transition the LCATS I signal processor technology into a product improvement for the Multi-Option Fuze for Artillery (MOFA)

(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 1992 Accomplishments:

- (U) Continued to develop and maintain the nuclear weapon effects (NWE) Survivability science and technology in all effects areas to increase the survivability of Army materials
- (U) Continued new hardening program efforts for the Joint Chiefs of Staff (JCS) identified threats

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602120A
PE Title: Electronic Survivability and Fuzing Technology Budget Activity: #1

- (U) Completed the Tactical Source Region (TSR) underground nuclear test and validated TSR hardening techniques
- (U) Calculated radiation protection for M1A1 Tank crew
- (U) Developed test management and diagnostic equipment for depot level nuclear survivability verification
- (U) Continued in coordination with Defense Nuclear Agency (DNA) to develop new blast and thermal simulation technologies for transition to the Large Blast/Thermal Simulator (LB/TS)
- (U) Identified Electomagnetic Pulse (EMP) protection methods for the Combat Information Processor

(U) FY 1993 Planned Program:
- (U) Continue to develop and maintain the NWE Survivability science and technology in all effe areas to increase the survivability of Army materials
- (U) Continue new hardening program efforts for JCS identified threats
- (U) Continue in coordination with DNA to develop new blast and thermal simulation technologies for transition to the LB/TS
- (U) Evaluate EMP shielding methods for non-metallic composite materials for use in future combat vehicles and helicopters
- (U) Complete modernization of the radiation shielding code for armored combat vehicles

(U) FY 1994 Planned Program:
- (U) Continue to develop and maintain the NWE Survivability science and technology in all effects areas to increase the survivability of Army Materials
- (U) Continue development of EMP shielding methods for composite materials to be used in future combat vehicles and helicopters
- (U) Complete development of non-volatile ferroelectric (Random Access Memory (RAM)) for enhanced radiation survivability
- (U) Define non-ideal blast survivability criteria for tactical Army systems

(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; Electronic Fuze Tech: Contractors include: 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; Beverley 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.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602120A**
PE Title: **Electronic Survivability and Fuzing Technology** Budget Activity: **#1**

(U) Related Activities: This program adheres to Tri-Service Reliance Agreements on Vulnerability Assessment and Directed Energy Weaponry 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 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 Canada.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602211A
PE Title: **Aviation Technology**

Budget Activity: #1

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

Project Number / Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
A47A Aeronautical & Aircraft Weapons Technology	42583	34784	23280
A47B* Vehicle Propulsion & Structures Technology	0	0	*4136
AH85 Aircraft Avionics Technology	7935	9997	6734
PE TOTAL	50518	44781	34150

* Project established in accordance with Army Research Laboratory implementation. FY 1994 funding is provided through a zero-sum transfer action from Project A47A.

B. (U) BRIEF DESCRIPTION OF ELEMENT: The objective of this program element (PE) is to expand scientific knowledge in aeronautical technology for demonstration of state of the art technologies 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 and air traffic management. 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. This PE also funds overall administration and management of Army Aviation Research and Development Center and Laboratories. These costs include salary, travel, equipment, and general support of civilian management and research personnel and their administrative support staffs. The work in this PE is consistent with the resource constrained Army Science and Technology Master Plan (ASTMP) and Army Aviation Modernization Plans; addresses Science and Technology Objectives in the ASTMP; and supports the DoD Science & Technology Thrusts including Thrust #2 Joint Air/Land/Sea Precision Strike, Thrust #5 Advanced Land Combat, Thrust #6 Synthetic Environments and Thrust #7 Technology for Affordability.

Program Element: #0602211A
PE Title: **Aviation Technology**

Budget Activity: #1

C. (U) JUSTIFICATION FOR PROJECTS:

(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/OSD Integrated High Performance Turbine Engine Technology (IHPTET) initiative goal demonstrators, advanced smart materials applications; flight simulation; improved soldier machine integration improvements in reliability and maintainability and pilot-vehicle interface, combat damage repair of new materials, survivability/vulnerability to new threats and logistics research and development for cost reduction. These technologies are being developed for application to all current as well as future DoD/Army VTOL rotorcraft systems and all rotorcraft system block improvement programs.

(U) FY 1992 Accomplishments:

- (U) Established a Technical Exchange Agreement with Boeing in the area of computational human engineering tools.
- (U) Demonstrated Man-Machine Integration Design and Analysis System (MIDAS) Phase V accomplishments to government and industry.
- (U) Completed Apache and T701C engine simulation integration.
- (U) Completed documentation of UH-60 Blackhawk simulation and fidelity assessment.
- (U) Completed system specifications of Rotorcraft/Aircrew Systems Concepts Airborne Laboratory (RASCAL).
- (U) Completed improved 30 mm ammunition investigation.
- (U) Evaluated benefits of using color TV sensor data for multiple sensor target acquisition system.
- (U) Completed major improvements in Second Generation Comprehensive Helicopter Analysis System (2GCHAS) run time and user interfaces.
- (U) Refined Army Aeronautical Design Standard for Handling Qualities of Military Rotorcraft (ADS-33) flight test criteria with emphasis on Comanche application.
- (U) Developed Active Rotor Control technique for controlling acoustic radiation.
- (U) Completed preliminary analysis of dynamic characteristics of active control surface rotor.
- (U) Completed evaluation of internal cooling design of advanced turbine blade and doubled the internal cooling heat transfer compared to the Joint Turbine Advanced Gas Generator (JTAGG) blade.
- (U) Completed High Temperature/High Work (HT/HW) Axial Turbine Cascade Facility and HT/HW axial turbine aero tests; heat transfer tests underway.
- (U) Completed On-blade Rotor Control System Interim Review.

(U) FY 1993 Planned Program:

- (U) Complete Advanced Rotor Blade Erosion System (ARBES) material evaluation.
- (U) Initiate contract for critical flight control system and display components for RASCAL.

Program Element: **#0602211A** Budget Activity: **#1**
PE Title: **Aviation Technology**

- (U) Develop and use advanced flight controls analysis tools to support Army research and development simulation (RAH-66 Comanche, system upgrades).
- (U) Conduct man-machine integration/behavioral studies.
- (U) Perform total system real-time simulation using Apach. pgraded model.
- (U) Conduct Phase VI of MIDAS to consolidate computational engines to a single system and continue technology transfer activities.
- (U) Demonstrate Weapons and Targeting Expert System (WATES).
- (U) Initiate advanced cannon technology investigation.
- (U) Develop 2GCHAS enhancements for free wake, multirotors, aero interference, flight controls, and provide application support for Comanche and advanced Chinook.
- (U) Conduct wind tunnel tests of advanced high lift rotor blades and control implementations for improved performance.
- (U) Continue studies of dynamic characteristics of active control rotor.
- (U) Initiate detailed design/analysis of damage tolerant thermoplastic composite tailboom.
- (U) Flight test Holometrics/Flight Data Recorder on Apache.
- (U) Initiate design of isotropic preforms.
- (U) Complete shake test finite element model correlation of Sikorsky Advanced Composite Aircraft Program (ACAP).
- (U) Initiate modeling and analysis architecture around which to conduct air vehicle survivability optimization studies.
- (U) Initiate development of a Turbine Engine Diagnostic System (TEDS).
- (U) Initiate concept studies of an advanced external cargo winch.
- (U) Explore impact of Nuclear/Biological/Chemical (NBC) environment on aircraft maintenance.
- (U) Initiate development/laboratory development of a Smart Integrated Microsensor System (SIMS).
- (U) Complete hypervelocity rocket firing signature/trajectory data collection.
- (U) Initiate Scenario Analysis of VTOL Vehicles using an Interactive Environment (SAVVIE) workstations for battlefield simulation.
- (U) Complete validation testing of two stage 5:1 axial compressor
- (U) Complete aerodynamic testing of mixed flow ceramic turbine
- (U) Complete dynamic validation testing of split torque balance beam transmission concept.
- (U) Develop Finite Element Model (FEM) to predict effects in composites with respect to residual stiffness, load redistribution and residual strength
- (U) mplete design, fabrication, and testing of structural coupons for rod/laminate characterization.
- (U) Complete fabrication of five bladed articulated hub for aeroelastic rotor testbed

(U) FY 1994 Planned Program:

- (U) Complete initial TEDS assessment and begin development of a specific concept
- (U) Complete concept studies of an advanced external cargo winch
- (U) Develop and use advanced flight controls analysis tools to support research and development simulation (RAH-66 Comanche, system upgrades)
- (U) Conduct man-machine integration behavioral studies
- (U) Conduct Phase VII of MIDAS to optimize user interface, incorporate advanced human models, and continue technology transfer activities
- (U) Initiate concept development of Suppression of Enemy Air Defense (SEAD) missile integration
- (U) Complete concept integration of hypervelocity rocket technology

Program Element: #0602211A Budget Activity: #1
PE Title: **Aviation Technology**

- (U) Initiate development of handling qualities criteria for next generation/future system (NG/FS) and secondary mission tasks
- (U) Initiate design and development of active control rotor blade models
- (U) Continue development of advanced blade technology for improved performance and reduced acoustic detection range
- (U) Complete aerodynamic/mechanical testing of low inertia turbine design
- (U) Fabricate and test candidate rotor with on-blade, smart material control system
- (U) Continue 2GCHAS application support and apply to Helicopter Active Control Technology (HACT) flight controls/dynamic interactions
- (U) Initiate preliminary design and analysis of militarized flexbeam hub
- (U) Complete testing of isotropic preforms
- (U) Complete air vehicle optimization studies based on parametrics of passive countermeasures, active countermeasures and tactics for survivability
- (U) Initiate radar absorbing material/radar absorbing structures (RAM/RAS) operational and durability studies
- (U) Test advanced ceramic ballistic armor concepts
- (U) Initiate advanced fire control integration investigation
- (U) Initiate distributed target acquisition investigation
- (U) Initiate active control model rotor testing in support of HACT
- (U) Complete concept analysis of vertical take-off landing effectiveness in combat tactical regimes (VECTR) project

(U) Project A47B - Vehicle Propulsion and Structures Technology: This project is for the purpose of conducting exploratory development of generic propulsion and structures technology in support DOD/Army VTOL airmobile systems improvements. Areas of investigation and research include concepts; 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 DOD/OSD 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. FY 1994 funding is provided through a zero-sum transfer action from Project A47A.

(U) FY 1992 Accomplishments: Work conducted in Project A47A.

(U) FY 1993 Planned Program: Work conducted in Project A47A.

(U) FY 1994 Planned Program:
- (U) Complete cascade testing of high temperature high work axial turbines.
- (U) Initiate testing of splittered rotor compressor stage.
- (U) Evaluate compliant backed ceramic combustor liner concept, with advanced fuel injector, for 3000F applications.
- (U) Develop FEM for composite primary structure to predict onset and progression of damage.
- (U) Investigate mechanical response of discontinuous through-the-thickness reinforced composite materials.

Program Element: #0602211A Budget Activity: #1
PE Title: **Aviation Technology**

- (U) Develop and validate analytical/experimental tools to minimize fixed and rotating system helicopter vibratory loads.

(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 1992 Accomplishments:**
- (U) Initiated low signature Terrain Following/Terrain Avoidance (TF/TA) flight testing .
- (U) Completed Army Fault Tolerant Architecture (AFTA) conceptual study.
- (U) Completed Real Time Artificial Intelligence System (RTAIS) detailed design.
- (U) Defined and demonstrated on board data base requirements for Expert Communications Link Manager (ECLM).
- (U) Completed test coordination for data communication in noise tests.
- (U) Completed test coordination for Command and Control (C2) antenna multiplexer.

(U) **FY 1993 Planned Program:**
- (U) Complete low signature TF/TA flight test.
- (U) Demonstrate injection of TF/TA flight path guidance symbols into night vision goggles.
- (U) Integrate laser radar obstacle avoidance sensor with flight path guidance algorithm and initiate flight test.
- (U) Complete AFTA detailed design.
- (U) Complete demo of AFTA compliance with open system architecture.
- (U) Complete system level diagnosis and functional te: ing of RTAIS brassboard.
- (U) Complete Monochrome Helmet Mounted Display (HMD) stereo capability evaluation.
- (U) Initiate effort to define nap of the earth flight path guidance display.
- (U) Complete data communication in noise tests.
- (U) Complete Command and Control (C2) antenna multiplexer tests.
- (U) Integrate Global Positioning System (GPS) and Digital Terrain Elevation Data (DTED) for route rehearsal.
- (U) Complete GPS reference receiver specification.
- (U) Complete GPS satellite selection algorithm based on altitude and terrain for Army NOE and emergency medical service missions.
- (U) Complete program plar r dual use voice input command understanding to provide intelligent access to military data base and National information highway.

(U) **FY 1994 Planned Program:**
- (U) Integrate radar deception and jamming (RD&J) pod in aided pilotage aircraft.
- (U) Develop route rehearsal with terrain visibility algorithms.
- (U) Develop software to integrate satellite imagery with perspective view generation.
- (U) Continued development of ECLM algorithms.

Program Element: #0602211A Budget Activity: #1
PE Title: **Aviation Technology**

- (U) Conduct preliminary ultraviolet testing for covert communications.
- (U) Complete brassboard development and Joint Integrated Avionics Working Group (JIAWG) interoperability of RTAIS.
- (U) Complete lab demo of AFTA fault tolerant capabilities for TF/TA.
- (U) Complete definition for high integrity database for precise terrain/obstacle registration.
- (U) Integrate GPS reference receiver into precision navigation configuration.
- (U) Demonstrate multi-mode command understanding system.
- (U) Integrate high integrity data base with active sensor for aided pilotage.

(U) Work Performed By: Contractors include: General Electric, Honeywell, Franklin Research Center, Feinstein Construction, Pratt & Whitney, TRW, International Telephone and Telegraph, Texas Instruments, Bell Helicopter Textron Incorporated, Boeing Helicopter Company, Sikorsky, General Dynamics, McDonnell Helicopter Company, IBM, Intermetrics, AIRNC, Charles Stark Draper Laboratory and Grumman. Primary in-house developers include: 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, Ft Eustis, VA. Related activities are performed by National 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 demonstration is conducted under PE #0603003A (Aviation Advanced Technology), PE #0604801A (Aviation - Engineering Development) and PE #0604270A (Electronic Warfare Development). 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 PE lead into demonstration/validation programs: PE #0603801A (Aviation - Advanced Development) and #0603003A (Aviation Advanced Technology). 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 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602270A
PE Title: **Electronic Warfare Technology** Budget Activity: #1

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

Project Number / Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
A442 Tactica ctronic Warfare Technology			
A906 Tactical Electronic Warfare Techniques			
PE Total			

B. (U) BRIEF DESCRIPTION OF ELEMENT:

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project A442 - Tactical Electronic Warfare Technology: This project develops electronic warfare sensor and Countermeasure (CM) technologies for the protection of air and ground platforms, jamming against enemy counter mortar/counter battery, combat surveillance and target acquisition radars, and electronic support measures for tactical targeting. 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 optically-directed threats including laser range finders, laser designators and laser beamrider missiles.
Electronic Support Measures - 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.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602270A
PE Title: **Electronic Warfare Technology** Budget Activity: #1

(U) **FY 1992 Accomplishments:**
- (U) Completed fabrication of multi-spectral environmental chamber to support technical insertion into Program Manager (PM) Aircraft Survivability Equipment (ASE), PM Survivability Systems, The Technical Cooperation Program (TTCP), Subgroup 17, and Special Operations Aircraft (SOA) programs
- (U) Initiated Armored Systems Modernization (ASM) EW upgrade to multi-spectral environmental generator and chamber (MSEG&C) with millimeter wave (MMW) and laser sources
- (U) Developed deception and direction finding techniques against advanced threats
- (U) Initiated a study of optical fibers that will transmit carbon dioxide (CO2) laser energy in support of advanced laser warning systems
- (U) Developed countermeasures against top attack munitions

(U) **FY 1993 Planned Program:**
- (U) Initiate IR jammer subsystem and Tri-Service coherent IR source for infrared countermeasures (IRCM) - Air
- (U) Completed CM for imaging seekers and incorporate into IRCM - Air
- (U) Initiate multi-spectral laser warning for air and ground platforms
- (U) Perform joint service live firing of directed infrared countermeasures (DIRCM) at Sandia National Laboratories
- (U) Continue to investigate CM technologies for protection of ground vehicles from top attack

(U) **FY 1994 Planned Program:**
- (U) Continue artificial intelligence (AI)/neural network sensor fusion and power management for Aircraft Survivability Equipment (ASE)/ASM, to provide situational awareness, assist in Combat ID, weapons cueing,and countermeasures against advanced radars
- (U) Continue investigation of low cost precision direction finding, high sensitivity Receivers/radar warning receivers sensors
- (U) Continue multi-spectral missile/laser warning prototype
- (U) Continue investigation of multispectral conformal laser and laser beamrider warning receiver
- (U) Investigate CM technologies applicable to family of deceptive jammers for SOF/LIC applications

(U) **Project A906 - Tactical Electronic Warfare Techniques:**

(U) **FY 1992 Accomplishments:**
- (U) Continued expert system decision control technology development for automated Electronic Countermeasures (ECM)
- (U) Continued to provide computer based simulation of force-on-force combat with emphasis on the effects of communications EW systems
-

Program Element: **#0602270A**
PE Title: **Electronic Warfare Technology** Budget Activity: **#1**

- (U) Demonstrated self-jamming /fratricide/ avoidance techniques on SPARC work station to show smart jammer controller concept to eliminate interference with friendly communications
-

(U) **FY 1993 Planned Program:**

- (U) Continue technology development for devices needed to meet common module requirements
- (U) Transition advancements in high temperature superconductivity material for amplifier and antennas to advanced development for application to radio frequency (RF) processing
- (U) Develop techniques to detect, sort and identify multiple communication signals in a dense signal environment
- (U)
- (U) Develop an automated battlefield planner utilizing existing Mapping Analysis and Propagation System (MAPS) for propagation performance analysis of Intelligence Electronic Warfare (IEW) equipment

(U) **FY 1994 Planned Program:**

- (U) Investigate antenna couplers which allow operation of jammers in lower frequency ranges to deny threat forces use of newer radios
- (U) Investigate technologies for devices which reduce size, weight, and prime power requirements of common modules (receivers, transmitters, antennas) for ground, air and unmanned aerial vehicle (UAV) application
- (U) Finalize design of miniature Acoustic Charge Transport base receiver
- (U) Integrate Modular Azimuth Positioning System (MAPS) into computer and graphic display technologies for more accurate battlefield intelligence
- (U) Design and test promising algorithms for IEW data fusion processes

(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, Griffiss 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,

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602270A
PE Title: **Electronic Warfare Technology** Budget Activity: #1

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. There is no unnecessary duplication of effort within the Army and DoD.

(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 France, Israel and Canada.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602303A
PE Title: **Missile Technology**

Budget Activity: #1

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

Project Number / Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
A214 Missile Technology	31037	37424	23777
DC04 Smart Munition Technology Management	2497	2729	0
PE TOTAL	33534	40153	23777

B. (U) BRIEF DESCRIPTION OF ELEMENT: This is the only Army exploratory development work to improve fielded Army missile and rocket components and to develop and evaluate technical options for future tactical missile systems in response to U.S. Army Training and Doctrine Command (TRADOC) mission area analyses of deficiencies. These deficiencies are addressed through work in concept synthesis, laboratory hardware development, and limited technology demonstrations in the areas of close combat, fire support, air defense, and intelligence and electronic warfare. This program is needed to achieve technological superiority in tactical missile and rocket technology while providing the Army a critical capability to acquire the best missile/rocket systems at the least life cycle costs. The work in this program element is consistent with the resource constrained Army Science and Technology Master Plan and Science and Technology Objectives (STOs) therein and supports DoD Science and Technology Thrusts for Precision Strike, Air Defense, and Advanced Land Combat.

C. (U) JUSTIFICATION FOR PROJECTS:

(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, and increase kill probabilities against hard targets. This project encompasses seven major areas:

- (U) Seekers/Sensors
- (U) Guidance
- (U) Simulation
- (U) Aerodynamics
- (U) Propulsion
- (U) Structures
- (U) Technology Integration

This project is partially transitioning to PE #0603313A, Projects D486, D493 and D496.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602303A
PE Title: **Missile Technology**

Budget Activity: #1

(U) FY 1992 Accomplishments:

- (U) Completed integration and testing of Advanced Kinetic Energy Missile (ADKEM) processor, telemetry, and control actuator and demonstrated Digital Signal Processing (DSP) technology in ADKEM autopilot
- (U) Evaluated Multi-Role Survivable Radar (MRSR) target identification (ID) capability
- (U) Completed brassboard design of Combined Arms Multipurpose Missile System (CAMMS) automatic target recognition (ATR) processor
- (U) Completed baseline tests of millimeter wave (MMW) radar and MMW missile electronic units for the ADKEM seeker concept
- (U) Evaluated requirements for computer image generated realtime target and background scenes with minimum frame delays
- (U) Continued development of third generation Joint Army Navy National Aeronautics and Space Administration (NASA) Air Force (JANNAF) code, Standardized Plume Flowfield (SPF-III), and Standardized Infrared Radiation Model (SIRRM-III)
- (U) Validated SPF utilizing laser Doppler velocimeter measurements of velocity and turbulent kinetic energy in co-flowing air plumes at transonic velocities
- (U) Initiated development of helicopter infrared scene generation model including freestream, rotor-downwash, and exhaust interaction
- (U) Demonstrated capabilities of Elastomer Modified Cast Double-Based (EMCDB) propellants in steel strip laminate and in composite tubes
- (U) Developed prototype fuel formulations for energy-managed systems
- (U) Developed propulsion for cluster designed ADKEM. Solved difficult ballistic reproducibility program to have all four ADKEM motors burn out simultaneously
- (U) Completed development of Control Actuation System (CAS), high performance rocket motor development, and computer-aided design (CAD) baseline integration drawings for ADKEM integration
- (U) Conducted ADKEM fin-in-plume tests, established thermal protection materials, and developed a precision tracking mount simulation on a High Mobility Multi-Purpose Wheeled Vehicle (HMMWV)
- (U) Established technology transfer program and cooperative research and development agreement for missile development

(U) FY 1993 Planned Program:

- (U) Complete development of an Ada-based real time executive operating system (RTEMS) as a candidate DoD standard for embedded microprocessors
- (U) Develop realtime guidance technology using digital and video map imagery
- (U) Complete design and testing of high-g guidance and control componentry
- (U) Evaluate wideband digital quadrature modulator performance in hardware-in-the-loop (HWIL) simulation applications
- (U) Apply extended realtime radio frequency (RF) chaff model to HWIL simulation and evaluate results for multiple chaff clouds
- (U) Develop MMW beam steering antenna for terminal homing seeker applications
- (U) Development of novel control devices with application to hypersonic missiles
- (U) Initiation of development of time-accurate nozzle/plume Computational Fluid Dynamics (CFD) model

Program Element: #0602303A Budget Activity: #1
PE Title: **Missile Technology**

- (U) Investigate advanced techniques for improving focal plane arrays for missile seekers; complete CAMMS autonomous target recognition (ATR) processor
- (U) Demonstrate a very low cost electro-optical (E-O) guidance system, design, and develop a laser radar (LADAR) receiver
- (U) Formulation of less sensitive minimum-signature propellants and evaluate new materials for smart insensitive propulsion
- (U) Demonstrate ADKEM guided missile flight capability, continue development of prototype virtual launch capability, and initiate development of alternate ADKEM rocket motor case design (annular composite motor case)
- (U) Initiate component developments for Ducted Rocket Engine (DRE) program with Japan
- (U) Integrate major Army research and development data bases to facilitate science and technology planning
- (U) Develop exit criteria for transition of technology to advanced development, develop technology product performance metrics
- (U) Simulate and design advanced sensor/fiber optic guided missile concepts for stand-off weapons in support of Rapid Force Projection Initiative
- (U) Demonstrate the feasibility of strap-down millimeter wave semiactive terminal homing sensors and inertial measurement units developed jointly with the Space and Strategic Defense Command for the ADKEM missile via digital and hardware-in-the-loop simulation

(U) **FY 1994 Planned Program:**

- (U) Complete the test and demonstration of an environmentally stable 1 degree/hr miniature fiber optic gyroscope, Control Actuation System (CAS), and high-bandwidth control system for hypervelocity missile applications
- (U) Complete integration of the interferometric transfer alignment device with the Inertial Navigational System (INS) and Land Navigation System (LNS), and test and evaluate this fully integrated system on a tactical missile system
- (U) Initiate testing of fuzzy logic and artificial intelligence for improving seeker target acquisition and engagement sequences and autonomous unmanned vehicle navigation
- (U) Extend wideband digital quadrature modulator applications to wideband frequencies
- (U) Identify prototype noise radar design requirements. Integrate optical processing into radar and evaluate low cost MMW electronic beam steering antenna
- (U) Implement improvements to target and background image scene projection for HWIL simulation of missiles guided by infrared signals
- (U) Wind tunnel testing of novel control devices
- (U) Develop specifications for a multiple application staring focal plane array (FPA) seeker; conduct IR polarization experiments; develop seeker processing algorithms
- (U) Develop signal processing techniques for LADAR seeker; develop and demonstrate three-band algorithms
- (U) Evaluate new materials for high energy smart insensitive propulsion
- (U) Develop new fuels and oxidizers for high energy smart insensitive propulsion
- (U) Initiate non-detonable smokeless propellant development
- (U) Complete heavyweight component development for DRE program with Japan
- (U) Combine launching and tracking simulations to a total end-to-end for efficient system design

Program Element: #0602303A
PE Title: **Missile Technology**

Budget Activity: #1

- (U) Optimize business areas for the U.S. Army Missile Research Development and Engineering Center (MRDEC)
- (U) Develop prototype long range fiber optic spool for enhanced fiber optic guided weapons
- (U) Demonstrate hypervelocity booster separation and inertial guidance in flight tests of the ADKEM airframe
- (U) Initiate a joint program with the Naval Surface Weapons Center on hypervelocity terminal homing technology

(U) Project DC04 - Smart Munition (SM) Technology Management: U.S. Army Missile Command (MICOM) is executive agent under charter from Army Materiel Command (AMC) to operate the AMC Smart Weapons Management Office (AMC-SWMO). This special management office was the AMC focal point for smart munitions weapon systems to look broadly across all range bands, user requirements, materiel developments, proposed concepts and technologies, other service programs, industry independent research and development, and allied research and development. The charter for this office expires on 30 September 1993, terminating this project.

(U) FY 1992 Accomplishments:

- (U) Conducted advanced technology survey of industry IR&D project at the request of the Assistant Secretary of the Army (Research, Development and Acquisition (ASA(RDA)) Director for Technology
- (U) Prepared smart weapons/smart munitions (SW/SM) system of systems analysis for AMC input into Long Range Army Materiel Requirements Plan (LRAMRP)
- (U) Developed target signature production management structure and established AMC-SWMO as Executive Agent
- (U) Developed smart munition countermeasure assessment guidelines
- (U) Conducted studies on signature reduction technologies for the Office, Deputy Chief of Staff for Operations (ODCSOPS) and U.S. Army Combined Arms Center
- (U) Initiated technical analysis of command center requirements and battle damage assessment of armor vehicles attacked by deep battle munitions
- (U) Conducted smart weapons course for Command and General Staff College (CGSC) at Ft. Leavenworth, Kansas
- (U) Demonstrated two new advanced warhead technologies for AMC/ODCSOPS

(U) FY 1993 Planned Program:

- (U) Manage Army participation in Joint Project Office - CHICKEN LITTLE
- (U) Manage target signature production efforts across several Army agencies
- (U) Assess specific smart weapon performance in presence of countermeasure/counter countermeasures
- (U) Manage tactical weapon Guidance and Control Information Analysis Center (GACIAC) for Joint Service Guidance and Control Committee (JSGCC) to benefit entire DoD community

(U) FY 1994 Planned Program: Not applicable

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602303A
PE Title: Missile Technology

Budget Activity: #1

(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 direct support contract, existing competitively awarded time and material contracts in Government laboratories and from the guidance and control information analysis center (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. 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, MOU pending with Japan for Ducted Rocket Engine development.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602307A
PE Title: Advanced Weapons Technology

Budget Activity: #1

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
A139 Directed Energy Technology	476	554	510

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element provides for the development of those specialized technologies associated with advanced Army weapons. It includes high energy lasers and other types of radiative weapons employing both narrow and wide band Radio Frequency (RF) energy, and also focuses on high bandwidth data links using optical fiber and microwave technology for advanced missiles carrying multispectrum imaging and non-imaging sensors. The objectives are, with radiative technology, to develop zero fly-out time weapons capable of achieving both soft and hard kills of vulnerable targets at extended ranges; and with data link missile weapons, to develop automatic target acquisition algorithm technology using multispectrum sensors coupled with ground based processors (via the data link) to achieve both fully autonomous (fire and forget) and teleoperated (man-in-the-loop) capability, and in either mode providing a significant reconnaissance and battle damage assessment capability via data link. Work in this program element is consistent with the resource constrained Army Science and Technology Master Plan (ASTMP), Science and Technology Objectives (STOs) and the Army Modernization Plan.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project A139 - Directed Energy Technology: This project will develop technologies related to the use of directed energy as a weapon against hardened target limitations in the fact that; the optical and RF components are inherently vulnerable to energy in their operating bands, thus enhancing the probability of developing highly effective directed energy weapons against sophisticated (sensor dependent) targets.

(U) FY 1992 Accomplishments:
- (U) Performed weapons assessment of Air Defense "Guardian" concept.
- (U) Evaluated laser weapon to neutralize chemical submunitions.

(U) FY 1993 Planned Program:
- (U) Evaluate scalability of Overtone Chemical Laser Concept.
- (U) Monitor and assess evolving laser weapons technologies.

(U) FY 1994 Planned Program:
- (U) Evaluate chemical-oxygen iodine laser for Army Air Defense mission.
- (U) Monitor and assess evolving laser weapons technologies.

(U) Work Performed By: Work primarily performed by U.S. Army Missile Command, Research, Development and Engineering Center, Huntsville, AL.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602707A
PE Title: **Advanced Weapons Technology**

Budget Activity: #1

(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 #0605601A (Army Test Ranges and Facilities), PE #0602601F, PE #0602221C, PE #0602301E, PE #0602707E 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: Not applicable.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602308A
PE Title: **Modeling and Simulation Technology** Budget Activity: #1

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
AC99 Modeling and Simulation Technology	7900	4727	0

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program provides exploratory development of state-of-the-art techniques and technology for Distributed Interactive Simulation (DIS) in support of weapon system concepts, modernization and upgrades. It supports modeling and prototyping in real time, soldier-in-the-loop, virtual reality battlefield simulations. This program element is a key Army initiative in support of Louisiana Maneuvers (LAM) development.

C. (U) JUSTIFICATION FOR PROJECT:

(U) Project AC99 - Modeling and Simulation Technology

(U) FY 1992 Accomplishments:
- (U) Funding has not been released

(U) FY 1993 Planned Program:
- (U) Develop aggregate level simulation protocols
- (U) Develop Rasputin, mobilization/deployment and After Action Report (AAR) models in support of LAM
- (U) Modify existing battle simulations and processes including Family of Simulations (FAMSIM) to support Louisiana Maneuvers exercises
- (U) Conduct geographic information research to include digital mapping and remote sensing analysis
- (U) Demonstrate the use of simulation technology as a tool to support acquisition from concept to production

(U) FY 1994 Planned Program: Not Applicable

(U) Work Performed By: Contractors include: University of Texas, Fort Worth, TX., MITRE Corp, McLean, VA., and Loral Western Development Laboratories, San Jose, CA. Work is primarily performed in-house by: Simulation, Training, and Instrumentation Command (STRICOM), Orlando, FL and Army Research Institute for the Behavioral and Social Sciences, Alexandria, VA.

(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 #0602727A (Non-System Training Device Technology) and PE #0604715A (Non-System Training Devices - Engineering Development). There is no unneccesary duplication of effort within the Army or DoD.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602308A**
PE Title: **Modeling and Simulation Technology** Budget Activity: **#1**

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

(U) International Cooperative Agreements: Not applicable.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602601A
PE Title: **Combat Vehicle and Automotive Technology** Budget Activity: #1

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
AH77 Advanced Automotive Technology	0	12292	12469
AH78 Natural Gas Vehicle Technology	0	945	0
AH91 Tank & Automotive Technology	22307	36037	20537
AH97 Advanced Components Test Bed	10196	0	0
DC05 Armor Exploratory Development	7599	8781	5988
PE TOTAL	40102	58055	38994

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program advances state of the art technologies leading to the 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 highly mobile, lightweight, versatile and highly survivable systems responding to the post Cold War era. New technology thrusts designed to yield more deployable future armored vehicles reflect the Army's decision 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. Work in this program element is consistent with the resource constrained Army Science and Technology Master Plan (ASTMP), Science and Technology Objectives (STOs) and the Army Modernization Plan.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project AH77 - Advanced Automotive Technology: This project was started in FY 1993 in response to Conference Report 102-1015, page 121, dated October 5, 1992. It is aimed at fostering automotive research, facilitating automotive and manufacturing development, and encouraging transfer of dual-use technologies. Recent economic and legislative changes 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. The location of TARDEC within the automotive capital of the world and its unique technical capabilities enable the NAC to leverage the U.S. automotive industry's R&D efforts. Initial collaborative R&D stresses the application of ongoing commercial R&D to military requirements, and military R&D to commercial needs. Gear technology and cold environment mobility research are areas of interest. A number of automotive technology Cooperative

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602601A
PE Title: Combat Vehicle and Automotive Technology Budget Activity: #1

Research and Development Agreements (CRDAs) 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 manage and fund the activities of the NAC and consolidate the collective expertise of the Departments of Energy (DOE), Transportation (DOT), Commerce (DOC), Labor (DOL), Education (DOED), the Environmental Protection Agency (EPA) and other DoD agencies. This polestar for the automotive industry will enhance our national competitiveness by minimizing duplication and allowing scarce R&D resources to be used where most productive. The NAC will support the military community by leveraging the commercial automotive industry resources on military ground vehicle projects.

(U) **FY 1992 Accomplishments:**
- (U) Not Applicable

(U) **FY 1993 Planned Program:**
- (U) Link with ongoing commercial and academia activities through awards of up to 20 collaborative R&D contracts.
- (U) Implement model CRDAs with automotive industry companies.
- (U) Establish operations Memorandums of Understanding (MOUs) with Defense Advanced Research Projects Agency (DARPA), DOE, DOT, DOC, DOL, DOED, and EPA.
- (U) Establish advisory committee charter.
- (U) Formulate concepts for professional development and long term strategy for NAC.
- (U) Establish industrial base plan.
- (U) Begin developing gear and cold environment technologies.

(U) **FY 1994 Planned Program:**
- (U) Expand commercial collaborative R&D activities incorporating other DoD laboratories.
- (U) Facilitate CRDAs with Industry
- (U) Implement interagency advisory committee.
- (U) Establish automotive information center.
- (U) Establish NAC management Memorandums of Agreement (MOA) with DARPA, DOE, DOT, DOC, DOL, DOED, and EPA.

(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 provided funding for a pilot program at Ft. Hood, Texas, to convert non-military fleet vehicles to use compressed natural gas.

(U) **FY 1992 Accomplishments:**
- (U) Not Applicable.

(U) **FY 1993 Planned Program:**
- (U) Initiate Pilot program.

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

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602601A
PE Title: **Combat Vehicle and Automotive Technology** Budget Activity: #1

(U) Project AH91 - Tank and Automotive Technology: This project provides improved concepts 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. 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 structural materials; 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. 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 will transition to PE #0603005A, and a contract will be awarded for a Composite Armored Vehicle (CAV) Advanced Technology Demonstration (ATD). The Department of Defense increased Project AH91 in FY 1993 to accelerate composite material and integrated survivability technologies that can be especially effective in reducing vehicle weights.

(U) FY 1992 Accomplishments:
- (U) Conducted concept exploration for the CAV ATD.
- (U) Initiated design study for lightweight composite/advanced survivability.
- (U) Demonstrated technologies to reduce detection of future combat vehicles.
- (U) Completed development of vehicle electronics systems architecture demonstrator.
- (U) Initiated two studies to determine high payoff electric drive technologies for future Army investment.
- (U) Initiated innovative lightweight CAV track development using metal matrix composite and Austempered Ductile Iron (ADI) technologies.

(U) FY 1993 Planned Program:
- (U) Complete CAV RFP and issue solicitation.
- (U) Perform concept formulation and analysis of lightweight composite vehicles and begin formulating 50 Ton Tank concepts.
- (U) Demonstrate modular low observable technology.
- (U) Expand the Tracked Vehicle Work Station (TVWS) to include structural design capabilities and optimization.
- (U) Complete electric drive technology studies and initiate development of selected electric drive technologies.
- (U) Fabricate innovative lightweight track concepts for CAV ATD.

(U) FY 1994 Planned Program:
- (U) Complete composite structure technology and integration survey contract.
- (U) Prepare Future Main Battle Tank (50 Ton Tank) and Future Infantry Fighting Vehicle (FIFV) concepts for Louisiana Maneuvers.
- (U) Complete evaluation of near term threat laser protected vision devices for combat vehicles.
- (U) Validate computer model for visual detection of combat vehicles.

Program Element: #0602601A
PE Title: **Combat Vehicle and Automotive Technology** Budget Activity: #1

- (U) Demonstrate integrated low observable components on ground combat vehicles.
- (U) Expand TVWS for improving source selection and evaluation activities and supporting virtual prototyping.
- (U) Develop capability for automated generation of optimized vehicle dynamics for virtual prototyping.
- (U) Develop electric drive critical technology and initiate laboratory demonstration.
- (U) Develop 22 ton vehicle (CAV ATD) band track concept.
- (U) Conduct laboratory evaluation of innovative metal matrix composite and ADI CAV track concepts.

(U) **Project AH97 - Advanced Components Test Bed:** This project was created in FY 1991 to improve program execution by allowing funds to be provided directly to the performing agency (i.e., the Program Executive Officer for Armored Systems Modernization (ASM)). It provided for advanced technology development of vehicle electronics, integrated survivability technology, combat vehicle simulation and analysis. This project ended in FY 1992 with the decision to defer several ASM programs, but maintain options to resume development as required by threat assessments, affordability and technology maturation.

(U) **FY 1992 Accomplishments:**
- (U) Provided vehicle and subsystem concept designs and computer analysis for wargaming and acquisition milestone documentation, including Advanced Field Artillery System (AFAS) and Future Armored Rearm Vehicle for Ammunition (FARV-A) simulation studies.
- (U) Validated simulation models for mobility, ride dynamics, firing dynamics and conducted vehicle signature prediction through comparative testing on the Component Advanced Technology Test Bed (CATTB).
- (U) Conducted Soldier Machine Interface (SMI) (Human Factors) for the CATTB through the Vetronics Crew Display Demonstrator (VCDD).

(U) **FY 1993 Planned Program:**
- (U) Program not funded.

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

(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 survivable combat vehicles, the emphases are on armor technology that will be compatible with the structural technology (e.g. composites) of future combat systems, on improving the mass efficiency of armors, 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 vehicles requiring high levels of armor protection against kinetic energy projectiles, explosively formed penetrators and chemical energy warheads. This project draws upon work in Army programs and in the joint Army/Defense Advanced Research Projects Agency (DARPA)/US Marine Corps (USMC)

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602601A**
PE Title: **Combat Vehicle and Automotive Technology** Budget Activity: **#1**

Armor/Anti-Armor (A3) Initiative, providing for the transition of products from those 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 of armor performance models and integration tools necessary to realize the benefits of this technology on the battlefield.

(U) FY 1992 Accomplishments:
- (U) Demonstrated reactive concepts to defeat kinetic energy (KE) and shaped charge warheads.
- (U) Continued development and improvement of armor systems for advanced threats.
- (U) Developed performance model of armor against shaped charge jets.
- (U) Fabricated and tested full scale reactive armor in a multi-hit structure.
- (U) Developed simulations of ceramic armor boundaries bounded by momentum traps or selected impedance mismatches.
- (U) Evaluated momentum transfer defeat mechanism at full scale.

(U) FY 1993 Planned Program
- (U) Continue development of advanced passive and energetic armor technologies to defeat side and top attack threats.
- (U) Configure hybrid KE/electromagnetic armor design and test at subscale.
- (U) Assess applicability of heavy armor technology to medium threat protection.
- (U) Develop concepts to improve performance of ceramic armor components.
- (U) Demonstrate proof-of-principle target for integral reactive armor.

(U) FY 1994 Planned Program:
- (U) Demonstrate light/medium shaped charge armor concepts based on exploitation of foreign non-energetic reactive armor.
- (U) Demonstrate first generation smart armor for medium caliber threats.
- (U) Complete analytical model of the "smart boundary" concept for minimizing collateral damage in ceramic armor systems.

(U) Work Performed By: In-house work primarily performed by the US 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; and Teledyne Continental Motors, Muskegon, 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. 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 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602618A
PE Title: **Ballistics Technology**

Budget Activity: #1

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
AH80	Ballistics Technology		
	27437	29494	23845
AH81	Armor/Anti-Armor MOU		
	34453	27410	5702
PE TOTAL	61890	56904	29547

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. Starting in FY 1992, 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 by restructuring the program and combining funds that had previously been provided from PE #0603004A, Project D223 and PE #0603005A, Project D221. This change was made to emphasize the Army's role as the major funding contributor and lead service, to provide improved visibility to this vital program and to better reflect the nature of the exploratory development work being performed. The main thrust of the joint A3 program is to tap the innovation of industry and foster healthy competition among government and industry. The work performed in this PE complies with the Army Science and Technology Master Plan and the Science and Technology Objectives (STOs) therein, and supports Advanced Land Combat (ALC), one of the Department of Defense Science and Technology Thrusts.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project AH80 - Ballistics Technology: This project produces ballistic technology needed to develop offensive 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 optimal protection 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. This project also develops vulnerability, lethality, and survivability (VLS) methodologies to support analysis/assessments of Army material against all battlefield threats (ballistics, chemical, biological, nuclear effects and electronic warfare).

(U) FY 1992 Accomplishments:

- (U) Demonstrated prototype propellant laser ignition system
- (U) Measured hypervelocity launcher dynamics for tank cannon

Program Element: **#0602618A**
PE Title: **Ballistics Technology** Budget Activity: **#1**

- (U) Determined optimal defeat mechanism for armor systems to defeat kinetic energy (KE) and chemical energy (CE) threats
- (U) Evaluated medium caliber ammunitions and design tradeoffs to defeat light and medium tracked/wheeled threat vehicles
- (U) Demonstrated HIRAM process: launch full-scale 120mm projectile at 2-2.5 KW/s

(U) **FY 1993 Planned Program:**
- (U) Design propellant laser ignition system for integration into emerging fielded system for greater KE lethality and improve indirect fire range
- (U) Hypervelocity launcher accuracy controlled to comparable accuracy of conventional tank cannon
- (U) Demonstrate optimal defeat mechanism for armor systems to defeat KE and CE threats
- (U) Design advanced medium caliber ammunition for light and medium target testing
- (U) Develop vulnerability/lethality/survivability (VLS) methodology for studies involving conventional ballistics

(U) **FY 1994 Planned Program:**
- (U) Formulate and test new Low Vulnerability Ammunition (LOVA) candidate propellants
- (U) Design composite aft rocket body for HICAP (High Capacity Artillery Projectile)
- (U) Develop techniques for direct propellant ignition using a double-pulsed laser concept
- (U) Establish methodology required for optimization of SPETC (Solid Propellant Electro-Thermal Chemical) gun firing
- (U) Complete development of interfaces and associated information Distribution Technology applications to support Louisiana Maneuvers exercise
- (U) Develop VLS methodology for studies involving conventional ballistics, electronic/directed energy warfare and nuclear, biological, and chemical environments

(U) **Project AH81 - Armor/Anti-Armor Memorandum of Understanding (MOU):** This program is a key element in providing an enhanced national capability in Armor/Anti-Armor (A3) technologies and applications. The overall objective 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. The A3 Program originally consisted of five major applications or product oriented subareas, namely: to develop and test ultralight through heavy, high efficiency armor systems; vehicle survivability systems to use with future armors; chemical energy (CE) warhead for existing and future anti-tank missiles; advanced kinetic energy (KE) projectiles using novel materials and designs for gun, missile and electromagnetic guns; and advanced technology threat surrogates to challenge friendly munition and armor designs. The current A3 Memorandum of Understanding (MOU) between Army, Marine Corps, and ARPA expires in FY 1993. In FY 1994 the program transitions into an Army only program, with continued coordination with USMC and ARPA. The Army expects to continue the program with an emphasis on survivability/lethality technologies which have potential for contribution to future system concepts (Advanced Land Combat) and system upgrades.

(U) **FY 1992 Accomplishments:**
- (U) Developed shaped charge warheads with unprecedented jet velocities
- (U) Greatly increased performance of warheads against reactive and composite armors
- (U) Developed preliminary ceramics hydrocode models
- (U) Initiated light armor, structures, and material development programs

- (U) Demonstrated Scorpion proof of concept in-flight deployment and separation of nine half-scale rod segments
- (U) Initiated interceptor program for terminal defense of high value weapons systems

(U) FY 1993 Planned Program:
- (U) Initiate new high risk, high payoff warhead development programs
- (U) Develop light armor technology to support DoD's Advanced Land Combat Thrust
- (U) Transition anti-armor technologies to weapons systems applications
- (U) Finalize parallel versions of hydrocodes for use by entire A3 community
- (U) Investigate rigid body penetrator penetration dynamics in ceramic, metal, and spaced-plate targets
- (U) Completion of all KE scaling experiments at 1/3, 1/6, and 1/12 scale at 1.5 and 2.25 km/sec
- (U) Transonic tunnel demonstration of expanding segmented rod separation alignment and stability

(U) FY 1994 Planned Program:
- (U) Development of lightweight armors and other protection systems in support of Advanced Land Combat and system upgrades
- (U) Investigate novel materials for exploitation as protective systems components
- (U) Complete concept exploration investigations of novel penetrator concept

(U) Work Performed By:
AH80: In-house efforts accomplished primarily by the US Army Research Laboratory (ARL), Adelphi, MD. Contractors include: New Mexico Institute of Mining and Technology, Socorro, NM; Dynamic Sciences, Inc., Phoenix, AZ; Honeywell, Minneapolis, MN; Aircraft Armaments Inc., Cockeysville, MD; and New Mexico State University, Las Cruces, NM.
AH81: Contractors include: Los Alamos National Laboratory, Battelle Memorial Institute, Lawrence Livermore National Laboratory, FMC, University of Texas, California Research and Technology, Southwest Research Institute, Science and Technology Associates, Kaman Sciences, Aerojet Ordnance, Physics International, Nuclear Metals, Alcoa Defense Systems, Alliant Tech Systems, General Dynamics Land Systems and General Research Corporation.

(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 (Federally-Funded Research & Development Center Electromechanics & Hypervelocity Physics), PE #0602624A (Weapons & Munitions Technology), and PE #0603004A (Weapons & Munitions 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 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602622A
PE Title: **Chemical, Smoke and Equipment Defeating Technology** Budget Activity: #1

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
A551	Nuclear Biological Chemical Survivability		
	8986	0	0
A552	Smoke/Novel Effects Munitions		
	6409	7749	3110
A553	Chemical/Biological (CB) Defense & General Investigations		
	31470	38350	34656
PE TOTAL	46865	46099	37766

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 with non-lethal munitions (i.e., new antimateriel and flame devices and advanced riot control agents technologies (ARCAT)) 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; and antiterrorism. Project A552 provides exploratory development of several essential capabilities to provide countermeasures to enemy weapons systems and to provide the overall capability of degrading or defeating the mission of an 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 operating in 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. In addition under project A552, anti-materiel devices will be developed for use during military operations. Project A551 addresses support to Program Executive Officer, Armored Systems Modernization, to include collective protection, smoke, detection and auxiliary powered environmental control system. Support to the PEO, ASM, will continue in FY93 under Project A553. The work in this program element supports the DoD Science and Technology Thrusts 5 and 8, the Army's Science and Technology Master Plan, and the Science and Technology Objectives (STOs) therein.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602622A
PE Title: **Chemical, Smoke and Equipment Defeating Technology** Budget Activity: #1

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project A551 - Nuclear Biological Chemical (NBC) Survivability: This project addresses support to Program Executive Officer, Armored Systems Modernization (PEO ASM) to include collective protection, smoke, detection and auxiliary powered environmental control system (APECS).

(U) FY 1992 Accomplishments:
- (U) Initiated full-scale simulant/agent testing on two pressure swing adsorption (PSA) math model validation systems
- (U) Completed work on preliminary PSA pr· ·tive math model
- (U) Completed chemical sample transfer syst· · breadboard and delivered to component advanced technology testbed 2 (CATTB2)
- (U) Continued to investigate/test infrared (IR) and millimeter wave (MMW) smoke materials and dissemination techniques
- (U) Completed Nuclear Biological Chemical Contamination Survivability (NBCCS) implementation plan

(U) FY 1993 Planned Program: Funded in Project A553, this PE

(U) FY 1994 Planned Program: Not applicable

(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 threat weapon sights, guided munitions, target acquisition devices, and surveillance systems. This project also provides technology essential to development of flame and incendiary payloads and antimateriel systems.

(U) FY 1992 Accomplishments:
- (U) Demonstrated XM56 MMW module capabilities and integrated remote control smoke generator in field trials
- (U) Conducted concept demonstration of light vehicle obscuration screening system (LVOSS) candidate system
- (U) Initiated design and fabrication of prototype electro-optical (EO) marking grenade
- (U) Initiated efforts to conduct joint service flame studies and continued to evaluate potential for international cooperation
- (U) Successfully modeled after-penetration effects of shaped-charged follow-through munition c·ncept using advanced hydrodynamic code analysis
- (U) Initiated efforts to identify thickeners for flame field expedients
- (U) Initiated efforts to evaluate payload materials for the enhanced incendiary grenade
- (U) Demonstrated additional mission kill payload materials for the defeat of armored vehicles
- (U) Continued modeling effort to determine feasibility of mission kill payload for indirect fire system

(U) FY 1993 Planned Program:
- (U) Complete LVOSS technology demo and transition to dem/val
- (U) Complete XM56 MMW module technology development
- (U) Continue multicomponent/multispectral smoke material development and evaluations

Program Element: #0602622A
PE Title: **Chemical, Smoke and Equipment Defeating Technology** Budget Activity: #1

- (U) Evaluate new payload materials and initiate hardware design concepts for an Enhanced Incendiary Grenade
- (U) Initiate design efforts and payload evaluation for a 40mm Incendiary Projectile
- (U) Demonstrated additional mission kill payload materials for the defeat of armored vehicles Continue modeling efforts to determine feasibility of mission kill payloads for indirect fire system
- (U) Demonstrated unique direct fire system for temporary defeat of armored vehicles

(U) FY 1994 Planned Program:

- (U) Continue multicomponent/multispectral material development and evaluations
- (U) Fabricate and test EO markers designs
- (U) Establish capability to simulate/evaluate obscurant effect on smart sensors
- (U) Design and test in house Shaped Charge Follow Through warhead concepts. Continue to assist MICOM monitor conceptual warhead technology program
- (U) Develop effectiveness evaluation methodology for thermal and blast overpressure effects within mission on urban terrain (MOUT) and bunker targets
- (U) Demonstrate optimum thickeners in large scale testing of Flame Field Expedients. Transition to Dem/Val

(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; 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 Officer, Armored Systems Modernization.

(U) FY 1992 Accomplishments:

- (U) Developed MS-2 simulant assay for bio-chemical (BC) detector; initiated BC detector Pre-Planned Produce Improvement (P3I) for enhanced detection capabilities
- (U) Initiated stability test program on Operation Desert Storm (ODS) biological agent test kits for two specific biological agents and initiated work to develop biological agent test kits for additional biological threat agents
- (U) Constructed two concept CB mass spectrometers which incorporate new design features to increase sensitivity and decrease response time; developed biological simulant algorithm
- (U) Delivered first frequency agile carbon dioxide (CO2) laser for the laser standoff chemical detector (LSCD)
- (U) Demonstrated a 2-3 km range in field test of the tactical laser standoff bio detector (TLSBD)
- (U) Conducted compatibility assessment of Respiratory Protection (RESPO 21), next generation mask, concept models with the Human Engineering Laboratory; initiated design optimization
- (U) Continued evaluation of regenerative filtration and commercial membrane technologies
- (U) Established joint U.S./Canadian program for development/adoption of a new protective mask canister (XC7)
- (U) Optimized the parameters of the process development unit and initiated start up for producing a new reactive adsorbent carbon
- (U) Transferred technology for destruction of residual nerve agent (VX) and mustard (HD) with minimal corrosion to equipment to Office of Program Manager, Chemical Demilitarization

Program Element: #0602622A
PE Title: **Chemical, Smoke and Equipment Defeating Technology** Budget Activity: #1

- (U) Selected single best technology and application concept for a self-stripping coating, hasty decontamination. Conducted humidity and temperature testing
- (U) Initiated decon efficacy efforts to determine best sorbent approaches for basic soldier skill decontamination
- (U) Developed and validated toxicology test for battlefield dress overgarment (BDO) protection trials
- (U) Completed vulnerability modeling of individual protection equipment for dusty agent challenge
- (U) Initiated study t[illegible]evise formulation of Decontaminant, Agent, Multipurpose (DAM) to eliminate interference with detection equipment
- (U) Completed synthesis of two newly identified threat agents; completed first phase of tests to evaluate effects on detection equipment

(U) FY 1993 Planned Program:

- (U) Collect pyrolysis mass spectra for threat biologicals and collect background mass spectra data for outdoor environments for CB mass spectrometer. Complete fabrication of four concept model CB Mass Spectrometers
- (U) Construct and evaluate a standoff chemical sensor system using the frequency agile laser
- (U) Field test imaging capability of the strategic laser standoff bio detector
- (U) Continue optimization phase and requirement assessments for RESPO 21
- (U) Revise/refine test methodologies for respiratory and exercise performance and visual and communications capabilities
- (U) Conduct communications/speech evaluations of potential voicemitters and amplifiers
- (U) Initiate test program on new protective mask canister (XC7)
- (U) Initiate program to develop new impregnation technology based on catalytic impregnants
- (U) Complete, deliver and test Auxilliary Powered Environmental Control System (APECS)/PSA units for CATTB2
- (U) Initiate effort to formulate and test new materials which decontaminate by substitution/elimination and are environmentally safe and noncorrosive
- (U) Evaluate concepts identified in trade-off determination for sensitive equipment and interior decontamination
- (U) Reformulate self-stripping coating to improve sprayability based on humidity and temperature test data analysis
- (U) Continue development of special purpose defensive material in detection, protection and incident response necessary to combat the CB terrorist threat
- (U) Synthesize newly identified threat materials and initia[illegible] evaluation
- (U) Complete development of methodology for detecting and analyzing trace amounts of mustard breakdown products in environmental waters by liquid chromatrography/mass spectrometry

(U) FY 1994 Planned Program:

- (U) Transition bio-detection kits program to production
- (U) Transition laser standoff chemical detector to demonstration/ validation
- (U) Design and build an improved laser for the tactical laser standoff bio detector
- (U) Transition lightweight standoff chemical agent detector to dem/val
- (U) Initiate build of a full range (100km) airborne strategic laser standoff bio detector
- (U) Complete optimization phase and requirement assessments for RESPO 21
- (U) Complete testing/development of new protective mask canister and transition to production
- (U) Evaluate catalytic impregnants against standard/nonstandard agents

Program Element: #0602622A
PE Title: Chemical, Smoke and Equipment Defeating Technology — Budget Activity: #1

- (U) Develop computational chemistry techniques to characterize toxicophores of toxins to permit better simulant selection for evaluating threat potential
- (U) Complete evaluation of new adsorbants for the sampling and recovery of CW agents from vapors which will enhance the capability of sampling ambient air and thus improve the subsequent analysis to determine the presence of chemical warfare agents
- (U) Support the CATTB2 demonstration with collective protection, detection, smoke
- (U) Initiate expanded evaluation of optimized substitution/elimination decontamination (DSX) to include toxicity, storage stability, effects on materials
- (U) Develop methods of application for decontamination approaches specific to sensitive equipment and interiors
- (U) Initiate study of technological advancements in self-stripping coatings with reactivity
- (U) Complete evaluation and toxicology testing of new threat agent material
- (U) Develop new and enhanced CB defense modules for CB play in wargames
- (U) Complete the biodefense program front end analysis

(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 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.

(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. 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.

(U) Other Appropriation Funds: ($ in Thousands) MOU with France for joint research and development effort titled "Laser Stand-Off Chemical Detection System", dated September 1988, and MOU with U.S./United Kingdom/Canada for research and development effort entitled "BC Detector", dated 1990.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602622A
PE Title: **Chemical, Smoke and Equipment Defeating Technology** Budget Activity: #1

(U) International Cooperative Agreements:

- MOU with France - Joint research and development of a Laser Standoff Chemical Detector.
- Trinational MOU with United Kingdom/Canada/U.S. on cooperative development of BC Detector.
- Trinational MOU with United Kingdom/Canada/U.S. on research, development, production and procurement of CB defensive materiel.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602623A
PE Title: **Joint Service Small Arms Program** Budget Activity: #1

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
AH21 Joint Service Small Arms Program (JSSAP)	4453	4643	3397

B. (U) BRIEF DESCRIPTION OF ELEMENT: Joint Service Small Arms Program (JSSAP): This effort provides a coordinated program for the exploratory development of small arms weapon systems to meet future battlefield requirements for all the Services. The JSSAP effort is configured to overcome the technological barriers associated with small arms/munitions/fire control for individual and crew-served weapons, to achieve substantial improvements in threat defeat, (including personnel with body armor and next generation lightly armored vehicles) under all environmental conditions with a goal of reducing the soldier's load. All JSSAP efforts are based upon approved Joint Service Science and Technology Objectives (JSSTO) which are drawn from the following Service documents: The Army Battlefield Development Plan; Small Arms Master Plan; the US Marine Corps' emerging Advanced Small Arms Plan; the Special Operations Command Destructive Capabilities Master Plan; the Air Force Air Base Ground Defense Plan and the requirements set forth by the Navy. This effort maximizes the return on investment as all Services are participants in this program. The efforts of the JSSAP is focused on the following projects: (1) The Crew-Served Weapon project which shall replace the M60 machine gun, the M2 machine gun, and the MK19 grenade machine gun with a man-portable system having comparable capability with a 60-75% weight reduction; (2) The technological areas being developed in the Bursting Munitions project include a 200 to 300% increase in hit probability and maximizing the range out to 500 meters; (3) The Nonconventional Target Effects project will provide optional, variable level, lethal/non-lethal, point and area fire through nonconventional mechanisms; and (4)The individual fighting system will explore developmental efforts for armament and fire control to meet the needs of the 21st Century. The work in this program element is consistent with the resource constrained Army Science Technology Master Plan (ASTMP), Science and Technology Objectives (STOs) and the Army Modernization Plan.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project AH21 - Joint Service Small Arms Program:

(U) FY 1992 Accomplishments:

- (U) Implemented Bursting Munitions Technology Assessment recommendations to address data gaps in fire control, ammunition, weapon/recoil, and system requirements definition/analysis
- (U) Demonstrated critical technologies for Advanced Crew Served Weapon System
- (U) Demonstrated critical technologies for Nonconventional Lethal Target Effects (anti-personnel, anti-materiel)
- (U) Conducted alternative incapacitation technology review for small arms among multi-service users and government technology experts
- (U) Began preparation of a harmonized Joint Master Plan for Small Arms

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602623A
PE Title: **Joint Service Small Arms Program** Budget Activity: #1

(U) FY 1993 Planned Program:
- (U) Conduct technology build/support analysis for Bursting Munitions
- (U) Complete overall technology assessment for Crew-Served Fighting System
- (U) Demonstrate nonconventional target effect of lethal and incremental breadboards
- (U) Complete preparation of a harmonized Joint Master Plan for Small Arms

(U) FY 1994 Planned Program:
- (U) Continue technology build/support analysis for Crew Served Fighting System
- (U) Initiate technology build/support analysis for nonconventional target effects with construction of chemical laser concept test bed
- (U) Initiate overall technology assessment of Nonconventional Target Effects

(U) Work Performed By: This exploratory development program is directed by the Joint Service Small Arms Program Management Committee. The primary in-house organization is the US Army Armament Research, Development and Engineering Center, Picatinny Arsenal, NJ, with other efforts at: Naval Surface War: : Center, Crane, IN, and Air Force Wright Laboratory/Armament Directorate, Eglin Air Force Base, FL. Contractors include: Battelle Columbus Labs, Columbus, OH; Mission Research Corp, Santa Barbara, CA; Scientific Applications & Research Associates Inc., Huntington Beach, CA; Hilton Systems, Jackson, MS; Day & Zimmerman, Philadelphia, PA; General Electric, Burlington, VT; Aerojet Ordnance, Downey, CA; Computing Devices Company, Ottawa, Ontario, Canada; and Dyna East Corp, Philadelphia, PA.

(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 #0601102A (Defense Research Sciences), PE #0602624A (Weapons and Munitions Technology), PE #0603607A (Joint Service Small Arms Program), and PE #0603802A (Weapons and Munitions-Advanced 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 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602624A
PE Title: **Weapons and Munitions Technology** Budget Activity: #1

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
AH18	Artillery & Combat Support Technology		
	23954	17142	17569
AH19	Close Combat Weaponry		
	8565	8544	8087
AH28	Munitions Technology		
	7544	10471	9138
PE TOTAL	40063	36157	34794

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program develops technologies applicable to future artillery weapons, munitions and armaments for air and ground combat vehicles to improve lethality and survivability. The program explores advanced gun propulsion technologies such as electric launch, lightweight composites for weapon applications and novel recoil concepts for gun applications. The program supports the Insensitive Munitions technological development for increased survivability of combat vehicles and safety in explosive manufacturing and storage facilities. The effort will include development of technology for high energy explosives to increase battlefield lethality and gun propellants for increased range and velocity. Advanced armament fire control systems and supporting technology advances in mine warfare and demolitions will be developed. Weapon stabilization and control techniques for aircraft armament to increase effectiveness at extended ranges will also be explored. This program element also develops technology for thermal management of high performance, high rate of fire, large caliber guns, and advanced air-to-air gun. The work in this program element is consistent with the Army Science and Technology Master Plan, Science and Technology Objectives (STOs) therein, and supports the DOD Science and Technology Thrusts for Precision Strike, Advanced Land Combat, and Air Superiority/Defense. FY 1994 funding reflects a reduction in projected workload in consonance with Army downsizing plans.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project AH18 - Artillery and Combat Support Technology: This project concentrates on exploratory development of technology for cannon artillery weapon systems and combat support systems. Technology is being developed to increase self-propelled howitzer battlefield survivability which benefits the Advanced Field Artillery System (AFAS); automation of the armament system has the potential to decrease the manpower requirements by up to fifty percent. Technology for precision guided munitions is being pursued to provide a significant increase in anti-armor capability while baseburn rocket technology is being refined to provide extended ranges for improved conventional munitions. Component technologies, including composites and novel recoil management concepts which are being developed to lighten towed howitzers and other systems resulting in improved strategic and tactical mobility for contingency and light forces. The program is also developing broadbase technology in the areas of advanced electrical propulsion to achieve hypervelocity launch to improve future hit and kill probability against threats at extended ranges.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602624A
PE Title: Weapons and Munitions T nology Budget Activity: #1

(U) FY 1992 Accomplishments:
- (U) Converted terrain data for Gun Fire Control System to standard Digital Mapping Agency (DMA) format
- (U) Conducted critical component ballistic tests for Extended Range Artillery (ERA) projectile
- (U) Completed testing of Royal Ordnance lightweight 155mm towed howitzer
- (U) Developed Intelligent Minefield test bed system at U.S. Army Engineer School (USAES), Ft. Leonard Wood, MO
- (U) Electric Armaments Research Center opened at the U.S. Army Armaments Research, Development and Engineering Center (ARDEC)
- (U) 120mm Electro-Thermal Chemical (ETC) laboratory gun propulsion testing initiated

(U) FY 1993 Planned Program:
- (U) Continue Extended Range Artillery Projectile component development and demonstrations
- (U) Demonstrate Reconnaissance, Selection and Occupation of Position (RSOP) decision aid module for Seld-Propelled Artillery and integrate into labortory model
- (U) Fabricate HI-Capacity (HICAP) Artillery Projectile test vehicle to demonstrate forward burster expulsion concept
- (U) Support development of two Air Defense concepts. (i.e., ARMICIDE, DEMO.)
- (U) Perform component research and lab testing of full scale high energy Electrothermal-Chemical (ETC) and Electromagnetic (EM) system components, e.g., barrels, projectiles, power supplies

(U) FY 1994 Planned Program:
- (U) Complete design documentation of Decision Support System (DSS) for transiti.. to the Advanced Field Artillery System (AFAS)
- (U) Continue research and testing of risk reducing alternative technologies in preparation for and in support of planned Electric Gun program technology demonstrations (TDs)
- (U) Complete software design/architecture for self defense & sustainment decision aid modules
- (U) Develop & implement model to simulate loading/temperature effects over the entire in-bore travel for Cannon Projectile Compatibility effort
- (U) Conduct breadboard demos of advanced sensor array with real time two dimensional tracking for Intelligent Minefield system

(U) **Project AH19 - Close Combat Weaponry:** The objective is to exploit new technologies which conceptualize and demonstrate improvements in cannons for tanks and automatic cannon technologies for ground and airborne combat vehicles, as well as, munition and feed systems. The scope of this project encompasses the system-oriented areas of combat vehicle, aircraft and air defense armaments, as well as, developing the basic technology in the areas of weapon stabilization and control, projectile design and fabrication, thermal management of high rate launching mechanisms, and munition systems automatic loaders. The specific investigations develop both hardware and analytical tools necessary to assess system performance, identify problem areas and address resolution of these problems. The resulting data base is used for the formulation of all subsequent direct fire cannon and munition system Advanced Development and Engineering and Manu: :ring Development.

(U) FY 1992 Accomplishments:
- (U) Completed testing of directed radiator for low collateral damage munitions
- (U) Completed design of thermal management system for howitzers

Program Element: #0602624A
PE Title: **Weapons and Munitions Technology** Budget Activity: #1

- (U) Completed design studies for the next generation of advanced kinetic energy ammunition
- (U) Completed phase 1 design of a simultaneous engagement fire control sub-system (Argus) for attack helicopters
- (U) Completed design studies for howitzer munition loader
- (U) Determined short and long term role of gun systems in theater air defense

(U) FY 1993 Planned Program:
- (U) Demo 105/120mm lightweight armament module
- (U) Fabricate initial advanced kinetic energy ammunition candidates and initiate test firings
- (U) Initiate design studies for the gun, ammunition, feed, storage, turret and fire control subsystems for a high performance armament system (HIPAS) for attack helicopters
- (U) Fabricate fire control systems for Argus
- (U) Test and evaluate advanced optical warhead versus electro- optical and bio-sensors for low collateral damage munitions and evaluate wavelength selectability for transition to 6.3a
- (U) Fabricate, test and transition howitzer thermal management sub-system
- (U) Complete evaluation and transition howitzer munition loader

(U) FY 1994 Planned Program:
- (U) Conduct user tests of first generation advanced kinetic energy ammunition
- (U) Limited gun/turret testing
- (U) Investigate simulation analyses vis a vis development and testing of hardware
- (U) Initiate design studies for second generation low collateral damage munition
- (U) Initiate trade off studies for feasibility of thermal management and munition loaders for direct fire cannon
- (U) Develop gun system option to intercept leakers (escapees from missile net) in forward area air defense

(U) Project AH28 - Munitions Technology: This project explores warhead concepts and other weapon development-supporting, generic technologies, such as, propellants, explosives, packaging and aeroballistics. The Insensitive Munition (IM) efforts conducted in this project will increase the survivability of tanks, artillery, helicopters and infantry fighting vehicles, as well as manufacturing plants and storage depots. 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 provide higher energy and density to increase light material anti-armor and multi-target lethality. Countermeasures being developed will protect low flying and relatively slow Army aircraft.

(U) FY 1992 Accomplishments:
- (U) Continue Congressionally directed research on wood packaging
- (U) Continue development of LX-14 explosive replacement
- (U) Develop procedure to produce high quality, large scale casts of t[illegible]troazetidine (TNAZ)
- (U) Evaluate non-asymmetric warhead with new liner materials/proces[illegible]
- (U) Design thermo-mechanical [illegible]rocessing scheme to achieve a preferred orientation in tungsten alloys

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602624A
PE Title: **Weapons and Munitions Technology** Budget Activity: #1

(U) FY 1993 Planned Program:
- (U) Transition LX-14 explosive replacement to Advanced Development
- (U) Perform ballistic and vulnerability evaluation of new insensitive propellants
- (U) Demonstrate non-axisymmetric EFP warhead
- (U) Process tungsten alloys thermo-mechanically using optimized texture approach
- (U) Develop and test target interaction lethality model for advanced multi-purpose EFP warhead designs against heavy and light targets

(U) FY 1994 Planned Program:
- (U) Formulate and test and transition potential insensitive replacements for PBX-0280 and Comp A-5
- (U) Develop cost effective continuous process procedure for insensitive energetic material production
- (U) Transition non-axisymmetric EFP warhead to 6.3
- (U) Conduc subscale ballistic tests of tungsten penetrators processed with optimized texture

(U) Work Performed By: In-house efforts primarily accomplished by US. Army Armaments Research Development and Engineering Center, Picatinny Arsenal, NJ. Contractors include: Alliant Tech Systems, Minneapolis, MN; Gen-Centers, Wharton, NJ; Drexel University, Philadelphia, PA; 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.

(U) Relat 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 #0601102A (Defense Research Sciences), PE #0601104A (Federally-Funded Research & Development Center Electromechanics & Hypervelocity Physics), PE #0602618A (Ballistics Technology), PE #0602623A (Joint Service Small Arms Program), PE #0603004A (Weapons & Munitions Advanced Technology), PE #0603506A (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 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 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602705A
PE Title: **Electronics and Electronic Devices** Budget Activity: #1

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
AH94 Electronic and Electronic Devices	20769	20790	19400

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program supports advanced, dual use, electronic device and power source device technology, pervasive to both present and projected Army systems, enabling considerable lower Operations and Support cost (O&S), superior performance, capability, and reliability, and greatly reduced acquisition cost. Advanced electric device and power source device technology is essential to Future Soldier System (FSS), autonomous missile systems, advanced land combat vehicles, electric weapons, secure jam-resistant communications, Automatic Target Recognition (ATR), and to many civilian applications such as improved cellular radio, collision avoidance radar for automobiles, high definition flat-panels displays and extremely long life batteries. The work under this program element provides enabling capability to perform precision strikes against critical mobile and fixed targets, to provide exceptional all-weather air defense against advanced enemy missiles and aircraft in future warfighting scenarios, and to develop small, low cost, lightweight, high energy sources of power for communications, target acquisition, miniaturization displays and microclimate cooling for future soldier system. Under Tri-Service 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 and Air Force. Principle 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-fratricide/positive Identification-Friend-or-Foe (IFF) and global positioning systems. Work in this program element is consistent with the resource constrained Army Science and Technology Master Plan (ASTMP), Science and Technology Objectives (STOs) and the Army Modernization Plan. It supports all of the Science and Technology Thrust areas that employ electronic technology. Beginning in FY94, all Army electronic device work is combined in this PE.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project AH94 - Electronic and Electronic Devices. Efforts in this project are restructured from PE #0603742A, Project DF32.

(U) FY 1992 Accomplishments:

- (U) Demonstrated O&S cost reduction and flexible manufacturing through obsolete parts replacement using generalized emulation of microcircuits.
- (U) Built and tested world's first full-color thin-film electroluminescent display (6"x8"), one million pixels.
- (U) Completed two-megajoule pulser module for Electro-Thermal Chemical (ETC) gun applications.
- (U) Established fully automated Radio Frequency (RF) life cycle test facility for comparative evaluation of Microwave and Millimeter Wave Monolithic Integrated Circuits (MIMIC) controllers; demonstrated low-noise amplifiers to enable small diameter satellite antenna.

- (U) Delivered double-energy batteries to meet Soldier Integrated Protective Ensemble (SIPE) Advanced Technology Demonstration (ATD) requirements.

(U) FY 1993 Planned Program:

- (U) Fabricate and evaluate full color, high resolution flat panel displays for interactive video.
- (U) Deliver prototype direct digital synthesizer for Army and Air Force all digital radio.
- (U) Demonstrate Heterojunction Bipolar Transistor (HBT) with high gain and high efficiency.
- (U) Complete single tube jammer for Apache escort system.
- (U) Demonstrate advanced millimeter wave sensor for triggering reactive armor protection.
- (U) Demonstrate integration of microwave, analog, and digital design and simulation tools.
- (U) Demonstrate first Very High Speed Integrated Circuits (VHSIC) hardware description language-based synthesis system for automatic design and full documentation of digital integrated circuits from a high-level functional description.
- (U) Develop Microwave Hardware Description Language (MHDL) model library and demonstrate MHDL-based simulation and test automation tools.
- (U) Establish an approach for mixed microwave, analog and digital synthesis.

(U) FY 1994 Planned Program:

- (U) Investigate multi-mode active sensing devices for next generation precision strike weapons, develop optical waveguides, fiber optic links and optoelectronic components, and photonic devices for phased-array radars, Electronic Warfare (EW) jammers, countermeasures, and communications systems.
- (U) Develop simulation and synthesis technologies and a generic hardware description language to integrate microwave, analog, and digital computer aided design systems.
- (U) Develop 100x higher accuracy miniature atomic clock, ultra low-power smart compensated oscillators, and fabrication process for vibration resistant acoustic oscillators.
- (U) Develop technologies to provide high data rate information interfaces to future soldiers to address all senses including touch, sound, and wide band-width vision. Continue development of high resolution, full-color, flat panel displays for military aircraft, vehicle, and ground systems.

(U) Work Performed By: Work is performed primarily by U.S. Army Research Laboratory, Electronic and Power Source Directorate, Ft. Monmouth, NJ. 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.

(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 unecessary duplication of effort within the Army or DoD.

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

(U) International Cooperative Agreements: Not applicable.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602709A
PE Title: **Night Vision Technology**

Budget Activity: #1

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

Project Number / Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
DH95 Night Vision and Electro-Optic Technology	29917	33310	18941

B. (U) BRIEF DESCRIPTION OF ELEMENT: The key objectives of this program are to provide electro-optical technology and devices which 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/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 is required to meet stringent target acquisition and fire control requirements for upgrades to Army systems. In signal processing exploitation of automatic target acquisition capabilities afforded by integrating second generation FLIR technology with advanced image processing algorithms, emerging processing devices and 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 directed energy and individual soldier applications. For modeling and analysis, the development of performance models 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, low cost, electro-optic target acquisition systems. This program supports the Precision Strike, Advanced Land Combat, Air Superiority/Defense and Improved Acquisition Science and Technology Thrust areas. Flexible manufacturing technologies are also being investigated. The program addresses affordability of technology in support of OSD thrusts particularly in the areas of Focal Plane Arrays (FPA) and signal processors. Work in this program element is consistent with the resource constrained Army Science and Technology Master Plan (ASTMP), Science and Technology Objectives (STOS) and the Army Modernization Plan. 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; and across-the-board DoD adjustments to fund dual use technologies.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project DH95 - Night Vision and Electro-Optic Technology:

(U) FY 1992 Accomplishments:

- (U) Continued investigation of one kilowatt flashlamp pumped laser source
- (U) Initiated development of an aided target recognition (ATR) model
- (U) Initiated investigation of advanced image intensification components (microchannel plates, fiber optics etc.) for high resolution, wide field of view pilotage applications
- (U) Conducted initial evaluation of multi-sensor algorithms for aided target recognition applications

Program Element: #0602709A
PE Title: Night Vision Technology Budget Activity: #1

- (U) Continued high density image processor technology development for Automatic Target Cueing and Recognition Engine (ATCURE)

(U) FY 1993 Planned Program:
- (U) Implement program to establish a family of modular high performance, Standard Electronics Module - Version E (SEM-E) ATR components that are suitable for deployment on next generation/future systems as a joint Army/Air Force effort
- (U) Initiate the binary optics microstructure work for smart sensors
- (U) Continue investigation of advanced image intensification components in preparation for transition to the Advanced Pilot's Aid (APA) Advanced Technology Demonstration (ATD) in FY 1994
- (U) Complete miniaturization of ACTURE components and conduct evaluation/assessment for application to ATR
- (U) Initiate technology development for large staring Focal Plane Arrays (FPAs).

(U) FY 1994 Planned Program:
- (U) Continue SEM-E component technology development for family of high performance image processors
- (U) Continue binary optical microstructures technology development for smart sensors
- (U) Complete laser source technology development and transition to optical countermeasure program
- (U) Complete advanced image intensifier technology development and transition to the APA program
- (U) Initiate advanced optical structures technology development for future sensor suites
- (U) Initiate camouflage modeling and signature reduction efforts

(U) Work Performed By: Work primarily performed by the U.S. Army Communications-Electronics Command (CECOM) Night Vision and Electronic Sensors Directorate, Fort Belvoir, VA. Contractors include: Martin Marietta, Orlando, FL; Texas Instruments, Dallas, TX; Rockwell International, Anaheim, CA and Fibertek Inc., Herndon, VA; Environmental Research Institute of Michigan, Ann Harbor MI; Lawrence Livermore Laboratory, Livermore 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 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.

(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 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602716A
PE Title: **Human Factors Engineering Technology** Budget Activity: #1

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
AH70 Human Factors Engineering Systems Development	5491	10252	15163

B. (U) BRIEF DESCRIPTION OF ELEMENT: This project focuses on maximizing the effectiveness of the soldier in concert with his materiel, in order to survive and prevail on the battlefield. 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 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 FY 1994, this Program Element (PE) is restructured to reflect transfer of the Manpower, Personnel, Training, Health Hazards and Safety (MANPRINT) functions from PE #602785A and PE #603007A to this PE. In addition, the Human Factors Engineering in System Design portion of PE #603007A is transferred to this PE in FY 1994. The work in this program is consistent with the resource constrained Army Science and Technology Master Plan (ASTMP) and the Science and Technology Objectives (STOs) therein.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project AH70 - Human Factors Engineering Systems Development:

(U) FY 1992 Accomplishments:
- (U) Transitioned human factors engineering design guidelines for air defense command and control and weapon system components to user/materiel developer.
- (U) Completed task analyses of a four-man main battle tank and identified technology options for redistributing tasks to a two-man crew.

(U) FY 1993 Planned Program:
- (U) Develop an operational prototype of a knowledge-based decision support system for Corps level baseline and contingency supply distribution.
- (U) Demonstrate a global positioning system (GPS) fuze concept for artillery registration rounds to improve effectiveness.
- (U) Develop image resolution algorithms for Aided Target Recognition devices.

(U) FY 1994 Planned Program:
- (U) Develop and transition control, display and crewstation design guidelines for two-man crew in future fighting vehicles.
- (U) Develop and expand a human factors database on soldier perceptual and cognitive capabilities in the performance of target acquisition.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602716A
PE Title: **Human Factors Engineering Technology** Budget Activity: #1

- (U) Develop and integrate full-function element joints for use in "soldier mobility enhancement" related exoskeleton.
- (U) Develop data base for modeling kinematic features of the individual soldier.
- (U) Demonstrate a knowledge-based decision support system that enables interactive planning and scheduling for petroleum, oil and lubricants (POL) and ammunition planning problems typical of the size and complexity of Operation Desert Storm.

(U) **Work Performed By:** In-house work is primarily performed by the Army Research Laboratory, Human Research and Engineering Directorate, Aberdeen Proving Ground, MD. Contractors include: Analytics, Inc., Willow Grove, PA; Magnavox, Fort Wayne, IN; Honeywell, Inc., Minneapolis, MN; Carnegie Group, Pittsburgh, PA.

(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 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602720A
PE Title: **Environmental Quality Technology** Budget Activity: #1

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

Project Number / Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D048 Industrial Operations Pollution Control Technology	4177	8748	3442
A826 Unexploded Ordnance Removal	0	9455	0
A827 NEWTTEC Technology	0	9455	0
A829 NDCEE Technology	0	4727	4751
A830 Biodegradable Packaging Technology	5678	14560	0
A835 Military Medical Environmental Criteria	4467	4637	4338
A896 Base Facility Environmental Quality	5356	6428	4746
AF25 Military Environmental Restoration Technology	9809	4865	3952
PE TOTAL	29487	62875	21229

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 resource constrained Army Science and Technology Master Plan and the Science and Technology Objectives (STOs) therein.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project D048 - Industrial Operations Pollution Control Technology: This project provides control technology required to reduce operating costs resulting from generation of hazardous wastes and provides the capability to meet the required environmental discharge standards for current and future waste streams. The Army generates approximately 60,000 to 80,000 tons of hazardous waste a year. The costs of disposing of these wastes continue to escalate as regulatory restrictions on disposal continue to become more stringent.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602720A**
PE Title: **Environmental Quality Technology** Budget Activity: **#1**

New technology is essential to reduce the generation of hazardous waste in order to continue reduction of hazardous waste by 1992 and to avoid future hazardous waste problems disposal costs and liabilities to the Army. Also, this project has been designated by congressional language as being of special interest; therefore, a funding enhancement of $5,000,000 in FY93 occurs for plasma technology and pink water demonstration projects at U.S. Army Toxic and Hazardous Material Agency (now referred to as the U.S. Army Environmental Center).

(U) FY 1992 Accomplishments:
- (U) Completed bench testing of processes for treatment of trinitrotoluene (TNT) explosives production wastes
- (U) Initiate pilot tests to evalua easibility of metal recovery in electroplating process and rinse waters
- (U) Initiate testing and evaluation of non-hazardous parts cleaning and degreasing technologies
- (U) Completed evaluation of alternative technologies for control of nitrogen oxide emissions from munitions production
- (U) Completed procurement design criteria for use of waste explosives as a heating fuel
- (U) Completed evaluation of alternative technologies to eliminate open burning of waste explosives

(U) FY 1993 Planned Program:
- (U) Demonstrate technology for treating pink water and demonstrate plasma arc technology for contaminants of concern
- (U) Complete evaluation of single base propellant recycle in small round ammunition
- (U) Complete bench evaluation of advanced treatment for dinitrotolvene (DNT) abatement and transfer protocol for field demonstration
- (U) Transfer operational protocol required for redwater to the Army Environmental Center for treatment of redwater by wet air oxidation
- (U) Complete plasma arc bench scale applicability testing on selected heavy metal hazardous wastes

(U) FY 1994 Planned Program:
- (U) Technical guide for nitrocellulose fines separation
- (U) Size reduction guidance for energetics as an alternative to open burning/open detonation
- (U) Develop paint stripper formulation for conventional paints

(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 establish a national research and development center for advancing the state-of-the-art in unexploded ordnance remediation at Jefferson Proving Ground.

(U) FY 1992 Accomplishments: No funds were appropriated in FY 1992

(U) FY 1993 Planned Program:
- (U) Establish a center for research, development, test and evaluation of technology to detect and remove unexploded ordnance

(U) FY 1994 Planned Program: No funds have been requested for FY 1994

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602720A
PE Title: **Environmental Quality Technology** Budget Activity: #1

(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 1992 Accomplishments: No funds were appropriated in FY 1992

(U) FY 1993 Planned Program:
- (U) Develop and use new technologies designed to expedite the remediation and cleanup of residual waste

(U) FY 1994 Planned Program: No funds have been requested for FY 1994

(U) Project A829 - National Defense Center for Environmental Excellence (NDCEE) Technology: This Congressionally mandated project is managed by the Army in behalf of the Office of the Deputy Assistant Secretary of Defense for the Environment (DASD(E)). 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 principal 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. Funded under PE/Project #0708045/DE99 in FY 1992.

(U) FY 1992 Accomplishments:
- (U) Staffed Center with multi-disciplinary environmental technology team
- (U) Completed Draft Five Year Business Plan
- (U) 70% completion of Environmental Technology Facility
- (U) Completed High Priority Environmental Impact Report
- (U) Completed Supporting Candidate Organizations Report
- (U) Completed Draft Environmental Assessment of Facility
- (U) Initiated work on DoD support tasks: Tooele Army Depot Support - EA (Economic Analysis) For Painting System; Corpus Christi Army Depot - EA for Paint Stripping System; Participation in Navy Comprehensive Approach to Pollution Prevention Program; Oklahoma City Air Logistics Center, Tinker Air Force Base Support - Unicoat Top Coat, Alternative Conversion Coating Process, and Pollution Prevention Plan

(U) FY 1993 Planned Program:
- (U) Complete the Environmental Technology Facility
- (U) Organize Senior Advisory Board
- (U) Organize Executive Advisory board
- (U) Establish a Liquid Carbon Dioxide Pilot Plant to assess the feasibility of reducing sulfur dioxide emissions in coal fired boilers
- (U) Develop an Advanced Plastic Sortation Demonstration at DoD installations
- (U) Develop a demonstration of a Medical Waste Tracking System
- (U) Initiate a Risk Assessment Program to examine dangers from defense manufacturing

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602720A
PE Title: **Environmental Quality Technology** Budget Activity: #1

(U) **FY 1994 Planned Program:**

- (U) Design & Procure Prototype for Non-Halogenated Metal Parts Cleaning System
- (U) Design & Procure Prototype for Zero Discharge Powder Coatings
- (U) Design & Procure Prototype for High Velocity Oxygen Fuel Spray Coatings
- (U) Design & Procure Prototype for Electrodeposited Paint Coatings
- (U) Design & Procure Prototype for Ion Beam Surface Processing
- (U) Determine baseline/assess processes/develop test protocols for Automated Ultra-High Pressure Waterjet System Workcell
- (U) Determine baseline/assess processes/develop test protocols for Portable Industrial-Scale Waste Oil Demetallation Unit
- (U) Determine baseline/assess processes/develop test protocols for Waste Minimization in Paint Handling and Spraying Equipment
- (U) Determine baseline/assess processes/develop test protocols for Replacement of Electroless Copper with a Direct Plating System for Manufacture of Multi-Sided and Multi-Layered Printed Circuit Boards
- (U) Determine baseline/assess processes/develop test protocols for Conversion of Waste Tires to Engineering Materials
- (U) Determine baseline/assess processes for Solvent Reduction Cleaning System
- (U) Determine baseline/assess processes for Automatic System for in-line Quantitative Analysis of Processing Fluids
- (U) Determine baseline/assess processes for Advanced Conductive Adhesives
- (U) Determine baseline/assess processes for Environmental Analysis of Powdercoating
- (U) Determine baseline/assess processes for Evaluation of Flourine Plasma Systems for Pre-Cleaning
- (U) Determine baseline/assess processes for Laser Assembly of Electronic Components
- (U) Determine baseline/assess processes for Biodegradation of Nitrate Esters in Wastewater and Soil

(U) **Project A830 - Biodegradable Packaging Technology:** This project is a joint DoD, Deptartment of Agriculture and industry program to commercialize biodegradable polymers for packaging applications. This program addresses starch-based technology 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.

(U) **FY 1992 Accomplishments:**

- (U) Conducted shipboard tests of an Meal-Ready-to-Eat (MRE) biodegradable spoon made from blended starches
- (U) Demonstrated no adverse impact of starch blends on fish larvae or plankton
- (U) Developed a first generation biodegradable film
- (U) Submitted a patent application for a biodegradable blown film and signed a Cooperative Research and Development Agreement with Warner-Lambert Co

(U) **FY 1993 Planned Program:**

- (U) Develop new starch-based and non starch-based blends of biodegradable materials to improve the properties of films

Program Element: **#0602720A**
PE Title: **Environmental Quality Technology** Budget Activity: **#1**

- (U) Develop high-strength fibers, special-purpose films/coatings, bioceramics, biosensors, and bioengineered elastomers and fuels/lubricants - all from renewable resources
- (U) Establish links to industry, government, and academic organizations to coordinate planning and management of programs in Advanced Materials from Renewable Resources
- (U) Establish consumer acceptance of biodegradable products

(U) FY 1994 Planned Program: Not Applicable

(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 thru 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 1992 Accomplishments:
- (U) Completed development of non-mammalian carcinogenicity model
- (U) Completed development of risk/endangerment assessment model
- (U) Completed validation of mobile biomonitoring facility
- (U) Completed ecological assessment of inventory smokes and obscurants

(U) FY 1993 Planned Program:
- (U) Complete development of developmental toxicity model
- (U) Complete health advisories and criteria for inventory munitions
- (U) Complete evaluation of hazard of replacement paint strippers
- (U) Complete environmental fate of smokes and obscurants

(U) FY 1994 Planned Program:
- (U) Complete development of acute aquatic toxicity screening tests and non-mammalian carcinogenicity model for soils and groundwater
- (U) Complete development of exposure biomarker model
- (U) Complete validation of acute toxicity screening tests, aquatic microcosm and carcinogenicity model
- (U) Complete evaluation of hazard of TNT production wastewater ("redwater")
- (U) Complete health advisories and criteria documents for smokes and obscurants
- (U) Complete evaluation of composting as a treatment technology for contaminated soils

(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 areas while conserving natural resources, including threatened and endangered species, and cultural resources. Efforts under this project will also enable the Army to comply with the myriad of Federal, state and host country environmental regulations dealing with water and wastewater, air emissions, solid wastes, and noise.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602720A
PE Title: **Environmental Quality Technology** Budget Activity: #1

(U) **FY 1992 Accomplishments:**
- (U) Developed design criteria for sound-absorbing structures
- (U) Provided guidelines for cost effective pollution control facilities for Army aircraft maintenance
- (U) Developed guidelines to evaluate training land to maximize training opportunities
- (U) Provided guidelines for facility compliance with Safe Drinking Water Act

(U) **FY 1993 Planned Program:**
- (U) Initiate criteria and procedures for training land design
- (U) Provide standardized data base analysis procedures for analysis of training land condition
- (U) Develop DOD noise assessment model providing a uniform basis for noise assessment
- (U) Provide real-time, weather-based sound propagation models of blast noise propagation
- (U) Initiate waste conversion program for solid waste minimization

(U) **FY 1994 Planned Program:**
- (U) Provide capabilities to remove volatile organic contaminants from air streams
- (U) Complete guidance for storm water management on Army installations
- (U) Complete upgrade and Geographic Resource Analysis Support System (GRASS) integration of Economic Impact Forecast System
- (U) Develop guidelines for integrating the Land Condition Trend Analysis System with the Geographic Resources Analysis Support System
- (U) Complete the international methods for long-term blast noise prediction

(U) **Project AF25 - Military Environmental Restoration Technology:** This project area provides the technology to reduce the cost of cleanup of DoD hazardous waste sites, especially those installations on the Environmental Protection Agency National Priority List. The thrust of this effort is to protect human health and the environmental both on and off post. Treatment systems capable of cost effective decontaminating soil and groundwater contaminated from past explosives production and waste disposal practices will be developed. Innovative, cost effective hazardous waste site identification assessment, characterization and monitoring technologies will also be developed.

(U) **FY 1992 Accomplishments:**
- (U) Provided analytical requirements for nitroaromatic degradation products
- (U) Developed concepts for design of fiber optic infrared instruments for the detection of organic contaminants in soil with the Site Characterization and Analysis Penetrometer System (SCAPS)
- (U) Provided specifications and design documentation for SCAPS equipment and instruments
- (U) Developed conceptual prototype hot gas soil samplers for the in situ purging and collection of volatile organic contaminants for soils
- (U) Provided bench scale assessment of photolytic/chemical oxidation of explosives in contaminated groundwater

(U) **FY 1993 Planned Program:**
- (U) Investigate physical fractionation of heavy metal contaminated soils
- (U) Complete protocol for laboratory evaluation of composting for treatment of explosives contaminated soils
- (U) Develop fiber optic IR sensor systems for use in detecting hazardous wastes with the SCAPS

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602720A
PE Title: **Environmental Quality Technology** Budget Activity: #1

- (U) Develop prototype hot gas purging sampler for collecting and extracting water samples for contaminant analysis

(U) FY 1994 Planned Program:
- (U) Develop self-contained field unit SCAPS equipped with state-of-the-art contaminant sensors
- (U) Develop analytical techniques for fate and transport of explosives
- (U) Develop specialized volatile organics sampler
- (U) Develop technical data package describing sorption limitations on bioremediation and methods for enhanced removal of explosives from soils
- (U) Develop bioslurry design criteria

(U) Work Performed By:
D048: The primary in-house developing agency is the U.S. Army Construction Engineering Research Laboratories, Champaign, IL.
A829: Concurrent Technologies Corporation, Johnstown, PA. The primary in-house development agency is the U.S. Army Armament Munitions & Chemical Command (Armament Research, Development & Engineering Center/Production Base Modernization Activity).
A830: The primary in-house developing agency is the U. S. Army Natick Research, Development and Engineering Center, Natick, MA. Contractors include: Toxicon Corp., Woburn, MA; Science Applications International Corporation, Narragansett. RI; Woods Hole Oceanographic Institute, Woods Hole, MA; University of Hawaii, Honolulu, HI; M [illegible], 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 in-house 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 in-house developing agency is the U.S. Army Construction Engineering Research Laboratories, Champaign, IL.
AF25: Contractors include: Cornell University, Ithaca, New York; Clark College, Atlanta, Georgia; Mississippi State University, State College, Mississippi; and A.D. Little Company, Cambridge, Mass. The Primary in-house developing agency is the U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi.

(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.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602720A**
PE Title: **Environmental Quality Technology** Budget Activity: **#1**

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

(U) **International Cooperative Agreements:** Not applicable.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602727A
PE Title: Non-System Training Device Technology
Budget Activity: #1

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
A230 Non-System Training Devices	3889	8021	4413

B. (U) BRIEF DESCRIPTION OF ELEMENT: 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 the Science and Technology Objectives (STOs) therein and supports the DOD Science and Technology (S&T) Thrust 6, Synthetic Environments.

C. (U) JUSTIFICATION FOR PROJECT:

(U) Project A230 - Non-System Training Devices

(U) FY 1992 Accomplishments:
- (U) Completed Shoot Through Obscuration Miles Integrated Laser Engagement Simulation System (MILES) (STOM) field testing and analysis
- (U) Provided enhanced capability for role player assist/transition to NTC
- (U) Initiated BDS-D Advanced Technology Demonstration (ATD) FY1992-1994
- (U) Continued Version 2 of Distributed Interactive Simulation (DIS) protocols and standards
- (U) Demonstrated Semi-Automated Forces Dismounted Infantry (SAFOR DI) for network simulators
- (U) Continued research in human behavior representation for computer generated forces
- (U) Completed linkage of PATRIOT Operator Tactics Trainer (OTT) with SIMNET DIS 1.0; supported OSD Critical Mobile Targets (CMT) demonstration

(U) FY 1993 Planned Program:
- (U) Continue establishment and evaluation of DIS networking standards
- (U) Continue dynamic terrain research
- (U) Initiate data compression technology for long haul networking in BDS-D
- (U) Complete bade element simulation in reusable software
- (U) Increase dynamic battlefield representation through architecture definition for SAFOR

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602727A
PE Title: **Non-System Training Device Technology** Budget Activity: #1

(U) FY 1994 Planned Program:

- (U) Support Battlefield Distributed Simulation-Developmental (BDS-D) Advanced Technology Demonstration (ATD)
- (U) Complete verification, validation, and accreditation of Distributed Interactive Simulation (DIS) models
- (U) Conduct research to identify modular elements for development and assessment of embedded training, behavioral research, and artificial intelligence instructional features

(U) Work Performed By: Contractors include: Loral Western Development Laboratories, San Jose, CA; The Analytical Science Corporation, Reading, MA; Honeywell, Minneapolis, MN; Pathfinder, Littleton, CO; University of Central Florida, Institute for Simulation and Training, Orlando, FL; Georgia Tech Research Institute, Atlanta, GA; EOIR Measurements, Inc., Fredericksburg, VA; Keweenaw Research Center, Hampton, MI; General Electric Co., Morristown, NJ; Lockheed Missiles and Space Co., Austin, TX. Work is primarily in-house: Simulation, Training and Instrumentation Command (STRICOM), Orlando, FL; Army Research Institute (ARI), VA.

(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 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602782A
PE Title: **Command, Control and Communications (C3) Technology** Budget Activity: #1

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
AH92	Communications Technology		
	11447	11079	10376
AH93	Combat Surveillance and Target Acquisition Technology		
	6771	6002	0
PE TOTAL	18218	17081	10376

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program contains three related projects: exploratory development of advanced communications technology, science and technology for advanced radar sensors and signal processing, and advanced surveillance 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, a capability best provided by responsive earth satellite systems. This program initially provides for development and demonstration of lightweight military satellite system concepts in extremely high frequency (EHF) communications. The systems include communications payloads, satellite and bus structures, mobile ground terminals, launch concepts, and command and control (C2), all organically responsive to the field commander. Flexible manufacturing technologies are also being investigated. The program makes maximum use of leveraged technologies available from the Strategic Defense Initiatives (SDI) Program; the Advanced Research Projects Agency (ARPA) Light Satellite Program; and communications, reconnaissance surveillance, and target acquisition (RSTA), launch, and C2 activities of the Services. It supports the Science and Technology Thrust in Global Surveillance and Precision Strike. Work in this program element is consistent with the resource constrained Army Science and Technology Master Plan (ASTMP), Science and Technology Objectives (STOS) and the Army Modernization Plan. The technology program in Project AH93 will be transferred to PE #0602120A Project AH16 in FY 1994 as a part of the restructuring for the newly formed 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 Equipment (MSE) Applications; Frequency Management; a family of 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. The 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 1992 Accomplishments:

- (U) Demonstrated Phase I expert system network frequency planning
- (U) Designed baseline tactical multinet gateway and multinet network simulation
- (U) Characterized narrow band packet protocols and established laboratory network

Program Element: **#0602782A**
PE Title: **Command, Control and Communications (C3) Technology** Budget Activity: **#1**

- (U) Fabricated and tested preliminary exploratory development models (PEDM) Mini Fiber Optic Transmitter/Receiver (FOT/R) for local area network (LAN) and integrated hardware into Tactical Local Area Network (TACLAN) testbed
- (U) Started development of optical transceiver as D-shaped optical fiber for applications in signal processing and LANs

(U) FY 1993 Planned Program:
- (U) Start digital radio breadboard and explore interchange module development
- (U) Implement tactical multinet gateway
- (U) Begin integration of narrow band packet with non-developmental item hardware base
- (U) Start assessment to identify tactical vehicles for use with conformal antennas

(U) FY 1994 Planned Program:
- (U) Demonstrate tactical multinet gateway
- (U) Complete technical assessment and identify specific conformal antenna targeted for candidate vehicles
- (U) Complete and test Digital Radio breadboard
- (U) Start development of capability for automated network utilization and reconfiguration
- (U) Design and fabricate PEDM integrated photonic and opto-electronic devices for use in fiber optic transmitters and receivers
- (U) Demonstrate Phase II expert system for integrated network frequency planning

(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 program focuses on (1) the technical radar and signal processing tasks associated with extracting stationary and slow moving targets and low, slow flying aircraft from the intense ground clutter environment, and (2) the advanced optical processing techniques to automatically, process at the sensor or near data to target information which is at a low enough bandwidth to be compatible with Army communications systems. All weather, wide area radar technology thrust areas include: (1) detection, location and recognition of low cross section moving and stationary targets in heavy clutter, and (2) detection, location and recognition of stationary targets employing concealment, camouflage, and deception. In thrust areas (1) and (2) Microwave and millimeter wave real aperture radar (RAR), ultra wide bandwidth (UWB) synthetic aperture (SAR) technologies will be in investigated, respectively. Optical Processing technology thrust areas include: (1) High throughput, lightweight optical processors to support advanced target identification algorithms (2) Model Based and Neural Network Approaches to radar automatic target recognition using optical processors. (3) Development of techniques for processing wideband radar signals. The technology program in this project will be transferred to PE #0602120A, Project AH16 in FY 1994 as a part of the restructuring for the newly formed Army Research Laboratory.

(U) FY 1992 Accomplishments:
- (U) Completed summer measurements of UWB propagation defects through foliage
- (U) Completed refinements of UWB interference rejection algorithms
- (U) Completed breadboard design of wide bandwidth microwave receiver/exciter
- (U) Began RAR moving ground target signature collection
- (U) Established devices and designs for multidimensional optical processing structures

Program Element: #0602782A
PE Title: **Command, Control and Communications (C3) Technology** Budget Activity: #1

- (U) Designed two-dimensional range-doppler optical processor for incorporation in the U.S. Army Missile Command (MICOM) "Quiet Radar"
- (U) Completed first iteration breadboard of Automatic Target Recognition (ATR) optical processor for testing template matching algorithms for sensor systems

(U) FY 1993 Planned Program:

- (U) Measure fall and winter UWB propagation defects through foliage
- (U) Measure calibrated and tactical stationary target responses to UWB waveform
- (U) Continue refinement of UWB detection and recognition algorithms
- (U) Measure and characterize RAR ultra high range resolution (UHRR) signatures of moving tactical ground targets in heavy clutter
- (U) Refine clutter rejection algorithms for RARs such as Longbow
- (U) Demonstrate laboratory breadboard range-doppler optical processor with signals from MICOM "Quiet Radar"
- (U) Develop wide bandwidth optical processor for real-time SAR image formation
- (U) Incorporate additional algorithms into ATR optical testbed to evaluate performance and permit operation with SAR imagery

(U) FY 1994 Planned Program: Not applicable

(U) Work Performed By: For Project AH92, contractors include: ITT Corp., Fort Wayne, IN; Hanis Corp., Rochester, NY; Canadian Marconi Corp., Montreal, Canada; Motorola Corp., Scottsdale, AZ; Xetron, Cincinnati, OH; and AT&T, Greensboro, NC. The primary in-house developing agencies are: Center for Command, Control and Communications Systems, U.S. Army Communications-Electronics Command (CECOM), Ft. Monmouth, NJ; DoD Electromagnetic Compatibility Analysis Center, Annapolis, MD; Rome Air Development Center, Rome, NY; Department of Energy, San Francisco, CA; Jet Propulsion Laboratory, Pasadena, CA; and Advanced Research Projects Agency. For Project AH93 in-house work is to be performed by U.S. Army Research Laboratory, Adelphi, MD; Electronic Technology & Devices Lab, Ft. Monmouth, NJ; Lincoln Laboratory, Lexington, MA; Defense Advanced Research Projects Agency (DARPA); U.S. Army Missile Command, Research Development and Engineering Center, Huntsville, AL; and CECOM Center for Electronic Warfare/Reconnaissance, Surveillance and Target Acquisition (EW/RSTA), Fort Monmouth, NJ. Contractors include: Eaton Corp., AIL Division, Melville, NY; Emerson Electric Corp., St. Louis, MO; Loral/Fairchild Systems, Milpotus, CA; University of Ohio, Columbus, OH; ERIM, Ann Arbor, MI; BDM Corp., McLean, VA; IITRI, Dayton, OH; ITT Corporation, Easton, PA; and Seattle Silicon, Seattle, WA.

(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.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602782A**
PE Title: **Command, Control and Communications (C3) Technology**

Budget Activity: **#1**

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

(U) International Cooperative Agreements: Not applicable.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602783A
PE Title: **Computer and Software Technology** Budget Activity: #1

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
A094 Tactical Software Technology	2137	2938	2401
DY10 Computer and Information Science and Technology	3145	0*	3342
PE TOTAL	5282	2938	5743

* FY 93 resources (manpower and funding) for project DY10 were transfered from the Army to the Defense Information Agency (DISA). Resources were returned to the Army in FY 1994.

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 the domain of tactical command, control, and information distribution for situational awareness (combat identification) 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 resource constrained Army Science & Technology Master Plan (ASTMP), Science and Technology Objectives (STOs) and the Army Modernization Plan.

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 computer (hardware) performance that is becoming equally available to both the scientific and tactical community. The ·ast gap in computational performance and capabilities that used to exist between computer systems ir ·se two domains is rapidly diminish·ng. Computer power previously available only to scientists and ·gineers is now becoming routinely available to the warrior and new concepts for one domain will be appli··ble 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 situational awareness challenge. 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. 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 1992 Accomplishments:

- (U) Assisted Program Manager (PM)/Program Executive Officers (PEO) in implementing the U.S. Army Communications-Electronics Command's (CECOM) Alternative Documentations and Review Practices
- (U) Developed Software Metrics Practices and Procedures Manual and Guidebook
- (U) Demonstrated Ada/Portable Operating System Interface for Computer Applications (POSIX) interface compatibility for real-time applications
- (U) Demonstrated reengineering techniques and tools on the Man Machine interface module of North Atlantic Treaty Organization (NATO) Airbase Satellite Communications (NABS)/SKYNET
- (U) Completed prototype Automated Reusable Component System (InQuisix)

(U) FY 1993 Planned Program:

- (U) Demonstrate InQuisix in the Common Architecture Support Environment
- (U) Provide Requirements Driven Evolutionary Acquisition Guidebook
- (U) Demonstrate as part of the Software Technology for Adaptable Reliable Systems (STARS) Demonstrations Project the advantages of a process driven, reuse based, tool supported development/maintenance environment on Improved Guardrail V (IGRV)
- (U) Complete Domain Analysis and develop improved IGRV domain specific software architecture
- (U) Provide an approach for using POSIX threads and Ada tasks for real-time software
- (U) Develop & implement automated analysis techniques to collect real-time network data and expedite data reduction for determining thresholds
- (U) Develop & demonstrate adaptive networking techniques that vary information requirements dynamic available bandwidth
- (U) Port, modify, and implement existing application programs to X-Window environments compatible with current Army hardware (for technology transfer purposes)
- (U) Survey & obtain the most appropriate network simulation tool(s), install on available computers, configure to match past tactical network performance experiment, and statistically validate results
- (U) Performed evaluation of three candidate massive parallel processing (MPP) computer architectures for Army weapon systems modeling codes

(U) FY 1994 Planned Program:

- (U) Design & implement automated network congestion control via dynamic information thresholds
- (U) Develop and implement robust recovery techniques for application with automated information distribution software
- (U) Demonstrate machine oriented storage, manipulation, and automatic distribution of planning (e.g., operations order) information in concert with related Army C2 research (e.g., CECOM)

Program Element: #0602783A
PE Title: **Computer and Software Technology** Budget Activity: #1

- (U) Use simulation tool(s) in adaptive tactical information distribution (ATID) development to determine low-level network parameters and to help determine generic protocol parameters
- (U) Devise metrics to compare thick composite manufacturing processes -- conventional versus virtual factory
- (U) Establish distributed computing environment for physical modeling of selected Army weapons systems application areas
- (U) Participate as Advanced Research Projects Agency's (ARPA) agent in their Domain Specific Software Architecture Program and apply architecture to the command and control domain
- (U) Continue executing the STARS Software Process Technology Demonstration Project on Improved Guardrail V
- (U) Transition Ada 9X and expedite its use in real-time applications
- (U) Validate Integrated Software Metrics Practices and Procedures Guidebook and expedite the use of Software Metrics

(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 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.

(U) FY 1992 Accomplishments:
- (U) Completed software reengineering research project as a proof-of-principle -- resulted in $3M cost savings
- (U) Formulated a methodology to assess software reliability using mathematical classification trees and tools
- (U) Completed review of software testing practices and software quality for the Director of Defense Information (DDI)
- (U) Initiated task to develop tools and techniques to aid in developing and evaluating open systems environments and the transition to open systems
- (U) Developed prototype to enable users and software developers to transparently access data (and integrate schemas) in a distributed heterogeneous environment

(U) FY 1993 Planned Program: Not applicable

(U) FY 1994 Planned Program:
- (U) Expand software transition decision models to include communication and data decisions

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602783A
PE Title: **Computer and Software Technology** Budget Activity: #1

- (U) Implement an open systems distributed system that will incorporate data management tool sets in conjunction with a repository management system to define, store, and manage the enterprise's information resources
- (U) Expand the capabilities of the integrated services digital network (ISDN) applications research testbed to include broadband ISDN via proof-of-principle experiments
- (U) Implement a metrics paradigm into DoD information engineering efforts

(U) **Work Performed By:** In-house work is 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), George Tech, Atlanta, GA); and the CECOM Research, Development & Engineering Center (CRDEC), Software Engineering Directorate, Fort Monmouth, NJ. Major contractors are Georgia Institute of Technology; Syracuse University; Morris Brown College; Purdue University; Clark Atlanta University; University of Arizona; University of Florida; Honeywell Federal Systems; Analytical Software Inc.; Science Applications International Corporation; American Management systems Inc.; Innovative Research Inc.; Delta Information systems; Artificial Intelligence Atlanta Inc.; Statistica Inc; Software Producibility Systems, Melbourne, FL; Lab Tek, Woodbridge, CT; ILEX, Shrewsbury, NJ; Paramax, Reston, VA.

(U) **Related Activities:** This program adheres to Tri-Service Reliance Agreements on Software with oversight provided by the Joint Directors of Laboratories. Work in this Program Element is related to and fully coordinated with efforts in PE #0603805A (Combat Service Support Control System Evaluation & Analysis), PE #0603006A (Command, Control & Communications Advanced Technology), PE #0603756D, PE #0303152A, PE #0602234N, PE #0601153N, PE #0604574N, #0602204F, #0602702F, #0603728F, and #0603756E. There is no unnecessary duplication of effort within the Army or DoD. Information distribution research covered by AO94 has received endorsement from JCS-J6 C4I for the Warrior; MOA pending.

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

(U) **International Cooperative Agreements:** Not applicable

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602784A
PE Title: **Military Engineering Technology** Budget Activity: #1

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
A855 Topography, Image Intelligence and Space Technology	11224	9361	9439
AH71 Atmospheric Investigations	5008	5895	4978
AT40 Mobility & Weapons Effects Technology	13805	10396	11452
AT41 Military Facilities Engineering Technology	5962	6341	5930
AT42 Cold Regions Engineering Technology	5587	5565	6584
AT45 Energy Technology Applied to Military Facilities	2891	2993	2800
PE TOTAL	44478	40551	41183

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. In addition, a portion of the program is directed towards developing technology for echelons-above-corps and Army-in-garrison activities to vastly improve the efficiency of facility acquisition and operations (design, construction, operation and maintenance) thereby providing significant cost savings and improving military personnel productivity through better quality of life. The work in this program element is consistent with DoD Science and Technology Thrust Area for Precision Strike, the resource constrained Army Science and Technology Master Plan and the Science and Technology Objectives (STOs) therein.

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 (three dimensional) 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 (e.g., tank ditches), and integrating the impacts of the battlefield environment (e.g., rain, snow, dust, etc) 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 (C 2), 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. Information required on weather and atmospheric effects is provided by the Atmospheric Sciences Laboratory under Project AH71.

(U) FY 1992 Accomplishments:
- (U) Demonstrated non-real time terrain visualization on tactical systems including the Digital Topographic Support System (DTSS), All Source Analysis System (ASAS) and the Army Command and Control System (ACCS) Common Hardware and Software (CHS)
- (U) Demonstrated the capability to generate custom terrain data bases with the Terrain Information Extraction System (TIES)
- (U) Provided visualization and simulation support to the Precision Strike Advanced Technology Demonstration (ATD) First Light Demonstration made available in part through participation in 73 Easting
- (U) Initiated program to provide visualization and topographic support to the Battlefield Distributed Simulation-Developmental (BDS-D) and the Close Combat Tactical Trainer (CCTT) programs

(U) FY 1993 Planned Program:
- (U) Initiate development of a virtual reality test bed
- (U) Initiate development of basic integrated capability for visual/infrared (IR) scene generation in support of Smart Weapons Operability Enhancement/Joint Test and Evaluation (SWOE/JT&E)
- (U) Complete TIES evaluation and transfer technology to Digital Topographic Support System (DTSS) preplanned product improvement (P3I)
- (U) Complete preliminary terrain-based mission planning capability

(U) FY 1994 Planned Program:
- (U) Develop and demo capability for update and rendering of dynamic terrain and dynamic environmental effects, obscurants etc. for distributed interactive simulations
- (U) Demonstrate integrated three-dimensional terrain based mission planning capabilities
- (U) Demonstrate advanced portable terrain analysis system with improved products and Global Positioning System (GPS) capability
- (U) Develop concept demonstration model of personal navigation and reporting capability

(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, improve war game realism and tactics and improve intelligence preparation of the battlefield. Develop weather decision aids for the commander by applying advanced computer techniques; incorporate new technology in meteorological sensor design; develop data fusion techniques to utilize data from advanced sensors in decision aids to enhance combat power on the battlefield.

(U) FY 1992 Accomplishments:
- (U) Investigated and verified Acoustic Turbulence Similarity Model with Non-Imaging System (NIS) Phase I test
- (U) Distributed Electro-Optical Systems Atmospheric Effects Library (EOSAEL) 92 with new and improved models of battlefield atmospherics

Program Element: #0602784A
PE Title: **Military Engineering Technology** Budget Activity: #1

- (U) Incorporated complex terrain influenced wind model into four-dimensional fusion module
- (U) Developed precipitation area and rate estimation using data from meteorological satellites
- (U) Integrated direct reception of the Defense Meteorological Satellite Program downlink into weather base station
- (U) Conducted sensitivity studies of outcomes to environmental conditions
- (U) Performed initial integration of distributed database into additional battlefield systems, including the Maneuver Control System (MCS) and Air Defense system

(U) FY 1993 Planned Program:

- (U) Conduct initial "live exercise" field tests of acoustic propagation Tactical Decision Aids (TDAs) and use feedback to improve TDAs
- (U) Develop a set of enhanced meteorological satellite imagery products from various wavelength bands
- (U) Integrate imagery and gridded weather data products into distributed architecture
- (U) Develop isentropic model to advect upper atmospheric wind, temperature, and pressure fields between Meterological Satellite (METSAT) passes
- (U) Field Test Mobile Profiler System

(U) FY 1994 Planned Program:

- (U) Perform Technology Demonstration for Mobile Profiler/Computer Assisted Artillery Meteorology
- (U) Transition meoscale meteorological model with 12 hour forecast capability for Integrated Meteorological System Block 2
- (U) Incorporate effects of target and scene shadows on target acquisition into a Target Acquisition (TARGAC) model
- (U) Transition Computer Assisted Artillery Meteorology software and documentation to Program Manager, Electronic Warfare/Reconnaissance Surveillance and Target Acquisition (PM, EW/RSTA)
- (U) Transition Meteorological Profiler System configuration documentation to the U.S. Army Communications-Electronics Research, Development and Engineering Center (CERDEC)
- (U) Prepare initial time and space variability analysis using data collected by the Mobile Profiler System

(U) Project AT40 - Mobility and Weapons Effects Technology: This project will provide DOD 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 terrain/environmental effects on weapons; techniques for rapid barrier creation; accurate assessments of environmental and terrain influences on mobility for maneuver commanders (and materiel developers during virtual prototyping); location of subsurface water in arid regions of the world during contingency operations; 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 S&T in this project directly supports the Army's DOD Project Reliance in-house S&T responsibilities in Airfields & Pavements, Survivability & Protective Structures, and Sustainment Engineering.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602784A
PE Title: **Military Engineering Technology** Budget Activity: #1

(U) FY 1992 Accomplishments:
- (U) Developed personal computer-based computer code and user's guide for prediction/analysis of free-field ground shock environments produced by buried conventional bombs
- (U) Developed capability to predict the vulnerability of protective structures to indirect fire
- (U) Developed concepts to protect masonry walls from a wide spectrum of terrorist weapons
- (U) Developed capability for tactical battlefield mobility analysis which was integrated into the Army Command and Control System (ACCS)
- (U) Provided dust control criteria for desert soils

(U) FY 1993 Planned Program:
- (U) Develop personal computer (PC)-based structural analysis computer code and user's guide for predicting in-structure shock for buried multi-story/multi-bay structures
- (U) Develop automated camouflage, concealment, and deception design capability for protection of fixed facilities from threats using visual and thermal infrared sensors
- (U) Develop dust control criteria that will reduce equipment, manpower and logistic requirements by 30 percent
- (U) Conduct Field test with Logistics-Over-The-Shore throughput simulation model

(U) FY 1994 Planned Program:
- (U) Design criteria for chapter on projectile penetration for Army Technical Manual 5-855-1 for antipenetration shield systems to defeat advanced design projectiles
- (U) Develop high efficiency standoff assault breaching techniques
- (U) Validate concepts for protection of division/brigade operations centers
- (U) Demonstrate Convoy Operations System Assessment Model

(U) Project AT41 - Military Facilities Engineering Technology: The research in this project is focused on developing improved technologies for the planning, programming, design, construction, infrastructure renewal, operation and maintenance of facilities which are essential to the training and readiness missions of the Army. Advanced materials, ceramics, mechanics, systems theory, artificial intelligence, robotics, management and microelectronics technologies are developed for application to all phases of the facility life cycle. Product development emphasizes satisfying Army facility needs with targets to maintain operations and services costs at the 1990 level through the year 2000 and maintain facility acquisition costs at the 1990 level through the year 2000.

(U) FY 1992 Accomplishments:
- (U) Provided cost effective techniques for rehabilitation of pipe lines
- (U) Developed Electromagnetic Pulse (EMP) shielding criteria for ferromagnetic materials
- (U) Provided improved technologies for the management of installation real property
- (U) Provided decision tools to optimize applications of innovative building technologies
- (U) Developed installation level engineered management system plan

(U) FY 1993 Planned Program:
- (U) Provide quality assurance techniques to be used in conjunction with automated construction
- (U) Develop knowledge-based system for automated generation of construction schedules
- (U) Complete automated railroad track inspection system
- (U) Complete earthquake criteria for design of base isolation system for buildings

- (U) Provide engineered management system component for uniform building inspection and assessment

(U) FY 1994 Planned Program:
- (U) Complete computer training module/support environment for concurrent engineering
- (U) Develop use of hypermedia information access for facilities master planning
- (U) Complete standard condition indices for Engineered Management System (EMS)
- (U) Complete design criteria for strengthening and repair of masonry construction

(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 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 1992 Accomplishments:
- (U) Initiated development of concrete masonry coatings for repair of water vapor damaged facilities in cold climates
- (U) Completed field validation of snow shock-wave attenuation to expand the range of mine neutralization capabilities
- (U) Measured dynamic millimeter wave dielectric properties in soils and snow to enhance sensor and weapons systems performance

(U) FY 1993 Planned Program:
- (U) Develop environmental design criteria for smart weapons performance in winter
- (U) Develop frost shielding methods for buried utilities
- (U) Complete tests on pavements constructed of low cost stabilized materials
- (U) Define criteria for environmental/perimeter security sensor integration for unmanned automated sites

(U) FY 1994 Planned Program:
- (U) Develop analytic design model for pavements and foundations that accounts for changes in state of materials subject to freeze/thaw cycles
- (U) Develop algorithms for predicting mobility on thawing soil
- (U) Develop a load bridge to validate mechanistic pavement design models
- (U) Develop methods for predicting snow properties that control electromagnetic signatures in snow

(U) Project AT45 - Energy Technology Applied to Military Facilities: The research conducted in this project provides the technology for providing energy efficient facilities, adapting new energy source technologies to military facilities, reducing dependence on non-renewable petroleum fuels, and improving the

efficiency of onsite heating plants. Research facilitates adaptation of new technology from industry to meet the specialized needs of the Army. Research is implemented in new construction and in upgrades of existing facilities. One goal is to reduce energy consumption 30% by 1995 from the 1975 base line.

(U) FY 1992 Accomplishments:
- (U) Completed recommendations on Army heat recovery possibilities
- (U) Provided retrofit technology for electrical energy conservation
- (U) Developed implementation criteria for energy storage systems
- (U) Completed detailed heating, ventilation and air conditioning (HVAC) acceptance testing procedures
- (U) Provided design guides and acceptance criteria for diurnal ice storage systems

(U) FY 1993 Planned Program:
- (U) Evaluate commercially available Distributed Digital Control (DDC) systems for Army applications
- (U) Develop/provide technologies to maximize (minimize cost) of central plant heat distribution systems
- (U) Provide modernization technologies for central heating plants
- (U) Improve steam supply management technologies
- (U) Provide electric motor retrofits for variable speed drive

(U) FY 1994 Planned Program:
- (U) Develop techniques for improved indoor air quality in relation to energy system performance
- (U) Develop technologies to reduce energy system harmonics on Army installations
- (U) Provide effective decision making tools for control heat plant modernization based on life cycle costs
- (U) Develop techniques for humidity control in Army facilities

(U) Work Performed By:
A855: Topography, Image Intelligence and Space Technology: Approximately 65 percent of the work is performed in-house primarily 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.
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: U.S. Army Engineer Waterways Experiment Stations: Approximately 82 percent work is performed in-house. Contractors include: Louisiana State University, Colorado State University, University of Colorado, Nichols Research, Applied Research Associates, and California Research and Technology.
AT41: Military Facilities Engineering Technology: Approximately 65 percent is performed in-house 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; and MIT, Cambridge, MA.
AT42: Cold Regions Engineering Technology: Approximately 75 percent is performed in-house primarily by the Cold Regions Research and Engineering Laboratory, Hanover, NH. Contractors include: Dartmouth College, Hanover, NH.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602784A
PE Title: **Military Engineering Technology** Budget Activity: #1

AT45: Energy Technology Applied to Military Facilities: Approximately 65 percent is performed in-house 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.

(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).

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 Bureau of Standards
National Academy of Sciences

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

(U) **International Cooperative Agreements:** Not applicable.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602785A
PE Title: Manpower, Personnel and Training Technology
Budget Activity: #1

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

Project Number / Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
ABB2 Life Science Technology	0	1670	0
A790 Personnel Systems and Performance Technology	6576	4576	4172
A791 Education and Training Technology	9213	9079	9147
PE TOTAL	15789	15325	13319

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 leading to: 1) cost-effective training strategies for synthetic training environments, 2) optimum simulator designs to achieve maximum learning at minimum cost, 3) enhanced leader and command staff performance, and 4) improved retention of quality soldiers to maintain Army's warfighting edge during downsizing. Work in this program element is consistent with the resource-constrained Army Science and Technology Master Plan (ASTMP), Science and Technology Objectives (STO) and the Army Modernization Plan. This program element is restructured in FY93 as the result of function transfers to U.S. Army Research Laboratory (ARL). The Manpower and Personnel Integration (MANPRINT) in-System Acquisition function transfers to ARL (initially for FY93 only to Project ABB2, this PE and in FY94 to PE #0602716A, Project AH70).

C. (U) JUSTIFICATION FOR PROJECTS:

(U) **Project ABB2 - Life Sciences Technology:** The objectives of this program are to provide a sound basis for identifying and integrating user requirements with available and emerging technical solutions. 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 DoD Key Technology Area #11 (Human System Interface) and DoD Thrust Area #6 (Synthetic Environments) and the Army's Modernization Plan. This funding line exists for FY93 only; thereafter this work transfers to PE #0602716A under the Army Research Laboratory.

(U) **FY 1992 Accomplishments:** Work performed under Projects A790 and A791, this program element

(U) **FY 1993 Planned Program:**

- (U) Complete prototype of Commander's display of realtime intelligence imagery and non-imagery (e.g., infrared, electro-optics) updates
- (U) Development of a MANPRINT-based model to examine effects of task-induced stress on battle staff competence and effectiveness in (a) communication and (b) decision-making
- (U) Validation and extension of a project to identify cognitive tests to predict target detection performance by soldiers in sustained operations

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602785A
PE Title: **Manpower, Personnel and Training Technology** Budget Activity: #1

(U) FY 1994 Planned Program: Work transfers to PE #0602716A under the Army Research Laboratory

(U) Project A790 - Personnel Systems and Performance Technology: The objectives of this project are to provide the scientific basis for: (1) improved methods for force structure planning during downsizing ; (2) improved organizational design to improve warfighting decision making; (3) enhanced classification procedures to ensure the right person is placed in the right job; and (4) technology-based methods for leader development. Research under this project supports DoD Key Technology Area #11 (Human-System Interface) and DoD Thrust #6 (Synthetic Environments).

(U) FY 1992 Accomplishments:
- (U) Developed biographical measures for predicting officer attrition
- (U) Identified characteristics for predicting performance of soldiers with low Armed Forces Qualification Test (AFQT) scores
- (U) Completed preliminary evaluation of the effects of coaching on temperament and spatial selection measures

(U) FY 1993 Planned Program:
- (U) Complete prototype command and control (C2) staff process model designed to enhance command staff organizational performance
- (U) Identify Military Occupational Specialties (MOS) where soldiers with low AFQT scores can perform effectively
- (U) Develop models of soldier career commitment and performance in a downsized environment
- (U) Develop compensatory screening model for predicting first-term soldier attrition

(U) FY 1994 Planned Program:
- (U) Identify and begin test development in new areas measuring general aptitude which can add predictive power to current selection and classification system
- (U) Complete development of improved biographical measures of leadership and adaptability for officer and enlisted personnel
- (U) Identify characteristics of successful leaders for developing improved leader development simulations
- (U) Analysis of long-term effects of Sinai deployment on combat mission performance and career commitment

(U) Project A791 - Education and Training Technology: The objectives of this project are to provide the behavioral technology for individual and collective (unit) training strategies using simulation-based synthetic environments, building on recent advances in the cognitive sciences. Research included in this program will provide an empirical basis for: (1) individual soldier training techniques exploiting the use of "virtual reality" technology, (2) instructional strategies for the efficient acquisition and retention of collective skills in synthetic training environments, (3) the design of "intelligent tutors" for teaching difficult cognitive skills (such as language acquisition), and (4) determining the minimum design features for simulators and training devices that will achieve effective training at the lowest cost. Research under this project directly supports DoD Key Technology Area #11 (Human-System Interface) and DoD Thrust #6 (Synthetic Environments).

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602785A
PE Title: **Manpower, Personnel and Trai ıg Technology** Budget Activity: #1

(U) FY 1992 Accomplishments:
- (U) Established and demonstrated simulator training research advanced testbed for aviation (STRATA)
- (U) Defined parameters for near-, mid- and far-term virtual environments for simulation of the dismounted soldier
- (U) Field tested new procedures for identifying soldier and unit performance problems during night operations
- (U) Identified the training implications of combat vehicle command and control systems ("C^2 on the move") based on company-level simulations
- (U) Developed a preliminary collective skill acquisition model

(U) FY 1993 Planned Program:
- (U) Complete training needs assessment for information integration/distribution tasks on dynamic future battlefield
- (U) Demonstrate tactically realistic scenarios for use with virtual environments
- (U) Develop prototype brigade-level unit performance indicators
- (U) Develop unaided-vision night training program

(U) FY 1994 Planned Program:
- (U) Demonstrate auditory and visual components of virtual reality training environment
- (U) Determine long-haul network requirements for high fidelity flight simulation systems
- (U) Complete prototype second-generation Spanish and Arabic "intelligent tutors" for use in research on cognitive skill acquisition within and across languages
- (U) Demonstrate method for developing cognitive maps based on expert commander performance for "visualization of the battlefield"

(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. The in-house developing agency for Project ABB2 is ARL, Aberdeen Proving Ground, MD. Contractors include: Evidence Based Research, Vienna, VA; Cognitive Technologies, Inc., Arlington, 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; 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 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: 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 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602786A
PE Title: **Logistics Technology**

Budget Activity: #1

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D283 Airdrop Advanced Technology	1436	2169	2056
A427 Tactical Shelters-Exploratory Development	4201	4610	2731
AH20 Mobility Equipment Technology	12374	12482	6975
AH98 Clothing & Equipment Technology	12018	9342	10101
AH99 Joint Services Food/System Technology	4200	4457	4984
DJ10 Combat Rations Quality Enhancement	2765	3759	1606
PE TOTAL	36994	36819	28453

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 resource constrained Army Science and Technology Master Plan (ASTMP) and Science and Technology Objectives (STOs).

C. (U) JUSTIFICATION FOR PROJECTS:

(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 1992 Accomplishments:**

- (U) Completed wind tunnel experiments of five inflated decelerator concepts and determined that minimizing the inflation inlet area enhances glide performance
- (U) Completed experimental measurement of the drag and pressure distribution on annular canopies
- (U) Defined best concepts to make opening of clustered parachutes more reliable; obtained a patent for "radial reefing"
- (U) Analyzed electric field patterns and calculated resulting electrostatic forces which impact on reliable parachute opening

(U) **FY 1993 Planned Program:**

- (U) Develop computational techniques to solve the equations of fluid dynamics in the presence of rapidly deforming decelerator shapes
- (U) Investigate the effects of unsteady flow, added mass and fabric porosity on parachute opening force, opening time and flow interaction with canopy
- (U) Develop model to predict motion and trajectory of payload-canopy systems and compare predictions with experimental results
- (U) Investigate clustered parachute interactions in the flow field to determine factors that influence opening

(U) **FY 1994 Planned Program:**

- (U) Experimentally determine details of the opening of decelerators including time, histories of shape, velocity, and pressure and flow fields about the decelerators
- (U) Define opening dynamics of deployable gliding wings to determine stresses in wings and forces on payloads

(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.

(U) **FY 1992 Accomplishments:**

- (U) Fabricated naturally curved seamless fabrics using three dimensional weaving and multi-layer interlocking braiding techniques and experimentally evaluated their use in advanced air beams
- (U) Experimentally determined fabric stress/strain relations and incorporated in model of axisymmetric stress concentrations in pressurized air beams; verified model by experiment
- (U) Developed three-dimensional laminar/turbulent code for circulation/containment transport in tents

(U) **FY 1993 Planned Program:**

- (U) Evaluate experimental pressurized airbeam specimen using advanced fabrication techniques

Program Element: #0602786A
PE Title: **Logistics Technology** Budget Activity: #1

- (U) Investigate stress concentrations in pressurized air beams with non-axisymmetric discontinuities
- (U) Validate, through experiments, air circulation/contamination transport model to improve habitability and chemical survivability

(U) FY 1994 Planned Program:
- (U) Evaluate pressurized ribs and air retention techniques
- (U) Design quick erect, lightweight large area night maintenance shelter using advanced high pressure airbeam supports

(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 1992 Accomplishments:
- (U) Completed sensor data acquisition for photon backscatter, a promising technology for Vehicular Mounted Mine Detector program
- (U) Completed Soldier Individual Power source front end analysis of technologies and components
- (U) Demonstrated 20 kw vehicle in-line power generator
- (U) Initiated concept design studies for the integration of advanced infrared, radar and visual signature control technologies for broadband Low Cost Low Observable (LCLO) camouflage systems

(U) FY 1993 Planned Program:
- (U) Demonstrate the ability to spoof the acoustic and seismic ground sensors of top-attack anti-tank mines
- (U) Investigate breaching and detection technologies for application to Individual Mine Clearer and Passive Scattermine Detection Systems
- (U) Complete development of Infrared (IR) thin films, IR topcoats and solar reflectance paints
- (U) Verify the capabilities of a breadboard high speed engine-generator-compressor assembly for Soldier Individual Power
- (U) Study surface modification of variant reverse osmosis elements for water purification

(U) FY 1994 Planned Program:
- (U) Investigate high resolution imagery technologies to complement development of a Vehicular Mounted Mine Detector
- (U) Select concept for a countermeasure breadboard system to demonstrate ability to neutralize ground and terminal sensors of top-attack Anti-Tank (AT) mines
- (U) Initiate Low Observable and Deception Simulation (LODSIM) project to develop computer tools to design and evaluate low observable systems, components and materials
- (U) Demonstrate a man portable engine-generator for tactical electric power (1 kw, 28 vdc, 18 lb)

(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

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602786A
PE Title: **Logistics Technology** Budget Activity: #1

Chemical/Biological (C/B), ballistic, flame and nuclear thermal protection; enhanced countersurveillance/camouflage for the individual soldier; dismounted soldier identification; directed energy protection, including eye protection against tuneable lasers; materials/concepts for protection in arctic/desert environments; and improvements to lighten the soldier's load. Also, simulation and modeling tools applicable to the soldier system are used to quantify soldier performance and determine optimal R&D alternatives.

(U) FY 1992 Accomplishments:

- (U) Incorporated new carbon-loaded semipermeable membrane/fabric laminates into a lightweight chemical protective uniform to provide enhanced liquid, vapor, and aerosol protection with minimal heat stress and reduced bulk
- (U) Demonstrated laser-limiting performance using the combination of microlens arrays and nonlinear optical polymers
- (U) Demonstrated advanced composite material systems providing both fragment and flechette protection
- (U) Transferred technology required to print Nomex/Kevlar fabric to end-item development of aircrew combat uniforms
- (U) Defined technologies for integrated dismounted soldier identification for near, mid, and long-term development
- (U) Developed a prototype soldier performance model to support soldier system item analysis

(U) FY 1993 Planned Program:

- (U) Demonstrate lightweight (25% reduction) ballistic protective composite helmet using new high strength fibers and materials processing techniques
- (U) Construct brassboard devices for eye protection against tunable lasers using improved nonlinear optical materials and/or hybrid lenslets
- (U) Characterize bioengineered polymers for feasibility in ballistic protective and electro-optic applications
- (U) Demonstrate composite material systems providing both fragme and flechette protection at lower cost than current material
- (U) Demonstrate an improved transparent, high strength polymeric material for eye armor
- (U) Demonstrate concept of a thin, stretchable meltblown web which incorporates adsorptive carbon for tight-fitting chemical protective undergarments

(U) FY 1994 Planned Program:

- (U) Combine multiple nonlinear optical materials in lenslet array to provide eye protection against both short and long-pulse laser threats
- (U) Integrate small arms protective technologies into ballistic protective research and development
- (U) Expand the soldier performance model to allow two-sided analysis of the effects of clothing and individual equipment on mission completion
- (U) Demonstrate near-term technology solutions for identification of the dismounted soldier to decrease the probability of fratricide
- (U) Design a disruptive camouflage pattern using adaptive camouflage colorant technology
- (U) Extend Unit Simulation System to allow platoon level force-on-force simulation, quantifying the effects of explicit changes to soldier's clothing and equipment

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602786A
PE Title: **Logistics Technology** Budget Activity: #1

(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 1992 Accomplishments:**

- (U) Identified/explored edible barrier coatings to improve ration acceptability, protect quality and reduce packaging waste
- (U) Developed a family of highly acceptable Tray Ration breakfast/egg items and a series of traditional and popular dinner entrees to enhance acceptability and improve consumption
- (U) Developed prototype shelf stable sandwiches that use state-of-the-art technology in intermediate moisture foods to provide a familiar, eat-out-of-hand food product
- (U) Established a Cooperative Research and Development Agreement (CRDA) with industry to allow access to a food irradiation source and enable cooperative effort to develop high quality food items for military and commercial use
- (U) Developed microwave sterilization technology for flexibly packaged foods, increasing quality and nutrient retention and negotiated CRDA to facilitate commercialization

(U) **FY 1993 Planned Program:**

- (U) Conduct modified atmosphere packaging studies to assess feasibility of this process for producing high quality ration items
- (U) Evaluate ration components subjected to environmental extremes and reformulate/replace to maintain total ration quality and acceptability during life cycle
- (U) Develop and evaluate advanced food service system concepts for new ship construction in the 21st century
- (U) Evaluate efficiency and effectiveness of heat transfer concept on the Modular Appliance Technologies, Centralized Heating (MATCH)
- (U) Conduct an afloat field evaluation of biodegradable trash bags and improved biodegradable utensils to enable waste disposal while at sea

(U) **FY 1994 Planned Program:**

- (U) Conduct a field evaluation of irradiated ration components to enhance variety in DoD field food service system and adapt, adopt and/or integrate for field use highly acceptable irradiated ration components
- (U) Complete field evaluation of sodium-reduced combat rations to ensure individual soldier acceptance and reduce negative health effects
- (U) Complete field test of biodegradable milk bladders, meat wrappers, and additional primary food packaging to allow disposal at sea
- (U) Use intrinsic chemical markers to validate efficacy of aseptic processing of particulate food for rations
- (U) Develop computer models/simulations of integrated food service systems for new ship construction and designs

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602786A
PE Title: **Logistics Technology** Budget Activity: #1

(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 maximizing 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. 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 1992 Accomplishments:
- (U) Explored efficacy of electric/magnetic processing technology in controlling spoilage and pathogenic microorganisms
- (U) Initiated research on an integrated approach for quantification and enhancement of quality for combat rations
- (U) Identified two high-potential technologies for the cold preservation of food: (1) hyperbarics and (2) pulsed-electric fields

(U) FY 1993 Planned Program:
- (U) Investigate raw material and process interactions on food quality
- (U) Develop baseline quality data for new food preservation technologies to document quality enhancements
- (U) Assess the practical use of new technologies in cold preservation of fresh-like foods for military rations using pulsed electric or high pressure preservation techniques

(U) FY 1994 Planned Program:
- (U) Conduct shelf life studies on selected items to demonstrate microbiological stabilization effectiveness of cold pasteurization technology(s)
- (U) Investigate kinetics of nutrient degradation during processing to help develop quality assurance guidelines
- (U) Develop analytical and sensory techniques for food quality measurement
- (U) Define optimization and process simulation parameters for quality quantification
- (U) Transition promising new processes identified from raw material and processing studies to combat ration manufacturing

(U) Work Performed By: In-house efforts primarily accomplished 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; Engineering, Inc., Hampton, VA; Allied Signal, Inc., Morristown, NJ; Albany International, Mansfield, MA; IITRI, Chicago, IL; Chicago Aerial, Barrington, IL; The Boeing Company, Seattle, WA; Teledyne Energy Corporation, Timonium, MD; Georgia Institute of Technology, Atlanta, GA; Stanford Research Institute, Menlo Park, CA; Hughes Aircraft, El Segundo, CA; National Academy of Science, Washington, DC; Caterpillar, Peoria, IL; Deere, Moline, IL; and Southwest Research Institute, San Antonio, TX; Reynolds Metal Co., Richmond, VA; Kansas State University, Manhattan, KS; ABIC International Consultants,

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602786A
PE Title: **Logistics Technology** Budget Activity: #1

Fairfield, NJ; COMPU-CAD, Inc., East Providence, RI; University of Massachusetts, Amherst, MA; Rutgers University, New Brunswick, NJ; Haake Buchler Instruments, Valencia, CA; Princeton Economics Inc., Princeton, MA; 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; University of Lowell, Lowell, MA; Boston University, Boston, MA; University of Massachusetts, Lowell, MA; Oak Ridge National Labs, Oak Ridge, TN; Sandia National Lab, Albuquerque, NM.

(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 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602787A
Title: **Medical Technology** Budget Activity: #1

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
A825	Combat Maxillofacial Injury		
	2299	2282	1669
A870	DoD Medical Defense Against Infectious Diseases		
	31606	20598	23287
A871	Medical Biological Defense - Exploratory Development		
	16144	17328	14847
A872	Neurofibromatosis Research		
	7900	0	0
A873	HIV Exploratory Research		
	1975	3309	2956
A874	Combat Casualty Care Technology		
	12129	11656	10075
A875	Medical Chemical Defense - Exploratory Development		
	17875	17248	15627
A878	Health Hazards of Military Materiel		
	9305	9609	9602
A879	Medical Factors Enhancing Soldier Effectiveness		
	10388	9164	8648
PE TOTAL	109621	91194	86711

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 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 ED in areas of medical protection against chemical agents and antidote/drugs, personnel/casualty decontamination, medical management of chemical casualties, and combat effectiveness/sustainability; research for medical biological defense and the prevention of diseases research including vaccine ED, prophylactic and therapeutic drug ED, arthropod vector repellent ED and the diagnosis/identification of naturally-occurring infectious diseases and/or biological threats; prevention and treatment of combat maxillofacial (face and neck) injuries, and the ED of medical equipment and materials required to provide essential dental treatment on the battlefield; combat casualty care ED addressing the investigations 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, and the ED of combat medical materiel; and research focusing on the health hazards of military materiel and medical factors to sustain or enhance soldier performance. This PE also provides funds for overall administration and management of RDTE,A laboratories. The costs include salary, travel, equipment, and general support of

Program Element: #0602787A
Title: **Medical Technology** Budget Activity: #1

civilian management personnel and their administrative support staffs. The work in this program element is consistent with the resource constrained Army Science and Technology Master Plan, Science and Technology Objectives (STOs) milestones for the Army's key emerging technologies and Army force modernization plans. Resource reduction in FY 94 will create a reduction in in-house infrastructure.

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 for providing field dental treatment. The Army has been designated Congressional lead agency for Combat Dentistry research.

(U) FY 1992 Accomplishments:
- (U) Validated animal model to reproduce pulp inflammation for study of a non-steroidal, indirect pulp-capping agent
- (U) Completed initial dose response studies of a potassium channel blocker as a dental anesthetic
- (U) Completed shelf life studies of dental biomaterials for a 3-year period
- (U) Formulated a biodegradable bone wax to control hemorrhage in bone wounds

(U) FY 1993 Program:
- (U) Evaluate the efficacy of a hemostatic bone wax in an animal model
- (U) Continue the shelf life study of perishable dental biomaterials
- (U) Test optimal non-steroidal, anti-inflammatory indirect pulp-capping agents in an animal model
- (U) Complete U.S. Space Shuttle experiment for microencapsulated ampicillin

(U) FY 1994 Planned Program:
- (U) Begin studies to enhance the stability of critical dental materials by improving composition and packaging
- (U) Improve and validate 3-D mapping technology to ultimately produce dental prosthetics for surgical reconstruction of traumatic craniofacial wounds

(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, so as to prevent casualties, sustain operational performance and minimize deaths and disability of armed forces during military operations.

(U) FY 1992 Accomplishments:
- (U) Screened enterotoxigenic *Escherichia coli* (ETEC) isolates recovered from servicemen deployed for Operation Desert Shield (ODS) for colonization factor actins and identified components that are necessary for a vaccine against 93 percent of ETEC bacterial agents
- (U) Demonstrated in field studies, in Peru, that the ipaH deoxyribonucleic acid (DNA) probe was sensitive and specific for detection of *Shigella* and ETEC, the latter of which cannot be detected by bacteriological means

Program Element: #0602787A
Title: **Medical Technology** Budget Activity: #1

- (U) Documented for first time that Norwalk virus posed enteric disease threat to U.S. forces deploying to Persian Gulf, South America and West Africa
- (U) Discovered that multi-drug resistant isolates of *Plasmodium falciparum* malaria are very susceptible to WR238605, WR2425211 and other new 8-aminoquinoline analog drugs
- (U) Molecularly cloned *Plasmodium falciparum* DNA polymerase, a possible new target for antimalarial drugs
- (U) Identified nine cases of viscerotropic *Leishmania tropica* and 16 cases of cutaneous leishmaniasis from troops returning from ODS
- (U) Demonstrated that the antimalarial drug artemisinin and analogs are effective transdermally
- (U) Designed a Western blot assay using a baculovirus expressed recombinant protein for the detection of acute Hepatitis E infection, providing a test to help determine the global threat posed by this virus
- (U) Identified immunologically significant epitopes within the genome of hepatitis E virus using overlapping synthetic peptides and expressed hepatitis E viral proteins in recombinant baculovirus and vaccinia virus, providing potentially useful vaccine candidates for the immunization of military personnel in endemic areas
- (U) Determined that dengue-1 virus has established endemicity in Peru following a recent epidemic, confirming the expanding threat of dengue in this part of Latin America to military operations
- (U) Created a polymerase chain reaction assay to detect the causative agents of bacterial meningitis by amplification of universal bacterial 16S recombinant ribonucleic acid (rRNA) sequences and selective hybridization of agent specific nucleic acid probes, thus providing a rapid and definitive diagnostic test for causative agents of bacterial meningitis to which military forces may be exposed
- (U) Determined that the 47 kD antigen of scrub typhus rickettsiae is highly conserved and that purified 47 kD recombinant antigen is a useful diagnostic reagent for serosurveys
- (U) Demonstrated the occurrence of spotted fever rickettsial infections in 20 percent of troops in an Airborne Division during a short deployment to Botswana, and provided evidence that the agent involved is *Rickettsia pijperi*, showing that this agent is a threat to operational troops in Sub-Saharan Africa
- (U) Established that acute respiratory diseases were among the leading causes of morbidity among Navy and Marine personnel deployed aboard ships, confirming the serious threat of the associated pathogens to military operations
- (U) Formulated a camouflage face paint/insect repellent combination to be included in the airmen survival kit
- (U) Identified a new focus of leishmaniasis transmission affecting peacekeeping troops in Northeast Sinai, Egypt
- (U) Initiated a protocol for polymerase chain reaction (PCR) diagnosis of *Leishmania* in peripheral blood and tissue biopsies from troops who have served in Operation Desert Storm/Shield
- (U) Identified a new focus of *Leishmania* transmission in sites used for Jungle Survival Training in French Guiana and Brazil
- (U) Defined the metabolism and toxicity of artemisinin antimalarials
- (U) Demonstrated the efficacy and immunogenicity of live *Shigella flexneri* and non-living *Shigella sonnei* vaccines using laboratory models

Program Element: **#0602787A**
Title: **Medical Technology** Budget Activity: **#1**

- (U) Discovered that a cytotoxic T-cell clone against a single epitope on the *Plasmodium yoelii* malaria sporozoite surface protein 2 (PySSP2) completely protected mice against challenge with more than 100 ID50s (infectious dose 50PERCENT) of this highly infectious organism, thereby providing the rationale for developing sporozoite surface protein 2 (SSP2) as a critical component of a multi-antigen malaria vaccine

(U) **FY 1993 Planned Program:**

- (U) Continue to assess regional risks of hemorrhagic fever viruses
- (U) Explore feasibility of using cytokines to modify septic shock
- (U) Continue studies to evaluate technologies aimed at reversing drug resistance to parasitic diseases
- (U) Explore means of preparing sporozoite and blood stage malaria antigens as candidate immunogens
- (U) Assess meningococcal antigen stability and potency
- (U) Continue evaluation of new antiparasitic drugs
- (U) Determine prevalence of hepatitis C and E antibodies in military personnel
- (U) Determine the ability of purified dengue virus proteins expressed in baculovirus systems to protect animals against lethal challenge
- (U) Determine feasibility of preparing a diagnostic skin test for *Leishmania tropica*
- (U) Initiate studies leading to the development of medical countermeasures against viruses that may cause high morbidity and mortality and are transmitted by mosquitoes, rodents, or aerosols
- (U) Evaluate feasibility and stability of and *E. coli-Shigella sonnei* hybrid as a candidate vacc e
- (U) Evaluate humoral and cellular immune response important to protection from ETEC diarrnea
- (U) Identify and evaluate field test sites for clinical trials of a vaccinia-vectored Korean hemorrhagic fever vaccine
- (U) Continue to evaluate and identify arthropod vectors which spread militarily relevant infectious diseases
- (U) Continue to evaluate militarily significant infectious disease immunogens designed to enhance aspects of the human immune response system
- (U) Determine the efficacy of adjuvant-active and diarrheagenic/pyrogenic doses of labile toxin
- (U) Characterize the structural properties of *Staphylococcus aureus* protein (SAP)
- (U) Assess sporozoite monoclonal antibodies as candidates for anti-idiotype vaccines against malaria
- (U) Characterize the antigenic variation of surface antigens of campylobacter
- (U) Develop antibody capture assays for identification of schistosomal and rickettsial disease from acute serum and other body fluids
- (U) Assess risk of hepatitis E virus disease in overseas areas
- (U) Continue studies to molecularly characterize blood and liver stage malarial antigens for potential as malaria vaccine candidates
- (U) Select candidate gonococcal antigens for microencapsulation
- (U) Evaluate and select new candidate drugs for malaria and other parasites
- (U) Establish suitable model systems for the study of genetically engineered dengue virus vaccines
- (U) Select Group B meningococcal antigen for incorporation into polyvalent r ningitis vaccine
- (U) Determine molecular properties of anti-idiotype monoclonal antibodies ir sessing candidate malaria vaccines

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602787A
Title: **Medical Technology** Budget Activity: #1

(U) FY 1994 Planned Program:

- (U) Assess regional risks of hemorrhagic fever viruses
- (U) Conduct drug acquisition and screening of series of compounds to reverse drug-resistance in malaria and leishmaniasis
- (U) Evaluate humoral and cellular immune responses important to protection from gonorrhea
- (U) Demonstrate technology to transition to advanced development a recombinant vaccine for Hemorrhagic Fever with renal syndrome
- (U) Evaluate new antiparasitic drugs
- (U) Evaluate and identify arthropod vectors which spread militarily relevant infectious diseases
- (U) Identify and evaluate additional immune stimulating compounds for enhancement of vaccine immunogenicity
- (U) Explore feasibility of using cytokines to modify septic shock
- (U) Explore means of preparing sporozoite and blood stage malaria antigens as candidate immunogens
- (U) Assess meningococcal antigen stability and potency
- (U) Determine prevalence of hepatitis C and E antibodies in military personnel
- (U) Determine the ability of purified dengue virus proteins expressed in baculovirus systems to protect against lethal challenge
- (U) Evaluate feasibility and stability of and E. coli-Shigella sonnei hybrid as a candidate vaccine
- (U) Evaluate humoral and cellular immune response important to protection from ETEC diarrhea
- (U) Determine efficacy of adjuvant-active and diarrheagenic/pyrogenic doses of labile toxin
- (U) Evaluate mucosal immunity to campylobacter
- (U) Select candidate anti-idiotype vaccines against malaria
- (U) Design PCR based methods for the diagnosis of leishmaniasis rickettsial and schistosomal disease
- (U) Sequence gene encoding malaria liver stage antigens for assessment of T-cell response
- (U) Identify and evaluate the potential of malaria antigens from both blood and liver stages as potential vaccine immunogens
- (U) Develop new vaccine candidates using genetically-engineered tick-borne viruses
- (U) Prepare leishmania antigen for diagnostic assays and skin tests
- (U) Select candidate gonococcal antigens for microencapsulation
- (U) Evaluate and select new candidate drugs for malaria and other parasites
- (U) Select Group B meningococcal antigen for incorporation into polyvalent vaccine
- (U) Complete preclinical studies of recombinant carriers (e.g., vaccinia, salmonella, and BCG) for potential use of malaria vaccines
- (U) Identify improved adjuvant and delivery formulations for candidate vaccines
- (U) Characterize the mechanisms of the immune response to enterogenic E. coli (ETEC) infection in rabbit models
- (U) Synthesize and evaluate in animal model formulations of vaccines based on pilus proteins incorporation in biodegradable microspheres
- (U) Characterize immunobiology and protective immune response of Shigella infections in biological organisms

(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,

Program Element: #0602787A
Title: **Medical Technology** Budget Activity: #1

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 1992 Accomplishments:
- (U) Validated an ELISA test for diagnosis of acute Q fever
- (U) Improved techniques for a non-radioactive, DNA based diagnostic system
- (U) Cloned and sequenced the genes responsible for four of the serotypes of botulinum toxin for potential bioengineered vaccine
- (U) Demonstrated the expression of anti-ricin antibodies in an avian system
- (U) Developed highly sensitive mouse model of Staphylococcal enterotoxin B (SEB) intoxication
- (U) Developed SEB vaccine candidates by genetic alteration to eliminate the toxin effect
- (U) Developed methods for encapsulating the ricin toxoid as a potential vaccine candidate
- (U) Performed preliminary tests on plague antibiotic sensitivity and identification using automated instrumentation

(U) FY 1993 Planned Program:
- (U) Evaluate aerosol models for Yersinia pestis
- (U) Evaluate antibiotic sensitivity of Yersinia pestis , Brucellosis and Bacillus anthracis.
- (U) Investigate the mechanism of protective immunity induced by candidate Brucella vaccines
- (U) Explore the application of nucleic acid technology for use in diagnostic kits
- (U) Evaluate the potential utility of passive immunotherapy for Staphylococcal enterotoxin intoxication
- (U) Generate *in vitro* models to verify functional domains of Botulinum toxin
- (U) Investigate computer models of therapeutic compounds against biological threat agents
- (U) Test receptor antagonists against physiologically active compounds
- (U) Conduct exploratory research on vaccines and drugs effective against other validated biological threat agents

(U) FY 1994 Planned Program:
- (U) Continue research on aerosol models for the evaluation of drugs and vaccines only against a limited number of high priority biological threat agents
- (U) Continue to provide exploratory research for the development of vaccines and drugs effective against biological threat agents
- (U) Continue exploratory development of technologies for the rapid diagnosis of biological threat agents

(U) Project A872 - Neurofibromatosis Research: This project is a Congressionally directed grant for neurofibromatosis research.

(U) FY 1992 Accomplishments:
- (U) A Broad Agency Announcement was drafted to solicit contract, grant and cooperative agreement proposals on gene linkage, oncogenes, hormonal and neural growth factors, or animal models

(U) FY 1993 Planned Program:
- (U) No program requested

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602787A
Title: **Medical Technology** Budget Activity: #1

(U) FY 1994 Planned Program:
- (U) No program requested

(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 1992 Accomplishments:
- (U) Demonstrated that the major region of the virus that determines tropism resides within the viral envelope
- (U) Demonstrated that ten N-glycosylation sites on the viral envelope are not essential for viral infectivity
- (U) Designed and evaluated a sensitive nested polymerase chain reaction method for detecting messenger RNA for regulatory genes *tat, rev, nef*

(U) FY 1993 Planned Program:
- (U) Initiate studies to define the immune response to unique HIV antigens after immunization with subunit vaccines
- (U) Initiate studies to define the effect of virus variability on the development of vaccine strains
- (U) Initiate epidemiological studies to define geographical areas of military importance with high incidence of disease
- (U) Study effects of early infection on T cell precursors in an animal model
- (U) To provide base line data for epidemiological studies

(U) FY 1994 Planned Program:
- (U) Continue studies to define the immune response, both humoral and cellular, after immunization with HIV antigens
- (U) Continue studies to evaluate variability in HIV genotypes and phenotypes
- (U) Continue studies to evaluate HIV infection prevalence and incidence
- (U) Study effects of early infection on T cell precursors in animal model
- (U) Maintain capability to handle and store large numbers of sera
- (U) To provide base line data for epidemiological studies

(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 1992 Accomplishments:
- (U) Initiated studies of the changes in the permeability of the brain during injury
- (U) Developed improved methods of preventing and treating hypertrophic scar formation in thermally injured patients
- (U) Supported the Army Space Initiative (space shuttle cell culture experiment)
- (U) Developed a 21-day post-thaw red blood cell storage solution

- (U) Found that hypertonic saline dextran is more effective than normal saline resuscitation in achieving normal cardiac function following hemorrhage in animal model

(U) FY 1993 Planned Program:
- (U) Assess the effectiveness of cytokine antibodies and inhibitors in modifying remote systemic effects of injury
- (U) Assess the effects of growth factors and skin substitutes on wound healing in thermally injured patients
- (U) Develop new technologies for cold sterilization to support field medical needs
- (U) Perform peripheral nerve and bone regeneration studies utilizing electrical current

(U) FY 1994 Planned Program:
- (U) Further perfect an intraosseous infusion device as an alternative method to deliver life-saving fluids on the battlefield
- (U) Initiate studies that involve innovative therapies such as lazeroids
- (U) Continue improving techniques of burn wound management to include topical agents, hormones, and skin substitutes
- (U) Determine the effect of head trauma on cardiodynamics

(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 drugs for treatment of the toxic processes of nerve, blister, and blood agents. A majority of the resources applied to this project support exploratory development of prophylaxes and 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 1992 Accomplishments:
- (U) Demonstrated that novel compounds which block cellular development reduce vesicant-induced (sulphur mustard) injury
- (U) Demonstrated effectiveness of exogenous acetylcholinesterase to protect against the lethal and behavioral effects of nerve agents
- (U) Produced monoclonal catalytic scavengers for nerve agents
- (U) Evaluated promising compounds for use as biological scavengers against sulfur mustard
- (U) Tested efficacy of antioxidant drugs following exposure to respiratory agents

(U) FY 1993 Planned Program:
- (U) Continue studies involving novel drugs which ameliorate or preclude vesicant-induced tissue injury
- (U) Continue program to design, synthesize and evaluate novel biological scavengers against sulfur mustard
- (U) Initiate efforts to incorporate a reactive decontaminant component into the topical skin protectant
- (U) Evaluate the role of mediators and therapeutic compounds for efficacy against respiratory agents
- (U) Examine efficacy of neuroprotectant agents

Program Element: #0602787A
Title: **Medical Technology** Budget Activity: #1

- (U) Conduct site-directed mutagenesis studies with genes for human cholinesterase
- (U) Determine the action of cyanide on the central nervous system

(U) FY 1994 Planned Program:
- (U) Continue efforts to identify and exploit new and better pharmacological approaches to the broad range of threat chemical warfare agents
- (U) Expand efforts to incorporate a reactive decontaminant component into the topical skin protectant
- (U) Continue efforts to develop new techniques to produce catalytic scavengers
- (U) Continue studies to identify the mechanisms of seizure-induced brain damage

(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 in the engineering design of weapons and systems associated with Army operations and training. Specific hazards include: steady-state noise, repeated impact jolt and vibration from operation of combat vehicles; blast overpressure and impulse noise generated by weapons systems; toxic hazards from combustion products and exposure to chemical byproducts; directed energy sources (laser and microwave); and environmental stress imposed by operating in protective clothing and/or equipment.

(U) FY 1992 Accomplishments:
- (U) Demonstrated reduction of retinal susceptibility to laser injury by pretreatment with heat shock proteins
- (U) Developed injury tolerance curve for axial displacement of mass for Army aviator helmets
- (U) Demonstrated that artillerymen and male radar equipment operators may have abnormal reproductive function which may be related to aerosol lead and microwave exposure, respectively

(U) FY 1993 Planned Program:
- (U) Develop methodologies to characterize the bioeffects of repeated impact jolt signatures of Army ground vehicles
- (U) Initiate studies to develop revised cardiovascular fitness criteria to avoid unnecessary, permanent grounding of Army aviators
- (U) Enhance the evaluation of heat strain in chemical protective ensembles through use of modeling technologies
- (U) Demonstrated in rats, that exposure to high peak power microwaves impairs memory and running endurance

(U) FY 1994 Planned Program:
- (U) Complete study of pulse duration dependence of laser induced retinal damage at 755 nm
- (U) Develop a model for the effects of environmental and operational stress on rifle marksmanship
- (U) Develop model to assess the visual performance decrements associated with laser exposure

(U) Project A879 - Medical Factors Enhancing Soldier Effectiveness: This project addresses the physiological and psychological factors underlying cognitive and physical performance requirements imposed by military systems and combat operations. The primary emphasis is to prevent combat casualties, ameliorate performance degradation, and sustain unit effectiveness under varying operational environments. Neuropsychiatric and physiological investigations are conducted to identify and quantify nutritional factors;

Program Ele· ·nt: #0602787A
Title: Medi Technology Budget Activity: #1

environmenta. . .resses, including heat cold, and altitude; isolation; and dehydration. Research on sleep and alertness is conducted to optimize performance during military operations. Determine strategies to prevent combat psychiatric casualties. Work in this project is consistent with both the Army and Medical Science and Technology Master Plan's Science and Technology Objectives (STOs).

(U) FY 1992 Accomplishments:

- (U) Developed methodology for assessing pilot performance using new integrated helmet and electro-optic display designs for the Comanche helicopter
- (U) Documented immune suppression in soldiers subjected to prolonged stress and nutritional deprivation
- (U) Demonstrated the ability of triazolam to improve sleep and speed of acclimatization to high altitude
- (U) Determine stress levels and consequences for the soldier through phases of Operation Desert Storm (ODS): deployment, imminent danger, combat, return, and readjustment

(U) FY 1993 Planned Program:

- (U) Devise and test strategies for reduction of musculoskeletal injuries during airborne operations
- (U) Conduct evaluations of prototype electro-optic visual display systems to assess performance optimization and impact on human visual system functions
- (U) Evaluate autologous red blood cell re-infusion for achieving pre-exposure acclimatization for high altitude
- (U) Evaluate the effectiveness of a 400-500 Kcal supplement to reduce the immune system suppression previously documented in soldiers subjected to prolonged stress and nutritional deprivation
- (U) Determine the physiological and psychological correlates of intense stress in a human model
- (U) Provide timely response to ODCSPER tasking to assess impact of operational stress in contingency actions (Operation Restore Hope)

(U) FY 1994 Planned Program:

- (U) Evaluate the use of melatonin for facilitating the transition from day to night operations
- (U) Evaluate the use of erythropoietin for achieving pre-exposure acclimatization to high altitude
- (U) Determine the effects of dehydration on thermoregulatory function during cold exposure
- (U) Evaluate candidate pharmaceutical for use in sleep management
- (U) Evaluate the efficacy of health-promoting menus and nutrition education videos for enhancing military readiness

(U) Work Performed By:

A825: Walter Reed Army Institute of Research, Dental Detachment, Washington, D.C. The two contractors are: Thermedics, Inc., Woburn, MA, and 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, 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.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602787A
Title: **Medical Technology** Budget Activity: #1

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 Ogden Bioservices Corporation, Gaithersburg, MD; University of Alabama, Birmingham, AL; Harvard University, Cambridge, MA; and The New England Deaconess Hospital, Boston, MA
A874: Letterman Army Institute of Research, Presidio of San Francisco, CA; Institute of Surgical Research, Fort Sam Houston, Texas; Walter Reed Army Institute of Research, Washington, D.C.; U.S. Army Medical Materiel Development Activity, Fort Detrick, MD. The top five contractors are: University of Massachusetts, Worcester, MA; Medical College of Virginia, Charlottesville, 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.
A875: In-house research is conducted at the U.S. Army Medical Research Institute of Chemical Defense, Aberdeen Proving Ground, MD; the U.S. Army Aeromedical Research Laboratory, Fort Rucker, AL; 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: Research Triangle Institute, Research Triangle Park, NC; SRI, Menlo Park, CA; Medical College of Virginia, Richmond, VA; Univ of Michigan, Ann Arbor, MI; and John Hopkins University, Baltimore, MD.
A878: The U.S. Army Research Institute of Environmental Medicine, Natick MA; Walter Reed Army Institute of Research, Occupational Toxicology Research Detachment, Washington, D.C.; Wright-Patterson Air Force Base, OH; U.S. Army Aeromedical Research Laboratory, Fort Rucker AL;U.S. Army Directed Energy Medical Research Detachment, WRAIR, Brooks Air Force Base, TX; and the Walter Reed Army Institute of Research, Washington, DC. The top five contractors are: EG&G Mason Research Institute, Worcester, MA; ER Facilities, Fairfax, VA; Catholic University, Washington, DC; JAYCOR, San Diego, CA; and Los Alamos National Laboratory, Los Alamos, NM.
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 five contractors are: Konigsberg Instruments, Inc., Pasadena, CA; Universal Energy Systems, Inc., Dayton OH; the University of Minnesota, Duluth, MN; the University of Colorado Health Sciences Center, Denver, CO; and the University of Wisconsin, Madison, WI.

(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,

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602787A**
Title: **Medical Technology** Budget Activity: **#1**

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 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0602789A**
PE Title: **Army Artificial Intelligence Technology** Budget Activity: **#1**

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
A880 Army Artificial Intelligence Technology	2838	3119	2696

B. (U) BRIEF DESCRIPTION OF ELEMENT: The objectives of the Army Artificial Intelligence (AI) Technology effort are 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 Technology 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 resource constrained Army Science and Technology Master Plan (ASTMP), Science and Technology Objectives (STOS) and the Army Modernization Plan.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project A880 - Army Artificial Intelligence Technology

(U) FY 1992 Accomplishments:
- (U) Fielded a prototype of the common hardware-software porting tool
- (U) Advanced accuracy and extensibility of verification and validation methods to expert systems
- (U) Investigated and demonstrated predictive analysis of interaction of flows of personnel, equipment and units against multiple Operations Plans (OPLANS)
- (U) Fielded Single Army Battlefield Requirements Evaluator (SABRE) at Headquarters Forces Command (HQ FORSCOM) to demonstrate AI solutions to Commander in Chief (CinC) management and warfighting requirements

(U) FY 1993 Planned Program:
- (U) Demonstrate applicability of expert systems technology to optimize multi-source/multi-object scheduling problems
- (U) Demonstrate use of prognostic and diagnostic intelligent systems
- (U) Demonstrate effectiveness of hybrid systems within manufacturing, robotics and decision domains

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602789A
PE Tit **Army Artificial Intelligence Technology** Budget Activity: #1

- (U) Investigate feasibility and requirements framework for interactive repository of knowledge-based systems or components

(U) FY 1994 Planned Program:

- (U) Demonstrate use of generic blackboard technology in integrating vastly different data and technologies to solve highly complex problems
- (U) Investigate neural networks analysis of large volumes of textual data
- (U) Investigate integration of hybrid systems within synthetic environments

(U) Work Performed By: In house efforts primarily performed by U.S. Army AI Center, Pentagon; U.S. Army Training and Doctrine Command (TRADOC) AI Center, Ft. Monroe, VA; U.S. Army Transportation Center, Ft. Eustis. VA; U.S. Army Combined Arms Center, Ft. Leavenworth, KS. Contractors include: Ascent Technologies, Boston, MA; American Management Systems, Rosslyn, VA; Idaho National Engineering Laboratories, Idaho Falls, ID; 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. 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 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602790A
PE Title: **Small Business Innovation Research/Small Business Technology Transfer Pilot Program**
Budget Activity: #1

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
MK50 SBIR - AMC	51312	61774	45761
MK51 SBIR - COE	4730	6000	6095
MK52 SBIR - MRDC	2888	4500	3657
MK53 SBIR - SDC	3000	3500	3048
MK54 SBIR - ARI	1018	1200	2438
MT50 STTR - AMC	0	0	1841
MT51 STTR - COE	0	0	164
MT52 STTR - MRDC	0	0	20
MT53 STTR - SDC	0	0	20
PE TOTAL	62948	*76974	63044

* The funding value stated here is accurate. It is inconsistent with the value reflected in the R-1 due to administrative error.

NOTE: The SBIR program was executed through FY 1993 in PE #0605502A. Program funds are displayed here for comparability only.

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Small Business Research and Development Enhancement Act of 1992 authorized both the Small Business Innovation Research (SBIR) program and a new pilot program, the Small Business Technology Transfer Program (STTR). The Act defined the SBIR and STTR programs, established an additional tax to the RDTE appropriation for funding of the program, and provides guidance on the selection of small businesses and research institutions for cooperative research and development initiatives. DoD funded the SBIR and STTR programs and transferred funding to program category 6.2 from all program categories-within the RDTE,A appropriation beginning in FY94. The purposes of the programs are to involve small businesses in federal R&D, increase private sector commercialization of technology developed by federal R&D, and foster and encourage participation by minority and woman-owned businesses. The Army SBIR program works with small businesses to develop innovative solutions to Army research requirements. The Army receives more than 4000 proposals each year from businesses in all 50 states responding to a wide variety of research topics of interest to the Army. Each

topic is generated by an Army research organization and seeks a technological solution for a specific or broad R&D requirement. Army SBIR topics are focussed into technology clusters which are based on the DOD technology thrust areas and Army critical technologies. SBIR technical efforts are funded in two phases. Phase I is a 6-month concept feasibility effort which is funded at $50K-$100K. Phase II efforts are awarded for promising Phase I results, and are funded at $500K-$750K over a period of two years.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project MK50 - Small Business Innovation Research (SBIR) - Army Materiel Command (AMC):

(U) FY 1992 Accomplishments:

- (U) Obligated $51M on Phase I and Phase II contracts across the country in all technology areas relevant to the Army materiel
- (U) Advanced Materials: Developed several advances in the composite materials field, including thermoplastic polymer matrix composite bridge deck for light bridge and a composite towbar for M-1 tanks. Developed fiberglass patch kits which were used to seal battle damaged vehicles and restore chemical agent and moisture resistance during Operation Desert Storm
- (U) Microelectronics and Photonics: Two projects extended infrared detection capabilities through use of focal plane array technology and high-speed laser rangefinders
- (U) High Performance Computing and Simulation: Developed reusable Ada software for real-time systems. Developed innovative new approach to networked computing. Developed combat vehicle platoon control system to aid in reduction of combat vehicle crew sizes
- (U) Engineering Sciences: Significantly expanded cargo handling system capabilities for high-sea offloading operations

(U) FY 1993 Planned Program:

- (U) Award Phase I contracts in approximately 167 topic areas ranging across the entire spectrum of Army/DoD technology requirements. Expect Phase I awards exceeding $10M across the country. Anticipate funding more than $50M in continuing and new start Phase II efforts covering a broad range of technologies

(U) FY 1994 Planned Program:

- (U) Initiate technical efforts in approximately 255 topic areas ranging across the entire spectrum of Army/DoD technology requirements. Anticipate obligations of approximately $19.1M on Phase I contracts and $26.6M on continuing and new Phase II contracts nation-wide

(U) Project MK51 - Small Business Innovation Research (SBIR) - Corps of Engineers (COE):

(U) FY 1992 Accomplishments:

- (U) Obligated in excess of $4.7M for Phase I and II contracts
- (U) Microelectronics and Photonics: Developed a handheld digital electronic compass which has made cumbersome handheld compasses obsolete
- (U) High Performance Computing and Simulation: Applied hyperspectral imaging spectroscopy to the detection and identification of military targets and backgrounds

Program Element: #0602790A
PE Title: **Small Business Innovation Research/Small Business Technology Transfer Pilot Program** Budget Activity: #1

- (U) Engineering Sciences: Successfully converted hardcopy maps into electronically readable forms by combining artificial intelligence with robotics technology

(U) FY 1993 Planned Program:

- (U) Award Phase I contracts in approximately 16 topic areas with mostly engineering science and environmental applications. Expect Phase I awards exceeding $1M. Anticipate funding $5M in continuing and new start Phase II efforts covering a broad range of technologies

(U) FY 1994 Planned Program:

- (U) Initiate technical efforts in approximately 20 topic areas in the areas of high performance computing and simulation, engineering science and environmental and geo sciences. Anticipate obligations of approximately $1.5M on Phase I contracts and $4.6M on continuing and new Phase II contracts

(U) Project MK52 - Small Business Innovation Research (SBIR) - Medical Research and Development Command (MRDC)

(U) FY 1992 Accomplishments:

- (U) Obligated nearly $3M for Phase I and Ph contracts
- (U) Microelectronics and Photonics: Develop[illegible] rugged personal computer for use in conducting field testing
- (U) Biotechnology: Developed instrumentation for detection of toxicants in drinking water. Another project extended capabilities for man-portable, lightweight reliable oxygen unit

(U) FY 1993 Planned Program:

- (U) Award Phase I contracts in approximately 16 topic areas related to biotechnology as well as life, medical and behavioral science. Expect Phase I awards exceeding $1M. Anticipate funding $3.5M in continuing and new start Phase II efforts

(U) FY 1994 Planned Program:

- (U) Initiate technical efforts in approximately 26 topic areas in the areas of biotechnology as well as life, medical and behavioral science. Anticipate obligations of approximately $2.0M on Phase I contracts and $1.6M on continuing and new Phase II contracts

(U) Project MK53 - Small Business Innovation Research (SBIR) - Space and Strategic Defense Command (SSDC):

(U) FY 1992 Accomplishments:

- (U) Obligated $3.5M on a variety of Phase I and Phase II contracts

(U) FY 1993 Planned Program:

- (U) Award Phase I contracts in approximately 10 topic areas in a variety of technological areas. Expect Phase I awards exceeding $500K. Anticipate funding $3.0M in continuing and new start Phase II efforts

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602790A
PE Title: **Small Business Innovation Research/Small Business Technology Transfer Pilot Program**
Budget Activity: #1

(U) FY 1994 Planned Program:
- **(U)** Initiate technical efforts in 5 topic areas. Anticipate obligations of approximately $350K on Phase I contracts and $2.7M on continuing and new Phase II contracts

(U) Project MK54 - Small Business Innovation Research (SBIR) - Army Research Institute (ARI):

(U) FY 1992 Accomplishments:
- **(U)** Obligated $1.2M on three Phase I contracts and several Phase II contracts. Developed simulation models to model human performance. Also performed theory-based training strategies for commander decision making skills

(U) FY 1993 Planned Program:
- **(U)** Award Phase I contracts in 3 topic areas related to life, medical and behavioral science. Expect Phase I awards exceeding $250K. Anticipate funding nearly $1M in continuing and new start Phase II efforts

(U) FY 1994 Planned Program:
- **(U)** Initiate technical efforts in 3 topic areas related to life, medical and behavioral science. Anticipate obligations of approximately $200K on Phase I contracts and $2.2M on continuing and new Phase II contracts

(U) Project MT50 - Small Business Technology Transfer Pilot (STTR) - Army Materiel Command (AMC):

(U) FY 1992 Accomplishments: Program not funded

(U) FY 1993 Planned Program: Program not funded

(U) FY 1994 Planned Program:
- **(U)** Fund $1.8M in cooperative efforts focusing on manufacturing technology

(U) Project MT51 - Small Business Technology Transfer Pilot (STTR) - Corps of Engineers (COE).

(U) FY 1992 Accomplishments: Program not funded

(U) FY 1993 Planned Program: Program not funded

(U) FY 1994 Planned Program:
- **(U)** Fund $164K in cooperative efforts focusing on engineering and environmental sciences

(U) Project MT52 - Small Business Technology Transfer Pilot (STTR) - Medical Research and Development Command (MRDC):

(U) FY 1992 Accomplishments: Program not funded

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0602790A
PE Title: **Small Business Innovation Research/Small Business Technology Transfer Pilot Program**
Budget Activity: #1

(U) FY 1993 Planned Program: Program not funded

(U) FY 1994 Planned Program:
- **(U)** Initiate cooperative effort with $20K funding

(U) Project MT53 - Small Business Technology Transfer Pilot (STTR) - Space and Strategic Defense Command (SSDC):

(U) FY 1992 Accomplishments: Program not funded

(U) FY 1993 Planned Program: Program not funded

(U) FY 1994 Planned Program:
- **(U)** Initiate cooperative effort with $20K funding

(U) Work Performed By: Small business firms.

(U) Related Activities: Not applicable.

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

(U) International Cooperative Agreements: Not applicable.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603001A
E Title: Logistics Advanced Technolo; Budget Activity: #2

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D150	Fuels and Lubricants		
	2244	2646	0
D242	Airdrop Equipment		
	1557	1634	1871
D528	Acousto-Optico Tunable Filter (AOTF) Technology Demostration		
	0	4727	0
D543	Ammunition Logistics		
	3033	6398	2671
D544	Cooperative Explosive Safety		
	0	0	956
D594	Metrology and Calibration		
	646	616	678
DC07	Joint Service Food Technology Demonstrations		
	564	468	2420
DC44	Tactical Logistics		
	1593	468	421
DJ28	Test Measurement Technology Development		
	1075	862	949
DXXA	Soldier Survivability		
	0	233	2947
PE TOTAL	10712	18052	12913

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 and personnel from lower 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 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 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 project reduces Operation and Support (O&S) costs of weapon systems by increasing the capability to rapidly diagnose and predict failures and by making automatic test programming faster and more efficient through the use of expert system methodology. Soldier Survivability demonstrates the integration of advanced technologies to enhance the performance and capabilities of individual soldiers. This Program Element contains one new start, Project D544, Cooperative Explosive Safety, which is a two year effort that resulted 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. This research will investigate the use of Acousto-Optico Tunable Filter (AOTF) technology. The work in this program element is consistent with the resource constrained Army Science and Technology Master Plan (ASTMP), the Science and Technology Objectives (STOs) contained therein, and the Army Modernization plans.

C. (U) JUSTIFICATION FOR PROJECTS:

(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. A portion of the Fuels and Lubricants program is being conducted by Army personnel collocated at Wright Lab under Project Reliance.

(U) FY 1992 Accomplishments:

- (U) Completed comprehensive assessment of JP-8 demonstrating quantifiable operations and support cost reductions.
- (U) Completed full scale engine testing of high-temperature engine lubricants in low-heat rejection engines.
- (U) Completed full scale rig simulator evaluation of non-flammable hydraulic fluid for application in the Advanced Field Artillery System (AFAS), and the Future Armored Resupply Vehicle FARV).
- (U) Completed development of experimental fuel filtration additive unit for upgrading and demonstrating field additive injection capabilities.

(U) FY 1993 Planned Program:

- (U) Complete development and transition near infrared spectroscopy technology (NIR) to existing mobile petroleum laboratories for predicting selected fuel inspection properties such as cetane number, freeze point, and distillation.
- (U) Complete evaluation of non-flammable hydraulic fluid in armored vehicle fluid system simulator.
- (U) Complete operational evaluation of the experimental fuel filtration additive unit at Ft Steward, GA; Ft Irwin, CA; and Camp Pendleton, CA.
- (U) Complete development of correlation between FLIR Spectroscopy and physical chemical property data on lubrication product as part of the Petroleum Quality Analysis (PQA).

(U) FY 1994 Planned Program: 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.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603001A
PE Title: **Logistics Advanced Technology** Budget Activity: #2

(U) Project D242 - Airdrop Equipment: This project focuses on the de nonstration and development of innovative techniques and equipment for aerial delivery of cargo and personnel. The goal is precision delivery of heavier payloads either at lower altitudes (300 ft) and higher velocities (250 knots) or at extremely high altitude (up to 30,000 ft). Rationale for delivery at extreme altitudes is improved cargo/personnel and aircraft survivability. Starting in FY 1993, this project is restructured in response to the needs of the DoD Thrusts, specifically Thrust #5, Advanced Land Combat. The primary requirement of Thrust #5 is rapid deployment of combat vehicles. Two efforts will be demonstrated in the Advanced Airdrop for Land Combat (AALC) Advanced Technology Demonstration (ATD) - High Speed Low Altitude Airdrop System (HSLAADS) and Advanced Recovery System (ARS). HSLAADS will demonstrate delivery of 42,000 lb of cargo at 300 ft and 250 knots. ARS will demonstrate precision delivery 42,000 lb of cargo but at 10,000 to 30,000 ft. To complement rapid deployment of combat vehicles, this project also provides the capabilities to reliably insert vehicle crewmen and other combatants en mass from aircraft traveling at high speeds and low altitudes. Delivery of these personnel will be demonstrated with the Mass Tactical Aerial Delivery System (MTADS). To meet the goals of these demonstrations, advanced parachute designs coupled with innovative aircraft exit techniques will be developed and integrated with advanced sensors.

(U) FY 1992 Accomplishments:
- (U) Fabricated components for a 1-ton Supply Container Delivery System for the FY 1993 demonstration.
- (U) Demonstrated 20,000 lb manually-guided air delivery system as part of joint venture with the National Aeronautics and Space Administration (NASA) for the ARS.

(U) FY 1993 Planned Program:
- (U) Demonstrate a 1-ton Supply Container Delivery System from 300 ft and 250 knots and transition program to engineering development.
- (U) Define concept, select material systems, and initiate technical evaluation to increase ARS payload to 42,000 lb.
- (U) Define and analyze conceptual design of MTADS.

(U) FY 1994 Planned Program:
- (U) Transition the 1-ton Sypply Container Delivery System program to engineering development.
- (U) Integrate Global Positioning System (GPS) navigation into the ARS and fabricate brassboards.
- (U) Develop initial parachute design for the HSLAADS.
- (U) Conduct a comprehensive engineering analysis of the MTADS.

(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 Petroluem Quality Analysis (PQA) project.

(U) FY 1992 Accomplishments: Not Applicable

(U) FY 1993 Planned Program:
- (U) Fabricate militarized (downsized, ruggedized) AOTF/NIR test models.
- (U) Prepare test plan, identify test parameters.
- (U) Develop preliminary calibration models.

- (U) Conduct correlation programs.
- (U) Conduct Round Robin test program.
- (U) Prepare final test report.

(U) FY 1994 Planned Program: Not Applicable

(U) Project D543 - Ammunition Logistics: Ammunition Logistics satisfies a critical need for improved systems to sustain and support operations and peacetime readiness for both strategic and tactical scenarios. It will improve packaging/palletization and weapon system rearm for Artillery, Armor, Air Defense, Aviation, and Infantry, as well as enhance Explosive Safety, Combat Service Support/Sustainability, and C4 for Ammo Management. It also exploits emerging technologies and productivity enhancers/cost savers aimed at quantum improvements to our global logistics system (strategic) and our combat focused logistics system (tactical).

(U) FY 1992 Accomplishments:

- (U) Selected concept for an improved Artillery Rearm Module (ARM II) and initiated design and fabrication of prototype.
- (U) Awarded contract to develop Modular Aviation Rearm/Resupply System (MARRS) concept in support of improved attack helicopter rearm.
- (U) Completed system architecture development and integration for the Standard Army Ammunition System-Ammunition Transfer Point (SAAS-ATP) management information system prototype.
- (U) Completed Future Armor Rearm System (FARS) system integration and engineering tests.
- (U) Initiated development of a tele-operated system for the Small Emplacement Excavator (SEE) to provide a remote operation capability for Explosive Ordnance Disposal (EOD) personnel.
- (U) Initiate design and fabrication of a truck mounted Loose Mine Restraint System (LMRS) prototype to assure safe tactical transport of M15 and M19 mines.
- (U) Fabricated improved Generic Design Missile Container (GDMC).

(U) FY 1993 Planned Program:

- (U) Complete fabrication and engineering testing of ARM II and transition to PM FARV.
- (U) Continue MARRS concept modelling and development; develop ammo mission configured load concepts; fabricate tactical resupply system components.
- (U) Complete software development and testing/technical demonstration of SAAS-ATP prototype in a field Ammunition environment with soldiers.
- (U) Conduct FARS technical demonstration, evaluate results and transition to PM Future Armored Resupply Vehicle (FARV).
- (U) Initiate development of concepts for advanced ammo storage/transfer technology and process controls for automated rearm systems.
- (U) Conduct market survey and develop concepts for improved Insensitive Munitions (IM) Packaging Technology (IMPACT).
- (U) Complete prototype development of EOD tele-operated system for SEE and conduct user demonstration.
- (U) Complete fabrication of LMRS, conduct safety certification testing and complete technical data package.
- (U) Conduct market survey and develop concepts to apply an advanced technology robotic arm/"smart" crane to improve rearm of High to Medium Altitude (HIMAD) missiles.

- (U) Develop concepts for future munitions packaging improvements; initiate development of common tri-service test and evaluation procedures/standards, data bases, and technical data.

(U) FY 1994 Planned Program:

- (U) Complete MARRS concept modelling and development. Demonstrate improved mission configured loads and tactical resupply system as part of the MARRS for helicopter rearm; develop concepts for improved rearm of helicopter rocket/missile weapon systems.
- (U) Continue development of concepts for advanced ammo handling (storage and conveyance) and process controls (automated docking and vehicle positioning sensors) prototypes for weapon rearm systems.
- (U) Select concept and initiate an advanced technology robotic arm/"smart" crane to improve rearm of High to Medium Altitude (HIMAD) missiles.
- (U) Complete SAAS-ATP final report and transition technology to PM ILOGS.
- (U) Complete design of IMPACT test models and support equipment.
- (U) Develop computer simulated modelling of ammunition airdrop survivability tests to reduce airdrop safety certification costs.
- (U) Develop crew saving resupply/rearm concepts for the Light Weight 155mm howitzer.

(U) Project D544 - Cooperative Explosive Safety: This project is a new start and the direct outgrowth of an Office of the Secretary of Defense (OSD) 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 1992 Accomplishments: Not applicable

(U) FY 1993 Planned Program: Not applicable

(U) FY 1994 Planned Program:

- (U) Complete the intermediate-scale testing of the most promising underground storage design concepts and obtain blast and debris data to evaluate design performance.
- (U) Perform an analysis and evaluation of the intermediate-scale test data supplemented by computer simulations to define in detail, detonation effects; make the final selection of the most effective and practical design features.
- (U) Validate existing computer codes against the intermediate-scale test results and obtain predictions for the large-scale, validation tests.
- (U) Initiate the large-scale validation test program to demonstrate the effectiveness of the proposed design concept of a full-scale ammunition storage facility and its ability to reduce or contain blast and debris hazards; design tests, select site(s), and construct test facilities.

(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). 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. All Army weapons systems benefit from this pervasive technology.

(U) FY 1992 Accomplishments:
- (U) Completed development of millimeter/microwave device calibration chamber.
- (U) Defined prototype quantitative standards for gas mask leak testing.
- (U) Validated performance of dynamic pressure measurement system.

(U) FY 1993 Planned Program:
- (U) Produce world's first all-Nb Junction 10-volt intrinsic primary voltage standard devices.
- (U) Complete development of gas mask leak test standards.
- (U) Complete development of dynamic pressure measurement system.

(U) FY 1994 Planned Program:
- (U) Demonstrate a portable, self-sustained 10-volt primary voltage standard with Global Positioning System (GPS) input.
- (U) Develop standard-grade microwave detector with VXI technology.
- (U) Develop standard-grade 8-1/2 digit voltmeter with VXI technology.

(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 materials, energy utilization, and combination heating technologies to provide extended, simplified field feeding without resupply, and to deliver hot foods to the battlefield. It exploits advances in ration quality, packaging, preservation, and nutritional enhancement to improve morale, extend endurance, and sharpen mental acuity.

(U) FY 1992 Accomplishments:
- (U) Demonstrated the utility of a self-heating mechanism for the self-heating, individual ration (SHIR) concept to enhance soldier acceptance and consumption.
- (U) Completed refinement/demonstration of a low saturated fat component of reconstituted milk powder to improve dietary intake.
- (U) Demonstrated a thermostabilized meal tray which provides familiar foods, reduced logistics costs, and reduced field waste.

(U) FY 1993 Planned Program:
- (U) Demonstrate methods to quickly monitor chemical or microbial changes in foods to enable Army inspectors to determine ration wholesomeness/servability in the field.
- (U) Demonstrate the performance and effectiveness of food service plastic waste handling equipment proposed for DoD applications.
- (U) Demonstrate single use chemical heating technologies suitable for reheating bulk rations for group feeding.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603001A
PE Title: **Logistics Advanced Technology** Budget Activity: #2

(U) FY 1994 Planned Program:

- (U) Demonstrate new product and packaging enhancements of the Self Heating Individual and Group Rations designed to enhance soldier acceptance and consumption.
- (U) Demonstrate producibility of mobility-enhancing ration components, institutional-size packaging, as well as technologies for vegetable texture and starchy food stabilization.
- (U) Demonstrate new rapid methodology for monitoring ration quality to quickly determine storage stability.
- (U) Complete prototype design for multifuel burner and centrally-heated modular appliances to support multi-ration food service systems, high mobility, and 30% reduction in fuel and manpower.

(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 1992 Accomplishments:

- (U) Developed Technology Demonstration hardware/software and initiated subassembly testing for Automated All-weather Cargo Transfer System (AACTS).
- (U) Successfully tested High Sea States Container Transfer System (HISEACOTS) prototype during J-LOTS III (Ocean Ventures '92).
- (U) Upgrade HISEACOTS system components.
- (U) Initiated hardware upgrades to technology demonstrator for the Pontoon Air Cushion Kit (PACK).

(U) FY 1993 Planned Program:

- (U) Conduct Joint Service (Army/Navy) demonstration of HISEACOTS and Navy landing craft assault craft interface and M1 tank transfer.
- (U) Complete system upgrades design to include Roll On/Roll Off (RO/RO) ramp interface.
- (U) Design, fabricate and evaluate Causeway Dredge
- (U) Design, fabricate and evaluate Portable Beach Ramp

(U) FY 1994 Planned Program:

- (U) Transition AACTS to 6.3b.
- (U) Transition HISEACOTS to 6.4.
- (U) Complete component development for a fuel cell driven quiet power system rated at 400 watts, weighing 11 lb at 2.5 kwh.

(U) Project DJ28 - Test Measurement Technology Development: This project demonstrates technology which increases Army weapons systems' reliability and mission availability by improving the speed, accuracy and reliability of the weapon failure diagnosis as well as failure prognosis. Test measurements technology exploits expert systems, micromachining, board Built-in-Test (BIT), and MMW Integrated Circuits (MMIC). It demonstrates new test techniques, where required, using Army-wide technology expertise.

Program Element: #0603001A
PE Title: **Logistics Advanced Technology** Budget Activity: #2

(U) FY 1992 Accomplishments:
- (U) Designed 8x8 light-addressable infrared scene generator array for infrared (IR) calibration evaluation.
- (U) Initiated concurrent engineering diagnostic tool evaluation program with the Navy, Program Manager Line-Of-Sight Anti-Tank (LOSAT), and Army depots.
- (U) Developed a library of fault modes and testability rules for MMIC devices.

(U) FY 1993 Planned Program:
- (U) Demonstrate low-cost 16X16 infrared scene generator for prototype built-in IR diagnostics/calibration.
- (U) Complete and beta-site tested concurrent engineering Diagnostic Analysis/Repair Tool Set (DARTS).
- (U) Demonstrate built-in test for MMIC brassboard comprised of GaAs-based MIMIC integrated circuits.

(U) FY 1994 Planned Program:
- (U) Demonstrate 32X32 infrared array prototype for built-in diagnostics/calibration.
- (U) Apply DARTS concurrent engineering tool to Army weapon system development and retrofitting of built-in test.
- (U) Apply MMIC built-in test technology to Army weapon system microwave brassboard.

(U) Project DXXA - Soldier Survivability: Beginning in FY 1993, the Soldier Survivability project has been restructured from PE #0603002A, Project D995. From FY 1990-1992, Project D995 included the Soldier Integrated Protective Ensemble (SIPE) Advanced Technology Demonstration (ATD). Project DXXA addresses the critical Army need to enhance the performance, protection, and sustainment of the individual soldier. The program exploits emerging technologies to provide soldiers with high technology operational capabilities and protective systems. Tactical enhancements include soldier-to-soldier communications, long-range hearing, indirect viewing, enhanced visual capabilities via thermal and infrared sensors, Global Positioning System (GPS)/digital mapping and compass, video capture, and information management. Technologies are anticipated to reduce heat stress in chemical/biological (CB) contaminated environments, enhance CB and ballistic protection, reduce the weight of the protective ensemble and improve the soldier-machine interfaces (i.e., communications, microclimate conditioning, weapons, etc.) for improved operational effectiveness. Technology advances will greatly improve the supply logistics system for multi-functional items required to protect and sustain the combat soldier.

(U) FY 1992 Accomplishments: Not applicable

(U) FY 1993 Planned Program:
- (U) Complete the Advanced Technology Demonstration (ATD) of the Soldier Integrated Protective Ensemble (SIPE).
- (U) From an assessment of the SIPE ATD, identify technologies for insertion into the enhanced integrated soldier system (TEISS), the 6.3B follow-on program for SIPE.
- (U) Investigate advanced/emerging technologies that show potential for Generation II SIPE ATD application.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603001A
PE Title: **Logistics Advanced Technology** Budget Activity: #2

(U) FY 1994 Planned Program:

- (U) Identify viable technologies for Generation II SIPE ATD.
- (U) Identify design criteria and begin component development for Generation II SIPE ATD.

(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; Army Research Laboratory, Aberdeen, MD; Natick Research, Development and Engineering Center, Natick, MA; Tooele Army Depot, Tooele, UT; Southwest Research Institute, San Antonio, TX; National Institute of Standards and Technology, Gaithersburg, MD; Sandia National Laboratories, Albuquerque, NM, Construction Engineering Research Lab, Champaign, IL; Oak Ridge National Lab, Oak Ridge, TN; Defense Ammo Center and School, Savannah, GA; Earle Naval Weapons Station, Earle, NJ; Test and Evaluation Command, Aberdeen, MD; U.S. Navy EOD Center. Contractors include: Giordano Associates, Inc., Sparta, NJ; Urdan Industries, Ltd., Israel; Vitronics, Inc., Eatontown, NJ; Advanced Technologies Research, Laurel, MD; American Coastal Industries, Renova, PA; Armament Systems International, Aberdeen, MD; Metric Systems Corp., Ft. Walton Beach, FL; Western Design Corp., Irvine, CA; Airmold Corp, Roanoke Rapids, NC; Arthur D. Little, Inc., Cambridge, MA; Indianhead, MD; General Electric Corp., Burlington, VT; Delorme Publishing Co., Freeport, ME; MTA, Inc., Huntsville, AL; Univ. of Illinois, Champaign, IL; Vitro Inc., Silver Spring, MD: SAIC, Huntsville, AL; and Rail Co., Towson, MD; Rutgers University (CAFT), New Brunswick, NJ; UMass-Amherst, MA; Rochester Institute of Technology, Rochester, NY; Brandeis University, Waltham, MA; Worcester Polytechnic Institute, Worcester, MA; Framingham State College, Framingham, MA; Land O' Lakes Co., Clear Lake, WI; Alfa Lavel/Tetra Pak, NY, NY; and Cherry Burrell Co., Louisville, KY.

(U) Related Activities: This program adheres to Tri-Service Reliance Agreements on Clothing, Textiles & Food, Explosive Ordnance Disposal, and Fuels and Lubes 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) and 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 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603002A
Title: **Medical Advanced Technology** Budget Activity: #2

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D804 Prostate Cancer Research	1975	1890	0
D805 Laser Burn Treatment	987	1890	0
D806 Breast Cancer Research	24688	204662	0
D807 Industrial Base/Medical Biological Defense Vaccines and Drugs	10956	13106	15724
D810 Industrial Base/Infectious Disease Vaccines and Drugs	2588	4644	9064
D819 Field Medical Protection and Human Performance Enhancement - Non-Systems Advanced Development	4018	3573	0
D840 Combat Injury Management	3387	3647	2851
D995 Medical Chemical Defense Life Support Materiel - Non-Systems Specific Advanced Development	8672	11803	12707
PE TOTAL	57271	*245215	40346

* The funding value stated here is accurate. It is inconsistent with the value reflected in the R-1 due to administrative error.

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, materials for ballistic and laser eye protection, and nutrition and soldier performance enhancement. The DoD Core Vaccine and Drug program, an Advanced Technology Transition Demonstration (ATTD) equivalent 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 resource constrained Army Science and Technology Master Plan, Science and Technology Objectives (STOs) milestones for the Army's key emerging technologies and Army force modernization plans.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603002A
Title: **Medical Advanced Technology** Budget Activity: #2

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project D804 - Prostate Cancer Research: By Congressional direction, the purpose of this project is to establish a prostate disease center at the Walter Reed Army Institute of Research.

(U) FY 1992 Accomplishments:

- (U) Program initiated in FY 1992. Funds ($1,975,000) transferred to the Uniformed Services University of Health Sciences for support of the Center for Prostate Disease Research at the Walter Reed Army Institute of Research
- (U) Established the Prostate Disease Research Center as a cooperative effort between the Walter Reed Army Institute of Research, Walter Reed Army Medical Center (WRAMC), and Uniformed Services University of the Health Sciences
- (U) Created a computer database to study and track all cases of prostate cancer treated at WRAMC
- (U) Compiled data on 300 patients who had radical prostatectomy
- (U) Initiated Clinical studies to evaluate autologous blood usage and to study cathepsin D and other potential cancer markers, and hormonal down staging prior to radical surgery and hormone combinations or advanced disease

(U) FY 1993 Planned Program:

- (U) Initiate a new study to evaluate better staging of prostate cancer using monoclonal antibodies
- (U) Convene a triservice collaborative research meeting to initiate a system-wide database
- (U) Employ a molecular biologist well known for work with P53 tumor suppressor gene
- (U) Continue clinical studies to evaluate autologous blood usage, morbidity such as impotence and incontinence, study cathepsin D and other potential cancer markers, and study hormonal down staging prior to radical surgery and hormone combinations for advanced disease

(U) FY 1994 Planned Program: No program requested

(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 1992 Accomplishments:

- (U) A prototype diagnostic system for burn depth and tissue assessment has been designed, constructed, is fully operational, and has been successfully tested in small animals (rats). Also, the computer software that utilizes image processing algorithums for burn depth assessment is being written
- (U) A prototype Burn Debridement System (Laser Robot for Removal of Burned Tissue) has been designed, constructed and is fully operational, and preliminary results suggest that laser-induced thermal damage in skin (approx. 100um) is adequate for burn debridement with grafting
- (U) The Burn Debridement system concept will be proven by treating large area burn injury ith subsequent skin grafting, in a pig animal model

(U) FY 1993 Planned Program:

- (U) Complete animal testing and continue software construction (image archiving, image analysis) of burn depth and tissue damage diagnostic system

- (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

(U) **FY 1994 Planned Program:** No program requested

(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 1992 Accomplishments:**

- (U) Approximately $5 million was transferred to Army, Navy and Air Force Medical Centers for purchase of state of the art stereotactic biopsy units for breast cancer screening and reporting of results
- (U) Thirty-one proposals to conduct research were received from Government activities; a peer review panel scientifically evaluated and prioritized the proposals
- (U) Six research projects initiated by Government activities for approximately $1.6 million to conduct studies on bone marrow, cytogenetics, vitamin D, sex hormones, retrotransposons and growth dynamics of cells
- (U) A Broad Agency Announcement to seek proposals on breast cancer research was issued to universities, nonprofit institutes and industry; Sixty-two proposals were received
- (U) Thirteen grants awarded to universities for approximately $11 million for research on new detection techniques, therapeutic agents, growth factors and markers
- (U) Award four grants/contracts recommended by peer panel review for remaining FY 92 appropriation

(U) **FY 1993 Planned Program:**

- (U) A peer-reviewed program of research will be executed by non-government scientists. The Institute of Medicine of the National Academy of Sciences is assisting in establishing the focus for this program

(U) **FY 1994 Planned Program:** No program requested

(U) **Project D807 - Industrial Base/Medical Biological Defense Vaccines and Drugs:** Research conducted in this pr ect focuses on preclinical development of safe and effective prophylaxis and therapy (vaccines and drugs) fo. soldiers exposed 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. To complete the defensive effort, a broad range of technologies involved in the targeting and delivery of prophylactic and therapeutic medical countermeasures are evaluated. USAMRDC functions as the DoD Executive Agent medical biological defense research.

(U) **FY 1992 Accomplishments:**

- (U) Demonstrated efficacy of microencapsulated toxoid v. cine against 22 times the lethal dose (LD_{50}) of aerosolized Staphylococcal enterotoxin B; immunity correlated with antibody level in lung and circulation
- (U) Demonstated that a new live vaccine candidate, B, anthracis Delta Sterne containing plasmid pPA102 was highly efficacious against B, anthracis challenge

Program Element: #0603002A
Title: **Medical Advanced Technology** Budget Activity: #2

- (U) Established Good Laboratory Practice (GLP) procedure for the in-house production of diagnostic reagents
- (U) Determined the final design characteristics for a diagnostic flow-through assay
- (U) Defined attenuation, reversion, and protection characteristic of genetically engineered Venezuelan encephalitis virus mutants in horses
- (U) Completed scarification and neurovirulence studies of cell culture-derived vaccinia (smallpox) candidate vaccines
- (U) Protected against lethal aerosol challenge of ricin for 10 weeks after last immunization with ricin toxoid
- (U) Tested bioengineered recombinant products for safety and efficacy against botulinum toxin serotype E challenge

(U) FY 1993 Planned Program:

- (U) Begin to evaluate the sensitivity and specificity of flow through diagnostic kits under laboratory conditions
- (U) Optimize use of the current pentavalent Botulinum toxoid vaccine
- (U) Evaluate the use of despeciated Equine Antitoxin for the ·y for Botulinum intoxication
- (U) Develop and evaluate microencapsulated vaccine against Staphylococcal enterotoxin B intoxication
- (U) Evaluate genetically engineered Venezuelan encephalitis virus vaccine
- (U) Evaluate the immunogenicity of vaccinia vectored vaccines for biological threat agents

(U) FY 1994 Planned Program:

- (U) Transition ricin toxoid to advanced development
- (U) Evaluate the potential utility of passive immunotherapy for Staphylococcal enterotoxin intoxication
- (U) Evaluate protective compounds against inhalation ricin challenge
- (U) Continue studies on Venezuelan encephalitis virus and vaccinia vectored vaccines
- (U) Transition Diagnostic Agent Field Kit to advanced development

(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 the following 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 1992 Accomplishments

- (U) Transitioned to advanced development a prototype oral CWC-OA vaccine for the prevention of *Campylobacter* diarrhea (1:1 mixture of heat-inactivated and formalin fixed *Campylobacter jejuni* whole cells supplemented with an oral adjuvant - *Escherichia coli* heat labile enterotoxin)
- (U) Determined multiple dose bioavailability of arteether intramuscular (IM) injection and single dose IM bioavailability using 14C-arteether
- (U) Determined an effective and practical topical paromomycin formulation for the treatment of cutaneous leishmaniasis in animal models

Program Element: #0603002A
Title: **Medical Advanced Technology** Budget Activity: #2

- (U) Produced and evaluated new candidate dengue 1, 2, 3, and 4 virus vaccines after serial passage in primary cells
- (U) Identified a West Nile Virus strain, which grows to high titer, suitable for the production of an inactivated virus vaccine

(U) FY 1993 Planned Program:

- (U) Perform phase I testing of a vaccinia vectored or baculovirus vectored circumsporite malaria vaccine
- (U) Develop a preclinical data package for a multicomponent sporozoite/liver stage malaria vaccine
- (U) Continue evaluation of novel means of non-specifically enhancing the immune response to candidate vaccines
- (U) Prepare preclinical data packages and phase one testing of candidate shigella immunogens to select preparations for transition to advanced development
- (U) Continue extramural preclinical safety tests for drugs against multidrug-resistant malaria and leishmaniasis
- (U) Perform Phase I safety testing of candidate vaccines for prevention of ETEC diarrheal diseases
- (U) Compare campylobacter recombinant antigens for efficacy in animal models
- (U) Determine malaria vaccine immunogenicity in animal models using liver-stage and CS protein antigens
- (U) Devise improved vaccine production, vaccine adjuvants, and vaccine delivery systems

(U) FY 1994 Planned Program:

- (U) Continue extramural preclinical safety tests for drugs against multidrug-resistant malaria and leishmaniasis
- (U) Continue to develop a live vectored P. vivax malaria vaccine
- (U) Perform Phase I safety testing of candidate vaccines for prevention of ETEC diarrheal diseases
- (U) Initiate studies to select field sites for vaccine testing
- (U) Perform intramural and extramural preclinical safety tests to qualify candidate drugs for parasitic diseases
- (U) Continue immunogenicity studies to evaluate single and multiple component vaccine candidates against *Campylobacter*
- (U) Prepare preclinical data packages and Phase I testing of candidate shigella immunogens to select preparations for transition to advanced development
- (U) Determine efficacy of oral cholera vaccine in prevention of enterotoxigenic *E. coli* caused diarrheas
- (U) Field test candidate malaria vaccines
- (U) Develop multiple component adjuvantized oral vaccines for the prevention of campylobacter traveller's diarrhea
- (U) Develop algorithms for predicting protective malarial immunity
- (U) Devise improved vaccine production, vaccine adjuvants, and vaccine delivery systems
- (U) Complete safety and immunogenicity studies of candidate liposomal malaria vaccines
- (U) Complete safety studies of candidate malaria vaccines in humans prior to and after exposure to malaria
- (U) Conduct a study in volunteers of an antenuated Shigella vaccine modified by the deletion of a gene responsible for virulence

- (U) Conduct efficacy and immunogenicity of oral and intranasal proteosome shigella vaccine in humans

(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 1992 Accomplishments:
- (U) Completed nutritional and biomedical evaluation of an improved field survival ration
- (U) Continued development and field evaluation of stable isotope and clinical nutrition technologies to measure energy expenditure, water consumption, and nutritional status
- (U) Performed extensive acceptance testing of initial production lots of Ballistic Laser Protective Spectacles

(U) FY 1993 Planned Program:
- (U) Conduct nutritional assessment of female soldiers during basic training
- (U) Conduct an assessment of nutrional status of Special Forces candidates
- (U) Complete development of sports nutrition orient

(U) FY 1994 Planned Program:
- (U) Project designation eliminated. Planning, programming, and execution of this research will occur under the PE #0602787 exploratory development research projects 878 and 879 commencing in FY 94

(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 casuality 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 1992 Accomplishments:
- (U) Developed an optimum mode of mechanical ventilation to prevent the adverse sequelae of inhalation injury
- (U) Studied the renal toxicity of model hemoglobin compounds (blood substitutes) in rabbit and swine models
- (U) Measured the effect of free-radical mediated injury associated with model hemoglobin compounds in rats
- (U) Optimized the design of the Medical Supply Envelope which organizes needed medical equipment in the field
- (U) Completed technical data packages for the field hospital bed side rails and footboards

- (U) Demonstrated the probable role of nitric oxide in hemoglobin associated hypertension
- (U) Developed three-week suspended release formulation for microencapsulated cephlazolin

(U) FY 1993 Planned Program:

- (U) Complete technical demonstration of a new medic bag and supply packet for emergency casualty aid
- (U) Initiate selection of candidate electromagnetic energy generators for field surgery
- (U) Study the hypertensive effect of model hemoglobin compounds in rabbit and swine models
- (U) Complete evaluation and testing of a Field Triage Light
- (U) Modify the Field Anesthesia Machine or concept exploration of a new device
- (U) Demonstrate the ability of fibrin glue to control wound hemorrhage
- (U) Formulate large biodegradable macro beads for use in infection control of large traumatic injuries
- (U) Begin studies on tissue adhesive composition in effecting wound stabilization, hemorrhage control, and healing

(U) FY 1994 Planned Program:

- (U) Define the role of nitric oxide in hemoglobin medicated vascular toxicity
- (U) Complete studies that will demonstrate the cause and consequences of hypertension induced by hemoglobin
- (U) Delineate the mechanisms controlling new blood vessel growth during wound healing
- (U) Initiate concept exploration an improved high frequency mechanical ventilator

(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. Recent activities in the Middle East have shown the need for medical protection against CW agents. 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 and vaccine program as well as the development of prototypes and models for the development of medical chemical defense devices and materiel.

(U) FY 1992 Accomplishments:

- (U) Synthesized research quantities of candidate pretreatment/therapy drugs as medical countermeasures for use in advanced testing and evaluation
- (U) Completed software development for 12 performance tests useful to predict militarily significant performance decrements
- (U) Modeled the medical impact of topical skin protectants in preventing casualties from vesicant agents

(U) FY 1993 Planned Program:

- (U) Provide advanced testing of potential medical countermeasures (antidotes, pretreatments, therapy, skin protectants, and skin decontamination) against vesicants, cyanide, nerve agents, and respiratory agents

Program Element: #0603002A
Title: **Medical Advanced Technology** Budget Activity: #2

- (U) Scale up synthesis of promising medical compounds to provide the necessary quantities for advanced safety and efficacy testing
- (U) Continue to expand application of performance assessment methodology in modeling and prediction of militarily significant performance decrements caused by potential pretreatments, antidotes, or other medical countermeasures

(U) FY 1994 Planned Program:

- (U) Provide advanced testing of potential medical countermeasures (antidotes, pretreatments, therapy,skin protectants and skin decontamination) against vesicants, cyanide, nerve agents and emerging threats
- (U) Scale up synthesis of candidate medical compounds to provide the necessary quantities for advanced safety and efficacy testing

(U) Work Performed By:

D810: Walter Reed Army Institute of Research, Washington, D.C.; Naval Medical Research Institute, Bethesda, MD; Herner and Company, Arlington, VA; University of California, San Francisco, CA; SRI International, Menlo Park, CA

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.;

D819: Letterman Army Institute of Research, San Francisco, CA; Walter Reed Army Institute of Research, Washington, DC; US Army Research Institute of Environmental Medicine, Natick, MA; US Army Aeromedical Research Laboratory, Fort Rucker, AL

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 contractor is Battelle Memorial Institute, Columbus, OH.

D995: In-house research is performed by the U.S. Army Medical Research Institute of Chemical Defense, Aberdeen Proving Ground, MD; Walter Reed Army Institute of Research, Washington, DC; U.S. Army Aeromedical Research Laboratory, Fort Rucker, AL; U.S. Army Research Institute of Environmental Medicine, Natick, MA; U.S. Navy laboratories; U.S. Air Force laboratories; and various other government laboratories. The three largest contractors are the University of California, San Francisco, CA; Ash Stevens, Detroit, MI; and Pharm Eco, Simi Valley, CA.

(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)
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 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603003A
PE Title: **Aviation Advanced Technology** Budget Activity: #2

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D313 Research Aircraft Systems	0	4046	10683
D435 Aircraft Weapons	736	497	936
D436 Rotary Wing Controls and Rotors	11589	14418	14242
D447 Aircraft Demonstration Engines	9086	7630	6513
DB38 Tractor Cone	5543	5614	2472
DB39 Advanced Distributed Simulation	2838	2421	12617
DB97 Aircraft Avionics Equipment	4256	3697	5610
PE TOTAL	34048	38323	53073

B. (U) BRIEF DESCRIPTION OF ELEMENT: Modern Army rotorcraft will be required to support the Army's global mission and, as such, face an awesome array of air defense threats which include optically and radar equipped 23mm and 30mm air defense guns, SA-11, -13, -14, and -15 infrared and radar guided missiles, and potential nuclear/biological/chemical and laser threats directed and delivered from both the ground and air vehicles. As a result, the aircraft must possess improved mobility, agility, firepower and inherent features to include durability 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 Army aircraft essential to the future integrated battlefield. This program element provides for the integration and demonstration of advanced technology components and subsystems. Emphasis is placed on application of advanced structures ballistically tolerant materials, avionics 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 flight controls for reduced weight and cost, advanced weapons integration, improved survivability reliability maintainability and reduced pilot workload/training requirements. In addition, this program element standardizes synthetic flight simulator component interfaces to facilitate system growth 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 aircraft man-machine interaction and performance. The technology is applicable for next generation DOD/Army aircraft of the mid-to-late 1990s and beyond, block improvements/system upgrades to existing aircraft. The work in this PE is consistent with the resourced

constrained Army Science and Technology Master Plan (ASTMP) and the Army Aviation Modernization Plan; addresses Science and Technology Objectives (STOs) milestones in the ASTMP; and supports the DoD Science & Technology Thrusts including Thrust #2 Joint Air/Land/Sea Precision Strike, Thrust #5 Advanced Land Combat, Thrust #6 Synthetic Environments and Thrust #7 Technology for Affordability.

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 of AirLand Battle Operations (ALO) battlefield. The project also provides Army support to joint research efforts conducted with the National Aeronautics and Space Administration (NASA) in the area of advanced research in rotary wing aircraft. Growth in this project is to initiate a classified program.

(U) FY 1992 Accomplishments: Project not funded

(U) FY 1993 Planned Program:
- (U) Conduct simulation/flight test to establish baseline handling qualities for cargo helicopters
- (U) Develop techniques for effective horizontal and vertical communications integration for airborne platforms within the combined arms team
- (U) Initiate the subsystem integration and support of the Rotocraft Pilot's Associate (RPA) Advanced Technology Demonstration (ATD)

(U) FY 1994 Planned Program:
- (U) Initiate classified program

(U) Project D435 - Aircraft Weapons: This project provides for the demonstration of aircraft 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.

(U) FY 1992 Accomplishments:
- (U) Completed test and evaluation of integrated air-to-air weapon (INTAAW) technologies
- (U) Developed weapon system and target acquisition specification for RPA ATD

(U) FY 1993 Planned Program:
- (U) Conduct weaponization support of RPA ATD

(U) FY 1994 Planned Program:
- (U) Conduct weaponization support of RPA ATD

(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, increased maneuverability and agility, with reduced vibration and maintenance. Provides for the demonstration of rotorcraft crew stations utilizing knowledge based information systems and artificial intelligence (AI) to develop Cognitive Decision Aiding (CDA) for crews and support demonstration of

advanced technology in computing methods, sensors, displays, and controls, to maximize combat helicopter mission effectiveness and survivability for day/night adverse weather operations. Provides for the demonstration of simulation capability to evaluate combined aircraft control and crew performance via virtual prototyping and Battlefield Distributed Simulation-Developmental (BDS-D). Funding increases in FY 1993-1994 are consistent with the Army priority to initiate the Rotorcraft Pilot's Associate (RPA) ATD that supports the Joint Air/Land/Sea Precision Strike Science and Technology Thrust #2.

(U) FY 1992 Accomplishments:
- (U) Completed quantification of RPA ATD goals and objectives
- (U) Prepared procurement package for FY1993 RPA ATD contract award
- (U) Completed day/night adverse weather pilotage system (D/NAPS) contract
- (U) Approved and awarded contract for Simulation Program for Improved Rotorcraft Integration Technology (SPIRIT) Defense Development Share Program with Canada
- (U) Developed networking approach to support BDS-D ATD

(U) FY 1993 Planned Program:
- (U) Award RPA ATD contract
- (U) Initiate preliminary system design of RPA ATD
- (U) Conduct cognitive decision aiding (CDA) and integration software design and development
- (U) Complete development of Crew Station Research and Development Facility (CSRDF) and BDS-D network link for RPA ATD
- (U) Conduct initial virtual prototyping simulation in support of RPA, Multi-Sensor Aided Targeting-Air (MSAT-Air) and RAH-66 Comanche

(U) FY 1994 Planned Program:
- (U) Continue CDA and integration design and development
- (U) Initiate system build and integration of RPA
- (U) Conduct initial RPA evaluation in BDS-D network environment
- (U) Participate in Army's Louisiana Maneuvers (LAM) '94 through the use of CSRDF/Comanche as the Army's high-fidelity node in the BDS-D environment

(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.

(U) FY 1992 Accomplishments:
- (U) Completed JTAGG I initial component tests
- (U) Completed JT. G I gas generator tests
- (U) Initiated JTAG + design
- (U) Initiated JTAGG + long lead hardware procurement/fabrication

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603003A
PE Title: **Aviation Advanced Technology** Budget Activity: #2

(U) FY 1993 Planned Program:
- (U) Demonstrate IHPTET/JTAGG Phase I turboshaft engine goals
- (U) Complete JTAGG I+ component design
- (U) Complete JTAGG I+ rig/gas generator hardware fabrication/tests
- (U) Initiate JTAGG I+ final configuration gas generator hardware

(U) FY 1994 Planned Program:
- (U) Demonstrate IHPTET/JTAGG Phase I+ turboshaft engine goals
- (U) Initiate JTAGG II initial design and component fabrication/test

(U) Project DB38 - Tractor Cone: This is a classified program.

(U) Project DB39 - Advanced Distributed Simulation: This project provides for the development and demonstration of advanced distributed simulation techniques and components for incorporation into the design of future simulators/simulations. These 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. Arrival of sophisticated, high technology equipment and their complex relationship to each other, coupled with increased constraints on personnel, money and time in the field environment, make this effort critical to the overall success of the Army both for weapons development and for training. This project supports the Battlefield Distributed Simulation-Developmental (BDS-D) Advanced Technology Demonstration (ATD) and Anti-Armor (A2) ATD based on enabling technologies for Distributed Interactive Simulation (DIS) provided by PE #0602727A. Increase in funds in this project in FY 1994 is to conduct the anti-armor ATD. The work in this program element is consistent with the resource constrained Army Science and Technology Master Plan (ASTMP), the Science and Technology Objectives (STOs) therein, and supports the DoD Science and Technology (S&T) Thrust 6, Synthetic Environments and Thrust #5 Advanced land Combat.

(U) FY 1992 Accomplishments:
- (U) Initiated BDS-D ATD
- (U) Completed exemplar photographic database for mission planning and rehearsal
- (U) Completed UH-1 Ada program
- (U) Defined the architecture and implementation methods for Semi-Automated Forces (SAFOR) capability in follow-on simulated battlefields
- (U) Initiated conformance test procedures and benchmarks for DIS

(U) FY 1993 Planned Program:
- (U) Continue BDS-D ATD implementation architecture
- (U) Demonstrate standard modular architecture for rotorcraft simulators to enhance reuse of standard components and reduce recurring development costs
- (U) Demonstrate first phase expanded battlefield simulation and site-to-site linkage between CSRDF and BDS-D Fort Rucker, Alabama, site
- (U) Establish SAFOR baseline for BDS-D ATD
- (U) Support Louisiana Maneuvers '94 (LAM '94)
- (U) Initiate A2 ATD

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603003A
PE Title: **Aviation Advanced Technology** Budget Activity: #2

(U) FY 1994 Planned Program:
- (U) Complete BDS-D ATD and demonstrate exit criteria
- (U) Demonstrate DIS linkage of Fort Knox, Kentucky and the U.S. Army Tank-Automotive Command armor simulators
- (U) Support LAM '94 exercise
- (U) Conduct A2 ATD experiments including preliminary linkages of analytical force on force models and DIS

(U) Project DB97 - Aircraft Avionics Equipment: This project supports advanced, integrated avionics engineering and troop/technology demonstrations. Evolving concepts in avionics, to include high levels of automation and cockpit integration, will be demonstrated in specially integrated avionics/electronics aircraft, and provide support to the RPA ATD.

(U) FY 1992 Accomplishments:
- (U) Completed aviation battle management concept (ABMC) Concept Evaluation Program (CEP) air picture
- (U) Developed real-time intel processing (correlation and tracking functions) in support of the Rotorcraft Pilots' Associate (RPA) cognitive decision aid (CDA)
- (U) Designed and initiated fabrication of prototype Army Airborne Command and Control Console (A2C3)

(U) FY 1993 Planned Program:
- (U) Implement intelligent message handling capability in tactical data acquisition and correlation (TDAC)
- (U) Develop documentation for TDAC tech transfer to RPA program
- (U) Develop aviation tactical operation center (AVTOC) functionality
- (U) Complete fabrication of prototype Army A2C3

(U) FY 1994 Planned Program:
- (U) Develop and integrate avionics for the RPA program
- (U) Provide Communication-Electronics Command (CECOM) technical support to the RPA program

(U) Work Performed By: Contractors include: Loral Western Development Laboratories, General Electric, Honeywell, Franklin Research Center, Feinstein Construction, Pratt & Whitney, TRW, International Telephone and Telegraph, Texas Instruments, Bell Helicopter Textron Incorporated, Boeing Helicopter Company, Sikorsky, General Dynamics, McDonnell Helicopter Company, BDM International, MITRE and Grumman. 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, Ft Eustis, VA. Related activities are performed by National Aeronautics and Space Administration.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603003A
PE Title: **Aviation Advanced Technology** Budget Activity: #2

(U) **Related Activities:** This program adheres to Tri-Service Reliance Agreements on Aeropropulsion and Ai. ehicles (Rotary) with oversight and coordination provided by the Joint Directors of Laboratories. Related concept exploration is conducted under PE #0602211A (Aviation Technology), PE #0604801A (Aviation - Engineering Development) and PE #0604270A (Electronic Warfare Development). 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 ATD 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 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603004A
PE Title: **Weapons and Munitions Advanced Technology** Budget Activity: #2

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D232	Advanced Warhead Demonstration		
	2914	4183	1753
D43A	Advanced Weaponry Technology Demonstrations		
	3747	7404	7633
D439	Advanced Armaments Demonstrations		
	0	2793	0
DL05	Bunker Defeat Munition		
	5925	4727	0
DL94	Electric Gun Systems Demonstration		
	47268	39961	7905
PE TOTAL	59854	59068	17291

B. (U) BRIEF DESCRIPTION OF ELEMENT: The overall objective of this Program Element (PE) is to demonstrate advanced munitions and major weapons systems or subsystems that will increase battlefield lethality. The effort is sub-divided into (1) gun propulsion, (2) combat vehicle, anti-armor munitions, and (3) field artillery technologies. The primary objectives of the gun propulsion project is to significantly enhance lethality by maximizing muzzle velocity and increasing range. The technologies being pursued for this effort include electromagnetic (EM) and electrothermal-chemical (ETC) for tank, other direct fire and indirect fire applications. The key objective of combat vehicle anti-armor project is to address Insensitive Munition (IM) warheads to enhance combat vehicle/crew survivability. Cased telescoped ammunition (CTA) efforts will provide generic development in the 20-45mm caliber range. Increased lethality results from the superior performance and stowage ability of CTA. There is also a program which will validate a throwaway munition for neutralizing earth and timber bunker field fortifications. The advanced explosively formed penetrator (EFP) warhead effort will exploit technologies in explosives, liner materials, and demonstrate increased armor penetration through advanced warhead concepts. New key technologies in support of cannon-fired smart munitions will also be demonstrated, i.e., body fixed (strap-down) laser radar (LADAR) and millimeter wave seekers, sensors, and on-board processors. Funding for the PE includes work consistent with the Army Science and Technology Master Plan's Science and Technology Objective (STOs) milestones for the Army's key emerging technologies and Advanced Technology Demonstrations (ATDs),an applicability to the Army force modernization plans and Science and Technology Thrusts: #2-Precision Strike, #5- Advanced Land Combat, and #3-Air Superiority/Defense.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project D232 - Advanced Warhead Demonstration: This project will develop new technology to enhance the lethality of smart projectiles by providing multi-role, multi-effect warheads capable of defeating point targets, e.g., tanks, and area targets, e.g., truck convoys. The key objective will be to expedite the

transfer of technology into smart cannon-fired projectiles and guided missiles in support of the DOD Precision Strike Science and Technology Thrust.

(U) FY 1992 Accomplishments:
- (U) Completed initial design of multiple finned rod Explosively Formed Penetrators (EFP), telescoping EFP, selectable EFP warhead
- (U) Completed initial test of multiple finned rod EFP and selectable EFP warheads

(U) FY 1993 Planned Program:
- (U) Continue design/test of dual liner EFP, and telescoping EFP warheads
- (U) Design and test second iteration of multiple finned rod EFP warhead
- (U) Fabricate full scale selectable EFP warhead

(U) FY 1994 Planned Program:
- (U) Test and incorporate full scale design of selectable EFP warhead
- (U) Continue to optimize design of selectable EFP and dual liner EFP warheads

(U) Project D43A - Advanced Weaponry Technology Demonstrations: Through FY 1994, the primary emphasis of this project is the demonstration of insensitive energetic materials (i.e., less sensitive explosives) to improve combat vehicle crew survivability and safety in field environments, during manufacturing, and in storage. A dual challenge is to provide these improvements in safety by avoiding undesired or unintentional detonation while maintaining performance of high explosives in such munitions as shaped charge warheads and explosively formed penetrators. This technology is applicable to future systems as well as product improvements to such fielded systems as the Tube-Launched, Optically- Tracked, Wire Command-Link Guided (TOW) missile, HELLFIRE, Sense and Destroy Armor (SADARM) and Javelin. Beginning in FY 1994, this Project supports the demonstration of smart munition technology necessary to achieve extended range, deep attack of mobile enemy launchers and incorporation of an "Identification of Friend-or- Foe" (IFF) feature to eliminate the potential for fratricide. Another key objective is the demonstration of state-of-the-art, precision guided mortar technology. This demonstration is a major milestone toward providing U.S. light forces with a top attack, extended range, anti- armor capability. The smart munitions and precision guided mortar demonstration are key elements of the rapid force projection initiative which will demonstrate enhanced lethality for the first-to-fight forces (DOD S&T Thrust #5).

(U) FY 1992 Accomplishments:
- (U) Completed phase 1 HELLFIRE Insensitive Munitions (IM) and qualification testing
- (U) Initiated program for IM integration into tank munitions

(U) FY 1993 Planned Program:
- (U) Complete phase 2 HELLFIRE IM and qualification tests
- (U) Complete technology demonstration of IM filled tank munitions
- (U) Initiate program for IM integration into SADARM
- (U) Initiate Javelin IM and qualification tests

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603004A
PE Title: **Weapons and Munitions Advanced Technology** Budget Activity: #2

(U) FY 1994 Planned Program:
- (U) Initiate insenitive munition technolgy program for Wide Area Mines (WAM)
- (U) Complete technology demonstration of IM-filled SADARM
- (U) Complete technology demonstration of IM-filled Javelin
- (U) Complete evaluation of IFF sensor (Millimeter Wave (MMW), IR, LADAR) and make selection
- (U) Initiate mobility platform tradeoff analysis for the 155mm howitzer
- (U) Initiate development of 155mm smart lightweight howitzer components (cannon, fire control, loader assist, navigation system, materials)
- (U) Initiate IM technology program for cyclotrimethylenetrinitramine (RDX) based explosives

(U) Project D439 - Advanced Armaments Demonstration: This project provides for the demonstration of advanced medium caliber armaments. Specifically, it will develop and demonstrate cased telescoped ammunition (CTA) in calibers from 20mm to 45mm to meet the needs of Joint Service users. Advanced technology demonstration efforts that were to have begun under this project in FY 1992 for a medium caliber cannon for future infantry vehicle or potential Bradley Fighting Vehicle upgrade applications were transferred by OSD to PE #0603645A.

(U) FY 1992 Accomplishments: Not applicable

(U) FY 1993 Planned Program:
- (U) Evaluate cased telescoped ammunition maturity for timely, low risk integration into Tri-Service core products/programs

(U) FY 1994 Planned Program: Work conducted under this project transfers to Project D43A of this PE

(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 (MPIM) requirement. One-year funding was provided to test candidate systems. The object is to demonstrate and evaluate man-portable weapons capable of defeating hardened targets including reinforced earth and masonry fortifications.

(U) FY 1992 Accomplishments:
- (U) Conducted market survey
- (U) Developed acquisition strategy
- (U) Solicited contractor proposals

(U) FY 1993 Planned Program:
- (U) Award hardware contracts
- (U) Develop criteria and initiate side-by-side tests
- (U) Transition to engineering development (PE #0604802A)

(U) FY 1994 Planned Program: Program not funded

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603004A
PE Title: **Weapons and Munitions Advanced Technology** Budget Activity: #2

(U) Project DL94 - Electric Gun Systems Demonstration: This project utilizes conditioned electrical energy concepts and technologies to demonstrate the propulsion of hypervelocity projectiles. Technology approaches include Electromagnetic (EM) and Electrothermal-Chemical (ETC). EM guns use an intense magnetic field and can achieve velocities not possible by any other means. There are two major efforts in the EM arena; Focused Technology Program (FTP) and Cannon Caliber EM Gun (CCEMG). The FTP will demonstrate the enabling technologies for the launch of 20 MJ class EM weapon system. The CCEMG is the joint USMC and Army program leading to a skid gun demonstration of a cannon caliber EM gun system. ETC guns use electrical energy to initiate and control the chemical reaction in energetic propellant, and provide the capability of defeating advanced threats such as in the Theater Missile Defense (TMD) scenario. There is a coordinated inter-agency program to exploit this technology for tactical weapon applications including this project, a Navy project involving a ship to shore artillery weapon system upgrade, and technology development efforts by the Advanced Research Projects Agency (ARPA) and the Defense Nuclear Agency (DNA). Coordination with related Strategic Defense Initiative Office (SDIO) projects ensures exploitation of common supporting technology development.

(U) FY 1992 Accomplishments:

- (U) Completed development of first generation self-contained transportable pulsed power supply which was subsequently used in the Navy's 60mm rapid fire ETC Gun demonstration
- (U) Continued the development of 9 megajoule (MJ) EM Range Gun
- (U) Initiated long term Focused Technology Program for development and demonstration of EM based technology weapon systems
- (U) Initiated Phase I, of the Army's ETC propulsion program; FMC's efforts completed; General Dynamics' land system (GDLS) will complete next year
- (U) Initiated Joint Army/U.S. Marine Corps (USMC) program for development of EM gun in cannon caliber 20-40mm
- (U) Continued development of the Army's second generation energy storage machine (SEAC); achieved record level energy densities
- (U) Fabricated and tested full scale antiarmor projectiles Sabot Launched Electromagnetic Gun-Kinetic Energy (SLEKE) including an 8.8 MJ (2.2KM/s) electric rail gun launch
- (U) Commissioned the U.S. Army Armaments Research, Development and Engineering Center's (ARDEC) Electric Armaments Research Center which houses the world's largest (52 MJ) pulsed power supply

(U) FY 1993 Planned Program:

- (U) Complete Phase I, concept development, of the Focused Technology Program
- (U) Complete Phase II of FMC ETC propulsion program
- (U) Complete Phase I, concept development, of Joint Army/USMC Cannon Caliber EM Gun program
- (U) Continue development of integrated sabot/armature package with less that a 50% parasitic mass
- (U) ARDEC Electric Armaments Research [illegible]er to launch D2 aeroshell to assess EM guns for air defense applications
- (U) Conduct materials research on wear, er[illegible]ion and structures for barrels, projectiles and EM gun components
- (U) Complete the Near Full Scale Hypervelocity (HV) Test program

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603004A
PE Title: **Weapons and Munitions Advanced Technology** Budget Activity: #2

(U) FY 1994 Planned Program:

- (U) Conduct Army's first "out of laboratory" EM firings from 9MJ range gun at Yuma Proving Ground, AZ
- (U) Initiate technology demonstration of Joint Army/USMC cannon caliber EM gun
- (U) Conduct experiments and analysis on the aerodynamic/aeromechanic effects of HV projectiles
- (U) Leverage follow-on program in ETC artillery as a DOD thrust Area 2 program with the Navy
- (U) Complete a scaled-down Phase IIA, component of Focused Technology Program

(U) Work Performed By: Management of this PE will be accomplished primarily by the U.S. Army Armaments Research, Development and Engineering Center (ARDEC) Electric Armaments Program Office. In-house efforts will be accomplished by ARDEC, Picatinny Arsenal, NJ and the US Army Research Laboratory (ARL), Aberdeen Proving Ground, MD. 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; Science Applications International Corp (SAIC), McLean, VA; LTV Aerospace, Dallas, TX; and The Center for Electro Mechanics (CEM), University of Texas, Austin, 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. Work in this Program Element is related to and fully coordinated with efforts in PE #0601101E, PE #0601104A (Federally-Funded Research & Development Center 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: 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: Memorandum of Understanding between the UK & US concerning Electromagnetic Launch Technology for tactical applications is being staffed for a 5 year extension. The US/FR/GE is proposing an umbrella MOU concerning Electric Armament Technology. Negotiations have not started. The Netherlands is proposing work on a low voltage electromagnetic armature for Non-Recurring Cost (NRC) funding. This proposal is being staffed up to OSD.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603005A
PE Title: **Combat Vehicle and Automotive Advanced Technology** Budget Activity: #2

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D221	Combat Vehicle Survivability		
	4493	19402	10491
D440	Advanced Combat Vehicle Technology		
	13993	6684	19823
D441	Combat Vehicle Mobility Technology		
	1982	1870	2100
D444	Combat Vehicle Track, Wheel and Suspension		
	1486	1404	0
D497	Combat Vehicle Electronics		
	4329	13040	6679
PE TOTAL	26283	42400	39093

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program demonstrates feasibility and operational potential of technologies which contribute to the continued upgrade of currently fielded ground combat systems and near term future systems (Advanced Field Artillery System (AFAS), Future Armored Rearm Vehicle (FARV) and Armored Gun System (AGS) and provides the science and technology for far-term acquisition of advanced vehicles which meet "new world order" requirements for a more deployable, survivable, and lethal Power Projection force. Work in this program element is consistent with the resource constrained Army Science & Technology Master Plan (ASTMP), Science and Technology Objectives (STOs) and the Army Modernization Plan. The technology areas supported by this program element include: survivability, mobility, vehicle electronics and integration. This program element provides the bulk of efforts necessary to achieve DoD's Advanced Land Combat Science and Technology Thrust objectives for the Advanced Vehicle Technologies top level demonstration. In the near term (FY 1993-1994), the Component Advanced Technology Test Bed (CATTB) will demonstrate integrated components that could be applied to an Abrams upgrade program or other chassis such as that used for the AFAS. In the mid-term (FY 1994-1998), critical technical barriers to making future heavy forces deployable and future light forces capable of defeating heavy conventional forces are being addressed in project level Advanced Technology Demonstrations (ATDs) supporting DoD Thrust Five: Advanced Land Combat. 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 PE that support Advanced Land Combat include: the advancement of composite materials to reduce weight of ground vehicle structures and armor (Composite Armored Vehicle ATD); integrated survivability (e.g., armor, threat sensors and countermeasures such as jammers, obscurants and decoys) (Hit Avoidance ATD); crew size reduction through automation of crew functions and better crew/vehicle integration (Crewman's Associate ATD); advanced light class vehicles incorporating hunter/scout technologies; 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.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project D221 - Combat Vehicle Survivability: To offset the increasing lethality of modern munitions, hit avoidance technologies in conjunction with armor are required to maintain and increase the level of protection for future combat vehicles. This project supports the Hit Avoidance ATD, a three-tiered program, consisting of laboratory demonstrations for top attack, hemispherical protection, and a vehicle demonstration. 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 for fielded and new vehicles 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: The Joint Army/Advanced Research Projects Agency (ARPA)/U.S. Marine Corps (USMC) Armor Anti-Armor (A3) Program (PE #0602618A, Project AH81); development of a flexible system architecture for the integration of Hit Avoidance technology on ground combat vehicles (PE #06012601A); Active Protection countermeasure development (PE #0601102A); development of sensors and countermeasures for aircraft and ground combat vehicles (PE #0602270A); development of obscurants and chemical/nuclear sensing (PE #0602622A). This project supports AFAS and FARV. FY 1993 funding level reflects restructuring the Armored System Modernization (ASM) program to demonstrate survivability technologies applicable to multiple systems in science and technology. Funds were transferred from PE #0603645A to this PE for this purpose.

(U) FY 1992 Accomplishments:
- (U) Hit Avoidance Sensor Development
- (U) Hit Avoidance Countermeasure Development
- (U) Hit Avoidance Architecture Development

(U) FY 1993 Planned Program:
- (U) Initiate Hit Avoidance ATD - Top Attack Protection System Integration
- (U) Acquire and demonstrate threat sensors and countermeasures

(U) FY 1994 Planned Program:
- (U) Continue Hit Avoidance ATD - Top Attack Protection System Integration
- (U) Initiate Hit Avoidance ATD - Hemispherical Protection System Integration

(U) Project D440 - Advanced Combat Vehicle Technology: This program constitutes a critical step in demonstrating the operational potential, technical feasibility and maturity of advanced combat vehicle technologies for the next generation of combat vehicles and product improvements. The objective is a

Program Element: **#0603005A**
PE Title: **Combat Vehicle and Automotive Advanced Technology** Budget Activity: **#2**

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 environment. Future efforts center around DoD's Advanced Land Combat (ALC) Thrust which examines technologies applicable to future, lighter weight, more lethal and survivable systems that offer significantly improved deployability over current systems. The ALC Thrust consists of two top level demonstrations: Advanced Vehicle Technologies and Rapid Force Projection Initiative. Project D440 includes the integration of efforts in both of the top level demonstrations, funding the system (vehicle) based demonstrations in both. The Composite Armored Vehicle (CAV) Advanced Technology Demonstration (ATD), which transitions to this PE from PE #0602601A in FY 1994, will include a hull made of composite materials to reduce weight and improve survivability, and integrated signature management technology. Exploratory development leading to the CAV ATD began in FY 1992. Many issues, such as ballistic performance, manufacturing methods and technology, repairability and nondestructive testing, remain to be resolved before composite technology can be expected to transition to systems. This project will demonstrate the degree to which lighter, projectable vehicles can be made survivable through non-traditional methods. An advanced, lightweight Hunter/Scout demonstration, using modified non-developmental systems or other options, is a key element of the ALC Rapid Force Projection Initiative top level demonstration. The Hunter/Scout program will demonstrate advanced lightweight class vehicle structures, survivability technologies and Command, Control, Communications, Computers, and Intelligence (C4I) systems to enable it to survive and operate effectively at a low weight and with minimum crew size. The Component Advanced Technology Test Bed (CATTB) contributes to the continued modernization and upgrade of fielded and future combat systems. The objective of the CATTB is to verify the integration and interaction of advanced combat vehicle technologies. Key technologies include: advanced propulsion, track, external suspension, power and data distribution, and vehicle controls, and displays. Growth from FY 1993 to FY 1994 is due to the completion of the CATTB in FY 1993 and transition from exploratory development and start of demonstrations for the CAV and lightweight Hunter/Scout in FY 1994.

(U) FY 1992 Accomplishments:
- (U) Demonstrated Advanced Integrated Propulsion System in CATTB
- (U) Conducted CATTB automotive and signature management demonstrations
- (U) Conducted CATTB Chassis system integration laboratory demonstration

(U) FY 1993 Planned Program:
- (U) Continue CATTB system integration lab effort
- (U) Demonstrate Standard Army Vetronics Architecture (SAVA) in CATTB
- (U) Demonstrate Vehicle Control and Operating System (VCOS) techniques on CATTB
- (U) Conduct CATTB demonstrator vehicle roll out and field tests
- (U) Complete CATTB signature reduction simulation model validation utilizing demonstrator field tests
- (U) Complete CAV ATD concept studies
- (U) Develop two technical approaches and designs for optimized composite structures
- (U) Perform material and ballistic testing on composite structure section

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603005A**
PE Title: **Combat Vehicle and Automotive Advanced Technology** Budget Activity: #2

(U) FY 1994 Planned Program:
- (U) Complete CAV Phase 1 studies
- (U) Begin CAV ATD design and composites development
- (U) Begin Hunter/Scout concept definition and demonstration preparation

(U) Project D441 - Combat Vehicle Mobility Technology: Mobility technology (e.g., engines, transmissions, track, suspension) is vital for combat vehicles, and military requirements for vehicle power are unique because of the need for very high power with low volume and weight. Operation Desert Storm (ODS) 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". Future forces dispersed on a more lethal, non-linear battlefield will need a mobility edge to succeed. Despite past accomplishments, the challenge of a "new world order" 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. Above 700 horsepower, there is no commercial market, so the development of large engines must be funded by the government. In the case of the Abrams tank, track and the propulsion systems are 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 engines developed for commercial requirements. 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. Current activities are focused on the demonstration of a compact, fuel efficient, diesel engine in the Component Advanced Technology Test Bed (CATTB). User requirements for advanced scout vehicles call for significant mobility differentials beyond that achieved by today's technology. Advances in predictive active suspensions and electric drive hold promise in providing this desired mobility edge. Future efforts will seek to further reduce the weight and volume of propulsion systems for light and medium classes of vehicles to make possible more deployable and highly agile systems with low sustainment requirements. This project is restructured in FY 1994 combining Projects D441 and D444.

(U) FY 1992 Accomplishments:
- (U) Demonstrated diesel Advanced Integrated Propulsion System (AIPS) in the CATTB
- (U) Began additional modifications to the propulsion system to support 270 volt vehicle

(U) FY 1993 Planned Program:
- (U) Support AIPS diesel testing in the CATTB and provide/test propulsion upgrades

(U) FY 1994 Planned Program:
- (U) Support AFAS electric drive development with a demonstration of high power high temperature switching, advanced cooling techniques, and robust high temperature high power motors

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603005A**
PE Title: **Combat Vehicle and Automotive Advanced Technology** Budget Activity: #2

(U) Project D444 - Combat Vehicle Track, Wheel and Suspension: This project was established to demonstrate advanced track, wheel and suspension technologies to improve performance, reduce weight and ownership costs. Activities through FY 93 are focused on demonstrating external suspensions and more durable, lightweight track in the Component Advanced Technology Test Bed (CATTB). The goals are to decrease track weight by up to 1300 pounds per vehicle while doubling track life, and to reduce suspension weight by about the same amount and save room inside the vehicle now used for torsion bars. 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 1992 Accomplishments:
- (U) Initiated test and evaluation of dynamic track tensioning system and external suspension system incorporating lockout and height control capabilities
- (U) Initiated validation and refinement of track pad laboratory simulation test capability

(U) FY 1993 Planned Program:
- (U) Complete test and evaluation of integrated suspension demonstrator with dynamic track tensioning system and external suspension with height control and lockout capabilities
- (U) Fabricate and initiate test and evaluation of refined hybrid XT-166 track
- (U) Complete validation and refinement of track pad laboratory simulation test capability

(U) FY 1994 Planned Program: Not applicable

(U) Project D497 - Combat Vehicle Electronics: Included in this project are demonstrations of technologies that distribute and control information and power in ground vehicles. The program emphasizes creation of a Standard Army Vetronics Architecture (SAVA), which will enable total system integration of all electrical and electronic system components; optimize the soldier-machine interface; and integrate the vehicle into the battlefield force via a Combat Vehicle Command and Control (CVC2) system. CVC2 is a Nunn amendment funded program being pursued jointly with Germany. The first generation of SAVA was successfully applied to the M1A2 Abrams tank and subsequent generations will be used in vehicles, such as the AFAS. Future work in this project will focus on operation of combat vehicles with smaller crews than currently fielded systems. Smaller crews lead to reductions in under-armor volume necessary to achieving goals in system size and weight reduction. This work will culminate with the Crewman's Associate ATD. The Crewman's Associate will demonstrate crew station concepts utilizing advanced displays and controls which will enable soldiers to quickly understand and easily react to large amounts of information. It will strive to reduce crew workloads by automating certain functions and speeding both intervehicle and intravehicle information flow. Artificial Intelligence (AI) will automate routine crew duties, freeing them to concentrate on more critical matters. The crew station technologies that fit this approach may include advanced displays, expert systems and voice interactive technology.

(U) FY 1992 Accomplishments:
- (U) Completed electronic integration of CATTB hull
- (U) Conducted CVC2 interoperability demonstration with Germany

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603005A**
PE Title: **Combat Vehicle and Automotive Advanced Technology** Budget Activity: #2

- (U) Completed development of vehicle electronics system architecture demonstrator
- (U) Initiated reduced crew technology demonstration development/integration

(U) FY 1993 Planned Program:
- (U) Demonstrate SAVA in CATTB
- (U) Initiate development of third generation electronics architecture
- (U) Enhance SAVA by incorporating key emerging technologies such as artificial intelligence, advanced signal processing and computing, and advanced micro-electronics
- (U) Validation and military hardening of SAVA modules
- (U) Deliver and install vehicle electronics systems architecture demonstrator
- (U) Continue reduced crew technology demonstration development, integration, and coordination
- (U) Complete enhancement of crew station development facility
- (U) Continue AI/autonomous function development supporting reduced crew demonstration
- (U) Conduct Crewman's Associate task analysis
- (U) 3-D model Crewman's Associate crew stations
- (U) Construct Crewman's Associate crew station mock-up
- (U) Support development of Crewman's Associate technologies

(U) FY 1994 Planned Program:
- (U) Component design evaluation for ALC Crewman's Associate
- (U) Continue to develop ALC Crewman's Associate crew task aides
- (U) Integrate/experiment with initial Crewman's Associate designs
- (U) Small scale force on force simulations to validate the U.S. Army Tank-Automotive Command Battlefield Distributed Simulation-Developmental (TACOM/BDS-D) network
- (U) Support ALC CAV/Crew Station space claim analysis

(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.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603005A**
PE Title: **Combat Vehicle and Automotive Advanced Technology** Budget Activity: **#2**

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

(U) International Cooperative Agreements: Not applicable.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603006A**
PE Title: **Command, Control and Communications Advanced Technology** Budget Activity: **#2**

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

Project Number / Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D247 Tactical Command, Control & Communications (C3) Technology Integration	4081	6159	8416
D257 Global Grid Communications	0	0	7633
D492 Space Technology Integration	5580	3640	0
PE TOTAL	9661	9799	16049

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element consist of three projects that will advance computer automated 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: (1) develops software products which ease the porting to the new Common Hardware Software (CHS), (2) conducts joint service demonstrations in support of the Joint Director of Laboratories (JDL) Technology Applications and Demonstrations Panel, and (3) provides key demonstrations of systems integration on Army battlefield functional areas. 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. The Space Technology Integration project has supported space experiments, demonstrations of space technology and 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 Global Grid Communications project is an element of an Office of the Secretary of Defense organized and coordinated program that involves the Services and many government agencies including DARPA, DISA, and NSA. The purpose of this new start program is to provide a worldwide, multimedia communications capability to tactical users at all echelons. It consists of a three phased effort to demonstrate secure, robust, seamless, digital, multimedia, information transport capability for the Army tactical user within the tactical arena, and a worldwide, multimedia communications capability to tactical users at all echelons. This program supports the Global Grid Master Plan, and Global Surveillance and Communications Science and Technology Thrust area. Work in this program element is consistent with the resource constrained Army Science and Technology Master Plan (ASTMP), Science and Technology Objectives (STOS) and the Army Modernization Plan.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project D247 - Tactical Command, Control and Communications Technology Integration: This project develops computer and communication systems in common hardware software format to support battlefield decision making for the five battlefield functional areas of maneuver, air defense, fire support,

intelligence and combat service support. These efforts support the evolving requirements of the Army Tactical Command and Control System (ATCCS) whose goal is automated real-time information transfer.

(U) FY 1992 Accomplishments:

- (U) Made fiber optic tactical local area network (FOTLAN) transition recommendations as part of proposed Advanced Technology Demonstration (ATD) evolving CHS products.
- (U) Utilized results of Army/Navy cooperative testing in modifying Local Area Network (LAN) hardware.
- (U) Completed automated network management definition phase in context of ATCCS.
- (U) Fabricated Ultra High Frequency (UHF) electronic counter countermeasures (ECCM) prototype of coder/decoder (CODEC) and adaptive antenna system (AAS) for Band I equivalent of the mobile subscriber equipment (MSE) line-of-sight (LOS) multichannel radio system.
- (U) Continued coordination and support to Army frequency engineering community

(U) FY 1993 Planned Program:

- (U) Demonstrate FOTLAN capability in a laboratory environment as a part of Survivable Adaptive System Technology ATD to provide greater dispersion of tactical command posts.
- (U) Demonstrate command and control on the move with a limited data only packet radio network integrated with the Battlefield Functional Areas (BFA's) and the MSE Packet Switch (Phase I Demo).
- (U) Demonstrate FOTLAN integrated with MSE voice, data and video to establish multimedia services for the soldier.
- (U) Demonstrate baseline wireless LAN and tracking antenna to prove out EHF transmission for wideband networking (36 Hz and 54 GHz), high capacity, C2 on the move.
- (U) Begin laboratory test and demonstration of modified commercial multinetwork gateway hardware and automatic network management protocols to enhance survivability of local area command posts.

(U) FY 1994 Planned Program:

- (U) Continue coordination and support to Army frequency engineering community/security support to ATCCS.
- (U) Deliver first prototype of obsolescence free reconfigurable Multiband Multimode Radio (MMR).
- (U) Demonstrate survivable integrated LAN systems including wireless LAN's, network management, gateway security and fiber optic tactical LAN's as force multiplier in the common hardware/software environment.
- (U) Continue laboratory tests and demonstrations of multinetwork gateway and network management techniques for SAS ATD to enable user friendly voice/data and video integrated local area communications.
- (U) Begin development of scenario to integrate all SAS technologies into Command Post Exercise (CPX) to support utilization of advanced network interconnections to enhance airland operations.

(U) Project D257 - Global Grid Communications: This project consists of a three phased joint services program to demonstrate a secure, robust, seamless, digital, multimedia, information transport capability for the Army tactical user, and a worldwide, multimedia communications capability to tactical users at all echelons. Phase I will interface wide area tactical communications capability and LAN technologies to commercial Asynchronous Transfer Mode (ATM) switches, and demonstrate tactical radio and satellite communication interfaces with wideband and ATM technologies. Phase II will develop communications interface with command and control on the move multimedia techniques, interface technology to ATM

switches for multimedia services, and demonstrate narrow band radio relay over satellite communications to digital data from mobile Comba: Net Radio (CNR) users. Phase III will demonstrate secure, theater-wide multimedia communications that extend the Global Grid from echelons above corps to the squad. This program involves integrating existing communications research and development programs and technologies (LAN, wide area, satellite, CNR, etc) into a global architecture. It supports the DoD concept of Command, Control, Communications, Computers and Intelligence (C4I) for the Warrior.

(U) FY 1992 Accomplishments: Not Applicable

(U) FY 1993 Planned Program: Not Applicable

(U) FY 1994 Planned Program:

- **(U)** Perform modeling and simulation of protocols for interfacing of hardware to allow tactical users to plug into the Global Grid at any theater location.
- **(U)** Perform studies in concert with other services to address interfacing issues to yield seamless joint service operations.
- **(U)** Interface wideband tactical communications to ATM switch testbed to integrate MSE into the Global Grid.
- **(U)** Interface packet switched CNR data network with MSE packet network to extend the Global Gird to the BFA environment.
- **(U)** Develop packet network extension over TACSAT to extend the range of CNR to enhance the soldier's access to the Global Grid.

(U) Project D492 - Space Technology Integration: Addresses technology development and early system definition of space applications. Constitutes the only Army space science and technology effort completely dedicated to integrating space technologies into Army tactical applications. Army thrusts include: space medicine experiments, data analysis on ionospheric composition to support imaging and communications, development of uncooled Infrared (IR) remote sensing, detection of chemical and biological agents, integration of real-time weather and terrain 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. Responsibilities associated with linking the Army tactical users to National space assets will be picked up by project D257 in FY94.

(U) FY 1992 Accomplishments:

- **(U)** Conducted initial space (micro-gravity) tissue loss experiment on board STS-45, initiated data evaluation, and prepared for follow-on flight in FY 1993 (STS-53).
- **(U)** Performed flight qualification testing for STARTRACKER experiment.
- **(U)** Continued exploration of uncooled IR sensors and detection of chemical and biological agents.
- **(U)** Began integration of acousto-optical tunable filter (AOTF) technology into a shuttle flight-qualified experiment.
- **(U)** Installed initial real-time weather/terrain integration modules into tactical decision aids process.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603006A
PE Title: **Command, Control and Communications Advanced Technology** Budget Activity: #2

(U) FY 1993 Planned Program:

- (U) Conduct field tests of the AOTF and began analysis of Hyperspectrral Imagery (HSI) and polarization signature of scenes for potential transition to future LANDSAT systems.
- (U) Initiate Phase I design for GPS Azimuth Determining System.
- (U) Develop and published theories of electromagnetic signal propagation through the atmosphere to support future remote sensor design activities.
- (U) Initiate EHF communications demonstrations using NASA ACTS.
- (U) Provide technical support to TRADOC Battle Laboratories to aid space technology transition via horizontal integration and to help evaluate space exploitation concepts.

(U) FY 1994 Planned Program: Program not funded.

(U) Work Performed By: C3 Advanced Technology - Work primarily performed in-house by: Center for C3 Systems-US Army CECOM, Fort Monmouth, NJ. Contractors include: SRI International, Menlo Park, CA; Bolt, Beranek & Newman, Boston, MA; and Jet Propulsion Laboratories, Pasadena, CA. Space Technology Integration - Work primarily performed in-house by: 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 (Atmospheric Sciences Laboratory), White Sands, NM; National Aeronautics and Space Administration. Contractors include: Applied Physics Laboratory of John Hopkins University, Columbia, MD; 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 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603007A
PE Title: **Manpower, Personnel and Training Advanced Technology** **Budget Activity: #2**

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
A792 Manpower and Personnel	4041	3927	4247
A793 Training Systems and Education	6552	2164	3817
A794 Education and Training	4222	4992	0
A795 Training Simulation	1	0	0
A796 Human Factors Engineering in Systems Design	985	4895	0
PE TOTAL	15801	15978	8064

B. (U) BRIEF DESCRIPTION OF ELEMENT: Beginning in FY93 this program element is restructured as the result of the transfer of the Manpower and Personnel Integration (MANPRINT) in-Systems Acquisition function from the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) to U.S. Army Research Laboratory (ARL). Starting in FY94 the remaining program has been aligned into two projects in order to simplify the funding structure. The objective of this program is to develop and demonstrate technologies to enhance soldier and unit performance that include: 1) training strategies for simulation-based training, 2) accurate behavioral models of individual and unit warfighting performance for use in synthetic environments, 3) optimized design of battle command staff groups for improved command and control (C2), and, 4) 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 resource constrained Army Science and Technology Master Plan (ASTMP), Science and Technology Objectives (STO) and the Army Modernization Plan.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project A792 - Manpower and Personnel: This project is restructured beginning in FY94. Funding from Project A794, this PE, will partially transfer into this Project and Project A793, this PE. The transfer will simplify ARI's program structure. This project develops and demonstrates soldier-oriented technology for multiplying force effectivessness by: 1) identifying quality male and female enlistees, 2) assigning them to Military Occupational Specialties (MOS) that maximizes total force readiness and 3) retaining the most effective performers. It also develops and demonstrates behavioral science-based methods for achieving optimized designs for Army decision-making staff organizations. Efforts under this project also will develop innovative, simulation-based methods for career-long leader development. This program supports DoD Thrust #5 (Advanced Land Combat).

(U) FY 1992 Accomplishments:

- (U) Completed a physical training handbook to help prepare new recruits for the Special Warfare Center and School to pass rigorous physical selection criteria

Program Element: #0603007A
PE Title: **Manpower, Personnel and Training Advanced Technology** **Budget Activity: #2**

- (U) Completed new first-line civilian supervisor selection tools for use by civilian personnel offices (CPO)
- (U) Completed analyses of the impact of downsizing on Army families
- (U) Demonstrated a training course for developing strategic thinking skills of students for use at the Army War College

(U) FY 1993 Planned Program:
- (U) Provide specifications for simulation technology to enhance warfighting thinking/decision-making skills
- (U) Complete civilian survey longitudinal database for use by the Department of the Army to monitor Army civilian climate
- (U) Develop improved procedures for assessing performance of special forces candidates
- (U) Determine best predictors of NCO success in order to improve promotion and reenlistment procedures during downsizing

(U) FY 1994 Planned Program:
- (U) Complete personnel allocation model to match soldier capabilities to Special Forces jobs
- (U) Detailed assessment of the impact of downsizing and homebasing on family quality-of-life
- (U) Demonstrate psychomotor, spatial and temperament selection tests for improving performance in infantry, armor and artillery Military Occupational Specialties (MOS)
- (U) Complete selection and classification procedures for ensuring better soldier-job matching

(U) Project A793 - Training Systems and Education: This project was restructured beginning in FY93. In FY94, funding from Project A794, this PE, will partially transfer into this Project and Project A792, this PE. The transfer will simplify ARI's program structure. In FY93, the Manpower and Personnel Integration (MANPRINT) in-System Acquisition function was transferred to ARL in Project A796, this PE, and in FY94 to Project AH70, PE #0602716A. This project leads to the demonstration of theory-based training strategies (i.e., prescriptions for cost-effective allocation of training resources, with a focus on synthetic training environments and distributed interactive simulation (DIS) networks) that will produce proficient soldiers and units at significantly reduced cost. This project will also investigate the application of electronic technology for individual and "school house" training. This program supports DoD Thrusts #5 (Advanced Land Combat) and #6 (Synthetic Environments).

(U) FY 1992 Accomplishments:
- (U) Developed a behavioral model for determining the future Military Intelligence manpower, personnel and training requirements
- (U) Empirically determined the factors affecting the reliability of information flow and decision making in field artillery systems

(U) FY 1993 Planned Program:
- (U) Determine how to employ air defense artillery and signal communications parameters in networked battle simulations for more realistic trainin~
- (U) Conduct needs analysis for command and control performance database
- (U) Produce prototype multi-media database of C2 performance data
- (U) Complete MOS restructuring assessment and feasibility analyses for Field Artillery

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603007A
PE Title: **Manpower, Personnel and Training Advanced Technology** **Budget Activity: #2**

(U) FY 1994 Planned Program:
- (U) Demonstrate asynchronous computer conferencing technology for more cost-effective battle staff training
- (U) Demonstrate simulation-based armor gunnery training strategy for the Reserve Components
- (U) Empirical determination of the training capabilities of armor gunnery and maneuver training aids, devices, simulations, and simulators (TADSS)
- (U) Assess Navy "school house" training technologies for improving classroom training

(U) Project A794 - Education and Training: (Efforts will be conducted under A793, this PE, for FY 1994 and beyond. See A793 description above).

(U) FY 1992 Accomplishments:
- (U) Demonstrated cost-effective tank gunnery training strategies, representing a mix of "live fire", individual training devices and team simulators
- (U) Empirically demonstrated the relationship between home station training and effective unit performance at Army Combat Training Centers (CTC)
- (U) Developed predictive collective (unit) skill retention models for estimating retraining requirements for unit warfighting tasks

(U) FY 1993 Planned Program:
- (U) Demonstrate Unit Performance Assessment System (UPAS) software and user's guide
- (U) Complete Commander's Battle Staff Training Handbook for mounted maneuver operations
- (U) Complete performance assessment methodology and guide for observers/controllers ıe Joint Readiness Training Center (JRTC)
- (U) Validate inflight training techniques and cockpit resource management strategies to reduce pilot-induced errors.

(U) FY 1994 Planned Program:
- (U) Dollars transition from this project to Project A792 and Project A793, this PE

(U) Project A795 - Training Simulation: Effective simulators and training devices in aviation and armor units are needed to avoid the high cost of using actual equipment for training while still enabling the Army to "train as it will fight." This project provides the United States Army Training and Doctrine Command (TRADOC) and the Simulation, Training and Instrumentation Command (STRICOM) with scientifically based recommendations for the design of lower-cost, lower complexity simulators and training devices, focusing on aviation and armor.

(U) FY 1992 Accomplishments:
- (U) Dollars transition from this project to Project A793, this PE, because of functions transfer to the U.S. Army Research Laboratory

(U) FY 1993 Planned Program: Not applicable

(U) FY 1994 Planned Program: Not applicable

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603007A
PE Title: **Manpower, Personnel and Training Advanced Technology** **Budget Activity: #2**

(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-system specific technology demonstrators for human factors engineering integration throughout the combat development and weapon system design process.

(U) FY 1992 Accomplishments:

- (U) Continued efforts to expand human factors expert system application to include Tri-Service coordination and demonstration in Army systems under development
- (U) Added torso rotation function and standing mobility to the man-model "JACK" and demonstrated/validated model in Line-of-Sight Anti-Tank (LOSAT), U.S. Marine Corps (USMC) Advanced Amphibious Assault Vehicle (AAAV), and Bradley fighting vehicle hatch design

(U) FY 1993 Planned Program:

- (U) Complete development, validation, and demonstration of first and second generation human factors engineering (HFE) knowledge-based/expert system/integrated decision aids which facilitate preparation of HFE/MANPRINT input to weapon system design documentation
- (U) Continue software development efforts to add motion, enhanced strength, reach, facial animation and natural language interface to the man-model ("JACK")
- (U) Address critical design deficiencies of the **HARDMAN III** system, a computer-based system allowing prediction of manpower, personnel and training (**MPT**) requirement interactions with costs and performance at the weapon, unit and force levels
- (U) Develop a model to predict the consequences on intelligence production of changing **MPT** requirements
- (U) Develop a comprehensive behavioral database of aviation maintainer attributes and abilities for use by system developers

(U) FY 1994 Planned Program: Dollars transition to PE #0602716A, Project AH70, because of function transfers to the U.S. Army Research Laboratory

(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. The in-house developing organization for Project A796 is the US Army Research Laboratory, Aberdeen Proving Ground, MD. Contractors include: Human Resources Research Organization, Alexandria, VA; CAE Link Corporation, Binghamton, NY; American Institutes for Research, Washington, DC; The BDM Corporation, Albuquerque, NM; Evidence Based Research, Vienna, VA; STATCOM, Inc, McLean, VA; 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 Joint Directors of Laboratories. Work in this Program Element contains no unwarranted duplication of effort among the Military Departments.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603007A**
PE Title: **Manpower, Personnel and Training Advanced Technology** **Budget Activity: #2**

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

(U) International Cooperative Agreements: Not applicable.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603053A**
PE Title: **Advanced Command and Control Vehicle**
Project Title: **Advanced Command and Control Vehicle**

Project Number: **DG23**
Budget Activity: **#4**

Picture Not Available

POPULAR NAME: **Command and Control Vehicle (C2V)**

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

SCHEDULE	FY 1992	FY 1993	FY 1994		
Program Milestones	Begin Development Effort	Milestone I			
Engineering Milestones	Begin design effort	Continue design effort			
T&E Milestones					
Contract Milestones					
BUDGET ($000)	**FY 1992**	**FY 1993**	**FY 1994**		
Major Contract	10956	17245			
Support Contract					
In-House Support	551	1344			
FE/OGA Other(SBIR)	3100 187	1800			
Total	14794	20389			

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603053A**
PE Title: **Advanced Command and Control Vehicle**
Project Title: **Advanced Command and Control Vehicle**

Project Number: **DG23**
Budget Activity: **#4**

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 is transitioning to PE #0604640A Project DG27.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- (U) Begin Development/Design
- (U) Concept and requirements definition

(U) FY 1993 Planned Program:
- (U) Begin Integration Design
- (U) Begin Pre-Production/prototype

(U) FY 1994 Planned Program:
- (U) Transitions to PE#0604640, Project #DG27

D. (U) WORK PERFORMED BY: FMC Corp, San Jose, CA

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY: NARRATIVE DESCRIPTION OF CHANGES

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

F. (U) PROGRAM DOCUMENTATION: Mission Need Statement (MNS) approved by Joint Requirements and Oversight Council, 11 Feb 93; MNS is at Department of Defense for Review. Operational Requirements Document approved HQ, Department of Army on 26 Mar 93.

G. (U) RELATED ACTIVITIES: The Electronic Fighting Vehicle System is a like system in development. There is no unnecessary duplication of effort within the Army or Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS:

		($ in Thousands)	
Appropriation	**FY 1992 Actual**	**FY 1993 Estimate**	**FY 1994**

Procurement: None
Military Construction: None

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603053A**
PE Title: **Advanced Command and Control Vehicle**
Project Title: **Advanced Command and Control Vehicle**

Project Number: **DG23**
Budget Activity: **#4**

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: NATO cooperative test. United States/Germany Combat Vehicle Command & Control (CVC2) Memorandum Of Understanding 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: None

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 3102A
PE Title: Materials . .l Structures Advanced Technology Budget Activity: #2

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D071 Components Scale-Up	1208	1270	0
DF33 Cast Ductile Iron Components	0	3309	0
DJ01 Combat Engineering Components	1507	1735	0
PE TOTALS	2715	6314	0

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element provides scale-up and demonstration of advanced materials, structures and concepts. It includes application of lightweight composite technology, corrosion control and prevention, component longevity, adhesive bonding and armor/anti-armor which are directed toward items such as light and medium combat vehicles, bridge structures and a lightweight howitzer. Expected advantages are more maneuverable combat vehicles with greater range; faster tactical bridge erection over wider gaps; longer lastir track components, and a howitzer suitable for airborne and othe: light forces, thereby improving the Army's capability to deploy and sustain itself. Other tasks concern audio and moving-target simulators, deception devices and counter surveillance schemes which enhance the survivability for our combat forces. The work in this program is consistent with the resource constrained Army Science and Technology Master Plan and the Science and Technology Objectives (STOs).

C. (U) JUSTIFICATION FOR PROJECTS:

(U) **Project D071 - Components Scale-Up:** This project provides scale-up and demonstrations of advanced materials and structural components emerging from laboratory analysis, exploratory designs, and small scale experiments. Tasks include lightweight composite structures, corrosion prevention and control, adhesive bonding and repair, and advanced armor/anti-armor materials. This project is restructured to PE #0602105, project AH84, beginning in FY 1994.

(U) **FY 1992 Accomplishments:**
- (U) Designed, fabricated and assembled fiber reinforced composite 50-ton tank hull.
- (U) Developed mine-blast test procedures and test fixtures for composite infantry fighting vehicle floors.
- (U) Initiated vulnerability testing at Ballistics Research Laboratory for a prototype composite infantry fighting vehicle.

(U) **FY 1993 Planned Program:**
- (U) Conduct manufacturing technology research for composite hull.
- (U) Evaluate fatigue and fracture toughness of commercial organic matrix structural composites

- (U) Demonstrate low cost manufacturing and processing methods, (e.g., resin transfer molding) for primary composite structures for lightweight trailer demonstrator.
- (U) Demonstrate selected passive armor materials.
- (U) Transition composite hull manufacturing to Manufacturing Technology program.

(U) **FY 1994 Planned Program:** Not Applicable

(U) **Project DF33 - Cast Ductile Iron Components:** This project is Congressionally directed. This project provides scale-up and demonstrations of advanced materials and structural components emerging from laboratory analysis, exploratory designs, and small scale experiments. Tasks include development, construction and testing of cast ductile iron track and running gear for medium and heavy tracked vehicles. Efforts are terminated in FY 1993.

(U) **FY 1992 Accomplishments:** Not Applicable

(U) **FY 1993 Planned Program:**
- (U) Conduct manufacturing technology research on cast ductile iron components for track, running gear; including road wheels, external road arms and other high wear suspension components.
- (U) Evaluate fatigue and fracture toughness of commercial cast ductile iron samples and components.
- (U) Bench scale demonstration of cast ductile iron improvements.
- (U) Demonstrate cast ductile iron road wheels, in-house tests.

(U) **FY 1994 Planned Program:** Program not funded.

(U) **Project DJ01 - Combat Engineering Components:** This project provides development and demonstration of advanced material components, structures, and concepts to overcome deficiencies in gap/river crossing capabilities, enhance the Army's ability to rapidly establish and sustain ground lines of communication, and improve survivability of tactical material through improved counter-surveillance and deception equipment. Composite materials technology is applied to bridge components to increase span, load class, durability, and survivability while decreasing weight, erection time, crew size, and numbers of transport vehicles. Components will be incorporated into the Heavy Dry Support Bridge (HDSB). This project also supports advanced development of Low Cost Low Observable (LCLO) technology necessary to field new and upgraded systems for enhanced survivability. LCLO brassboards will be used to demonstrate and prove the principals for broadband multispectral signature control in mobile and static configurations. Efforts in this project terminate in FY 1993.

(U) **FY 1992 Accomplishments:**
- (U) Transitioned composite reinforced traversing beam for the HDSB to 6.3b.
- (U) Investigated air technology for application as fascines for rapid crossing of anti-tank ditches.
- (U) Determined feasibility of using ultralightweight camouflage nets for general purpose and high mobility applications.
- (U) Evaluated and upgraded the performance of the thermal suppression kit for PATRIOT generators (150kw).
- (U) Determined the optimal flash signature technique to replicate firing of the M1 main gun.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603102A
PE Title: **Materials and Structures Advanced Technology** Budget Activity: #2

(U) FY 1993 Planned Program:

- (U) Demonstrate LCLO systems using integrated technologies to provide broadband multispectral signature control.
- (U) Evaluate flash firing mechanisms and transition flash system to the Close Combat Decoy (CCD).
- (U) Demonstrate general purpose thermal suppression tarp.
- (U) Complete design and fabrication of air fascines.

(U) FY 1994 Planned Program: Not Applicable

(U) Work Performed By: In-house efforts will be primarily accomplished by Belvoir Research, Development and Engineering Center, Ft. Belvoir, VA; U.S. Army Research Laboratory, Adelphi. MA; Armament Research, Development and Engineering Center, Picatinny, NJ; Ballistics Research Lab, Aberdeen Proving Ground, MD; and Tank-Automotive Command, Warren, MI. Contractors include: FMC Corp., San Jose and Santa Clara, CA; Alliant Computer System, Littleton, MA; Tocco Inc., Madison Heights, MI; General Dynamics Land Systems Division, Warren, MI; Aries, Concord, MA; Foster-Miller, Inc., Waltham, MA; Catholic Univ., Washington, DC; and Dornier GmbH, Federal Republic of Germany.

(U) Related Activities: This program adheres to Tri-Service Reliance Agreements on advanced Materials with oversight and coordination provided by the Joint Directors of Laboratories. Work in this Program Element is related to and has been fully coordinated with 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: Not applicable.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603105A
PE Title: Military HIV Research
Budget Activity: #2

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
DH29 Military HIV Research	27339	53790	3410

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. Beginning in FY 1992, some tasks that had been supported in this Project Element and Programs in FY 1991 were transferred to 6.1 (0601102.BS17) and 6.2 (0602787.A873) programs.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) FY 1992 Accomplishments:

- (U) Mapped the binding sites where human immunodeficiency virus (HIV) viral antigen, gp 120, and host cell protein CD 4 interact, suggesting possible targets for immunoprophylaxis
- (U) Cloned and expressed *gag*, *pol*, *env* and *nef* in *Salmonella* vectors, a potential vaccine production method
- (U) Characterized behaviors associated with acquisition of HIV-1 infection among soldiers
- (U) Documented rates of progression of HIV-1 disease in early stages and applied methods to assess safety and efficacy of experimental therapies for early asymptomatic stages
- (U) Documented scientific feasibility of post-infection vaccination to broaden and redirect host response to chronic pathogens
- (U) Correlated declining susceptibility to ddI and ddC, anti-HIV drugs, with the development of zidovudine (AZT) resistance in patients on AZT monotherapy
- (U) Showed that CD34+ bone marrow cells are infected *in vivo* in HIV infected individuals, confirming earlier results showing that the virus can infect bone marrow progenitor cells
- (U) Identified and characterized HIV isolates with decreased susceptibility to AZT, ddI and ddC, and a multi-drug resistant virus isolate
- (U) Evaluated recombinant gp160 candidate vaccines in terms of clinical efficacy and safety for treatment of HIV
- (U) Evaluated recombinant gp120 candidate vaccines in terms of clinical efficacy and safety for treatment of HIV
- (U) Developed polymerase chain reaction (PCR)-based techniques which quantitatively measure *in vivo* HIV ribonucleic acid (RNA) and deoxyribonucleic acid (DNA)
- (U) Documented rates of progression of HIV-1 disease in early stages and applied methods to assess safety and efficacy of experimental therapies for early asymptomatic stages
- (U) Mapped the binding sites where HIV viral antigen, gp120, and host cell protein CD4 interact, suggesting possible targets for immunoprophylaxis

Program Element: #0603105A
PE Title: **Military HIV Research** Budget Activity: #2

- (U) Documented scientific feasibility of post-infection vaccination to broaden and redirect host response to chronic pathogens
- (U) Characterized behaviors associated with acquisition of HIV-1 infection among soldiers
- (U) Cloned and expressed *gag, pol, env* and *nef* in *Salmonella* vectors, a potential vaccine production method

(U) FY 1993 Planned Program:

- (U) Continue evaluation of promising prophylactic and immunotherapeutic vaccines
- (U) Continue to monitor the prevalence of HIV infections in military recruits
- (U) Continue to assess behavior modification to control the spread of HIV infection
- (U) Evaluate unique HIV peptides for enclosure in future vaccines
- (U) Continued evaluation of promising prophylactic and immunotherapeutic vaccines
- (U) Identify possible prophylactic vaccine testing sites
- (U) Improve usefulness of animal models for HIV infection
- (U) Continue collection and characterization of HIV strains worldwide
- (U) Evaluate unique HIV peptides for incorporation in future vaccines
- (U) Continue studies of combination therapy to prevent/treat drug resistance HIV strains and opportunistic infections

(U) FY 1994 Planned Program:

- (U) Develop scientific and operational capability to conduct large prophylactic vaccine field trials
- (U) Select the optimal prophylactic human vaccine product based on continued animal testing and human therapeutic programs
- (U) Continue to characterize HIV specific immunoregulatory mechanisms associated with HIV infection
- (U) Continue to refine and evaluate education and support programs; assess cognitive deficits due to infection
- (U) Prepare technical data package to transition a recombinant vaccine to advanced development
- (U) Implement genetic therapy for HIV infection
- (U) Continue collection and refinement of international epidemiological data
- (U) Provide technical data to guide policy on unit level behavior modification

(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 US Navy CONUS/OCONUS units and by extramural non-profit organizations, universities, and industries. The five major contractors are Henry M. Jackson Foundation for the Advancement of Military Medicine, Rockville, MD; SRA Technologies, Inc., Alexandria, VA; ERC BioServices Corp., Gaithersburg, MD; Biotech Research Laboratories, Rockville, MD; and Harvard University, Cambridge, MA.

(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)

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603105A**
PE Title: **Military HIV Research** Budget Activity: #2

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.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603238A
PE Title: Air Defense/Precision Str Technology

Budget Activity: #2

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D160 Missile System Demo	0	17019	0
D177 Joint Air/Land/Sea Precision Strike (PS) Demonstration	0	0	18988
D182 Tractor Hole	0	0	9542
D189 Tractor Hike	0	12764	954
D197 Seeker Advanced Development	0	4727	0
PE TOTAL	0	34510	29484

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element provides for the enhancement, demonstration, and simulation of a joint service precision strike capability to locate, identify, and kill high-value, time-sensitive targets and assess damage within tactically useful timelines. The Joint Air/Land/Sea Precision Strike Demonstration (JPSD) program will join users and developers in a cooperative effort to enhance and integrate precision strike capabilities by leveraging advanced technologies and analyzing new precision strike concepts and architectures through a series of Army precision strike demonstrations (1993-1996) followed by integrated demonstrations with the Air Force, Navy, ARPA and other thrust areas (1997-1999). Joint Air/Land/Sea (A/L/S) Precision Strike Demonstration efforts in FY 1993 were conducted in PE #0603772A. This program element also provides for advanced development of relatively short range anti-air capabilities with emphasis on low altitude helicopter targets. A seeker development program which addressed an urgent Army need to be able to attack helicopters buried in background clutter from both ground and helicopter platforms has been transitioned to The Army Combined Arms Weapon System (TACAWS) program. This program element also demonstrated technology for a more sophisticated future multipurpose missile capable of attacking targets that may be temporarily masked from the defended platform. Work in this program element is consistent with the resource constrained Army Science and Technology Master Plan (ASTMP), Science and Technology Objectives (STOs) and the Army Modernization Plan. In addition, it supports the DoD Science and Technology Thrusts for Air Superiority/Air Defense and Precision Strike.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) **Project D160 - Missile System Demo:** This project demonstrates a semi-active (laser designated) version of the Stinger missile. Work in this project completes in FY 1993.

(U) **FY 1992 Accomplishments:** Not applicable

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603238A Budget Activity: #2
PE Title: **Air Defense/Precision Strike Technology**

(U) **FY 1993 Planned Program:**
- (U) Conduct fire and forget approach and laser designated semi-active approach comparison simulation
- (U) Conduct semi-active seeker performance simulation
- (U) Simulate and demonstrate laser tracker performance
- (U) Operational analysis studies of line-of-sight lock for ground-to-air and air-to-air applications
- (U) Conduct trade studies and analysis to determine best infrared (IR) Focal Plane Array approach
- (U) Conduct analysis and simulations to demonstrate compatibility of a small IR Focal Plane Array seeker
- (U) Design, fabricate, and demonstrate IR Focal Plane Array seeker hardware

(U) **FY 1994 Planned Program:** Not applicable

(U) **Project D177 - Joint Air/Land/Sea Precision Strike Demonstration:** This demonstration will integrate actual and simulated sensors, weapons, processors, and communication systems to exercise end-to-end slices of an objective precision strike capability. This project was a restructure from PE #0603772A, Project D289.

(U) **FY 1992 Accomplishments:** Not applicable

(U) **FY 1993 Planned Program:** (Funded under PE #0603772A, Project D289.)
- (U) Complete JPSD Advanced Technology Demonstration Plan
- (U) Begin building of the JPSD Testbed
- (U) Conduct three (3) PS Demonstrations (1st Light/Prairie Warrior/Beyond LOS)
- (U) Support Desert Capture and Zealous Pursuit Demonstrations
- (U) Plan FY 1994/1995 PS demonstrations

(U) **FY 1994 Planned Program:**
- (U) Prepare final report on the FY 1993 Demonstrations
- (U) Begin operation of the JPSD Testbed
- (U) Participate in Louisiana Maneuvers Exercises
- (U) Continue Testbed integration of sensors, weapons, models
- (U) Conduct the Surface-to-Surface demonstration (4th QTR)
- (U) Support DARPA Zealous Pursuit and Desert Capture II
- (U) Continue FY 1995 Rotorcraft Demonstration Preparation
- (U) Begin planning for the FY 1996 PS SOF Demonstration
- (U) Begin PS architectural/concept analyses at the Testbed
- (U) Begin integrating DARPA War Breaker technologies into JPSD demonstrations

(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 track targets in clutter. Work in this project is completed in FY 1993.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603238A Budget Activity: #2
PE Title: **Air Defense/Precision Strike Technology**

(U) FY 1992 Accomplishments: Not applicable

(U) FY 1993 Planned Program:

- **(U)** Design compact imaging IR seeker for anti-air role with sophisticated clutter rejection signal processing appropriate for Stinger upgrade

(U) FY 1994 Planned Program: Not applicable

(U) Work Performed By: Work performed primarily 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. The missile system demonstration project is managed by Program Manager, Air-to-Air Missiles (PM ATAM), Huntsville, AL. The JPSD program is managed by the JPSD Task Force, Falls Church, VA. Contractors to be determined.

(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 Joint Precision Strike Demo Task Force with the Global Surveillance and Synthetic Environments thrusts as well as the U.S. Air Force's Artemis and Navy First on the Scene (FOTS) programs. ARPA's War Breaker program and distributed node simulation efforts will contribute to the capabilities of the JPSD testbed. The efforts of all of these programs will be combined into broad DoD precision strike demonstrations between 1997-99. Technology developed in the Seeker Advanced Development project will compete for potential application to the The Army Combined Arms Weapon System (TACAWS) Advanced Technology Demonstration in PE #0603313A (Missile and Rocket Advanced Technology). Work in the program element contains no unwarranted duplication of effort within DoD.

(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 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603270A**
PE Title: **Electronic Warfare Technology** Budget Activity: **#2**

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
DK15 Advanced Communications Electronics Countermeasures Demonstration			
DK16 Non-communications Electronic Countermeasures Technology Demonstration			
DK18 STINGRAY			
PE TOTAL			

B. (U) BRIEF DESCRIPTION OF ELEMENT:

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project DK15 - Advanced Communications Electronics Countermeasures Demonstration:

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603270A
PE Title: **Electronic Warfare Technology** Budget Activity: #2

(U) **FY 1992 Accomplishments:**

-
-
-
- (U) Increased frequency resolution/decreased sample time (by a factor of 8) utilizing statistical estimation theory
- (U) Demonstrated software at USAICS and 18th Airborne; IEW sensor placement tool, sensor and jammer location planning and propagation model analysis

(U) **FY 1993 Planned Program:**

- (U) Continue Stand-Off Communications Jammer prototype technology development for the AN/TLQ-17 and initiate laboratory demonstration of capability
- (U) Conduct field validation of next generation fusion technology prior to incorporation into the development process
- (U) Conduct mission requirements analysis to determine the enhanced equipment architectures needed for UAV payload development
- (U) Complete demonstration of continuous look-thru techniques prior to integration into remote jamming package
- (U) Develop and test prototype signal processing and control equipment and software techniques to identify and jam digital data radio signals

(U) **FY 1994 Planned Program:**

- (U) Begin integration of Electronic Countermeasure (ECM) payload for laboratory testing
- (U) Integrate new signals for applique demonstration
- (U) Demonstrate and test evolutionary software for IEW data fusion requirements to provide enhanced maps, smart databases, fusion/correlation modules and intelligent networks
- (U) Demonstrate prototype signal processing and control equipment and software techniques to identify and jam digital radio signals

(U) **Project DK16 - Non-Communication Electronics Countermeasures Technology Demonstrations:** This program demonstrates the feasibility and effectiveness of non-communication electronic warfare hardware and software going against radar, optical, electro-optical and infrared threats.

(U) **FY 1992 Accomplishments:**

- (U) Refined Radar Deception and Jamming (RDJ) Advanced Technology Demonstration (ATD) per request of U.S. Army Training and Doctrine Command (TRADOC)
- (U) Continued Joint Electronic Warfare Center (JEWC)) RDJ threat/performance modeling

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603270A
PE Title: **Electronic Warfare Technology** Budget Activity: #2

(U) FY 1993 Planned Program:
- (U) Hold Preliminary Design Review (PDR) and Critical Design Review (CDR) and begin system fabrication on RDJ
- (U) Continue JEWC modeling for RDJ

(U) FY 1994 Planned Program:
- (U) Initiate Enhanced survivability for Ground Vehicle (ESGV) technology demonstration in support of Advanced Land Combat (ALC)
- (U) Complete RDJ fabrication and conduct ground and UH-60 flight tests

(U) Project DK18 - STINGRAY: The STINGRAY program provides increased survivability and effectiveness along with added time to engage the threat with convention armament systems. It embodies man-in-the-loop simulation through the use of Battlefield Distributed Simulation-Development (BDS-D). The simulation effort will develop a STINGRAY "virtual prototype" which will be utilized to: evaluate MANPRINT concerns; optimize tactics and doctrine development; guide user operational testing; and enhance soldier training. This technology program is specifically aimed at developing, integrating, and testing advances in systems capability for STINGRAY and other EOCM programs. STINGRAY was restructured from engineering & manufacturing development (EMD) to advanced technology demonstration (ATD). Prior to FY 1993, STINGRAY was funded in PE #0604270A, Project D540.

(U) FY 1992 Accomplishments:
- (U) Restructured EMD to ATD

(U) FY 1993 Planned Program:
- (U) Award STINGRAY ATD contract
- (U) Conduct preliminary design review of system hardware
- (U) Initiate simulation development
- (U) Conduct limited battle exercises with STINGRAY virtual prototype
- (U) Conduct preliminary design review of system software

(U) FY 1994 Planned Program:
- (U) Conduct critical design review of system software
- (U) Accept first laser units
- (U) Integrate, test and deliver six systems
- (U) Enhance battle exercises with STINGRAY virtual prototype
- (U) Conduct preliminary test and evaluation using BDS-D

(U) Work Performed By:
DK15: In-House - Primarily performed by the US Army Communication-Electronics Command (CECOM) Intelligence Electronic Warfare Directorate, Warrenton, VA. 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.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603270A
PE Title: Electronic Warfare Technology
Budget Activity: #2

DK16: In-House - Primarily performed by CECOM Night Vision Electronic Sensors Directorate, Fort Belvoir, VA; US Navy Naval Weapons Center, China Lake, CA; U.S. Army Test and Experimentation Command, Fort Rucker, AL. Contractors include: 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 by PM Electronic Warfare/Reconnaissance, Surveillance and Target Acquisition, Fort Monmouth, NJ; Program Executive Officer IEW, Fort Monmouth, NJ, and 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. 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. There is no unnecessary duplication of effort within the Army and DoD.

(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 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603313A
PE Title: Missile and Rocket Advanced Technology

Budget Activity: #2

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D085	Demonstration of Advanced Radar Techniques (DART)*		
	1744	0	0
D206	Missile Simulation		
	3157	3282	3829
D263	The Army Combined Arms Weapon System (TACAWS) Technology Demonstration(s)		
	4226	7627	17865
D271	Multi-role Survivable Radar		
	3414	3322	0
D401	Insensitive Munitions for Missile Propulsion		
	7405	5646	4764
D404	Dual Mode Seeker		
	0	134	0
D486	Rapid Force Projection Simulation		
	0	0	8111
D493	Rapid Force Projection Demonstration		
	0	0	1432
D496	Non-Line of Sight (NLOS) Missile Demonstration		
	0	0	10496
PE TOTAL	19946	20011	46497

* Program will continue until completion of the North Atlantic Treaty Organization (NATO) Cooperative Effort.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This is the only Army program for scaling up new air defense radar and missile concepts and components developed under exploratory development. Technology to permit ground based radars to survive antiradiation missile threats is demonstrated as is multipurpose fire and forget seeker technology that can deal with threats buried in clutter backgrounds. This program element also provides the means to develop new and improved missile realtime hardware-in-the-loop simulation technology. Mission Area Analysis (MAA) deficiencies stated by the U.S. Army Training and Doctrine Command (TRADOC) require materiel development solutions for product improvements to existing systems and new systems concepts to provide: air threat detection systems with low probability of intercept and reduced vulnerability to antiradiation missile threat and electronic counter-countermeasures, cost reduction of missile components and systems; a survivable anti-armor system to meet the emerging threat, and advanced concepts and seekers for application to direct or indirect fire missiles in the antitank role. The work in this program element is consistent with the resource constrained Army Science and Technology Master Plan, Science and Technology Objectives (STOs) and the Army Modernization Plan and supports DoD Science and Technology (S&T) Thrusts in Precision Strike, Air Defense, and Advanced Land Combat.

Program Element: #0603313A
PE Title: **Missile and Rocket Advanced Technology** Budget A ity: #2

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project D085 - Demonstration of Advanced Radar Techniques (DART): This project develops a prototype radar through the cooperation of six NATO countries. It is a short-range, X-band radar which will evaluate the effectiveness of various potential antiradiation missile (ARM) countermeasures and electronic counter-countermeasures (ECCM) operational modes. Features include low sidelobe antennas, frequency and waveform flexibility, and distributed transmitters for decoy or bistatic operation.

(U) FY 1992 Accomplishments:
- (U) Completed German ARM countermeasures national trials
- (U) Completed French ARM countermeasures national trials
- (U) Began international ARM countermeasures trials at Naval Air Weapon Center, China Lake, CA
- (U) Continued ARM countermeasures simulation and analysis

(U) FY 1993 Planned Program: Not applicable

(U) FY 1994 Planned Program: Not applicable

(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 real-time in a nondestructive laboratory environment; (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 1992 Accomplishments:
- (U) Commenced development of a high performance, low cost, multi-element digital signal processor configured for HWIL signal environment simulation
- (U) Performance specification for equipping and testing the Millimeter/Microwave Simulation Facility (MMSF) Millimeter Simulation System 2 (MSS2) were defined
- (U) Requirements for the next generation realtime target and background scene generator for HWIL simulation of electro-optically guided missiles were established and fabrication initiated
- (U) A single channel laser diode-based infrared target scene projector was successfully demonstrated and the design scaled to a multi-channel linear array
- (U) Extended and refined Battlefield Environment Simulation System (BEWSS) infrared target and background signature models using measured data
- (U) Developed statistical models of target/clutter scenes for BEWSS and verified with measured data

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603313A
PE Title: **Missile and Rocket Advanced Technology** Budget Activity: #2

(U) FY 1993 Planned Program:

- (U) Continue 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
- (U) Complete the fabrication of the next generation realtime target and background scene generator for HWIL simulation of electro-optically guided missiles
- (U) Fabricate and test a multi-channel laser diode-based infrared target and background scene projector for use in HWIL simulation of infrared guided missiles
- (U) Integrate an extended line array of radiating millimeter wave antennas into the Millimeter Simulation System
- (U) Continue the refinement/development of obscurant radiance, path radiance, and IR emitters (IR controlled flares and gunflash) for BEWSS
- (U) Initiate development/incorporation of BEWSS MMW obscurant countermeasure models and verification with field test data collected in other programs

(U) FY 1994 Planned Program:

- (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
- (U) Integrate and checkout the fully configured Millimeter Simulation System 2 (MSS2) for specific missile system HWIL simulation applications
- (U) Integrate the low cost host processor for SIMSTAR hybrid computers into the Imaging Infrared HWIL Simulation Laboratory (IIRL)
- (U) Integrate and interface the next generation realtime HWIL simulation target and background scene generator for electro-optically guided missiles into the IIRL
- (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
- (U) Continue and expand the development/incorporation of MMW obscurant countermeasure models. Verify with field test data collected from other programs

(U) Project D263 - The Army Combined Arms Weapon System (TACAWS) Technology Demonstration(s): This project provides for the demonstration of an advanced tactical missile technology including seekers, propulsion, airframes, warheads, and guidance and control. Work is conducted through Technology Demonstration (TD) and an Advanced Technology Demonstration (ATD). 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 optical 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 common 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. Demonstrated missile system performance (i.e.; weight, range, kill ratio, speed, lethality) must 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. The TACAWS Technology Demonstration Program is the only approved 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. Final approval for a JAWS Mission Needs Statement (MNS) is anticipated in the third quarter FY93. JAWS is expected to receive strong support as the next generation Army missile system. TACAWS will permit the testing of the key JAWS technologies before committing to a higher risk Demonstration/Validation program. The TACAWS program has been structured so that upon successful coompletion of test flights at the end of FY96, a decision whether to keep TACAWS as a 6.3a Tech Base program and proceed to an Advanced Technology Demonstration (ATD) or transition into a Dem/Val program for JAWS can be made. Increase in funds will support the ATD.

(U) FY 1992 Accomplishments:
- (U) Development of detailed TACAWS Program Plan
- (U) Development of Technology Development Plan (TDP)
- (U) User agreement on design goals
- (U) Conducted preliminary design studies and established preliminary TOW-size design

(U) FY 1993 Planned Program:
- (U) Refine missile design through missile simulation studies and user input
- (U) Conduct seeker, datalink, data compression, motor tests with limited hardware
- (U) Complete trade studies on alternative missile configurations and determine optimum configuration to satisfy multi-role/multi-target design goal
- (U) Perform in-depth contractor study of seeker design
- (U) Develop advanced simulations of missile and seeker for digital and HWIL
- (U) Explore multi-mission seeker technology

(U) FY 1994 Planned Program:
- (U) Begin building five flight-worthy seekers and motors to support technology demonstration flights in FY1996
- (U) Continue testing of seekers, datalink, motors
- (U) Continue refinement of missile design configuration and performance analysis
- (U) Begin tower and captive flight testing of seekers
- (U) Development and refinement of signal processing algorithms for acquisition of targets in clutter at long range
- (U) Evaluate and test multi-mission seeker technology

(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 completes in FY 1993.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603313A
PE Title: **Missile and Rocket Advanced Technology** Budget Activity: #2

(U) FY 1992 Accomplishments:
- (U) Hardware/software integration
- (U) In-plant testing completed at contractor facility
- (U) MRSR delivered to the U.S. Army Missile Command (MICOM)
- (U) Government acceptance tests

(U) FY 1993 Planned Program:
- (U) Survivability demonstration tests
- (U) Non-cooperative target recognition
- (U) Main Beam communication
- (U) Weapon cueing

(U) FY 1994 Planned Program: Not applicable

(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.

(U) FY 1992 Accomplishments:
- (U) Demonstrated rugged non-detonable (RND) near-term formulation survival under shaped charge jet (SCJ) attack
- (U) Developed and determined ballistic and IM properties of Elastomer Modified Cast Double Base (EMCDB) in graphite overwrap (GO) and steel strip laminates (SSL) test vessels and technical demonstration motors
- (U) Developed ammonium nitrate/composite propellant (AN/CP) based minimum smoke formulation for IM use
- (U) Showed feasibility of roll bonded composite material and fabrication techniques for IM motor cases

(U) FY 1993 Planned Program:
- (U) Determine ballistic and IM properties of nitramine polymer formulations
- (U) Fabricate graphite composite (GC) technical demonstration motors with AN/CP minimum smoke propellant and test for performance and IM characteristics
- (U) Demonstrate case mitigation device for fast cook-off/slow cook-off (FCO/SCO) response
- (U) Design and fabricate components for a gel feasibility study for IM
- (U) Characterize gel propellants
- (U) Initiate development and characterization of high performance non-deflagrating composite smoke formulations for IM use

(U) FY 1994 Planned Program:
- (U) Identify approaches and ingredients for high performance minimum signature propellants and inert structures to yield IM propulsion systems

Program Element: #0603313A
PE Title: **Missile and Rocket Advanced Technology** Budget Activity: #2

- (U) Formulate and initiate performance evaluation of GC formulations for use in ducted rocket engine (DRE) and hybrid propulsion applications
- (U) Develop and evaluate new candidate oxidizers and energetic monomers/polymers
- (U) Demonstrate bipropellant gel components
- (U) Design IM bipropellant gel system based on tested components
- (U) Demonstrate ballistic and IM characteristics of composite propellant in a GC or roll bonded test vessel

(U) Project D404 - Dual Mode Seeker: This project originally was to support the Army portion of a joint Air Force/Army millimeter wave and infrared seeker development. The program now supports the DoD-directed international effort with Japan on a Dual Mode Seeker. This support will be used in place of SDIO funding, which has not been forthcoming for the US/Japan program. The dual mode seeker program will develop seeker concepts for joint analysis and trade studies between the two countries. In addition, simulation techniques will be investigated in both countries for dual mode seekers. Algorithm work in the international program will concentrate on data registration work. Work in this project terminates in FY 1993.

(U) FY 1992 Accomplishments: Not applicable

(U) FY 1993 Planned Program:
- (U) Identify dual mode seeker concepts for joint trade studies and analyses
- (U) Identify dual mode data set for sensor data registration algorithm development
- (U) Investigate dual mode simulation capabilities in both countries

(U) FY 1994 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 top level demonstration simulations. Work in this project transitioned from PE #0602303A, project A214.

(U) FY 1992 Accomplishments: Not applicable

(U) FY 1993 Planned Program: Not applicable

(U) FY 1994 Planned Program:
- (U) Perform baseline analysis to determine optimal weapon/sensor/command, control and communications (C3) mix
- (U) Conduct transportability analysis
- (U) Examine Advanced Technology Demonstration effectiveness using high fidelity simulations
- (U) Evaluate weapon system requirements for RFPI

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603313A
PE Title: **Missile and Rocket Advanced Technology** Budget Activity: #2

(U) Project D493 - Rapid Force Projection Demonstration: This project will investigate air deployable, first-to-fight forces that are both lethal and highly survivable against armor with the approach to demonstrate new technology and tactics for the hunter/standoff killer through a combination of field tests and force-on-force simulations. Features include the use of non-line-of-sight weapons 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 1992 Accomplishments: Not applicable

(U) FY 1993 Planned Program: Not applicable

(U) FY 1994 Planned Program:
- (U) Establish demonstration scenarios and define demonstration architecture
  (U) Interface the specifications of Advanced Technology Demonstrations (ATDs) and Battlefield Distributed Simulation - Developmental (BDS-D) assets to Top Level Demonstration (TLD.
- (U) Conduct an early version of TLD with emphasis on sensor to shooter connectivity

(U) Project D496 - Non-Line of Sight (NLOS) Missile Demonstration: This project will provide demonstration of global positioning system (GPS)/inertial navigation and an imaging infrared (IIR) seeker enhancements to the Fiber Optic Guided-Missile (FOG-M) Initial Operational Evaluation (IOE) system. These enhancements are needed to provide increased lethality and survivability necessary for system deployment as a part of a rapid force contingent. Work in this project transitioned from PE #0602303A, project A214.

(U) FY 1992 Accomplishments: Not applicable

(U) FY 1993 Planned Program: Not applicable

(U) FY 1994 Planned Program:
- (U) Conduct engineering analysis of GPS/inertial navigation
- (U) Perform seeker trade-off studies
- (U) Incorporate fiber optic link design improvements for GPS and IIR seeker
- (U) Procure candidate long lead time components

(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. The LOSAT Technology Demonstration project will be managed by the LOSAT Project Management Office.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603313A
PE Title: **Missile and Rocket Advanced Technology** Budget Activity: #2

(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 #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 ^Hoint 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 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603392A**
P Title: **Anti-Satellite Weapons (ASAT)**
P ct Title: **Anti-Satellite Weapons**

Project Number: **#DE16**
Budget Activity: **#3**

POPULAR NAME: **ASAT**

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

SCHEDULE	FY 1992	FY 1993	FY 1994		
P ram ones					
Engineering Milestones	SSR-Aug				
T&E Milestones					
Contract Milestones	Restructure-Aug				
BUDGET ($000)	**FY 1992**	**FY 1993**	**FY 1994**		
Major Contract	24972	17400			
Support Contract	4633	3200			
In-House Support	4417	3668			
GFE Other	0/0	500			
Total	34022	18909*	0		

* The funding value stated here is accurate. It is inconsistent with the value reflected in the R-1 due to administrative error.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603392A**
PE Title: **Anti-Satellite Weapons (ASAT)**
Project Title: **Anti-Satellite Weapons**

Project Number: **#DE16**
Budget Activity: **#3**

B. (U) BRIEF DESCRIPTION OF MISSILE REQUIREMENT AND SYSTEM CAPABILITIES: The objective of the Kinetic Energy (KE) Anti-Satellite program is to develop a system to deter, deny, and negate threat satellites in accordance with the National Security Strategy, (Aug 91), the National Space Policy, and US Commander-in-Chief, Space (USCINCSPACE) requirement. The Joint Chiefs of Staff have validated U.S. Space Command's Multi-Command Required Operational Capability (MROC) for space control. KE ASAT will provide a capability to kill/reduce the operational capability of space-based threat assets and improve survivability and warfighting ability of U.S. forces.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- (U) Conducted KE ASAT System Design Review (SDR)
- (U) Conducted Hover Test to verify simulation
- (U) Performed Missile Subsystems Simulations, Hardware-in-the-Loop testing and Hardware/Software Integration testing

(U) FY 1993 Planned Program:
- (U) Conduct risk reduction program, KE ASAT booster development, Kill Enhancement Device testing and system design
- (U) Fabricate and assemble Kill Vehicle components
- (U) Complete coding of weapon control system software
- (U) Conduct Kill Vehicle simulations and Hardware-in-the-Loop testing
- (U) Continue ground test on critical components
- (U) Conduct System Software Review (SSR)

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

D. (U) WORK PERFORMED BY: U.S. Army Strategic Defense Command; KE ASAT DEM/VAL prime contractor, Rockwell International Corporation, Los Angeles, CA; Nichols Research Company, Huntsville, AL; Advanced Sciences Group Inc, Huntsville, AL; and EER Systems, Huntsville, AL.

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY:
NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** None
2. **SCHEDULE CHANGES:** Due to funding reductions, Early User Test & Evaluation (EUT&E) will not be accomplished in FY93 as originally scheduled.
3. **COST CHANGES:** The Army was unable to fund this program beyond FY93.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603392A
PE Title: **Anti-Satellite Weapons (ASAT)**
Project Title: **Anti-Satellite Weapons**

Project Number: #DE16
Budget Activity: #3

F. (U) PROGRAM DOCUMENTATION:

Defense Acquisition Board Acquisition Decision Memorandum (S), 9 Mar 89
Defense Acquisition Board Acquisition Decision Memorandum for Kinetic Energy Anti-Satellite (KE ASAT) Concept Definition Selection (U), 15 Dec 89
System Concept Paper, 1 Nov 89
System Threat Assessment Report, 1 Jan 93
Test and Evaluation Master Plan, 1 Oct 89
Cost and Operational Effectiveness Analysis, 1 Dec 89
Operational Requirements Document, 11 Mar 93
Cost Analysis Requirements Description, 26 Feb 93
Baseline Cost Estimate, 26 Feb 93

The Acquisition Decision Memorandum (ADM), 15 Dec 89, issued by the Defense Acquisition Board (DAB) designated the Army as lead for the development of the KE weapon system. The basing mode selected from the three options under consideration was land-basing. ADM, 16 Feb 90, authorized the program to proceed into DEM/VAL phase. As part of the 1 Oct 92 Congressional Record - House, the U.S. Space Command was directed to prepare a new Operational Requirements Document (ORD). The Secretary of Defense is to review the ORD, restructure the program as required, and submit the ORD to the Congressional Defense Committees by 15 Mar 93.

G. (U) RELATED ACTIVITIES:

PE #0102424F, (SPACETRACK); Include Air Force Surveillance and BM/C3 development for ASAT.
PE #0603222C, (Kinetic Energy Weapons); SDIO kinetic energy weapons research.

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

H. (U) OTHER APPROPRIATION FUNDS: Not Applicable

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

J. (U) TEST AND EVALUATION DATA: The KE ASAT Test and Evaluation Master Plan (Army Annex to the Capstone TEMP) was completed, staffed, and approved by OSD 31 Mar 92.

FY 1994 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 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D135 Nuclear Development Support	1168	1362	0
D153 Nuclear Effects Support Team (NEST)	2147	1691	2006
PE TOTAL	3315	3053	2006

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 1994:

(U) Project D135 - Nuclear Development Support: This project funds the orderly termination of developmental efforts in accordance with a Presidential order to terminate tactical nuclear programs.

(U) FY 1992 Accomplishments:
- (U) Continued orderly termination of Research and Development efforts within Project Manager for Nuclear Munitions.

(U) FY 1993 Planned Program:
- (U) Complete termination of Research and Development efforts within the Project Manager for Nuclear Munitions.

(U) FY 1994 Planned Program: Program not funded.

(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 1992 Accomplishments:
- (U) Conducted nuclear survivability assessments of developmental systems.
- (U) Continued development of expert system design aids to assist the nuclear survivability efforts of Army project managers.

(U) FY 1993 Planned Program:
- (U) Conduct nuclear survivability assessments of developmental systems.
- (U) Assess test and evaluation master plans for adequacy of nuclear survivability testing.
- (U) Maintain and update the Army database on nuclear survivability of systems.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603604A**
PE Title: **Nuclear Munitions - Advanced Development** Budget Activity: **#4**

- (U) Continue development of expert system design aids to assist the nuclear survivability efforts of Army project managers.

(U) FY 1994 Planned Program:
- (U) Conduct nuclear survivability assessments of developmental systems.
- (U) Assess test and evaluation master plans for adequacy of nuclear survivability testing.
- (U) Maintain and update the Army database on nuclear survivability of systems.
- (U) Continue development of expert system design aids to assist the nuclear survivability efforts of Army project managers.

(U) Work Performed By: In-house efforts are performed by the Project Manager for Nuclear Munitions and the U.S. Army Research, Development and Engineering Center, Picatinny Arsenal, NJ; Harry Diamond Laboratories, Adelphi, MD; and Ballistics Research Laboratory, Aberdeen Proving Ground, MD. Major contractors are Booz, Allen and Hamilton, Bethesda, MD; and Kaman Sciences Corporation, Colorado Springs, CO.

(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 is being terminated in an orderly manner. There is no unnecessary duplication of effort within the Army or Department of Defense.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603606A
PE Title: Landmine Warfare and Barrier Advanced Tech.. ,logy
Budget Activity: #2

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D006 Landmine Warfare Dev	239	2584	2333
D608 Countermine & Barrier Dev	16958	15507	7662
PE TOTAL	17197	18091	9995

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element provides for advanced development of landmine and countermine capabilities. 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. The Congress, recognizing these deficiencies, increased funding in FY 1992 for countermine research and development. Work in this Program Element complies with the Army Science and Technology Master Plan, the Science and Technology Objectives (STOs) therein and supports the DoD Science and Technology Thrusts for Precision Strike, Air Superiority/Defense and Advanced Land Combat.

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. An anti-helicopter mine concept will improve the effectiveness of our air defense assets by forcing enemy helicopters and low speed aircraft to operate at higher altitudes. 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 communication, 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 (DoD Science and Technology Thrust for Advanced Land Combat).

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603606A
PE Title: **Landmine Warfare and Barrier Advanced Tec. nology** Budget Activity: #2

(U) FY 1992 Accomplishments:
- (U) Transitioned wide area mine command and control (WAM C2) to 6.3b.
- (U) Initiated development of prototype anti-helicopter mine (AHM).
- (U) Completed installation of Intelligent Mine Field (IMF) simulator (Test Bed) workstations at the Armament Research, Development and Engineering Center (ARDEC) and U.S. Army Engineer School (USAES).

(U) FY 1993 Planned Program:
- (U) Initiate Contractual Development of Four (4) Key IMF Components.
  - Gateway Overwatch Minefield Controller
  - Next Generation Battlefield Sensors
  - Remote Mine Handling Vehicles/Device
  - Command Center Control Station
- (U) Proceed with IMF Simulation and Concept/Requirements Definition Phase.

(U) FY 1994 Planned Program:
- (U) Install Preliminary Simulation Models into ARDEC IMF Test Bed.
- (U) Conduct Functional (Bench Top) Demonstrations of IMF Software and Hardware Interfaces.

(U) Project D608 - Countermine and Barrier Development: Operation Desert Storm 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. In-stride breach efforts are concentrated on the Improved Dispersed Explosives (IDX) for stand-off breach of minefields.

(U) FY 1992 Accomplishments:
- (U) Transitioned Standoff Minefield Detection System (STAMIDS) to 6.3b.
- (U) Performed trade-off analyses of aerial and linear IDX munitions concepts and selected linear concept for further refinement; initiated component design.
- (U) Completed design and fabrication of a separated aperture antenna and data acquisition system for close-in man portable mine detector (formerly improved hand-held detector).

(U) FY 1993 Planned Program:
- (U) Transition IDX program to 6.3b.
- (U) Initiate design and fabrication of vehicular mounted mine detector (Photon Backscatter Mine Detection System (PHOMIDS)) subsystem.
- (U) Fabricate field data acquisition system for the close-in man portable mine detector program.
- (U) Complete design for balanced bridge brassboard and initiate fabrication in support of the close-in man portable mine detector.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603606A
PE Title: **Landmine Warfare and Barrier Advanced Technology** Budget Activity: #2

(U) FY 1994 Planned Program:

- (U) Complete design and fabrication of vehicular mounted detector PHOMIDS subsystem (i.e., X-ray source, power source, detector arrays and displays).
- (U) Complete fabrication of separated aperture and balanced bridge brassboards in support of the close-in man portable mine detector.

(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 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603607A
PE Title: Joint Service Small Arms Program
Budget Activity #2

(U) RESOURCES: ($ in Thousands)

Project Number Title	FY 1992 Actual	FY 1993 Actual	FY 1994 Estimate
D627 Joint Service Small Arms Program (JSSAP)	5336	5458	5529

B. (U) BRIEF DESCRIPTION OF ELEMENT: This effort develops and demonstrates brassboard systems leading to the advanced development of small arms weapons for all Services. JSSAP is configured to overcome the technological barriers associated with small arms/munitions/fire control for individual and crew-served weapons to achieve substantial improvements in threat defeat under all environmental conditions with a goal of reducing the soldier's load. All JSSAP efforts are based upon approved Joint Service Science and Technology Objectives (JSSTO) 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, and Navy requirements. Work in this program element is consistent with the resource constrained Army Science & Technology Master Plan (ASTMP), Science and Technology Objectives (STOs) and the Army Modernization Plan. The main efforts include the following: (1) Modular Fire Control: Reduce life cycle cost and improve effectiveness; (2) Canister Cartridge: Provides improved anti-personnel capability (90% hit probability) at 100 meters; (3) Training Ammunition: Provide realistic training with 50-90% range reduction; (4) Multi-platform Ballistic Sight: 24-hour capability against materiel and personnel, increasing first burst hit probabilities from the present 15% to 90%; (5) Objective Individual Combat Weapon: Provide the first element of the next generation of small arms; (6) Controlled Penetration Ammunition: Minimizing collateral damage in confined operational environments; and (7) Crew Weapons Test Bed: Establish for the next generation crew-served weapons.

C. (U) JUSTIFICATION FOR PROJECT:

(U) Project D627 - Joint Service Small Arms Program:

(U) FY 1992 Accomplishments:

- (U) Designed/fabricated modular fire control prototypes and initiated iterative engineering and design tests.
- (U) Awarded two (2) brassboard development contracts for multi- platform Ballistic Sight.
- (U) Completed demonstration and transition 7.62mm short range training Ammunition.
- (U) Completed demonstration of improved 40mm High Explosive, Dual Purpose (HEDP) ammunition and 40mm Canister cartridge for MK19 Grenade Machine Gun.
- (U) Transitioned improved, lightweight, ground mount for MK19 and M2 machine guns.

(U) FY 1993 Planned Program:

- (U) Complete conceptual design and trade-off study, downselect to one contractor, and initiate engineering design of multi-platform ballistic sight.

Program Element: #0603607A
PE Title: **Joint Service Small Arms Program** Budget Activity #2

- (U) Complete modular fire control engineering design testing, accept delivery of three prototype systems, conduct technical tests to confirm hit probability estimates, and ready for transition to engineering and manufacturing development.
- (U) Fabricate cal .50 limited range training ammunition prototypes, perform technology demonstration and transition to engineering development.
- (U) Award low collateral damage rifle ammunition development contract.
- (U) Design/construct 5.56mm limited range (lead free) training ammunition concepts.

(U) FY 1994 Planned Program:

- (U) Integrate design and fabricate multi-platform ballistic sight initial prototype.
- (U) Award Objective Individual Combat Weapon Development Contract(s).
- (U) Demonstrate low collateral damage rifle ammunition.
- (U) Complete cal .50 limited range training ammunition demo and transition to EMD.
- (U) Finalize design and fabricate 5.56mm limited range (lead free) training ammo protypes.

(U) Work Performed By: This program is directed by the 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 Naval Surface Warfare Center, Crane, IN; and Air Force Wright Laboratory/Armament Directorate, Eglin Air Force Base, FL. Contractors include: Olin Corp., East Alton, IL; Contraves USA, Pittsburg, PA; SCN Industrial Technologies, Inc., Montreal, Canada; and Elbit Systems of America, Grand Rapids, MI.

(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 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603617A**
PE Title: **Non-Line of Sight (NLOS)**
Project Title: **Non-Line of Sight (NLOS) Missile**

Project Number: **D095**
Budget Activity: **#4**

POPULAR NAME: NLOS-CA

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

SCHEDULE	FY 1992	FY 1993	FY 1994		
Program Milestones		OSD RFP Review 6/93	Milestone II - 2/94		
Engineering Milestones					
T&E Milestones					
Contract Milestones		Contractor Analyses Complete - 5/93 Release Development RFP -7/93	Award Development contract - 3/94		
BUDGET ($000)	**FY 1992 (Carryover to FY93)**	**FY 1993**	**FY 1994**		
Major Contract	0	0	18187		
Support Contract	5205	0	3503		
In-House Support	3515	0	12205		
GFE/ Other	80	0	807		
Total	8800	0	34702		

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603617A
PE Title: Non-Line of Sight (NLOS)
Project Title: Non-Line of Sight (NLOS) Missile

Project Number: D095
Budget Activity: #4

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The Non-Line of Sight Combined Arms (NLOS-CA) System is a multi-purpose, multi-mission precision weapon system that can reach out to 15 km. The mission is to defeat threat main battle tanks, armored vehicles, rotary wing aircraft, and other high value targets beyond, or masked from, the line of sight of direct fire weapon systems. NLOS consists of a heavy HMMWV mounted gunner's station, a tactical missile, and a fiber optic data link. The fiber optic data link allows the gunner to guide the missile to the target. The gunner views the target via a seeker on the missile which is linked to a video console in the gunner's station. This program was restructured and FY92 carryover funds were used to complete accomplishments in FY93.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments: None

(U) FY 1993 Planned Program:
- (U) Completion of four Contractor Analyses contracts
- (U) Completion of Austere Proof-of-Principle demonstration
- (U) Release draft and final Request for Proposal (RFP) for the NLOS-CA development contract

(U) FY 1994 Planned Program:
- (U) Evaluate Development contract proposals
- (U) Milestone Decision Review for award of Development contract
- (U) Award Development contract/initiate design and fabrication

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 1993 AMENDED DESCRIPTIVE SUMMARY:
NARRATIVE DESCRIPTION OF CHANGES

1. TECHNICAL CHANGES: None

2. SCHEDULE CHANGES: A Chief of Staff of the Army (CSA) "Off Site" Review was conducted on 27 January 1992 where the CSA approved a revised acquisition strategy for the NLOS-CA development program.

3. COST CHANGES: This program is fully funded in the FY94 Budget Estimate.

F. (U) PROGRAM DOCUMENTATION: Operational and Organizational Plan, 8/91
Draft Operational Requirement Document, 9/92

G. (U) RELATED ACTIVITIES: There is no unnecessary duplication of effort within the Army or DOD. Related activities include:

PE#0604810A Project No. DC26 - Non-Line of Sight (NLOS) Engineering Development

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603617A**
PE Title: **Non-Line of Sight (NLOS)**
Project Title: **Non-Line of Sight (NLOS) Missile**

Project Number: **D095**
Budget Activity: **#4**

H. (U) OTHER APPROPRIATION FUNDS: Not Applicable

Appropriation	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
		($ in Thousands)	
Procurement			
Military Construction	NONE	NONE	NONE

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. (U) TEST AND EVALUATION DATA: None (FY92 - FY94)

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603619A
PE Title: **Landmine Warfare and Bar: r - Advanced Development** Budget Activity: **#4**

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D005 Landmine Advanced Development	4285	-0-	5253
D606 Countermine/Barrier Advanced Development	3082	12761	16432
PE TOTAL	7367	12761	21685

P

B. (U) BRIEF DESCRIPTION OF ELEMENT: Development of countermine equipment which serves to maintain mobility on the modern battlefield. The countermine equipment provides detection, breaching and marking capabilities for the maneuver forces. The countermine projects include the Standoff Minefield Detection System (STAMIDS), and the Improved Dispersed Explosives (IDX). These countermine programs support the Army's Countermine Modernization Plan. This program el·ment also provides mines and demolitions systems to complement natural obstacles to fix, turn and bl. ck attacking forces, thus enhancing the performance of direct and indirect fire weapons.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(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 1992 Accomplishments:
- (U) Completed M15 mine fuze Demonstration/Validation phase
- (U) Inititated Minefield Command and Control Demonstration/Validation phase

(U) FY 1993 Planned Program:
- (U) Project not funded

(U) FY 1994 Planned Program:
- (U) Complete Minefield Command and Control Demonstration/Validation p.ase

(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. Contractors are to be selected.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603619A**
PE Title: **Landmine Warfare and Barrier - Advanced Development** Budget Activity: **#4**

(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 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603619A** Project Number: **D606**
PE Title: **Landmine Warfare and Barrier - Advanced Development** Budget Activity: **#4**

A. (U) RESOURCES: ($ in Thousands)
Project Title: **Countermine/Barrier Advanced Development**

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Stand-off Minefield Detection System (STAMIDS) / Improved Dispersed Explosives (IDX)	3082	12761	16432

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project provides advanced development of new countermine systems by evaluating and prototyping advanced sensors, and evaluating concepts for the detection, neutralization, breaching and clearing of mines to enhance U.S. capability in countermine warfare. The program provides for proof-of-principle testing of these systems.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- (U) Completed Milestone I for Stand-off Minefield Detection System (STAMIDS)
- (U) Prepared STAMIDS solicitation and Source Selection Documentation
- (U) Conducted STAMIDS multi-spectrum sensor demonstration
- (U) Conducted technical and cost analysis for countermine systems

(U) FY 1993 Planned Program:
- (U) Complete STAMIDS source selection
- (U) Initiate STAMIDS Demonstration/Validation phase design
- (U) Conduct STAMIDS component system design review
- (U) Initiate Improved Dispersed Explosives (IDX) mine neutralization system component design

(U) FY 1994 Planned Program:
- (U) Continue STAMIDS Demonstration/Validation phase with software development
- (U) Continue Demonstration/Validation phase for IDX

D. (U) WORK PERFORMED BY: The Project Manager for Mines, Countermine and Demolitions, Picatinny Arsenal, NJ is assigned responsibility for countermine development. The contractors are to be selected.

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY: NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603619A** Project Number: **D606**
PE Title: **Landmine Warfare and Barrier - Advanced Development** Budget Activity: **#4**

2. (U) SCHEDULE CHANGES: Milestone I for STAMIDS changed from 1QFY92 to 4QFY92
Milestone II for STAMIDS changed from 4QFY92 to 1QFY96

3. (U) COST CHANGES: Increased funding provides an improved profile for accomplishment of project goals.

F. (U) PROGRAM DOCUMENTATION:

Mission Need Statement (MNS)	5/92
Operational Requirement Document (ORD)	8/92

G. (U) RELATED ACTIVITIES: Component work and explorative 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: None

I. U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

J. (U) MILESTONE SCHEDULE:

Milestones	Milestones Dates
STAMIDS Milestone I	4QFY92
STAMIDS Milestone II Proof-of-Principle complete	1QFY96

FY 1994 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 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
DE78 Target Defeating Systems	0	6432	954
DE79 Smoke, Obscurant-Advanced Development	12748	11486	5092
PE TOTAL	12748	17918	6046

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 smoke and obscurant agents, munitions, and devices to improve the survivability of the combined arms force, and complement combined weapons systems. Improvements are sought across the entire multispectral range from visual through infrared (IR) and millimeter (MM)(radar) wavelengths.

C. (U) **JUSTIFICATION FOR PROJECTS LESS THAN $10 MILLION IN FY 1994:**

(U) **Project DE78** - Target Defeating Systems: Provides Advanced Development (AD) of non lethal riot control devices.

(U) **FY 1992 Accomplishments:**
- (U) Project not funded

(U) **FY 1993 Planned Program:**
- (U) Award Advanced Riot Control Agent Device (ARCAD) development contract

(U) **FY 1994 Planned Program:**
- (U) Initiate ARCAD prototype design and hardware fabrication

(U) **Project DE79** - Smoke/Obscurant Systems -AD: 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, 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 an upgraded M901A chassis. 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 use standard smoke grenade hardware to disseminate smoke/obscurant material and fully obscure the vehicle. The XM81 is a bi-spectral smoke grenade which provides screening in

Program Element: #0603627A
PE Title: Smoke, Obscurant and Target Defeating Systems - Advanced Development
Budget Activity: #4

both MM and IR spectra. It is designed to launch from existing and developmental 66mm grenade launchers.

(U) FY 1992 Accomplishments:
- (U) Completed fabrication of the XM1101 prototype
- (U) Conducted XM1101 demonstration testing
- (U) Completed Milestone I/II in-process review (IPR) of the XM81 MM/IR screening grenade
- (U) Conducted user demonstration of LVOSS

(U) FY 1993 Planned Program:
- (U) Procure long lead items for PPQT of the following systems: M901A upgrade to XM1101; Thermal Imagers; M113A3 Reliability Improved Selected Equipment (RISE) packages; Modular Azimuth Position System (MAPS)
- (U) Procure and evaluate alternative turbine engines for XM1101 large area smoke system application
- (U) Conduct XM1101 PPT on large area smoke system
- (U) Complete hardware development on XM1101 projected smoke system
- (U) Conduct XM1101 Milestone I/II IPR

(U) FY 1994 Planned Program:
- (U) Conduct Milestone O/I In-Process Review (IPR) for the LVOSS and approve Acquisition Plan (AP)
- (U) Select materials and hardware for LVOSS system design

(U) Work Performed By: The Product Manager for Smoke/Obscurants, Aberdeen Proving Ground (APG), MD; U.S. Army Chemical and Biological Defense Agency, APG, MD and contractor TBD.

(U) Related Activities: Program Elements #0602622A (Chemical, Smoke and Equipment Defeating Technology) and #0603627A (Smoke, Obscurant and Target Defeating System-Engineering Development). In order to meet Service needs and to prevent unnecessary duplication of effort, coordination is maintained with 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 Army or DoD.

(U) Other Appropriation Funds: Not applicable

(U) International Cooperative Agreement: Not Applicable.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603640A** Project Number: **DB91**
PE Title: **Artillery Propellant Development** Budget Activity: **#4**

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

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Unicharge	7890	16127	12033

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 the XM297 52 Caliber Solid Propellant Armament System. XM230 Unicharge capitalizes on the M215 and 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 XM297 52 Caliber Solid Propellant Armament System is a one year funded effort to begin development of a 155mm armament system. The XM297 is intended to increase range from 30KM to 40KM and 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 breach and barrel mechanism and a fiber optic laser ignition system.

C. (U) **PROGRAM ACCOMPLISHMENTS AND PLANS:**

(U) **FY 1992 Accomplishments:**
- (U) Congressional direction to pursue Unicharge development in 39 Caliber systems
- (U) Completed improvements to the combustible case
- (U) Develop laser as alternate ignition device
- (U) Completed research of improved package
- (U) Identified preliminary physical properties of Unicharge for automated handling properties

(U) **FY 1993 Planned Program:**
- (U) Select insensitive munition propellant
- (U) Conduct Milestone II
- (U) Freeze design of complete charge
- (U) Select final packaging configuration
- (U) Conduct laser ignition test of Unicharge in cannon
- (U) Begin fabrication of Unicharge increments to support development and operational testing (DT/OT) (39 Cal weapon)
- (U) Characterize automation handling of Unicharge increments
- (U) Fabricate a 52 Caliber cannon barrel assembly with thermal cooling, progressive rifling, continuous bore evacuation, and integral muzzle brake
- (U) Develop and refine a breech assembly using a slide breech block, electrical breech actuation, and fiber optic laser ignition

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603640A
PE Title: **Artillery Propellant Development**

Project Number: DB91
Budget Activity: #4

(U) **FY 1994 Planned Program:**

- (U) Freeze Unicharge design
- (U) Conduct final engineering tests
- (U) Complete fabrication of Unicharge increments to support Development Testing (DT) and Operational Testing (OT)
- (U) Begin Developmental Testing

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, New Jersey. 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, Northern Industrial Services, Albany, NY.

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY: NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** Development of XM297 Armament System in FY93
2. **SCHEDULE CHANGES:** One year development effort of Armament System
3. **COST CHANGES:** Program plus-ups of $10 million in FY93 for development of Armament Systems

F. (U) PROGRAM DOCUMENTATION:
Preliminary Operational Requirements Document, 7/92

G. (U) RELATED ACTIVITIES: None

H. (U) OTHER APPROPRIATION FUNDS: None

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: 155mm Joint Ballistic Memorandum of Understanding, December 1991. Members include Italy, Germany, United Kingdom, France, and the United States.

J. (U) TEST AND EVALUATION DATA:

Milestones	Dates
Insensitive Munition Propellant Selection	3Q93
Milestone II	6/93
Design Freeze	10/93
Final Engineering Tests	1/94-8/94
Development Testing/Operational Testing	1/95-6/95
Milestone III	9/95

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603645A
PE Title: **Armored Systems Modernizatio: ;M) - Advanced Development**
Budget Activity: #4

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

Project Number / Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
DB82 System Engineering Analysis (SEA)	983	2781	954
DB83 Common Chassis Advanced Technology Transition Demo (CCATTD)	193471	181947	0
DB86 Combat Mobility Vehicle - Advanced Development (CMV)	11385	0	0
DB87 Combat Vehicle Survivability	1965	0	22251
DB88 Future Armored Resupply Vehicle - Ammunition (FARV-A)	0	20296	21125
DB98 Component Development	0	0	48703
D409 Advanced Field Artillery System (AFAS)	89915	109122	55309
PE TOTAL	297719	314146	148342

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. FY 93 funding as shown above does not reflect the restructured Acquisition Strategy. 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.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) Project DB82 - System Engineering Analysis (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.

(U) FY 1992 Accomplishments:

- (U) Continue SEA contract support until award of AFAS and FARV Dem/Val contract

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603645A
PE Title: **Armored Systems Modernization (ASM) - Advanced Development**
Budget Activity: #4

(U) **FY 1993 Planned Program:**
- (U) Continue SEA contract support until award of AFAS and FARV Dem/Val contract

(U) **FY 1994 Planned Program:**
- (U) Conclude SEA contract support until award of AFAS and FARV Dem/Val contract

(U) **Project DB83** - Common Component Advanced Technology Transition Demonstrator (CCATTD) - Contractor efforts w design, fabricate, demonstrate and mature numerous sub-systems with state of the art vetronics, survivability, mobility and propulsion systems. This will be the basis for the mobility of the Advanced Field Artillery System (AFAS) and the Future Resupply Vehicle (FARV). This project has been restructured.

(U) **FY 1992 Accomplishments:**
- (U) Restructured CCATTD program to focus on AFAS and deleted tank specific work
- (U) Downscoped CCATTD contracts to conclude with the receipt of acceptable performance specifications
- (U) Incorporated FARV design efforts into current contracts

(U) **FY 1993 Planned Program:**
- (U) Conclude current contract efforts with Armored Vehicle Technologies Associated (AVTA) and Teledyne Continental Motors (TCM) to focus on critical electronics and mobility subsystems
- (U) Award additional subsystem and component contracts to develop key technologies for AFAS and FARV
- (U) Engagement timeline analyses for all AFAS top attack and direct fire threats
- (U) Verification of component (sensor and countermeasure) performance
- (U) Software processing requirements to support Vehicle Integration Defense System/Active Protection (VIDS/AP) engagement timelines
- (U) Develop compartmentation methodology for AFAS and FARV liquid propellent and 155mm projectiles
- (U) Develop technology for radiation/spall liners for crew occupied areas and shock hardening technologies for AFAS and FARV subsystems

(U) **FY 1994 Planned Program:**
- (U) Program funded under Project DB98

(U) **Project DB86** - Combat Mobility Vehicle - Advanced Development provides preliminary development work for the Breacher, PE 0603649A, Project DG24, prior to FY 1993.

(U) **FY 1992 Accomplishments:**
- (U) Army Acquisition Executive program designation as Acquisition Category III 1QFY92
- (U) Test and Evaluation Master Plan (TEMP) signed 3QFY92
- (U) Milestone I review conducted 3QFY92
- (U) Approval to enter Demonstration/Validation phase 3QFY92
- (U) Justification & Approval (J&A) for sole source contract approved 3QFY92
- (U) Request for Proposal (RFP) released 4QFY92

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603645A
PE Title: A mored Systems Modernization (ASM) - Advanced Development
Budget Activity: #4

(U) **FY 1993 Planned Program:** Project not funded

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

(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. A sole source acquisition with BMY Combat Systems, a Division of Harsco Corporation, York, Pennsylvania, is planned for the CMV program. Management of the CCATTD prime contractor is accomplished by the Project Manager of the AFAS program. The prime contractor is Teledyne Continental Motors (TCM) of Muskegon, MI. Upon conclusion of the AVTA contract and scope reduction of the TCM contract, other contractual instruments will be executed. Management of the CMV contract is accomplished by the Project Manager of the Combat Mobility Vehicle program. Other government agency support is provided by the Tank-Automotive Command, Warren, MI, Belvoir Research, Development and Engineering Center, Waterways Experimental Station, and the Test and Evaluation Command.

(U) **Related Activities:**
- 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)
- PE #0603649A (Engineer Mobility Equipment Development)
- PE #0603645A (Armored Systems Modernization - 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 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603645A**
PE Title: **Armored Systems Modernization - Advanced Development**

Project Number: **DB87**
Budget Activity: **#4**

A. (U) RESOURCES: ($ in Thousands)
Project Title: Combat Vehicle Survivability-Advanced Development

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Survivability	1965	0	22251

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This effort evaluates methods of reducing AFAS and FARV susceptibility to smart/guided top attack threats and characterizes system design approaches capable of reducing system vulnerability to ballistic and non-ballistic threats. Specific activities consist of analytical characterization of top and direct fire engagement timelines (the time required for a threat munition to detect and engage its target), definition of required sensor and countermeasure performance characteristics, simulations, and field tests to verify the predicted performance requirements of selected devices. In coordination with TACOM ALC efforts, this program will demonstrate effective performance of system against AFAS and FARV threats at the component and sub-system level. This program will also relate to other critical AFAS and FARV survivability technologies: development and demonstration of the potential to compartment Liquid Propellant (LP), 155mm HE and DPICM projectile; generation of b[illegible]c shock specifications which will ensure the operational effectiveness of AFAS/FARV sub-systems when [illegible]cted by threat weapons; and development and demonstration of interior shielding tech[illegible]logies providing integrated radiation and spall protection for the crew. This effort also supports maturation and demonstration of NBC collective protection technologies and demonstration of stand off chemical agent detectors.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- (U) Survivability master plan
- (U) Passive armor technology demonstration
- (U) Verification of threat munition performance

(U) FY 1993 Planned Program:
- (U) Program funded under Project DB83

(U) FY 1994 Planned Program:
- (U) Support demonstration of the ability to intercept/defeat top attack threats before they can engage/hit their intended targets
- (U) Add artillery workstations to Battlefield Distributed Simulation and Development (BDSD) facility to provide capability for AFAS contractor to simulate survivability suites
- (U) Continue Pressure Swing Adsorption/Catalytic Oxidation (PSA/CATOX) filtration program toward a technology selection, and integrate the prototype Lightweight Standoff Chemical Agent Detector (LSCAD) in surrogate combat vehicle
- (U) Demonstrate the potential for compartmenting LP and 155mm projectiles
- (U) Develop generic specifications for shock attenuation
- (U) Complete spall liner and radiation shielding analysis

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603645A**
PE Title: **Armored Systems Modernization - Advanced Development**

Project Number: **DB87**
Budget Activity: **#4**

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 Electronics Warfare, Reconnaissance and Target Acquisition Material Technology Laboratory, U. S. Army Ballistic Research Laboratory, Army Material Systems Analysis Agency, Vulnerability Assessment Laboratory,and other contractors to be determined.

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY: NARRATIVE DESCRIPTION OF CHANGES

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

F. (U) PROGRAM DOCUMENTATION: None

G. (U) RELATED ACTIVITIES:
- 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)
- 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 DATA:

Milestones	Dates
Complete testing of Active Protection (AP) system (ALC Demonstration)	FY94
Demonstration of self-protection systems sensors & countermeasures	FY94
Complete PSA/CATOX filtration studies	FY94
Complete NBC Collective Protection tech demo	FY94
Complete Artillery System BDS-D Survivability Experiments	FY94

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603645A**
PE Title: **Armored Systems Modernization - Advanced Development**
Project Title: **Future Armored Resupply Vehicle (FARV)**

Project Number: **DB88**
Budget Activity: **#4**

PICTURE NOT AVAILABLE

POPULAR NAME: **FARV**

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

SCHEDULE	FY 1992	FY 1993	FY 1994		
Program Milestones	ASM Restructured		MS I - 4Q94		
Engineering Milestones		Perf Spec - 2Q93			
T&E Milestones		TEMP - 4Q93			
Contract Milestones					
BUDGET ($000)	**FY 1992**	**FY 1993**	**FY 1994**		
Major Contract	0	0	0		
Support Contract	0	6783	5606		
In-House Support	0	13513	15519		
GFE/ Other	0	0	0		
Total	0	20296	21125		

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603645A
PE Title: Armored System Modernization - 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, fuel and electronic data. The FARV will support the decentralized and continuous operations of the Advanced Field Artillery System (AFAS) thereby increasing system firepower. Automation and robotics in the FARV will allow crew reduction resulting in life cycle cost benefits over current systems. The mobility improvements feature increases vehicle range (465 km) and speed (48 to 60 km) cross country and positive navigation.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments: Project not funded

(U) FY 1993 Planned Program:
- (U) Initiate technology demonstration projects for ammunition transfer, liquid propellant resupply, and automated ammunition marking/identification
- (U) Complete concept definition on internal/external robotics handling techniques
- (U) Initiate Cost and Operational Effectiveness Analysis (COEA) and FARV specification
- (U) Prepare contract Request for Proposal (RFP) documentation
- (U) Complete Test and Evaluation Master Plan (TEMP), Trade Off Analysis (TOA), and TOD program documentation

(U) FY 1994 Planned Program:
- (U) Complete designs, fabrication, and demonstrations of critical components in the supporting FARV technologies
- (U) Complete documentation COEA and performance specification documentation
- (U) Conduct Milestone I with AFAS

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.

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY:
NARRATIVE DESCRIPTION OF CHANGES

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

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Ele. nt: **#0603645A** Project Number: **DB88**
PE Title: **Armored Systems Modernization - Advanced Development** Budget Activity: **#4**
Project Title: **Future Armored Resupply Vehicle (FARV)**

F. (U) PROGRAM DOCUMENTATION:
ASM Capstone O&O, 2/90
Draft TEMP, 3/93
FARV Draft ORD, 7 DEC 92

G. (U) RELATED ACTIVITIES:
- PE #0603645A (Armored Systems Modernization Advanced Development)
- 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: None

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603645A
PE Title: **Armored Systems Modernization - Advanced Development**

Project Number: DB98
Budget Activity: #4

A. (U) RESOURCES: ($ in Thousands)
Project Title: Component Development

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Comp Dev	0	0	48703

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 FY94. 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:

(U) FY 1992 Accomplishments:
- (U) Program funded under Project DB83

(U) FY 1993 Planned Program:
- (U) Program funded under Project DB83

(U) FY 1994 Planned Program:
- (U) Continue subsystem/component contracts
- (U) Support AFAS and FARV Milestone I work effort
- (U) Close out AVTA contract which was concluded in FY 1993
- (U) Continue subsystem/component contracts
- (U) Test the contractor Automotive Test Rig
- (U) Conduct the System Integration Demonstration (SID)
- (U) Continue component development to support the award of the AFAS/FARV Demonstration/Validation contract
- (U) Begin the Source Selection Evaluation Process

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) of Huntsville, AL and Cummins Engines of Columbus, IN.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603645A
PE Title: Armored Systems Modernization - Advanced Development

Project Number: DB98
Budget Activity: #4

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY: NARRATIVE DESCRIPTION OF CHANGES

NOTE: DB98 is a new project for the development of AFAS and FARV critical mobility systems and subsystems in support of the AFAS and FARV Milestone I decision and subsequent Demonstration/Validation contract award. Many of the specific development efforts were initiated, justified and funded under a 6.3b (post Milestone I) project, DB83 (CCATTD). The following will address changes to project DB83 that will also impact project DB98.

1. TEC CAL CHANGES: By direction of Congress, the CCATTD was restructured by deletion of tank specific from the contracts, downscoping contract effort by 40 percent (including stopping work on the demonstr , and insertion of FARV design work into current contracts.
2. SCHEDULE CHANGES: Because of the Congressional er sis 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 4th quarter FY 1994.
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 Ma ter Plan (Draft) 6/91
Operational Requirements Document (ORD) 12/92

G. (U) RELATED ACTIVITIES:

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

H. (U) OTHER APPROPRIATION FUNDS: None

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603645A**
PE Title: **Armored Systems Modernization - Advanced Development**

Project Number: **DB98**
Budget Activity: **#4**

J. (U) TEST AND EVALUATION DATA:

Milestones	Dates
Conclude AVTA contracts	2Q93
Award multiple subsystem contracts	3Q93 - 4Q93
Rescope/refocus TCM contract	2Q93
Automotive Test Rig (ATR) rollout	1Q94
ATR 2000 Km test	2Q94 - 3Q94
Final software SIL Demonstration	2Q94

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603645A** Project Number: **D409**
PE Title: **Armored Systems Modernization - Advanced Development** Budget Activity: **#4**
Project Title: **Advanced Field Artillery System (AFAS) - Advanced Development**

PICTURE NOT AVAILABLE

POPULAR NAME: **AFAS**

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

SCHEDULE	FY 1992	FY 1993	FY 1994		
Program Milestones	ASM Restructured		MS I - 4Q94		
Engineering Milestones	ATD PDR - 3Q92	Perf Spec - 2Q93 ATD CDR - 3Q93	ATD Delivery - 2Q94		
T&E Milestones		Mount & Cannon Test	ATD EDT		
Contract Milestones		Dem/Val Draft RFP Rel'd - 3Q93			
BUDGET ($000)	**FY 1992**	**FY 1993**	**FY 1994**		
Major Contract	59539	92296	39231		
Support Contract	2785	1336	1500		
In-House Support	27591	15490	14578		
GFE/ Other	0	0	0		
Total	89915	109122	55309		

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603645A** Project Number: **D409**
PE Title: **Armored Systems Modernization - Advanced Development** Budget Activity: **#4**
Project Title: **Advanced Field Artillery System (AFAS) - Advanced Development**

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 AFAS XM300 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 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 1992 Accomplishments:
- (U) Completed Concept Definition and conducted preliminary design review of the XM300 RLPG
- (U) Conducted the Preliminary Design Review (PDR), and began detail design of the Advanced Technology Demonstrator
- (U) Six square meter electrolysis cell to produce Hydroxyl Ammonium Nitrate (HAN) successfully brought "on-line"
- (U) Initiated XM46 liquid Propellant advanced development
- (U) Demonstrated technical feasibility of projectile tracking system

(U) FY 1993 Planned Program:
- (U) Complete fabrication and assembly of ATD RLPG system
- (U) Deliver ATD performance specification from contractor
- (U) Conduct ATD Critical Design Review (CDR)
- (U) Conduct cannon and mount tests
- (U) Fabricate second HAN cell
- (U) Conduct live fire demonstration of 35 Ghz projectile tracking system
- (U) Define and develop ATD technical fire control algorithms
- (U) Initiate AFAS survivability component development efforts
- (U) Develop ballistic algorithms for multiple round missions, real-time MET, projectile weight, muzzle velocity, and gun tube position
- (U) Define muzzle velocity management prediction neural network architecture
- (U) Develop automated ammunition handling system with automated inductive fuze setter
- (U) Release Demonstration/Validation draft Request for Proposal (RFP)

(U) FY 1994 Planned Program:
- (U) Continue design of XM300 RLPG system
- (U) Finalize LP container design
- (U) Complete live fire demonstration of MET extraction algorithms
- (U) Integrate accuracy enhancements into artillery concepts test system
- (U) Complete ballistics computation technology efforts for rate-of-fire and multiple round simultaneous impact requirements
- (U) Complete fabrication, integration and assembly of AFAS ATD and accept delivery from contractor

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603645A
PE Title: Armored Systems Modernization - Advanced Development
Project Title: Advanced Field Artillery System (AFAS) - Advanced Development

Project Number: D409
Budget Activity: #4

(U) FY 1994 Planned Program (continued)
- (U) Conduct ATD Engineering Design Tests (EDT)
- (U) Conduct Milestone (MS) I

D. (U) WORK PERFORMED BY: Management is accomplished ny 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 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, General Electric, Pittsfield, MA, Olin, Charleston, TN, Thiokol, Elkton, MD, and Gruman, Great River, NY.

E. (U) COMPARISON WITH FY 1993 AMENDED 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 (draft), 12/92
TEMP (draft), 6/91

G. (U) RELATED ACTIVITIES:
- PE #0604645 (Armored System Modernization Advanced Development) Project D175 AFAS Multi-Option Fuze for Artillery (MOFA) - 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: None

J. (U) TEST AND EVALUATION: In FY92, AFAS testing centered around the Regenerative Liquid Propellant Gun (RLPG). Two tests were conducted at Yuma Proving Grounds. All test objectives were met. The first series confirmed minimum and maximum range potential and first order assessment of projectile and fuze compatibility. The second test confirmed the performance of the ATD gun mount and complete additional compatibilty firings. The balance of fiscal year 1993 will evaluate the performanc of the ATD ballastic tube and selected components of the RLPG.

FY 1994 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 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Breacher	-0-	11492	29464

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 Air Land Battle doctrine.

C. (U) **PROGRAM ACCOMPLISHMENTS AND PLANS:**

(U) **FY 1992 Accomplishments:** (Funded under PE #0603645A, Project Number DB86).
- (U) Army Acquisition Executive program designation as Acquisition Category III 1QFY92
- (U) Test and Evaluation Master Plan (TEMP) signed 3QFY92
- (U) Milestone I Review Conducted 3QFY92
- (U) Approval to enter Demonstration/Validation phase 3QFY92
- (U) Justification & Approval (J & A) for sole source contract approved 3QFY92
- (U) Request for Proposal (RFP) released 4QFY92

(U) **FY 1993 Planned Program:**
- (U) Breacher contract modification award
- (U) Prototype design and long lead item fabrication
- (U) Vulnerability Analysis
- (U) Component Maturation
- (U) Software Development and Documentation
- (U) System Safety Analysis and Report
- (U) Automatic Depth Control modeling/testing
- (U) Mission modeling by Training and Doctrine Command (TRADOC)

(U) **FY 1994 Planned Program:**
- (U) Mature design and fabricate Breacher prototype vehicles
- (U) Vulnerability Analysis
- (U) Component Maturation
- (U) Software Development and Documentation
- (U) System Safety Analysis and Report
- (U) Automatic Depth Control modeling/testing
- (U) Mission modeling by TRADOC

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603649A
PE Title: **Engineer Mobility Equipment - Advanced Development**
Project Number: DG24
Budget Activity: #4

(U) **FY 1994 Planned Program:** (Continued)
- (U) Safety Release 4QFY94
- (U) In-Process Review to begin testing/Test Readiness Review/Test Plan 4QFY94

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 Systems, 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). Sole Source acquisition with BMY Combat Systems, a Division of Harsco Corporation, York, Pennsylvania, is on going.

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY:

TECHNICAL CHANGES: No changes from previous submission.
SCHEDULE CHANGES: Planned start of chassis refurbishment and procurement of long lead items for Low Rate Initial Production has slipped from FY 1995 to FY 1996.
COST CHANGES: Cost for Advanced Development phase has been increased. Increases reflect the cost projections in the Breacher validated Baseline Cost Estimate adjusted in FY93 for addition of a second prototype vehicle.

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

G. (U) RELATED ACTIVITIES: PE #0603645A, Armored Systems Modernization Advanced Development, Project DB86, provided preliminary development work for the Breacher prior to FY 1993. 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: None

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603649A** Project Number: **DG24**
PE Title: **Engineer Mobility Equipment - Advanced Development** Budget Activity: **#4**

J. (U) TEST AND EVALUATION:

Milestones	Dates
Contract Modification to current contract	4QFY92
Early User & Operational Testing	1QFY95-3QFY95
Milestone II Review	3QFY95
Development Contract Award	3QFY95
Testing	2QFY96-2QFY99
Low Rate Initial Production Long Lead Items Award	4QFY96
Low Rate Initial Production I contract	2QFY97
Low Rate Initial Production II contract	2QFY98
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	1QFY99
Milestone III Review	4QFY99
Exercise Production Option	4QFY99
Initial Operational Capability (IOC)	1QFY00

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603653A**
PE Title: **Advanced Tank Armament System** Budget Activity: **#4**

A. (U) RESOURCES: ($ in Thousands)
Project Title: Advanced Tank Armament System (ATAS)

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
DB 99 Advanced Tank Armament System (ATAS)	0	0	5435
PE TOTAL	0	0	5435

B. (U) BRIEF DESCRIPTION ELEMENT: The objective of this program is 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 range under conditions of darkness and adverse weather. HIT includes a fire control system capable of computing the location of moving targets and precise gun 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) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN 1994:

(U) DB99 Advanced Tank Armament System (ATAS)

(U) FY 1992 Planned Program:
- **(U)** Funded under PE #0604630 in FY 1992

(U) FY 1993 Planned Program:
- **(U)** Funded under PE #0604630 in FY 1993

(U) FY 1994 Planned Program:
- **(U)** Continue development of the various components of the ATAS system up through a system integration lab.
- **(U)** Complete and demonstrate the M1A2 Integration Test Bed.
- **(U)** Begin XM291 Safety Release Testing, begin 120mm Ammunition Requalification and continue development.

(U) WORK PERFORMED BY: Computing Devices of Canada, Ottawa, Ontario, Canada; Cadillac Gage, Warren, MI; Texas Instruments, Dallas, TX; Martin Marrietta, 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, MD.

(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.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603653A**
PE Title: **Advanced Tank Armament System** Budget Activity: **#4**

(U) OTHER APPROPRIATION FUNDS: None

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Memorandum of Agreement (MOA) with France, Germany, and Great Britain to harmonize parameters for the Future Tank Main Armament (FTMA).

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603654A**
PE Title: **Line-of-Sight Antitank (LOSAT) Technology Demonstration** Budget Activity: **#2**

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D460 LOSAT Technology Demonstration	27900	113150*	0*

*The Army will carry over FY93 funds to finance the FY94 program.

B. (U) BRIEF DESCRIPTION OF ELEMENT: 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 LOSAT program reverted to a technology demonstration in FY92. The remaining FY92 program is still being executed under PE #0603612A. The proposed level of funding insures a robust technology demonstration where components of the system can be matured and affords the greatest probability that the program will transition into Engineering and Manufacturing Development (EMD) in FY96.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project D460 - LOSAT Technology Demonstration: The LOSAT technology demonstration will develop technologies for a replacement system(s) for the Improved Tube-Launched, Optically-Tracked, Wire-Guided (TOW) Missile Vehicle (ITV) system. The objectives of the technology demonstration are to position the program for an FY96 EMD start, conform to approved user requirements, reduce fire control system risks, upgrade key subsystems to incorporate new technologies, develop an improved missile configuration suitable for the affordable standard Bradley chassis, demonstrate subsystem capabilities in flight tests and simulations, and identify options to reduce unit costs.

(U) FY 1992 Accomplishments: (performed under PE #0603612A/D096 except as noted)
- (U) Conducted dirty battlefield/target tracker tests
- (U) Conducted system requirements review
- (U) Conducted System Design Review
- (U) Conducted follow-up User Tests using Simulator-Network Development
- (U) Completed automotive test rig tests
- (U) Awarded Technology Demonstration Contract (performed under PE #0603654A/D460)
- (U) Conducted lethality analysis/tests (performed under PE #0603654A/D460)

(U) FY 1993 Planned Program:
- (U) Complete lethality analysis/tests
- (U) Begin missile procurement and fabrication
- (U) Modify existing chassis for flight tests
- (U) Continue system survivability studies
- (U) Begin fire control system upgrades (2nd generation FLIR, high resolution controls and displays, object oriented ADA software, evaluate alternate laser uplink)
- (U) Continue missile procurement and fabrication
- (U) Continue systems survivability studies

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603654A
PE Title: **Line-of-Sight Antitank (LOSAT) Technology Demonstration** Budget Activity: #2

- (U) Perform FLIR evaluation
- (U) Perform plume test to evaluate long wave length laser
- (U) Perform fire control system integration
- (U) Perform subsystem integration
- (U) Conduct tactics, techniques and procedures simulations
- (U) Support Anti-Armor Advanced technology demonstration

(U) FY 1994 Planned Program: FY 1994 funding is not necessary. FY 1993 carryover funds will be used to continue the efforts in FY 1994.

(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 teamed with Texas Instruments of Dallas, TX (fire control subcontractor).

(U) Related Activities:
PE #0603612A (Advanced Anti-Tank Weapon System)
PE #0602709A (Night Vision Technology)
PE #0603710A (Night Vision Advanced Technology)
PE #0603003A (Aviation Advanced Technology)
There is no unnecessary duplication of effort within the Army or other Services/Agencies within the Department of Defense.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603710A
PE Title: Night Vision Advanced Technology
Budget Activity: #2

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

Project Number / Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
DK70 Night Vision Advanced Technology	12694	14647	21376
DK86 Night Vision, Airborne Systems	6281	9922	10830
DK87 Night Vision, Combat Vehicles	4049	2318	6455
PE TOTAL	23024	26887	38661

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program follows a night vision and electro-optic science and technology investment strategy as a principle DoD effort to develop new and improved tactical stand alone, target acquisition, and multisensor system suites for infantry, anti-armor, air defense, combat vehicle, and airborne operational scenarios. The development of these high performance target acquisition and engagement systems are essential to meet the target servicing requirements of future weapon systems. These sensor system/suites 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. This PE will provide the target acquisition sensor suites for DoD Thrust 5, Advanced Vehicle Technologies and Rapid Force Initiative demonstrations. Technology advances achieved under this PE have tri-service applications. Efforts are directed toward demonstration of sensor suites to support day/night pilotage and obstacle avoidance/wire detection for nap-of-the-earth pilotage at high speeds. 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. This program supports the OSD Precision Strike, Advanced Land Combat, Air Superiority/Defense and Technology for Affordability Science and Technology (S&T) Thrust areas. 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 Advanced Technology Demonstration (ATD) under Thrust #5. Work in this program element is consistent with the resource constrained Army Science and Technology Master Plan (ASTMP), Science and Technology Objectives (STOS) and the Army Modernization Plan.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project DK70 - Night Vision Advanced Technology: This project will develop and demonstrate high performance, sensor/multisensor suites to meet the target servicing requirements for weapon systems upgrades. Emphasis is placed upon development of infrared (IR) search and track Sensors for air defense applications, multisensor aided targeting sensor suites for aviation and ground vehicle applications, and 2nd generation sensor suites for the scout aspects of the DoD Rapid Force Initiative under the Advanced Land Combat Thrust. In addition this project addresses the individual soldier/requirements for an advanced manportable sensor systems which integrates the weapon sight with the soldier protective ensemble.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603710A
PE Title: Night Vision Advanced Technology Budget Activity: #2

(U) FY 1992 Accomplishments:
- (U) Completed fabrication and conducted initial demonstration of the Advanced Air Defense Electro-Optical System (AADEOS) Advanced Technology Demonstration (ATD). The AADEOS is a IR search and track System designed to passively acquire and track multiple fixed and rotary wing aircraft for air defense assets
- (U) Initiated development of the Army's Multisensor-Aided Targeting (MSAT)-Air ATD to demonstrate the economical fusion of multiple sensor and processor modules for aided target recognition requirements of aviation and ground vehicles
- (U) Continued development of the Standardized Advanced Detector Dewar Assemblies (SADA) to provide cost effective modular components for second generation thermal imaging systems

(U) FY 1993 Planned Program:
- (U) Complete field trials of the AADEOS sensor prototype
- (U) Continue development of the MSAT ATD
- (U) Initiate development of an unattended Remote Sensor Suite ATD comprised of electro-optic devices for remote surveillance/reconnaissance by scout units. This demonstration is a key component of the Rapid Force Projection aspect of the OSD Advanced Land Combat S&T Thrust. The ATD will involve uncooled Forward Looking Infrared (FLIR), cuing sensors (acoustic, magnetic, seismic), low light level television (TV), data compression/image transfer, secure communication links and global positioning system with electronic compass technologies

(U) FY 1994 Planned Program:
- (U) Initiate demonstration of an Advanced Integrated Manportable System (AIMS) for the soldier modernization applications. The AIMS will be a low-cost integrated system of ultra-lightweight sensor, display and laser modules which can be mixed and matched to suit several varying infantry missions
- (U) Continue technology development for the AIMS technology demonstration
- (U) Complete development of SADA components, conduct pilot line prototype evaluation and transition to weapon systems development/integration
- (U) Continue development of the Remote Sensor Suite ATD
- (U) Initiate development of an extended range Scout Sensor Suite ATD for the advanced Scout vehicle. The sensor suite will incorporate second generation technology with aided target recognition for information transfer between scout vehicles and tactical operations centers
- (U) Complete development and integration of MSAT-Air prototypes in surrogate airborne platform Conduct field trials in preparation for Comanche demonstration/validation testing

(U) **Project DK86 - Night Vision, Airborne Systems:** This project concentrates on the demonstration sensor suites to meet the pilotage and obstacle avoidance requirements of advanced airborne vehicles. Prototype demonstrators are being developed to support day/night pilotage and obstacle avoidance/wire detection for nap of the earth pilotage at high speeds under adverse weather/battlefield conditions. These demonstrators will significantly enhance the survivability of Army aviation assets by reducing exposure to radar and heat seeking missile threats, and by reducing collisions with wires and other obstacles.

(U) FY 1992 Accomplishments:
- (U) Completed studies and trade-off analysis to determine optimum sensor suite for Advanced Helicopter Pilotage (AHP) program. Fabrication to be initiated in FY 1993

- (U) Continued development of the Obstacle Avoidance System (OASYS) to detect and warn pilots of wires and obstacles within the flight path

(U) FY 1993 Planned Program:
- (U) Initiate design and fabrication of AHP sensor and display to visually couple pilots to their surrounding during night and adverse weather conditions
- (U) Complete fabrication of OASYS, integrate in surrogate aviation testbed and initiate field tests
- (U) Initiate of the Army's Advanced Pilot's Aid (APA) ATD. The APA is an advanced night vision goggle for aviation and driving; it provides significant increases in visual acuity and field of view over current generation devices

(U) FY 1994 Planned Program:
- (U) Continue development of the AHP sensor suite
- (U) Complete field test of the OASYS system and transition to Program Manager (PM) Aircraft Survivability Systems (ASE) for Engineering and Manufacturing Development (EMD)
- (U) Continue development of the APA ATD

(U) **Project DK87 - Night Vision, Combat Vehicles:** This project demonstrates target acquisition suites to meet the stringent fire control requirements of combat vehicles. These sensor suites will provide the range and sensitivity necessary to align with the target engagement capabilities inherent in weapon fire control systems of ground vehicles.

(U) FY 1992 Accomplishments:
- (U) Initiated design and fabrication of a prototype 2nd generation tank sight. Sensor package consist of a 2nd generation thermal sight, eye safe laser rangefinder and low light level TV for IR imaging during day/night and adverse weather conditions

(U) FY 1993 Planned Program:
- (U) Continue development of 2nd generation tank sight

(U) FY 1994 Planned Program:
- (U) Complete fabrication of 2nd Generation tank sight and integrate in M1 tank for field trials
- (U) Initiate development of an electro-optic sensor suite for ground vehicles for air defense/antiarmor application

(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. Contractors include: Martin Marietta Corporation, Orlando, FL; Texas Instruments, Inc., Dallas, TX; Hughes Aircraft Company, El Segundo, CA; Honeywell, Inc., Minneapolis, MN; General Electronic Corp, Utica, NY; 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

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603710A
PE Title: **Night Vision Advanced Technology** Budget Activity: #2

Development) in accordance with ongoing Reliance joint planning process. There is no unnecessary duplication of effort within the Army or DoD.

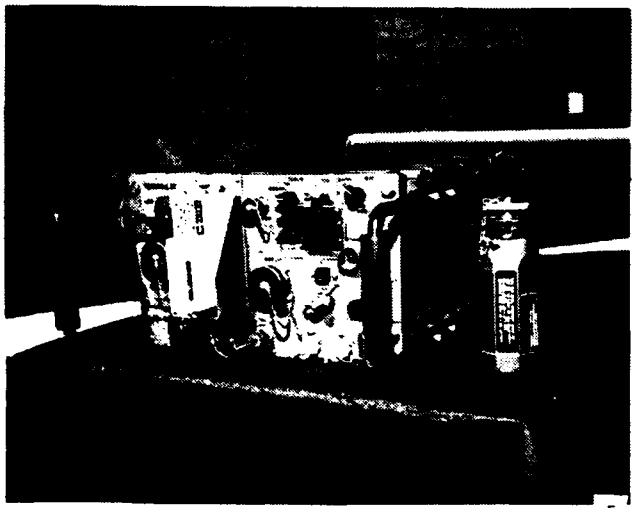
(U) **Other Appropriation Funds:** ($ in Thousands) Not applicable.

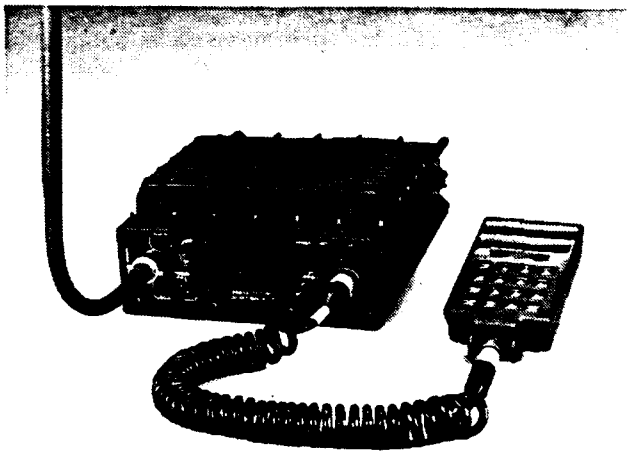
(U) **International Cooperative Agreements:** International interchange of information is accomplished primarily through active participation on various NATO working groups, the Technical Cooperation Program (United States, United Kingdom, Canada, Australia), and the International Standardization Program.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603713A**
PE Title: **Army Data Distribution System (ADDS)**
Project Title: **PJH-PLRS/JTIDS Hybrid**

Project Number: **D370**
Budget Activity: **#4**





POPULAR NAME: **ADDS**

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

SCHEDULE	FY 1992	FY 1993	FY 1994		
Program Milestones			JTIDS MSIII 2nd Qtr		
Engineering Milestones			NCS-J/DJRU S/W INTEGRATION		
T&E Milestones	JTIDS System TT 1st Qtr	JTIDS IOTE 4th Qtr	EPLRS OTE 3rd Qtr		
Contract Milestones	EPLRS OPT 2 2nd Qtr	Complete NCS-J/ DJRU-S/W 1 Qtr			
BUDGET ($000)	**FY 1992**	**FY 1993**	**FY 1994**		
Major Contract	14942	5754	5497		
Support Contract	0	0	0		
In-House Support	7266	5303	4487		
GFE/ Other	773	1640	1773		
Total	22981	12697	11757		

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603713A
PE Title: Army Data Distribution System (ADDS)
Project Title: 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. ADDS is a Corps based system which will employ up to three Net Control Stations - JTIDS (NCS-Js) to perform network management and provide connectivity and five Dedicated JTIDS Relay Units (DJRUs) to support high throughput requirements. 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 efforts are within this project.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- (U) Continued EPLRS downsized Net Control Station-EPLRS (NCS-E) development
- (U) Conducted JTIDS System Technical Test

(U) FY 1993 Planned Program:
- (U) Complete JTIDS System Technical Test
- (U) Initiate and complete JTIDS initial operational test and evaluation (IOTE)
- (U) JTIDS First Unit Equipped (FUE) with Research & Development assets
- (U) Continue EPLRS Downsized NCS-E Development

(U) FY 1994 Planned Program:
- (U) JTIDS MS III
- (U) Complete EPLRS Downsized NCS-E Development
- (U) Conduct Testing of Downsized NCS-E
- (U) EPLRS Operational Test and Evaluation (OTE)
- (U) NCS-J/DJRU S/W integration into Theater High Altitude Area Defense (THAAD)/Patriot Development

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.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603713A** Project Number: **D370**
PE Title: **Army Data Distribution System (ADDS)** Budget Activity: **#4**
Project Title: **PJH-PLRS/JTIDS Hybrid**

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY: NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** None
2. **SCHEDULE CHANGES:** A one year delay in JTIDS production was caused by a funding reduction in production.
3. **COST CHANGES:** None

F. (U) PROGRAM DOCUMENTATION:

- Required Operational Capability (ROC) - Sep 86
- Organization & Operation Plan (O&O) - Oct 86
- Acquisition Program Baseline - Mar 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

H. (U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Other Procurement Army, (OPA 2)			
(SSN: BU1400)	44283	54754	21978

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. (U) TEST AND EVALUATION DATA:

	Dates
EPLRS PROGRAM:	
• Technical Test (TT)	05/88 - 03/89
• Operational Test and Evaluation (OTE)	04/94
JTIDS PROGRAM:	
• Technical Test	06/90 - 03/91
• System TT/Initial Operational Assessment (IOA)	10/91 - 09/92

FY 1994 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 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Tactical Surveillance System - Advanced Development	16535	14134	15422

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 and developments are under the Army's Tactical Exploitation of National Capabilities (TENCAP) program and includes development of the tactical Imagery Processing and Dissemination System (IPDS) as part of the Joint Services Imagery Processing System (JSIPS) program with USAF/USMC. The IPDS will provide direct operational access to national and theater imagery in near-real-time to provide critical, deep target intelligence support to tactical commanders as well as support contingency missions and low intensity conflicts. Additionally, the imagery processing algorithms and common synthetic aperture radar (SAR) processor for the advanced development of the Enhanced Tactical Radar Correlator (ETRAC) are carried under this project. The ETRAC contains the common SAR processor and is a C-130 drive on/off system capable of processing a variety of SAR signals from airborne platforms. Engineering development of the ETRAC and common SAR processor hardware is conducted under PE # 0604740A. These efforts are all directed at meeting the Army's need for timely information on enemy forces under day, night, and all weather conditions anywhere in the world. Further details may be found at the Top Secret Special Access Level in the Tactical Intelligence and Related Activities (TIARA) Congressional Justification Book, Volume VI, and the TENCAP Master Plan.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- (U) Completed and fielded total capability of initial IPDS (softcopy and hardcopy).
- (U) Continued imagery studies for tactical field exploitation and reporting support.
- (U) Initiated development of imagery processing algorithms and common SAR processor for ETRAC.
- (U) Continued development funding of IPDS within the joint JSIPS program.
- (U) Conducted testing of the initial IPDS development model and interoperability with the TRAC system.
- (U) Conducted studies of imagery dissemination for effective tactical intelligence support to committed forces through secondary imagery dissemination.

(U) FY 1993 Planned Program:
- (U) Continue joint development within the JSIPS program for the second IPDS development system.
- (U) Conduct user evaluation of initial IPDS.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603730A (TIARA)
PE Title: Tactical Surveillance System - Advanced Development

Project Number: #D560
Budget Activity: #4

- (U) Conduct imagery exploitation studies to include secondary imagery dissemination and low-volume tactical terminals
- (U) Develop tactical processing and exploitation enhancements for new sensor technology.
- (U) Continue development of imagery processing algorithms and the common SAR processor for the ETRAC.

(U) FY 1994 Planned Program:

- (U) Develop multiband communication terminal for tactical imagery dissemination.
- (U) Participate in joint development of prototype optical correlator for tactical Automatic Target Recognizer (ATR).
- (U) Complete development of imagery processing algorithms and common SAR processor for ETRAC.
- (U) Continue joint development within JSIPS program for the second IPDS development.

D. (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; MRJ, Inc., Fairfax, VA; and Science Applications International Corporation, Tucson, AZ.

E. (U) COMPARISON WITH AMENDED FY 1993 AMENDED DESCRIPTIVE SUMMARY: NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.

2. (U) SCHEDULE CHANGES: Final Acceptance of first IPDS was delayed from FY 92 to FY 93. Development of second Engineering Development Model (EDM) IPDS was rescheduled from FY 93 to FY 94. This was to coincide with the fielding of a new and improved national input segment (NIS).

3. (U) COST CHANGES: None.

F. (U) PROGRAM DOCUMENTATION:
Material needs for Army Tactical Requirements for National Level Reconnaissance, May 73 (S) USAF, USA, USMC Memorandum of Understanding (MOU), establishing JSIPS 8 Jan 87.

G. (U) RELATED ACTIVITIES:
PE #0604740A (Tactical Surveillance System - Engineering Development) provides the continued engineering development efforts for timely and accurate tactical receipt, exploitation and dissemination of digital imagery. To ensure no duplication of effort, this work is coordinated with the 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).

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands) Not Applicable.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603730A (TIARA)**
PE Title: **Tactical Surveillance System - Advanced Development**

Project Number: **#D560**
Budget Activity: **#4**

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

J. (U) MILESTONE SCHEDULE:

Milestones	Milestones Dates
Award Contract	FY87
Field initial IPDS initial operational capability (IOC)	1Q/FY92
Initiate development of ETRAC/common SAR processor (CSP)	3Q/FY92
Initial IPDS user test/ Field Operating Constraint (FOC)	3Q/FY93
Award Contract Second IPDS	1Q/FY94
Complete Baseline CSP	FY94

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603734A
PE Title: **Military Engineering Advanced Technology** Budget Activity: #2

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
DT08 Combat Engineering Systems	3013	3218	2910

B. (U) BRIEF DESCRIPTION OF ELEMENT: Terrain and weather affect combat operations more significantly than any other physical factors on the battlefield. The Army is seriously deficient in its capability to effectively use terrain and weather to its advantage. The Air Land Battlefield Environment (ALBE) technology demonstration program develops and demonstrates the capability to correct the Army's deficiency in effectively exploiting the combined impact of terrain, weather, and atmospheric obscurants on current and planned operations. This capability is accomplished by tactical decision aid (TDA) software which allows the commander and his staff to calculate rather than guess, the impact of the environment on friendly and threat weapon systems and react within the decision cycle of the enemy. This software will be implemented on field Army systems like the Digital Topographic Support System (DTSS) and the Maneuver Control System (MCS). In addition, the ALBE program furnishes specifically tailored terrain and weather products to the needs of other Program Executive Officer and Program Manager (PEO/PM) organizations. During tactical evaluations of the software by operational units, impacts on doctrine and training are also identified, and critical feedback from these evaluations is provided directly to materiel developers of the systems on which the TDAs will be implemented.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project DT08 - Combat Engineering Systems: The ALBE technology demonstration program is the Army focal point for development and tailoring of environmental-based TDAs that have applicability to all Army Battlefield Functional Areas. The TDA software exploits the integrated effects of standard terrain and weather data on weapons systems, vehicles, other materiel and personnel in both combat and training situations. These demonstrations validate TDA utility and make the Army a smart buyer of this new technology. This software will be provided to the materiel developers for implementation on Army Command, Control, Communications and Intelligence (C3I) systems.

(U) FY 1992 Accomplishments:
- (U) Integrated and documented ALBE TDAs with the new ALBE geographic information system/user interface/graphics software environment.
- (U) Completed baseline terrain evaluation capability for the Army Command and Control System's (ACCS) Terrain Evaluation Module (TEM).
- (U) Conducted field test demonstration of ALBE Tactical Decision Aids at Corps field training exercises in Germany.

(U) FY 1993 Planned Program:
- (U) Conduct formal field test of ALBE TDAs in Germany.
- (U) Complete final documented and integrated ALBE Geographic Information System (GIS) and TDA application software package.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603734A
PE Title: **Military Engineering Advanced Technology** Budget Activity: #2

- (U) Transition ALBE capabilities for use in the Joint Precision Strike Demonstration - Task Force.

(U) FY 1994 Planned Program:
- (U) Demonstrate and transition improved TDA software package to the ACCS community.
- (U) Incorporate near-real time terrain visualization software into the ALBE testbed for demonstration.
- (U) Demonstrate environmental sciences algorithms and models from the Smart Weapons Operability Enhancements program with integrated package.

(U) Work Performed By: The work is primarily performed by the Topographic Engineering Center, Fort Belvoir, VA; Atmospheric Sciences Laboratory, White Sands Missile Range, NM; Waterways Experiment Station, Vicksburg, MS; and the Cold Regions Research and Engineering Laboratory, Hanover, NH.

(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 in PE #0602784A (Military Engineering Technology) and PE #0601102A (Defense Research Sciences) and contains no duplication of effort among the Military Departments. To preclude unnecessary duplication, research is coordinated with: U.S. Army Materiel Command, U.S. Army Training and Doctrine Command, U.S. Army Forces Command, Office of Director of Defense Research and Engineering, U.S. Air Force, Defense Mapping Agency, Department of Energy, and U.S. Geological Survey, Department of Interior.

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

(U) International Cooperative Agreements: Not applicable.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603742A
PE Title: **Advanced Electronic Devices Development** Budget Activity: #2

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
DF32 Advanced Electronic Devices	7337	6283	0

B. (U) BRIEF DESCRIPTION OF ELEMENT: Provides essential funding to transition major technology advances and breakthroughs in advanced electronic devices, component assemblies and subsystems into high priority and congressionally-mandated Army systems developments. These proof-of-design technology demonstrations provide vital assessments and feedback of emerging advanced electronic device technology for future soldier system, smart munitions, superior all-weather air defense, advanced land combat vehicles, secure jam-resistant communications, and advanced electronic warfare. The program reduces escalating procurement, operations, and support costs by replacing old or obsolete electronic devices and circuits found in fielded Army systems with modern advanced electronic device technology. This program element supports the development and demonstration of prototype full-color, high resolution flat panel interactive displays required by unit commanders to rapidly review and analyze intelligence, targeting, and command and control for timely response to non-linear Airland Battlefield situations. A family of high power microwave-resistant electronic packages and an ultra-compact processor subsystem for advanced fire-and-forget munitions, soldier's computer, and advanced all-digital radio system will also be demonstrated under this work effort. This program element provides the critical link between the research and development science and technology and system developers promoting insertion of advanced electronic device technology required by both present and future Army systems.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) **Project DF32 - Advanced Electronic Devices:** Efforts in this project are restructured to Project Element #0602705A, Project AH94, in FY 1994.

(U) **FY 1992 Accomplishments:**

- (U) Demonstrated interactive digital maps on full color flat panel displays for command, control and communication systems and future Battle Laboratory.
- (U) Delivered soldier "casualty" status monitor for Multiple Integrated Laser Engagement System (MILES) to National Training Center.
- (U) Demonstrated proof-of-principle model Traveling Wave Tube Amplifier (TWTA) for Aircraft Survivability Equipment (ASE) Radar Deception and Jamming Advanced Technology Demonstration (ATD).
- (U) Delivered engineering model Millimeter Wave (MMW) seeker Traveling Wave Tube (TWT) to PATRIOT and delivered K-band transmitter to White Sands Missile Range (WSMR), New Mexico, for PATRIOT upgrade field testing.
- (U) Delivered downsized PDR-77 radiac electronics by 1/2 for enhanced portability.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603742A
PE Title: **Advanced Electronic Devices Development** Budget Activity: #2

(U) FY 1993 Planned Program:

- (U) Complete 1.0 kilowatt (KW) traveling wave tube module for electronic warfare/reconnaissance, surveillance, and target acquisition for AN/ALQ-136 systems.
- (U) Deliver Ka-band TWT for PATRIOT upgrade.
- (U) Develop 16-grey shade thin film electroluminescent (TFEL) display for Common Hardware-Software (CHS) Lightweight Computer Unit (LCU).
- (U) Demonstrate producible miniaturized sensor for active tank defense.
- (U) Demonstrate cost effective MMW imaging arrays for surveillance application.
- (U) Develop high definition Soldier Integrated Protective Ensemble (SIPE) display using Defense Agency Research Project Agency (DARPA) funded head-mounted display device technology.

(U) FY 1994 Planned Program: Not Applicable

(U) Work Performed By: In-house effort primarily performed by: U.S. Army Research Laboratory, Electronics and Power Supply Directorate, Fort Monmouth, NJ. Contractors include: TRW, Redondo Beach, CA; AT&T Technology Systems, Greensboro, NC; Northrop, Rolling Meadows, IL; Hughes EDD, Torrance, CA; Booz-Allen & Hamilton, Bethesda, MD; and Planar Systems Inc., Beaverton, OR.

(U) Related Activities: This program adheres to Tri-Service Reliance Agreements on Electronic Devices with oversight provided by the Joint Directors of Laboratories. Work in this Program Element is related to and fully coordinated with efforts in PE #0602120A (Electronic Survivability and Fuzing Technology) and PE #0602705A (Electronics and Electronic Devices) 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: Not applicable.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603745A (TIARA)**
PE Title: **Tactical Electronic Support Systems - Advanced Development**
Budget Activity: **#4**

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D535 Intelligence Fusion Analysis Demonstration	3306	2938	4363

B. (U) BRIEF DESCRIPTION OF ELEMENT: Program funds development of advanced intelligence fusion analysis technologies and validation. This project supports the urgent requirement for an automated intelligence processing system. Intelligence fusion analysis provides for the application of advanced computer science/artificial intelligence concepts to intelligence processing systems. Development and validation of this technology will identify and support product improvements to enhance the All Source Analysis System (ASAS), both during development and after fielding.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) Project D535 - Intelligence Fusion Analysis Demonstration:

(U) FY 1992 Accomplishments:
- (U) Prototyped parallel processing neural network software for map separates generation.
- (U) Developed initial set of Very Large Scale Integrated (VLSI) chips and initial configuration of a high performance neural computer for map separates generation, terrain/weather/movement analysis, and resource allocation.
- (U) Initiated integration of multiple topographic processing and analysis capabilities into a high-performance, parallel processing terrain analysis server.
- (U) Developed new correlation techniques for error recovery and terrain integration.
- (U) Applied advanced processing/mathematical concepts and techniques to generate an "automated nodal analysis" prototype of advanced situation assessment/template analysis software tools.
- (U) Generated initial prototype set of software tools for rapid graphic representation of knowledge.
- (U) Continued to expand the Tactical Intelligence Fusion Test Bed's open software architecture and tools and to integrate and evaluate ASAS-and Intelligence Electronic Warfare (IEW)-oriented fusion technology applications.
- (U) Procured large-scale hypercube systems and associated data base software.

(U) FY 1993 Planned Program:
- (U) Determined the feasibility of integrating artificial intelligence techniques with neural net map separates techniques to provide a highly automated terrain data base generation capability.
- (U) Develop improved VLSI chips and continue to prototype an electronic neural computer with plug-in circuit cards for both generic neural net applications and ASAS-tailored applications.
- (U) Investigate application of optical and opto-electronic neural net approaches to intelligence fusion.
- (U) Complete basic prototype of high-performance, parallel processor-based terrain analysis server.
- (U) Continue to generate, evaluate and refine new/modified correlation techniques and interactive graphic knowledge representation software tools.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603745A (TIARA)
PE Title: **Tactical Electronic Support Systems - Advanced Development** Budget Activity: #4

- (U) Continue to expand the predictive intelligence capabilities of the automated nodal analysis prototype and integrate its capabilities with graphic knowledge representation tools and improved correlation algorithms into a high-performance parallel processing fusion analysis server for correlation, analysis and situation assessment functions.
- (U) Continue to refine and expand Fusion Test Bed modular architecture and tools and continue to integrate and evaluate advanced fusion technology applications for ASAS and related systems.
- (U) Benchmark/evaluate current ASAS major data base operations and compute-intensive software applications on hypercube parallel processors to determine performance improvement potential.

(U) **FY 1994 Planned Program:**

- (U) Begin development of a hybrid expert system/neural net prototype for rapid, highly automated generation of a terrain data base from raw map backgrounds.
- (U) Complete basic prototype of neural computer and conduct ASAS/user-oriented evaluations.
- (U) Prototype and test hybrid electronic/optical neural net configurations against fusion applications.
- (U) Continue to refine, expand and evaluate the functional and performance capabilities of the prototype terrain analysis and fusion analysis servers for potential modular insertion into ASAS and related systems.
- (U) Continue to generate and evaluate improved correlation and aggregation algorithms, refined/expanded graphic knowledge representation tools and situation assessment/predictive techniques.
- (U) Generate and prototype an experimental alternative ASAS parallel/distributed processing architecture.
- (U) Continue to evolve the established ASAS Tactical Intelligence Fusion Test Bed and integrate and evaluate candidate fusion technology applications.

(U) **Work Performed By:** Major Contractor for Intelligence Fusion Analysis Demonstration is Jet Propulsion Laboratory, Pasadena, CA. In-house developing organizations are: US Army Communications-Electronics Command Signals Warfare Directorate, Vint Hill Farms Station, Warrenton, Va; and the ASAS Project office, McLean, 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 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603746A
PE Title: **Single Channel Ground and Airborne Radio Systems (SINCGARS) - Advanced Development** Budget Activity: #4

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D555 SINCGARS-V Advanced Development	1670	4930	0

B. (U) BRIEF DESCRIPTION OF ELEMENT. The single project in the element funds advanced development of Single Channel Ground and Airborne Radio Systems (SINCGARS) Objective/Improved Combat Radio to enhance electronic counter countermeasures capability, to initiate interoperability improvements, to reduce power and to include other improvements generated by the user,as delineated 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 user include reduced weight of the manpak 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 1994:

(U) Project Number and Title: D555 SINCGARS Advanced Development: This program provides for the analysis and implementation of overall product improvements to the SINCGARS Combat Net Radio. The priorities for the product improvement program are Global Positioning System (GPS) interfaces, improved data capability, weight reduction, MANPRINT (ease of operations), vehicular system re-engineering, improved electronic counter-counter measure (ECCM) performance, switched system dial up interfacing and alternate remote control of the manpack radios. This program will provide simplified operations, improved performance of existing capabilities, new operational capabilities and reduced life cycle costs.

(U) FY 1992 Accomplishments:
- (U) Conducted feasibility studies of the product improvement effort

(U) FY 1993 Planned Program:
- (U) Initiate efforts with the current contractor(s) to begin satisfying Block I requirements
- (U) Complete study phase of alternate design approaches to satisfy Block I improvement requirements.
- (U) Award Development Engineering Change Proposal (ECP) for Phase I improvements

(U) FY 1994 Planned Program:
- (U) Funds restructured to SINCGARS-Engineering Development, Program Element #0604805A, Project D282.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603746A**
PE Title: **Single Channel Ground and Airborne Radio Systems (SINCGARS) - Advanced Development**
Budget Activity: **#4**

(U) Work Performed By: Program management is provided by Project Manager, SINCGARS reporting to the Program Executive Officer for Communications at Ft. Monmouth, New Jersey with support from the US Army Communications- Electronics Command. The Contractors for the Product Improvement Program, D555, 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 Product Improvement for the SINCGARS Combat Net Radio. There is no unnecessary duplication of effort within the Army or Department of Defense.

(U) Other Appropriation Funds: N/A

(U) International Cooperative Agreements: None

FY 1994 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 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D610 Food Advanced Development	2330	2022	3607
D669 Clothing and Equipment	5447	4638	6925
DC09 Unit/Organizational Equipment	1671	6501	2661
PE TOTAL	9438	13161	13193

B. (U) BRIEF DESCRIPTION OF ELEMENT: Development of improved clothing, individual equipment, fabric shelters, field service equipment, food and food service equipment enhances soldier battlefield efficiency, survivability and sustainment. Development of new food items and food service equipment for the Department of Defense to meet high nutrition requirements, reduce food service personnel, food costs, and food logistics requirements. 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. This project addresses requirements of the total force as well as specialized requirements for aviators, combat vehicle crewmen, Special Operations Forces, light infantry divisions, and others. This program supports preliminary design, and demonstration and validation, of: new field service support items; small, large and collective protection soft shelters; decontamination items; and improved field space heaters to sustain soldiers in the field. This program includes development of the Force Provider system, a deployable, self-contained system of shelters and support equipment to units deployed to undeveloped theaters.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) Project D610 - Food Advanced Development: Conduct advanced development on improved subsistence and subsistence support items to enhance soldier effectiveness

(U) FY 1992 Accomplishments:

- (U) Completed market survey of components for a Containerized Kitchen
- (U) Completed User Test (UT) of the Dental Liquid Ration. Technical data packages are being coordinated for the Dental Liquid Ration, which will result in a ration for patients unable to consume solid food
- (U) Conducted producibility and field tests of Food Packet, Survival, General Purpose, Improved
- (U) Contractor completed validation of producibility of the Food Packet, Long Range Patrol, Improved, and conducted large scale field test

- (U) Initiated design/development of more efficient refrigeration system for field hospital food service operations, replacing Chloro-Flouro-Carbon (CFC)-type refrigerants with a non-ozone depleting alternative

(U) **FY 1993 Planned Program:**
- (U) Transition Army Containerized Kitchen to Engineering and Manufacturing Development (EMD)
- (U) Evaluate and upgrade subsistence items for the B Ration field feeding system
- (U) Conduct market investigation of energy efficient food service equipment
- (U) Conduct field tests of prototype refrigeration system for field hospital food service operations
- (U) Conduct field producibility tests of Long Life Ration Packet, Improved
- (U) Evaluate and refine equipment and packaging for bottling water at field distribution points
- (U) Develop Force Provider acquisition strategy, design system layout, and procure test package

(U) **FY 1994 Planned Program:**
- (U) Complete field tests of field hospital food service refrigeration system improvements
- (U) Conduct investigation of biodegradable food packaging
- (U) Conduct prototype testing of bottled water equipment/packaging
- (U) Transition TDPs of Long Life Ration Packet, Improved, to DLA
- (U) Conduct a user test of a self-powered multifuel heat source
- (U) Initiate design/development of cold weather field feeding system

(U) **Project D669** - Clothing and Equipment: Improve clothing and individual equipment to enhance soldier effectiveness and survivability.

(U) **FY 1992 Accomplishments:**
- (U) Developed prototypes for chemical protective underwear and outer garments
- (U) Conducted design review of chemical suit prototypes for depot workers and Explosive Ordnance Disposal (EOD) personnel
- (U) Initiated developmental program of a chemical/biological tactile glove
- (U) Evaluated prototypes of micro-climate cooling and flechette/fragment protective vest
- (U) Provided technical support for fielding of the interim depot workers' chemical protective suit

(U) **FY 1993 Planned Program:**
- (U) Fabricate prototypes for Technical Test/User Test of a chemical protective suit for depot workers and joint service EOD personnel
- (U) Conduct tests (agent, human factors, heat stress, material) of chemical protective underwear and garments for Joint Service Lightweight Integrated Suit Technology (JS LIST) program
- (U) Review test results of flechette/fragment protective vest for transition to engineering development
- (U) Type Classify a single canister Toxicological Agent Protective (TAP) Hood
- (U) Procure test items for TT/UT of the Individual Soldier Microclimate Cooling System (IMCS) and Microclimate Cooling Air Vest

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element #0603747A
PE Title: **Soldier Support and Survivability** Budget Activity #4

(U) **FY 1994 Planned Program:**
- (U) Procure test items and conduct TT/UT of the Advanced Combat Vehicle Crewman (CVC) Helmet
- (U) Initiate design concepts for The Enhanced Integrated Soldier System (TEISS)
- (U) Complete TT/UT and type classify the Microclimate Cooling Air Vest
- (U) Complete evaluations of IMCS

(U) **Project DC09** - Unit/Organizational Equipment Advanced Development: Develop and field lightweight tents and shelters to improve unit sustainability.

(U) **FY 1992 Accomplishments:**
- (U) Procured prototypes for the Modular General Purpose Tent System (MGPTS), and conducted testing
- (U) Initiated advanced development of the 35K British Thermal Units (BTU) Convective Space Heater
- (U) Continued prototype fabrication of Laundry and Decontamination Dry-cleaning System (LADDS)
- (U) Procured hardware for Chemical/Biological (C/B) Mortuary Affairs
- (U) Completed testing in-house and at Quartermaster Center School (QMCS) of C/B Mortuary Affairs

(U) **FY 1993 Planned Program:**
- (U) Transition MGPTS to EMD
- (U) Initiate Technical Feasibility Test (TFT) on 35K BTU Convective Space Heater
- (U) Initiate Advanced Development of Night Maintenance Shelter and Large Area Shelter
- (U) Initiate Ammunition Cover Program

(U) **FY 1994 Planned Program:**
- (U) Fabricate LADDS TT/UT prototype
- (U) Complete TFT and Early User Test and Experimentation (EUT&E) on 10K BTU/Arctic Heaters
- (U) Award contract to develop fabric with uniform tensile strength for Ammunition Covers
- (U) Redesign Ammunition Covers, procure prototypes and conduct TT
- (U) Initiate Demonstration/Validation Phase for Lightweight Maintenance Tent
- (U) Initiate TT of THE

(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; Project Office, Army Field Feeding, Woodbridge, VA; Belvoir R&D Center, Fort Belvoir, VA. Other supporting government agencies include U.S. Army Test and Evaluation Command, Aberdeen Proving Ground (APG), MD; Yuma Proving Ground, AZ; 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; Oakridge National Laboratories, Oakridge 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; and Uvex Winter Optics, Southfield, RI; KPM-Tek, Inc., Inwood, PA; American Optical Corp., South Bridge, MA; Safetech Inc., Newton, PA; Research Inc., Waynesville, NC; Teledyne Inc., Northridge, CA; and Environmental Technologies Group Inc., Towson, MD.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element #0603747A
PE Title: **Soldier Support and Survivability** Budget Activity #4

(U) Related Activities: PE #0601102A (Defense Research Sciences); PE #0602786A (Logistics Technology); PE #0603760A (Special Operations Forces (SOF) Equipment-Advanced Development); 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 in DoD.

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

(U) International Cooperative Agreements: Not applicable.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603759A
PE Title: **Chemical Biological Defense and Smoke Advanced Technology** Budget Activity: #2

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
DE83 Chemical Biological Defense Systems Advanced Technology	4118	3306	2634

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element funds Technology Demonstrations (TD) 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 TDs are risk-reducing demonstrations conducted in an operational environment with active user and developer participation of capabilities to integrate diverse technologies to improve DOD CW deterrence and CB defense. This program element is in support of the DoD Science and Technology Thrusts 5 and 8.

C. (U) JUSTIFICATION FOR PROJECT:

(U) Project DE83 - Chemical Biological Defense Systems Advanced Technology: This project establishes a Technology Demonstration (TD) Program 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 1992 Accomplishments:
- (U) Successfully transitioned Biological-Chemical Detector to Dem/Val
- (U) Demonstrated the ability of the Chemical Biological (CB) Mass Spectrometer to detect an aerosolized biological simulant cloud released in the environment
- (U) Demonstrated the ability of the CB Mass Spectrometer to detect critical chemical threat agents
- (U) Demonstrated decon efficacy of the best technology for self-stripping coating for hasty decon
- (U) Completed phase one of technology demo for self-stripping coating
- (U) Initiated Respo 21, next generation mask, technology demonstration

(U) FY 1993 Planned Program:
- (U) Complete algorithm development for biological agents and conduct bio-profiling for CB Mass Spectrometer. Transition to Dem/Val
- (U) Continue Respo 21 technology demonstration
- (U) Initiate sorbent decontamination technology demonstration in support of basic soldier skills decontamination
- (U) Initiate design/fabrication of candidate technology for collective protection for fixed sites

(U) FY 1994 Planned Program:
- (U) Complete Respo 21 technology demonstration and transition to Dem/Val
- (U) Complete improved sorbent decontamination technology demonstration for Basic Soldier Skills and interior decontamination and transition to Dem/Val

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603759A
PE Title: **Chemical Biological Defense and Smoke Adv. ..ced Technology** Budget Activity: #2

- (U) Complete design/fabrication of candidate technology for collective protection for fixed sites Evaluate performance. Complete technology demonstration and transition to Dem/Val.

(U) **Work Performed By:** Work is primarily performed by the U.S. Army Edgewood Research, Development and Engineering Center (ERDEC), has responsibility for program management. The major supporting laboratory is ERDEC, Aberdeen Proving Ground, MD. Contractors include: Battelle Memorial Institute, Environmental Technologies Group, Teledyne, Bruker-Franzen Analytik; additional contractors may be identified at a later date.

(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.

(U) **Other Appropriation Funds:** ($ in Thousands). Memorandum of Understanding (MOU) with U.S./United Kingdom/Canada for research and development effort entitled "BC Detector" dated 1990.

(U) **International Cooperative Agreements:** Trinational MOU with United Kingdom/Canada/U.S. on cooperative development of Biological-Chemical Detector and Trinational MOU with United Kingdom/Canada/U.S. on Research, Development, Production and Procurement of Chemical and Biological Defensive Materiel.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603766A (TIARA)** Project Number: **#D907**
PE Title: **Tactical Electronic Surveillance System - Advanced Development** Budget Activity: **#4**

A. (U) RESOURCES: ($ in Thousands)
Project Title: Tactical Electronic Surveillance System - Advanced Development

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Tactical Electronic Surveillance System - Advanced Development	18001	14022	15373

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 and deficiencies, and develop concepts, techniques and prototype processors to exploit the critical data for near-real time integration into the appropriate tactical echelon. Specific details are provided at the Top Secret Special Access Level in the Tactical Intelligence and Related Activities (TIARA) Congressional Justification Book, and in the Army TENCAP Master Plan.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- (U) Continued to refine concepts, tactical systems specifications, and applications to ensure interface compatibility with both the dynamic changes occurring in national and theater sensors and the mission needs of the Army.
- (U) Initiated evaluations for testing the prototype Mobile Integrated Tactical Terminal (MITT)
- (U) Studied redesign of Electronic Process and Dissemination Systems (EPDS) to insure interface with a restructured national systems mix.

(U) FY 1993 Planned Program:
- (U) Initiate evaluation and field testing of the MITT, based on commercial open architecture standards applicable to PEO IEW's production efforts.
- (U) Initiate redesign of the EPDS system and development for continued tactical interface with emerging national systems' mix.
- (U) Continue 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.
- (U) Initiate advanced development to retrofit eight Enhanced Tactical Users Terminals (ETUT) with enhanced MITT hardware and software.

(U) FY 1994 Planned Program:
- (U) Continue to pursue technology and refine techniques for fully exploiting national capabilities to meet the changing threat environment.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603766A (TIARA)
PE Title: Tactical Electronic Surveillance System - Advanced Development

Project Number: #D907
Budget Activity: #4

- (U) Initiate development of five additional MITTS to replace existing Tactical High Mobility Terminals (THMT).
- (U) Continue advanced development to retrofit eight ETUT with enhanced MITT hardware and software.

D. (U) WORK PERFORMED BY:
In-house development agencies: Harry Diamond Laboratories, Adelphi, MD; US Army Information Systems Command, Fort Huachuca, AZ. Contractor: Aerospace Corporation, El Segundo, CA.

E. (U) COMPARISON WITH FY 1993 AMENDED 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:
Program Element #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 Material 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
Initiate MITT field testing with MITT #1	3Q/93
Complete field testing of MITT 2, 3, 4, 5, 6	3Q/94
Build and Field additional five MITTs	FY94-FY96
ETUT Retrofit Research	FY93-FY95

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603772A
PE Title: **Advanced Tactical Computer Science and Sensor Technology** Budget Activity: #2

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D101 Tactical Automation	3847	2405	14381
D243 Sensors and Signal Processing	7524	4849	9484
D281 Ground Combat ID Demonstrations	0	4727	7081
D289 Joint Air/Land/Sea Precision Strike Demonstration	0	6618	0
PE TOTAL	11371	18599	30946

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. 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 fratricide reduction, point of engagement identification friend or foe (IFF) integration, development and display of common battlefield view, 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. Products will be transitioned to PEO CCS, PEO Aviation and PEO ASM for integration within their systems and subsequent fieldings. Project D243 provides for the timely and effective transition of critical sensor and signal processing technology for real time, all weather, automatic detection, classification/identification of fixed or moving high priority targets for the commander. Technologies in the following areas will be pursued: bistatic radars, lightweight, Synthetic Aperture Radars (SAR), ultra wide band and three dimensional SAR, modular Moving Target Indicator (MTI) radars, hybrid digital-optical processors, Very High Speed Integrated Circuitry (VHSIC), and Gallium Arsenide (GaAs) based digital processors. Project D281 will support the Combat Identification (ID) Advanced Technology Demonstration (ATD), which will develop integrated situation awareness and point of engagement identification approaches to reduce fratricide for ground forces. Project D289, the Joint Air/Land/Sea (ALS) Precision Strike Demonstration (Army lead) is initiated in FY 1993 in response to DoD Science and Technology (S&T) thrust which identifies a requirement for all weather, day/night precision strike against 21st Century critical mobile and fixed targets. The demonstration will integrate surveillance, target acquisition, processing and attack for rapid esponse execution at extended range short-dwell targets. End-to-end systems capabilities to successfully engage targets with high accuracy will be simulated on a combined arms Electronic Battlefield (EB) and correlated to test exercise data. Simulation of promising advanced technologies will be evaluated on an EB. An assessment will be made of clutter, countermeasures and execution times. This program supports the DoD Science and Technology

Program Element: #0603772A
PE Title: **Advanced Tactical Computer Science and Sensor Technology** Budget Activity #2

Thrusts for Air Superiority/Air Defense and Precision Strike. Work in this program element is consistent with the resource constrained Army Science and Technology Master Plan (ASTMP), Science and Technology Objectives (STOS) and the Army Modernization Master Plan.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project D101 - Tactical Automation: This project supports the Combined Arms Command and Control (CAC2) and Airland Battle Management (ALBM) ATDs. These programs are directed at providing the intuitive commander with the decision support tools to get inside the enemy's decision cycle and the seamless data connectivity and near real time availability necessary to win against numerically superior and heavier forces.

(U) FY 1992 Accomplishments:
- (U) Conducted successful field demonstration of early ALBM products in conjunction with the user at FT Riley, KA
- (U) Initiated CAC2 front end analysis and design
- (U) Successfully demonstrated the capability to forward project combat effectiveness of military units based on current status data and predict attrition planning factors

(U) FY 1993 Planned Program:
- (U) Complete development of ALBM and transition to PEO CCS
- (U) Complete CAC2 front end analysis and begin modeling and simulation to verify system design
- (U) Finalize brigade and below digital information flow requirements
- (U) Design situational awareness architecture
- (U) Complete and validate detailed SINCGARS engineering design model

(U) FY 1994 Planned Program:
- (U) Complete verification of CAC2 system design and begin tabletop and hot bench prototyping
- (U) Demonstrate horizontal integration of selected combined areas platforms
- (U) Complete design specifications for target identification/situational awareness interfaces for select platforms
- (U) Initiate joint/multi-national command and control (MN C2) upper echelon command and control program directed at proving a seamless data architecture to complement the Global Grid communications architecture

(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 the technology for the Common Ground Station (CGS) to support the ground station Engineering and Manufacturing Development planned by Program Manager Joint Stars in FY 1996. The CGS ATD will develop the technology 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.

Program Element: #0603772A
PE Title: **Advanced Tactical Computer Science and Sensor Technology** Budget Activity: #2

(U) **FY 1992 Accomplishments:**
- (U) Initiated internal and contractual work for the Bistatic Radar for Weapons Location (BRWL) ATD
- (U) Modified A Non-Developmental Item (NDI) for integration into surrogate Unmanned Aerial Vehicle (UAV) platform in preparation for UAV MTI Radar Concept Demonstration
- (U) Demonstrated limited CGS concepts as part of the first Light Joint Precision Strike Demonstration

(U) **FY 1993 Planned Program:**
- (U) Continue BRWL ATD
- (U) Conduct UAV MTI Radar Technology Concept Demonstration
- (U) Initiate MTI/stationary target indicator (STI) data collection
- (U) Convert surrogate UAV platform into airborne multi-sensor testbed
- (U) Demonstrate preliminary CGS work station as part of the UAV MTI Concept Evaluation Program (CEP)
- (U) Demonstrate operator and commander CGS displays with limited simulated multi-sensor inputs
- (U) Initiate development of CGS hardware and software architecture

(U) **FY 1994 Planned Program:**
- (U) Continue BRWL ATD
- (U) Integrate sensors into multi-sensor testbed
- (U) Develop CGS architecture and IEW data base to support CGS processing and initiate advanced antenna integration

(U) **Project D281 - Ground Combat Identification Demonstrations:** The objective of this program is to, in accordance with the Battlefield Combat Identification System Operational Requirement Document select, develop, and demonstrate techniques (both target identification and situational awareness) that minimize fratricide during ground-to-ground and air-to-ground engagements and 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 lead to specifications for engineering and manufacturing development of the combat identification systems. Work in this project was restructured from project D243, this PE.

(U) **FY 1992 Accomplishments:** Not applicable

(U) **FY 1993 Planned Program:**
- (U) Conduct architecture study to define basis to execute 6.3A target identification and situational awareness program culminating in the force demonstration in FY 96 for the mid term solution
- (U) Support selection of candidate mid and far term technologies with modeling and simulation
- (U) Exploit and integrate existing models/simulations to assess combat identification capabilities

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603772A
PE Title: **Advanced Tactical Computer Science and Sensor Technology** Budget Activity: #2

(U) FY 1994 Planned Program:
- (U) Develop prototype hardware for target ID to support farce demonstration
- (U) Continue modeling and simulation analysis of candidate technologies for target ID and situational awareness
- (U) Conduct human factors studies for target ID and situational awareness
- (U) Design and simulate the FY 96 force demonstration in conjunction with the Battle Labs

(U) Project D289 - Joint Air/Land/Sea Precision Strike Demonstration: This project supports the Army lead for demonstration of the Science and Technology Thrust for all-weather, day/night, precision strike against 21st Century critical mobile and fixed targets. The demonstration, initiated in FY 1993, will link and integrate surveillance and automatic target recognition (ATR) assets, Joint Surveillance and Target Attack Radar System (JSTARS), Army Tactical Army Missile Systems (ATACMS), and Air Force and Navy precision munitions to achieve an all-weather end-to-end precision strike execution capability against critical mobile and fixed targets at extended range. The demonstration will be simulated on a combined arms electronic battlefield (EB) and correlated to test exercise data. Work will make the transition to PE #0603238A, project D177.

(U) FY 1992 Accomplishments: Not applicable

(U) FY 1993 Planned Program:
- (U) Complete Joint ALS Precision Strike Demonstration Technology Development Plan
- (U) Initiate development of a combined arms EB for precision strike at extended range
- (U) Initiate design of test exercise demonstration of all-weather end-to-end precision strike execution capability

(U) FY 1994 Planned Program: Not applicable

(U) Work Performed By: In-house work performed by: 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. Program oversight is through Project Manager, Combat Identification, Fort Monmouth, NJ and Program Executive Officer Intelligence Electronic Warfare, Vint Hill Farms Station, Warrenton, VA. 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; plus various other vendors.

(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 Technology), PE #0602709A (Night Vision Technology), and PE #0603710A (Night Vision Advanced Technology) in accordance with the ongoing Reliance joint planning process. There is no unnecessary duplication of effort within the Army or DoD.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603772A
PE Title: **Advanced Tactical Computer Science and Sensor Technology** Budget Activity: #2

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

(U) **International Cooperative Agreements:** Not applicable

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603774A
PE Title: Night Vision Systems Advanced Development

Budget Activity: #4

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D131 Night Vision Systems Advanced Development	5343	7440	4794

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 1994:

(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 phase of the Acquisition Cycle. This project provides the funding necessary to institute technology advances for product improvement or horizontal integration to upgrade current capabilities to "Own the Night".

(U) FY 1992 Accomplishments:
- (U) Completed development of the Multisensor Target Acquisition Sensor System (MTASS) and successfully demonstrated Ground Vehicle Radar Concept.
- (U) Implemented program for standardized Detector/Dewar assembles for infrared sensor systems for combat vehicles.

(U) FY 1993 Planned Program:
- (U) Modify Multisensor Target Acquisition Sensor suite to address stationary targets and integrate to vehicle for field trials.
- (U) Continue program for standardized detector/dewar assemblies for infrared systems for horizontal technology integration of second generation forward looking infrared (FLIR).

(U) FY 1994 Planned Program:
- (U) Implement development of adjunct program for Laser Countermeasure System (LCMS) pre-planned product improvement (P3I).
- (U) Implement development of an integrated helmet mounted display program for the commander and tank crewman to provide virtual imagery on a see through display.

(U) Work Performed By: Inhouse efforts accomplished by U.S. Army Communications and Electronics Command (CECOM), Fort Monmouth, NJ and the Night Vision and Electro-Optics Directorate (NVEOD), Fort Belvoir, VA. Contractors are Rockwell International, Anaheim, CA and SBRC, El Segundo, CA.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603774A** Budget Activity: **#4**
PE Title: **Night Vision Systems Advanced Development**

(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 night vision and electro-optics devices and systems.

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

(U) Other Appropriation Funds: Related procurement funding is listed under PE# 0604710A.

(U) International Cooperative Agreements: None

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603778A**
PE Title: **MLRS Product Improvement Programs** Budget Activity: **#4**

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

Project Number / Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D050 MLRS Improved Fire Control System	20213	10811	23589
D054 Extended Range - MLRS	0	12858	17326
PE TOTAL	20213	23669	40915

B. (U) BRIEF DESCRIPTION OF ELEMENT: Threats from expanding regional powers require an evolutionary improvement program to maintain the effectiveness of the Multiple Launch Rocket System (MLRS). The MLRS PIP provides for the Engineering and Manufacturing Development of an Extended Range - MLRS (ER-MLRS) Rocket and Improved Fire Control System (IFCS) for the MLRS launcher. The ER-MLRS project will enhance the capability of the existing MLRS by providing improvements in range, accuracy and effectiveness, and maneuver force safety (develop self-destruct fuze to reduce dud rate). 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 costs due to addition of built-in test equipment and will provide growth capabilities for existing and future MLRS Family of Munitions (MFOM) weapon systems. This program was restructured from Other Missile Product Improvement Programs.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603778A**
PE Title: **MLRS Product Improvement Program**
Project Title: **Improved Fir ontrol System (IFCS)**

Project Number: **D050**
Budget Activity: **#4**

POPULAR NAME: **IMPROVED FIRE CONTROL SYSTEM (IFCS)**

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

SCHEDULE	FY 1992	FY 1993	FY 1994
Program Milestones	MILESTONE II IPR		
Engineering Milestones		SYSTEM DESIGN REVIEW	PRELIMINARY DESIGN REVIEW CRITICAL DESIGN REVIEW
T&E Milestones		APPROVED TEMP COORDINATION OF TEST PROGRAM	TESTING REDSTONE AND WSMR
Contract Milestones	EMD AWARD	DEFINITIZE LTR CONTRACT	
BUDGET ($000)	**FY 1992**	**FY 1993**	**FY 1994**
Major Contract	4800	8100	20558
Support Contract	1552	898	506
In-House Support	2297	1463	2025
GFE/ Other	1564	350	500
Total	20213*	10811	23589

*$10M of this funding is allocated to Project D054, Extended Range-MLRS.

FY 1994 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: #4

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 1992 Accomplishments:
- (U) Award EMD contract with LVS
- (U) In Process Review Milestone (MS) II

(U) FY 1993 Planned Program:
- (U) System Design Trade Studies
- (U) System Requirements Review
- (U) Conduct System Design Review

(U) FY 1994 Planned Program:
- (U) Initiate Preliminary Design Review
- (U) Critical Design Review

D. (U) WORK PERFORMED BY: LVS will be the prime contractor and integrator with maximum competition at the subcontract level. Government technical organization will be Research, Development, and Engineering Center at MICOM.

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY:
NARRATIVE DESCRIPTION OF CHANGES

1. TECHNICAL CHANGES: NONE
2. SCHEDULE CHANGES: NONE
3. COST CHANGES: Funding has been increased by a total of $2.9 million in FY94 to initiate software rehost options for MLRS Family of Munitions (MFOM).

F. (U) PROGRAM DOCUMENTATION:
Operational Requirement Letter (Jun 92)
Acquisition Plan (Jan 92)
Integrated Program Summary (Sep 92)
EMD Contract Award (Sep 92)
Test and Evaluation Master Plan (approved Jan 93)

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603778A** Project Number: **D050**
PE Title: **MLRS Product Improvement Program** Budget Activity: **#4**
Project Title: **Improved Fire Control System (IFCS)**

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.

H. (U) OTHER APPROPRIATION FUNDS:

	($ in Thousands)		
Appropriation	**FY 1992 Actual**	**FY 1993 Estimate**	**FY 1994 Estimate**
Missile Procurement Army	229032	286143	263949
BUDGET ACT 2:			
MLRS RKT (SSN C65400)	59700	109766	9801
MLRS ADV PROC (SSN C65400)	0	0	0
MLRS LAUNCHER (SSN C65900)	125064	144819	216616
MLRS ADV PROC (SSN C65900)	686	0	0
MLRS INITIAL SPARES (SSN CAO257)	0	17431	12411
SADARM MLRS RKT	0	0	0
BUDGET ACT 3:			
MLRS MODS (SSN C67500)	44268	12146	23197
BUDGET ACT 4:			
MLRS MOD SPARES (SSN CAO265)	0	1981	1924

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 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.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603778A**
PE Title: **MLRS Product Improvement Program**
Project Title: **Extended Range - MLRS (ER-MLRS)**

Project Number: **D054**
Budget Activity: **#4**

POPULAR NAME: **EXTENDED RANGE - MLRS (ER-MLRS)**

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

SCHEDULE	FY 1992	FY 1993	FY 1994
Program Milestones		MS II IPR	PROD READINESS REV
Engineering Milestones		H/W PDR	H/W CDR S/W PDR/CDR
T&E Milestones			FLIGHT TESTING
Contract Milestones	EMD RFP RELEASED	EMD CONTRACT AWARDED 12/92	
BUDGET ($000)	**FY 1992**	**FY 1993**	**FY 1994**
Major Contract	6735	8100	9800
Support Contract	665	1990	2964
In-House Support	1128	2018	2900
GFE/ Other	1472	750	1662
Total	10000*	12858	17326

*This funding is included in the total FY92 funding for project #D050, MLRS IFCS.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603778A
PE Title: MLRS Product Improvement Program
Project Title: Extended Range - MLRS (ER-MLRS)

Project Number: D054
Budget Activity: #4

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project provides for the Engineering and Manufacturing Development 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 1992 Accomplishments:

- (U) Prepared documentation to support EMD IPR
- (U) Released EMD Request for Proposal

(U) FY 1993 Planned Program:

- (U) In Process Review MS II
- (U) EMD Contract Award
- (U) Complete rocket design
- (U) Initiate Wind Measuring Device (WMD) Design
- (U) Initial fabrication to support flight testing

(U) FY 1994 Planned Program:

- (U) Initiate flight testing and software development
- (U) WMD demonstration/validation
- (U) Fabrication of improved submunition fuzes

D. (U) WORK PERFORMED BY: Rocket contractor will be LVS. Wind Measurement Device contractor will be LVS. Improved submunition fuzes developed by Armaments Research Development and Engineering Center (ARDEC) and provided Government Furnished Equipment (GFE). Government technical organization will be Research, Development, and Engineering Center at US Army Missile Command (MICOM).

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY:
NARRATIVE DESCRIPTION OF CHANGES

1. TECHNICAL CHANGES: NONE
2. SCHEDULE CHANGES: NONE
3. COST CHANGES: Congress provided $10 million funding in FY92 to initiate the program and $13.6M in FY93 to bridge the gap between FY92 and FY94 Army funding. Sufficient total funding is available through FY97 to execute the development program.

F. (U) PROGRAM DOCUMENTATION: FY92 funding received 15 Jul 92. EMD contract award was December 92.

G. (U) RELATED ACTIVITIES: Zero Launch Detent (device to hold and release rocket from the launch tube) is being developed under the MLRS SADARM effort and will enhance accuracy of the ER-MLRS.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603778A
PE Title: MLRS Product Improvement Program
Project Title: Extended Range - MLRS (ER-MLRS)

Project Number: D054
Budget Activity: #4

H. (U) OTHER APPROPRIATION FUNDS:

Appropriation	($ in Thousands) FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
MISSILE PROCUREMENT ARMY	229032	286143	263949
BUDGET ACT 2:			
MLRS RKT (SSN C65400)	59700	109766	9801
MLRS ADV PROC (SSN C65400)	0	0	0
MLRS LAUNCHER (SSN C65900)	124378	144819	216616
MLRS ADV PROC (SSN C65900)	686	0	0
MLRS INITIAL SPARES (SSN CAO257)	0	17431	12411
SADARM MLRS RKT	0	0	0
BUDGET ACT 3:			
MLRS MODS (SSN C67500)	44268	12146	23197
BUDGET ACT 4:			
MLRS MOD SPARES (SSN CAO265)	0	1981	1924

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 Pre-Production 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 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603801A**
PE Title: **Aviation-Advanced Development** Budget Activity: **#4**

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
DB32 Advanced Maintenance Concepts and Equipment	3598	3654	3071
DB33 Cargo Handling Equipment	335	1510	2742
DB45 Aviation Life Support Equipment (ALSE) - Advanced Development	9748	11140	4946
PE TOTAL	13681	16304	10759

B. (U) BRIEF DESCRIPTION OF ELEMENT: This PE provides advanced development aviation support of tactical programs associated with air mobility support, advanced maintenance concepts and equipment, and Aviation Life Support Equipment (ALSE).

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) Project DB32 - Advance 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 damage 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 1992 Accomplishments:
- (U) Initiated Non-Destructive Inspection & Test (NDI/NDT) to support field repair of composites
- (U) Initiated final configuration of Unit Maintenance Aerial Recovery Kit (UMARK)
- (U) Fabricated prototype hardware and equipped an AH-64 battalion with full complement of New Aircraft Tool System (NATS) hardware for conduct of customer test
- (U) Redesigned and fabricated prototype Advanced Boresight Equipment (ABE) hardware

(U) FY 1993 Planned Program:
- (U) Finalize hardware concept for NDI/NDT capability for composite repair
- (U) Complete definition and assembly of Combat Maintenance/Battle Damage Repair (CM/BDR) Kit for fiber optic components
- (U) Complete detailed design and initiate fabrication of UMARK hardware
- (U) Complete bench-test evaluation of transmission vibration diagnostic system for CH-47D
- (U) Finalize diagnostic software for all 20 AH-64 subsystems; complete initial user evaluation of IFL
- (U) Complete integration and validation of prototype ABE

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603801A**
PE Title: **Aviation-Advanced Development** Budget Activity: **#4**

(U) FY 1994 Planned Program:
- **(U)** Demonstrate NDI/NDT hardware concept and initiate development of final version of hardware
- **(U)** Complete development and demonstrate CM/BDR kit for fiber optic systems
- **(U)** Conduct flight-test evaluation of UMARK
- **(U)** Finalize technical data package (TDP) for NATS
- **(U)** Complete design, fabrication and integration of ABE pre-production units; initiate contractor tests

(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 1992 Accomplishments:
- **(U)** Contract awarded for development of improved 30mm ammo loader design for AH-64A which will speed up Forward Arming and Refueling Point (FARP) operations

(U) FY 1993 Planned Program:
- **(U)** Contract award for development of helicopter internal/external (INTEX) pallet system
- **(U)** Contract award for application of advanced materials to external cargo handling slings
- **(U)** Complete detailed design, fabricate and conduct functional test of improved 30mm ammo loader

(U) FY 1994 Planned Program:
- **(U)** Complete design of INTEX pallet system; fabricate and test hardware
- **(U)** Initiate Advanced Aerial Cargo Handling System to enhance cargo helicopter productivity
- **(U)** Complete documentation of improved 30mm ammo loader
- **(U)** Complete demonstration of Aviation Aerial Forward Refuel/Rearm System

(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 (NBC) cockpit filtration utilizing new concepts in absorption of the chemical/biological threat; reduction of ingress of NBC agents into cockpits 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 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 AIE includes the Aircrew Integrated Common Helmet (AICH) which is compatible with all weapon sighting stations on all aircraft types.

(U) FY 1992 Accomplishments:
- **(U)** Initiated tr service Agile (tunable) laser eye protection program
- **(U)** Prepared statement of work and reviewed prior study effort for NBC Contamination Avoidance Program
- **(U)** Designed, fabricated and initiated testing for Inflatable Body and Head Restraint System

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603801A
PE Title: **Aviation-Advanced Development** Budget Activity: #4

- (U) Initiated AIE effort as joint Army/Navy program with tri-service potential
- (U) Completed source selection of the IBAHRS contractor and initiated design effort

(U) **FY 1993 Planned Program:**
- (U) Fabricate and evaluate advance laser eye protective visor
- (U) Design, fabricate, and integrate full NBC Cockpit Filtration system into aircraft
- (U) Initiate design development of NBC Contamination Avoidance system
- (U) Complete evaluation and testing of IBAHRS (AH-1)
- (U) Analyze existing and current technologies for AIE near term and far term program
- (U) Accomplish a tri-service memorandum of agreement (MOA) for AIE

(U) **FY 1994 Planned Program:**
- (U) Complete Milestone III IPR for IBAHRS
- (U) Initiate follow-on effort to apply IBAHRS to AH-64, OH-58D and EH-60
- (U) Fabricate Army version of Agile Laser Protective Visors

(U) **WORK PERFORMED BY:** Projects DB32/BB33: Candidate contractors to perform planned 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; SAIC Tech Services, Co. Huntsville, AL. In house work performed by: Aviation Applied Technology Directorate, Ft. Eustis, VA; Chemical Systems Laboratories, 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; and USAATCOM and ALSE PMO(PEO-Aviation), St. Louis, MO.

(U) **RELATED ACTIVITIES:** Projects DB32/DB33: PE #0602211A (Aviation Technology) includes related science and technology work. Project DB45 PE #0604801A (Aviation Engineering Development) IBAHRS is a joint Army/Navy program and the Agile Laser effort is a tri-service program. The ABE program is a tri-service effort with oversight by the Joint Logistics Commanders (JLC)/Joint Aeronautical Commanders Group (JACG). The AIHS and AIE program have tri-service interest, especially with USN. There is no unnecessary duplication of effort within the Army or DoD.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603801A**
PE Title: **Aviation-Advanced Development** Budget Activity: **#4**

(U) OTHER APPROPRIATION FUNDS:

Appropriation	FY1992 Actual ($ in Thousands)	FY1993 Estimate	FY1994 Estimate
APA (AZ3510) Sets,Kits/Outfits	6253	6821	9806
APA (AZ3520) Ground Spt Equip	14241	13959	12499
APA (AZ3110) ALSE	0	8157	11692

(U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

FY 1994 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 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
DXXB MK19-3 Improvement Program	0	0	764
PE TOTAL	0	0	764

B. (U) BRIEF DESCRIPTION OF ELEMENT: This project is a new start. The MK19-3 (Grenade Machine Gun) Improvement Program consists of two efforts, the Gunnery Trainer and the Tactical Engagement Simulator. The Gunnery Trainer, a video style classroom trainer, is an adaptation 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 replicate 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 Tactical Engagement Simulator is an adaptation of an existing training device, the Multiple Integrated Laser Engagement System (MILES). This device will be used as a means to evaluate the performance of the weapon system and crews in force-on-force operations. Together these devices comprise part of the training subsystem supporting the MK19-3 and will enhance training of the crews and provide potential savings associated with reduced ammunition expenditure in qualification and live fire exercises.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) DXXB MK19-3 Improvement Program

(U) FY 1992 Accomplishments:
- (U) Not Applicable

(U) FY 1993 Planned Program:
- (U) Not Applicable

(U) FY 1994 Planned Program:
- (U) Conduct In-Process Review (IPR) 4QFY94
- (U) Type Classify Gunnery Trainer 4QFY94

(U) Work Performed By: The prime in-house organization is the U.S. Army Armament Research, Development and Engineering Center, Picatinny Arsenal, NJ with other efforts at the Army Research Institute, Ft. Benning, GA and Project Manager Trai..ing Devices, Orlando, FL.

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

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603802A
PE Title: **Weapons and Munitions - Advanced Development** Budget Activity: #4

(U) Other Appropriation Funds:

Appropriation	($ in Thousands) FY 1992 Actual	FY 1993 Estimate	FY 1994

Procurement
WTCV - (SSN GZ3100)

(U) International Cooperative Agreements: None

FY 1994 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 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D266 Airdrop Equipment Adv. Dev.	6247	3843	4418
D428 Tactical Rigid Wall Shelters Adv. Dev.	5128	1375	939
D526 Marine Oriented Logistic Equipment Adv. Dev.	934	94	478
DG01 Combat Engineer Equipment Adv. Dev.	2092	2718	2880
DG10 Advanced Tactical Power Sources Adv. Dev.	1383	1217	189
DG11 Advanced Electrical Energy Concepts Adv. Development	1450	2331	1622
DG14 Logistics Support Equipment Adv. Dev.	1044	1400	2357
DK39 General Support Equipment Adv. Dev.	728	700	1000
DK41 POL Distribution Equipment Adv. Dev.	1572	793	812
PE TOTAL	20578	14471	14695

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program supports advanced development of technology necessary to field 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 mobility, operational capability and survivability of combat forces while reducing the logistics support burden.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) Project D266 - Airdrop Equipment Advanced Development: Develop and test airdrop equipment to improve soldier mobility, sustainability and survivability.

(U) FY 1992 Accomplishments:

- **(U)** Modified Low Altitude Retrorocket System (LARRS) program to permit development of light and heavy (30K and 60K) systems
- **(U)** Initiated development of heavy LARRS
- **(U)** Fabricated an advanced lightweight prototype system and initiated advanced Technical Feasibility

Testing (TFT) of the 30K LARRS
- (U) Designed, fabricated and tested advanced prototype parachute system for LARRS

(U) FY 1993 Planned Program:
- (U) Conduct test to enhance load extraction ratio of LARRS
- (U) Complete TFT of the lower weight LARRS prototype system

(U) FY 1994 Planned Program:
- (U) Conduct initial TFT of the heavy 60K LARRS
- (U) Conduct Milestone I/II IPR of lower weight LARRS

(U) Project D428 - Tactical Rigid Wall Shelters Advanced Development: Develop family of tactical rigid wall shelters to enhance soldier command, control, communications; survivability; and sustainability.

(U) FY 1992 Accomplishments:
- (U) Developed and Type Classified - Limited Procurement Urgent a kit to convert the M577A2 to the M1068 Standard Integrated Command Post System (SICPS) Track
- (U) Began testing of Pre-Planned Product Improvement (P3I) Components of SICPS Rigid Wall Shelter (RWS)
- (U) Awarded Phase II of Lightweight Hardened SICPS Shelter contract
- (U) Initiated advanced development of cargo bed covers
- (U) Initiated development of the 80dB International Standard Organization (ISO) Shelter

(U) FY 1993 Planned Program:
- (U) Fabricate prototype for Technical/User testing on Large SICPS Shelter
- (U) Award contract to design and fabricate Cargo Bed Cover prototypes for testing on the High Mobility Multi-purpose Wheeled Vehicle (HMMWV)

(U) FY 1994 Planned Program:
- (U) Complete design and begin fabrication of Cargo Bed Covers
- (U) Fabricate and test the 80dB ISO Shelter Prototype and transition to Engineering and Manufacturing Development (EMD)

(U) Project D526 - Marine Oriented Logistic Equipment Advanced Development: Develop advanced concepts and equipment to improve the Army's Logistics-Over-The-Shore (LOTS) capability.

(U) FY 1992 Accomplishments:
- (U) Designed Air Cushion Landing Platform
- (U) Initiated fabrication of the Air Cushion Landing Platform

(U) FY 1993 Planned Program:
- (U) Complete fabrication of the Air Cushion Landing Platform

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603804A**
PE Title: **Logistics and Engineer Equipment - Advanced Development** Budget Activity: **#4**

(U) FY 1994 Planned Program:
- **(U)** Design and fabricate causeway dredge

(U) Project DG01 - This program supports advanced development of technology necessary to field new and improved combat support and combat service support equipment essential to sustaining combat operations. Bridging development will increase the tactical mobility and operational capability of combat forces.

(U) FY 1992 Accomplishments:
- **(U)** Conducted a market investigation to determine potential non-developmental item candidates
- **(U)** Designed a composite reinforced traversing beam to increase the length and load capacity of existing military or NDI bridging to meet bridging requirements
- **(U)** Defined assault bridge launcher Reliability, Availability and Maintainability (RAM) requirements to support test efforts and completed the Integrated Logistics Support (ILS) plan
- **(U)** Dynamic crossing and cyclic testing of both bridge designs were conducted as well as launch/retrieve tests on scissor and horizontal launch concepts
- **(U)** Completed Phases I and II for the worldwide gap study

(U) FY 1993 Planned Program:
- **(U)** Conduct Milestone I Program Review for Heavy Dry Support Bridge (HDSB)
- **(U)** Fabricate composite reinforced HDSB traversing beam
- **(U)** Prepare solicitation for lease of three candidate systems for feasibility testing

(U) FY 1994 Planned Program:
- **(U)** Test and demonstrate the Heavy Dry Support Bridge traversing beam
- **(U)** Award lease contracts for candidate systems
- **(U)** Initiate transportability study to assess mounting candidate systems on selected transporters and to assess the mobility of vehicles over chosen candidate systems

(U) Project DG10 - Advanced Tactical Power Sources Advanced Development: Develop advanced tactical power sources to improve soldier mobility, sustainability and survivability. It is the only program that bridges the gap between tech base and full scale production of new higher energy density, lower cost, all-weather batteries/battery systems to satisfy the unique tactical and logistical requirements of portable electronic battlefield equipment.

(U) FY 1992 Accomplishments:
- **(U)** Initiated development of low cost, high energy throw-away lithium solid cathode battery for high power radios
- **(U)** Demonstrated first generation smart lithium throw-away battery
- **(U)** Designed first generation rechargeable lithium battery for Thermal Weapon Sight (TWS)

(U) FY 1993 Planned Program:
- **(U)** Initiate development of super high energy throw-away battery for soldier system.
- **(U)** Initiate development of rechargeable lithium battery for Special Operating Forces (SOF)

- (U) Test, evaluate and develop a tech data package for low cost lithium battery test meter
- (U) Initiate development of smart battery - equipment interface (second generation smart battery) for on-line state-of-charge indicator for Single Channel Ground and Airborne Radio System (SINCGARS)
- (U) Complete test and evaluation of first generation rechargeable lithium battery for TWS
- (U) Initiate development of lithium "pouch" battery design to maximize energy density and minimize cost of lithium - solid cathode battery system
- (U) Continue development of lithium solid cathode battery for high power radios

(U) **FY 1994 Planned Program:**
- (U) Demonstrate proof-of-principle of second generation smart battery
- (U) Continue development of rechargeable lithium battery for SOF, "pouch" battery and super high energy soldier system battery

(U) **Project 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 Army tactical electric power program, and to introduce Auxiliary Power Units (APUs) as a higher mobility, lower cost alternative to the present family of stand alone generator sets rated at 1 1/2, 3, 5, 10, 15, 30, 60, 100 and 200kw.

(U) **FY 1992 Accomplishments:**
- (U) Developed and evaluated a 5kw rotary engine generator set using medium distillate fuels
- (U) Tested, modified and reevaluated the 5kw/18kw combination Auxiliary Power Unit and Environmental Control Unit (ECU)
- (U) Completed and evaluated work on standardized controls and diagnostics for the 10kw Auxiliary Power Unit and 15kw Tactical Quiet Generator (TQG) sets
- (U) Composite material investigation continued

(U) **FY 1993 Planned Program:**
- (U) Identify and evaluate emerging technology lightweight engines for generators and auxiliary power units
- (U) Design and fabricate prototype generator sets using brassboard standardization control and diagnostics systems as well as composite materials
- (U) Investigate various configurations and components of Auxiliary Power Units and integrated APU/ECUs

(U) **FY 1994 Planned Program:**
- (U) Fabricate generator sets/APUs using emerging technology for lightweight engines
- (U) Investigate emerging lightweight generator set components such as 270 vdc alternators and conversion electronics
- (U) Test and evaluate prototype generator sets

(U) **Project DG14** - Logistics Support Equipment Advanced Development: Develop and transition to engineering development a series of materiel handling equipment.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603804A
PE Title: **Logistics and Engineer Equipment - Advanced Development** Budget Activity: **#4**

(U) FY 1992 Accomplishments:
- (U) Prepared program documentation for MS I/II IPR for the All Terrain Lifter, Articulated System (ATLAS) forklift
- (U) Prepared initial program documentation for the Equipment Deployment and Storage System - Ground (EDSS-Ground)
- (U) Obtained hardware for the EDSS-Ground Test and Evaluation
- (U) Conducted test of EDSS-Ground Electromagnetic Pulse (EMP) shielding capability
- (U) Conducted Advanced Development on Stereoscopic Vision Systems for reach type lift trucks

(U) FY 1993 Planned Program:
- (U) Conduct MS I/II IPR for the ATLAS program
- (U) Award contracts for Remote Operated Cargo Retriever (ROCAR) to unload 40 foot ISO shelters
- (U) Initiate fabrication of ROCAR prototypes.
- (U) Conduct Advanced Development Testing on the EDSS-Ground
- (U) Initiate preparation of documentation for MS I/III IPR for the EDSS-Ground
- (U) Restructure EDSS-Ground to project DK39 in FY94

(U) FY 1994 Planned Program:
- (U) Complete fabrication of ROCAR prototypes
- (U) Test ROCAR prototypes to determine the viability of emptying a 40 foot container without vehicle entering the container.

(U) Project 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. Construct prototype units for demonstration and proof of applied technologies.

(U) FY 1992 Ac plishments:
- (U) Comple valuation of Water Purification Components including sea water intake system, cartridge fil nd lightweight media filters.
- (U) Initiate uation of high turbidity clarification system for 600 Gallon Per Hour (GPH) Reverse Osmosis W urification Unit (ROWPU).

(U) FY 1993 Planned Program:
- (U) Conduct market investigation to identify state of the art technology for next generation ROWPU system including alternative disinfecting methods, composite materials and improved system instrumentation.
- (U) Perform Trade-off Analysis on selected candidate components. Initiate component procurement and testing.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603804A**
PE Title: **Logistics and Engineer Equipment - Advanced Development** Budget Activity: **#4**

(U) FY 1994 Planned Program:
- **(U)** Complete Water Purification Component testing. Design and fabricate test bed for evaluation of selected candidate components.
- **(U)** Initiate testing of Water Purification Components test bed.
- **(U)** Award contracts for advanced motor controllers for ECUs.
- **(U)** Conduct Milestone I/III; Type Classify the EDSS-Ground
- **(U)** Design common components and assemblies across the family of ECUs in order to reduce spare parts requirements.
- **(U)** Modify the 9K British Thermal Units (BTU) ECU's multi-level power unit to a dual level unit.

(U) Project DK41 - Petroleum, Oil and Lubricants (POL) Distribution Equipment Advanced Development: Design new POL transfer surveillance and distribution items to improve soldier mobility and survivability.

(U) FY 1992 Accomplishments:
- **(U)** Initiated component development of second-generation Standard Army Refueling System (SARS).
- **(U)** Conducted three design reviews and finalized prototype SARS design.
- **(U)** Completed initial SARS prototype.

(U) FY 1993 Planned Program:
- **(U)** Conduct prototype testing and initiate final Technical Data Package (TDP) for SARS.
- **(U)** Initiate development of Petroleum Quality Analysis System (PQAS).

(U) FY 1994 Planned Program:
- **(U)** Complete manuals and conduct operational evaluation of SARS nozzle and receptacle.
- **(U)** Procure petroleum test equipment prototypes and finalize test requirements for the Petroleum Quality Analysis System (PQAS).

(U) Work Performed By: In-house efforts will be accomplished by 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. 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, Huntvalley, 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,

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603804A
PE Title: **Logistics and Engineer Equipment - Advanced Development** Budget Activity: #4

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; Saft America, Cockeysville, MD; Yardney Technical Products, Pawcatuck, CT; Ultralife Batteries, Inc., Newark, NJ; Power Conversion, Inc., Saddlebrook, NJ; Rayovac Corp., Madision 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. There is no unnecessary duplication of effort within the Army or DoD. Full-service Joint Working Group (JWG) reviews draft Mission Needs Statements, Tri-service Panel reviews Environmental Control Units.

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

	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Other Procurement Army:			
6K Forklift / Side Loader Forklift			
BLIN 156	1000	8289	0
Standard Integrated Command Post System (SICPS)			
BLIN 126	40993	36611	34475
3K Reverse Osmosis Water Purification Unit (ROWPU)			
BLIN 139	16698	12296	0
Generators			
BLIN 155	49204	44279	35685

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

FY 1994 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 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D091 Combat Service Support Control System	21566	16741	19020
D246 Tactical Communications Systems-Advanced Development	0	2005	1482
XFFF Maintenance Trainer	8582	0	0
PE TOTAL	30148	18746	20502

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 62782, 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.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:
(U) Project Number and Title: 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 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 1992 Accomplishments: Project not funded

(U) FY 1993 Planned Program:
- **(U)** Develop FSHPAC for use with the Improved High Frequency Radios.
- **(U)** Develop prototypes for Advanced Concepts and Technology Frequency Agile Solid-state Tuner (ACTFAST).

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603805A
PE Title: **Combat Service Support Control System Evaluation and Analysis** Budget Activity: #4

(U) **FY 1994 Planned Program:**
- (U) Complete development of high frequency power amplifier and coupler technology. Initiate development of antenna technology transitioned from PE 0602782A, Project AH92.
- (U) Initiate advanced development of adaptive high frequency (HF) applique. Initiate power amplifier/coupler integration of ACTFAST.

(U) **Project Number and Title:** XFFF - Maintenance Trainer: FIREFINDER Intermediate Maintenance, will increase training effectiveness by simulating FIREFINDER Radar operations and faults. The training device consists of one instructor station with two instructor terminals and eight student stations, four each for the AN/TPQ-36 and 37. Students will be able to troubleshoot and fault isolate in a hazard-free environment prior to training and testing on actual non-hazard-free FIREFINDER Radars. This trainer will decrease training time required on actual hardware, thus freeing critically needed radars for fielding to operational units.

(U) **FY 1992 Accomplishments:**
- (U) Awarded Option 2
- (U) Conducted critical design review
- (U) Fabricated dual instructor station and 8 student stations

(U) **FY 1993 Planned Program:** None

(U) **FY 1994 Planned Program:** None

(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. Contractors to be selected.

(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:** Not applicable.

FY 1994 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 Number: **D091**
Budget Activity: **#4**

POPULAR NAME: **CSSCS**

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

SCHEDULE	FY 1992	FY 1993	FY 1994		
Program Milestones			Feb 94: MS III Rev Apr 94: IOC		
Engineering Milestones	Mar 92: Ver 3 PDR; Jun 92: CDR		Dec 93: Ver 4 CDR 2Q94: Ver 4 PDR		
T&E Milestones	Sep-Oct 92: Ver 3 EUT&E/FDT&E	Sep-Oct 93: Ver 3 IOT&E			
Contract Milestones					
BUDGET ($000)	FY 1992	FY 1993	FY 1994		
Major Contract	15335	12000	13420		
Support Contract	768	768	920		
In-House Support	2561	2625	2972		
GFE/ Other	2902	1348	1708		
Total	21566	16741	19020		

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603805A** Project Number: **D091**
PE Title: **Combat Service Support Control System Evaluation and Analysis** Budget Activity: **#4**
Project Title: **Combat Service Support Control System**

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. CSS control centers must provide supportive information and a rapid decision support capability to the commanders more quickly than is possible with the present manual systems. This program develops for the CSS battlefield functional area an automated capability to provide key command selected information to support the force commander's decision process and enhance the capability to rapidly collect, analyze and disseminate critical data for internal CSS functional command and control. 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 1992 Accomplishments:
- (U) Conducted Version 3 Preliminary and Critical Design Reviews (PDR/CDR)
- (U) Continued full-scale development of Version 3
- (U) Continued prototyping to refine user requirements and resolve design issues
- (U) Conducted Early User Test & Experimentation (EUT&E) and Force Development Test & Evaluation (FDT&E)

(U) FY 1993 Planned Program:
- (U) Continue full-scale development of Version 3
- (U) Conduct Initial Operational Test and Evaluation (IOT&E)
- (U) Begin development of Version 4 (Echelon Above Corps Capability)

(U) FY 1994 Planned Program:
- (U) Complete development of Version 3 (Corps Capability)
- (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
- (U) Begin Version 3 Total System Tactical Validation (TSTV)
- (U) Attain Version 3 Initial Operational Capability (IOC)
- (U) Begin fielding of Version 3
- (U) Continue development of Version 4

D. (U) WORK PERFORMED BY: Contractors are TRW Inc., Carson, CA (Version 3/4 Developer); Systems Engineering & Management Association (SEMA), Alexandria, VA (Technical Support Services); and Vitro Corporation, Rockville, MD (Acquisition Support Contractor). In-house developing organizations are: 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; and US Army Electronic Proving Grounds, Ft. Huachuca, AZ.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603805A
PE Title: Combat Service Support Control Syste valuation and Analysis
Project Title: Combat Service Support Control Sy...em
Project Number: D091
Budget Activity: #4

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: None
2. (U) SCHEDULE CHANGES: None
3. (U) COST CHANGES: None

F. (U) PROGRAM DOCUMENTATION:

Mission Element Need Statement (MENS)	06/82
Required Operational Capability (ROC)	09/90
Operational and Organizational (O&O) Concept	10/90
Test and Evaluation Master Plan (TEMP)	05/91
Program Baseline	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 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Other Procurement, Army			
OPA 2 (W34600)	0	0	12833
(BA9706)	0	0	713

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

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
- (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 IOT&E - Sept-Oct 93

FY 1994 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 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D483 Radiac Equipment Advanced Development	200	5502	0
D601 NBC Contamination Avoidance Systems	17884	6297	17267
D604 NBC Protection Systems	2039	6184	6425
DE80 Chemical Biological Individual Protection Concepts	3654	3116	0
DE81 NBC Decontamination Systems	7657	8281	8471
PE TOTAL	31434	29380	32163

B. (U) BRIEF DESCRIPTION OF ELEMENT: US forces must be able to effectively survive and sustain combat operation on the Nuclear, Biological, and Chemical (NBC) contaminated battlefield. 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.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(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 for correlating 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 1992 Accomplishments:
- (U) Initiated AD for RTS
- (U) Completed AARS Operational Requirements Document (ORD) and Milestone I/II In Process Review (IPR)
- (U) Awarded Pocket Radiac Meter development contract

Program Element: #0603806A
Title: NBC Defense Systems - Advanced Development Budget Activity 4

(U) **FY 1993 Planned Program:**
- (U) Initiate Pocket Radiac Meter prototype design and hardware fabrication
- (U) Transition AARS to PE #0604806, Proj. D517 in FY93
- (U) Pocket Radiac Meter transitions to PE #0604806A, proj. D517, and the AN/UDR-13 in FY93
- (U) Work performed in this project is restructured to D601 in FY94

(U) **FY 1994 Planned Program:**
- (U) Project restructured to D601

(U) **Project D604** - NBC Protection Systems. Provides for AD 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 or catalytic oxidation). The effort extends vehicular collective protection applications providing for reductions in system size, weight, and energy and in filter change logistics burden. Additionally, the effort provides a system solution for countering future threat agents and alleviating the disposal problems associated with hazardous material impregnated carbon filters.

(U) **FY 1992 Accomplishments:**
- (U) Initiated demonstration and validation for AICPS

(U) **FY 1993 Planned Program:**
- (U) Reformulate AICPS acquisition strategy and acquisition plan for AICPS
- (U) Conduct AICPS catalytic oxidation and pressure swing absorption studies

(U) **FY 1994 Planned Program:**
- (U) Award AICPS developmental contract
- (U) Develop AICPS design concepts

(U) **Project DE80** - Chemical Biological Individual Protective Concepts: Provides for AD of the XM45 Aircrew Protective Mask (ACPM). The ACPM will replace the M43 and M43A1 aviators mask and eliminate air crew dependency on forced air while providing compatibility with aircraft sighting and night-vision systems.

(U) **FY 1992 Accomplishments:**
- (U) Completed prototype design and fabrication of the ACPM

(U) **FY 1993 Planned Program:**
- (U) Approve ACPM ORD
- (U) Conduct Milestone I/II IPR for the ACPM
- (U) ACPM transitions to PE #6064806A, Proj. D019 in FY93
- (U) Work performed in this project is restructured to D601 in FY94

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603806A**
PE Title: **NBC Defense Systems - Advanced Development** Budget Activity: **#4**

(U) FY 1994 Planned Program:
- **(U)** Project transitions to PE #0604806, Project D019

(U) Project DE81: AD of decontaminating solutions, systems, and equipment. 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. The project supports the Decontaminating Agent, Multipurpose (DAM), a replacement for Decontaminating Solution #2 (DS2) and Super Topical Bleach (STB). It offers operational, logistics, cost, safety, and environmental improvements over current decontaminants for deliberate decontamination. Supports development of the Chemical and Biological (CB) Self-Stripping Coatings to obtain a more environmentally sound, less water dependent, and less labor intensive system for removing gross contamination, and eliminate dependence on battalion assets for hasty decontamination. Lastly, supports the Sorbent Decontamination System which provides a more environmentally sound system for decontaminating personal equipment and key areas of vehicles and crew served weapons while reducing transfer vapor and contact hazards.

(U) FY 1992 Accomplishments:
- **(U)** Completed prototype design and fabrication of MDS
- **(U)** Initiated Technical Testing (TT) and approved Operational Testing (OT) for MDS
- **(U)** Awarded AD contract for Batch DAM

(U) FY 1993 Planned Program:
- **(U)** Initiate Pre-Production Test (PPT) for MDS
- **(U)** Select DAM candidates
- **(U)** Initiate Technical Testing (TT) of DAM compatibility and decontamination efficacy

(U) FY 1994 Planned Program:
- **(U)** Complete PPT of MDS
- **(U)** Conduct Milestone I IPR for self-stripping CB protective coating
- **(U)** Select final DAM candidate
- **(U)** Continue MDS design efforts

(U) Work Performed By: Project Manager NBC Defense, Aberdeen Proving Ground (APG), MD; U.S. Army Chemical and Biological Defense Agency, APG, MD; U.S. Army Tank and Automotive Command, Warren Michigan; 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, Delmarva, 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; and Environmental Technology Group, Inc., Baltimore, MD.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603806A**
PE Title: **NBC Defense Systems - Advanced Development** Budget Activity: **#4**

(U) Related Activities: Program Elements #0602622A (Chemical, Smoke, and Equipment Defeating Technology) and #0604806A (NBC Defense Systems Engineering 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 Requirements Group, 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 performed 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 Army or DoD.

(U) Other Appropriation Funds
($ in Thousands)

Appropriation	**FY 1992 Actual**	**FY 1993 Estimate**	**FY 1994 Estimate**
Other Procurement, Army			
BLIN 118 Decontamination Apparatus Pwr Dr Lt Wt	7010	0	7228

(U) International Cooperative Agreement: Not Applicable.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603806A** Project Number: **D601**
PE Title: **NBC Defense Systems - Advanced Development** Budget Activity: **#4**

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

Project Title: NBC Contamination Avoidance Systems

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
NBC Reconnaissance, Detection, and Identification	17884	6297	17267

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project provides Advanced Development (AD) of Reconnaissance, Detection, and Identification (RDI) equipment. Efforts will provide a Biological and Chemical (BC) detector to automatically and continuously detect standard biological agents. The project will exploit advancements in detection technology to provide a more advanced capability, the Chemical and Biological (CB) mass spectrometer, to automatically and continuously detect a limitless number and combination of chemical and biological agents. Program funding will also support development of a long-range Laser Stand-off Detector for ground employment to provide chemical liquid agent detection, mapping, and ranging. Funding will support demonstration and validation of the Multi-Purpose Integrated Chemical Agent Detector (MICAD) to provide automatic transmission of NBC alerts in digital format and activation of existing collective protection systems on vehicles, vans, and shelters. These systems increase existing chemical and biological war fighting capabilities by providing more complete, accurate, and current battlefield data.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- (U) Completed CADNET prototype fabrication and initiated Technical Testing (TT)
- (U) Completed MICAD concept feasibility test and evaluation
- (U) Conducted program decision briefing and initiated AD for Biological Detector
- (U) Awarded AD contract and initiated feasibility test of Biological Detector support hardware

(U) FY 1993 Planned Program:
- (U) Complete MICAD Operational Requirements Document (ORD) and conduct Milestone I/II In-Process Review (IPR)
- (U) Continue concept feasibility test and evaluation of the Biological Detector
- (U) Complete Biological Detector ORD
- (U) Complete acquisition strategy for the CB Mass Spectrometer
- (U) Transition MICAD to PE #0604806, Proj. D020, in FY93

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603806A
PE Title: NBC Defense Systems - Advanced Development

Project Number: D601
Budget Activity: #4

(U) FY 1994 Planned Program:

- (U) Conduct Milestone I/II IPR for the Biological Detector
- (U) Initiate AD for the CB Mass Spectrometer
- (U) Complete AP for the Laser Stand-off Detector and initiate AD

D. (U) WORK PERFORMED BY: U.S. Army Chemical and Biological Defense Agency, Aberdeen Proving Ground (APG), MD; Program Director for Biological Defense, APG, MD; Sandia National Laboratories, NM. Current known contractors are Environmental Technology Group, Inc., Towson, MD; General Electric Automated Systems Department, Burlington, MA; Qualtron, Tulsa, OK; Base Ten, Trenton, NJ; Graseby Ionics, LTD, Watford, England; Battelle Memorial Inst., Columbus, OH.

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY: NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: Former BC Detector program will primarily focus on biological detection, and will be referred to as the Biological Detector program.
2. (U) SCHEDULE CHANGES: The Milestone I/II IPR for the Biological Detector has been changed from 4QFY92 to 2QFY93, since requirement documents for program initiation have yet to be approved. MICAD ORD and Milestone I/II In- Process Review (IPR) slipped from 4QFY92 to 1QFY93.
3. (U) COST CHANGES: Funding increase in FY94 allows for more timely accomplishment of activities to alleviate shortcomings.

F. (U) PROGRAM DOCUMENTATION:

MICAD	
O&O	01/85
Acquisition Plan (AP)	11/89
ORD	11/92
Biological Detector	
O&O	06/91
AP	12/91
AS (Amended)	08/92
ORD	09/93
CB Mass Spectrometer	
Mission Need Statement	10/92
ORD	02/95

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603806A** Project Number: **D601**
PE Title: **NBC Defense Systems - Advanced Development** Budget Activity: **#4**

Laser Stand-off Detector	
Mission Need Statement	02/93
ORD	02/96

G. (U) RELATED ACTIVITIES: Program Elements #0602622A (Chemical, Smoke, and Equipment Defeating Technology) and #0604806A (NBC Defense Systems Engineering Development). Department of Defense Directive 5160.5 designates the U.S. Army as the Executive Agent for the CB Defense Research Development, and Acquisition (RDA) Program to ensure the Services embark on a collective approach to prioritize, coordinate, and consolidate CB defense needs. A number of oversight committees, such as the Joint Service Requirements Group, and the Joint Panel on CB Defense, are chaired by the Army to periodically review RDA programs to ensure joint service requirements are satisfied, and that duplicative efforts are not performed by the Services. Joint Service coordination is enhanced by the periodic reviews of the Joint-Chemical Biological 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 Army or DoD.

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

Appropriation	**FY 1992 Actual**	**FY 1993 Estimate**	**FY 1994 Estimate**

Not applicable

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

J. (U) MILESTONE SCHEDULE:

Milestones	Milestone Dates
MICAD	
Milestone I/II IPR	02/93
Biological Detector	
Milestone II IPR	09/94
CB Mass Spectrometer	
Milestone I/II IPR	09/96
Laser Stand-off Detector	
Milestone II IPR	03/97

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603807A
PE Title: **Medical Systems - Advanced Development** Budget Activity: #4

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

Project Number / Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D808	DoD Drug and Vaccine - Advanced Development		
	6763	4608	8638
D809	Medical Biological Defense Drug and Vaccine - Advanced Development		
	6686	4403	4609
D811	Military Human Immunodeficiency Virus (HIV) Vaccine and Drug - Advanced Development		
	6279	5586	2856
D836	Combat Medical Materiel - Advanced Development		
	2527	2637	2769
D837	Soldier System Protection - Advanced Development		
	591	1948	1770
D993	Medical Chemical Defense Life Support Materiel - Non Systems - Advanced Development		
	7307	8277	986
PE TOTAL	30153	27459	27628

B. (U) BRIEF DESCRIPTION OF PROGRAM 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 or 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.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project D808 - DoD Drug and Vaccine - Advanced Development: Supports the formulation, advanced toxicology and initial clinical testing of drugs and vaccines (bacterial, viral and parasitic) that will protect U.S. forces against infectious diseases of military significance.

(U) FY 1992 Accomplishments:

- (U) Filed an Investigational New Drug Application (IND) with the Food and Drug Administration (FDA) for WR 238605, a new antimalarial drug
- (U) Initiated Phase I Clinical Study on WR 238605

Program Element: **#0603807A**
PE Title: **Medical Systems - Advanced Development** Budget Activity: **#4**

- (U) Completed long term toxicology study (2 years) on halofantrine as a malaria prophylactic
- (U) Continued Phase II efficacy studies in Kenya on the antileishmanial WR 6026
- (U) Completed user testing of Liquid Pesticide Sprayer
- (U) Completed user testing of Aerosol Generator for pesticides
- (U) Transitioned chikungunya vaccine to Full Scale Development
- (U) Initiated Phase I testing of Rift Valley fever live vaccine
- (U) Continued clinical tests of candidate falciparum malaria sporozoite vaccines
- (U) Initiated Phase I studies of *Neisseria meningiditis* (meningitis) group B vaccine

(U) FY 1993 Planned Program:
- (U) Conclude Phase I clinical study on antimalarial prophylactic, WR 238605, and initiate Phase II studies
- (U) Conduct a Phase I/II clinical study on antimalarial halofantrine, prophylactic
- (U) Hold a Milestone (MS) I/II In-process Review (IPR) for halofantrine, prophylactic
- (U) Complete Phase II efficacy studies on WR 6026
- (U) Transition Paromomycin, a topical antileishmanial drug to advanced development
- (U) Transition Liquid Pesticide Sprayer to procurement
- (U) Transition Aerosol Generator for pesticides to procurement
- (U) Initiate Phase I testing of a falciparum malaria blood stage vaccine
- (U) Transition Rift Valley fever vaccine to Full Scale Development
- (U) Initiate preclinical testing of vaccines against entertoxigenic *Escherichia coli* (ETEC) and *Campylobacter*

(U) FY 1994 Planned Program:
- (U) Conclude Phase II clinical studies for WR 238605 and conduct a MS II IPR
- (U) Hold a MS II IPR for WR 6026
- (U) Submit an IND for Paromomycin and conduct Phase I clinical studies
- (U) Initiate Phase II testing of candidate falciparum malaria vaccines
- (U) Transition dengue vaccine to Full Scale Development
- (U) Initiate Phase I testing of vivax malaria sporozoite vaccine

(U) Project D809 - Medical Biological Defense Drug and Vaccine - Advanced Development: Supports advanced development of drugs, vaccines, and rapid identification products effective in diagnosing, preventing or treating the effects of biological agents; includes the assembly of preclinical data and submission of Investigational New Drug applications (IND) to the Food and Drug Administration; conducts Phase I/II safety and immunogenicity studies.

(U) FY 1992 Accomplishments:
- (U) Initiated Phase I testing of a Q-fever chloroform methanol risidue (CMR) extract vaccine
- (U) Initiated production and preclinical testing of a recombinant anthrax vaccine
- (U) Completed preclinical testing of a cell cultured derived smallpox (vaccinia) vaccine

(U) FY 1993 Planned Program:
- (U) Transition Q-fever vaccine to full scale development
- (U) Initiate Phase I testing of botulinal toxoid, type F
- (U) Initiate Phase I testing of the new smallpox vaccine

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603807A
PE Title: **Medical Systems - Advanced Development** Budget Activity: #4

(U) FY 1994 Planned Program:
- (U) Initiate Phase I testing of the recombinant anthrax vaccine
- (U) Continue preclinical testing of ricin toxoid
- (U) Continue preclinical testing of vaccine against staphylococcal enterotoxin B

(U) Project D811 - Military Human Immunodeficiency Virus (HIV) Vaccine and Drug - Advanced Development: This project was created to accommodate a FY92-97 redistribution of work and funds across appropriate PEs and does not represent a new start. This project funds the system specific advanced development through support of clinical trials of vaccines, chemotherapy regimens and gene therapy for medical defense against and treatment of HIV infections.

(U) FY 1992 Accomplishments:
- (U) Transitioned GP160 vaccine to Full Scale Development
- (U) Expanded Phase I trials of GP120 vaccine

(U) FY 1993 Planned Program:
- (U) Initiate Phase I testing of liposome encapsulated GP160 vaccine
- (U) Initiate Phase I studies of Zidovudine (AZT) and vaccine combination therapy

(U) FY 1994 Planned Program:
- (U) Continue Phase I studies of GP160 and GP120 vaccine

(U) Project D836 - Combat Medical Materiel - Advanced Development: Supports advanced development of new and improved systems essential for battlefield casualty care and return to duty in support of special, contingency, and conventional force operations.

(U) FY 1992 Accomplishments:
- (U) Completed user testing of Field Computed Tomography (CT) Scanner
- (U) Completed brassboard prototype of Lightweight Medical X-ray System
- (U) Continued development of Medical/Dental Filmless Imaging System
- (U) Transitioned External Rescue Hoist, UH-60 to AVSCOM
- (U) Completed technical testing of Molecular Sieve Oxygen Generating System

(U) FY 1993 Planned Program:
- (U) Award a contract for the development of Microencapsulated Antibiotic, Ampicillin (MEAA)
- (U) Continue development of Medical/Dental Filmless Imaging
- (U) Complete implementation of Medical Digital Imaging System
- (U) Transition CT Scanner to procurement
- (U) Initiate development of Field Triage Light
- (U) Initiate development of Suction Apparatus
- (U) Initiate development of Anesthesia Machine
- (U) Conducted a MS II IPR for the Antimicrobial Dermal Dressing (ADD) for Special Operational Forces use

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603807A
PE Title: **Medical Systems - Advanced Development** Budget Activity: #4

(U) FY 1994 Planned Program:
- (U) Completed technical testing Molecular Sieve Oxygen Generating System to procurement
- (U) Prepare an investigational new drug for MEAA Microencapsulated Antibiotic Ampicillin
- (U) Start development of Combat Emergency Medicine Expert System
- (U) Conduct user test of Medical/Dental Filmless Imaging System prototype
- (U) Initiate development of Intravenous Access Device
- (U) Continue development of Anesthesia Machine

(U) Project D837 - Soldier System Protection - Advanced Development: Supports demonstration and validation of medical materiel, including devices, pharmacologics and other tools, to protect, enhance, and sustain the physiological and psychological capabilities of soldiers in the face of combat operations under all environmental conditions.

(U) FY 1992 Accomplishments:
- (U) Continued advanced development of a hand-held, heat stress monitor whose output advises work/rest cycles and water consumption to support tactical decision-making
- (U) Conducted testing of commercially available "dip stick" technology to measure the presence of selected hazardous chemicals in field water
- (U) Initiated comparative evaluation of rapid bacteriological test procedures for incorporation into field water test kits

(U) FY 1993 Planned Program:
- (U) Continue advanced development of a hand-held heat stress monitor
- (U) Initiate, in conjunction with Army Materiel Command, technical testing and evaluation of vision correction devices for integration into soldier protective equipment
- (U) Complete technical testing and transition to engineering development of a rapid bacteriological test kit for field water potability analysis

(U) FY 1994 Planned Program:
- (U) Complete advanced development of a hand-held heat stress monitor
- (U) Continue technical testing and evaluation of vision correction devices for integration into soldier protective equipment

(U) Project D993 - Medical Defense Against Chemical Threats - Advanced Development. 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, sustain individual performance in a chemical environment and provide for self-aid and medical treatment of chemical casualties. 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.

(U) FY 1992 Accomplishments:
- (U) Conducted an In Process Review for the Multichambered Autoinjector, a replacement for the Nerve Agent Antidote Kit, Mark I

Program Element: #0603807A
PE Title: **Medical Systems - Advanced Development** Budget Activity: #4

- (U) Optimized a formulation for the Topical Skin Protectant which will protect against percutaneous exposure to chemical warfare agents
- (U) Completed Preformulation toxicology studies on the Nerve Agent Antidote System (HI-6/Atropine)
- (U) Completed user testing of Life Detector prototype

(U) FY 1993 Planned Program:
- (U) Award a contract for the final development of the Multichambered Autoinjector
- (U) Hold a Milestone I In Process Review for the Topical Skin Protectant, submit an application to the FDA, and initiate clinical studies
- (U) Conduct a special In Process Review for Nerve Agent Antidote System (HI-6/Atropine)

(U) FY 1994 Planned Program:
- (U) Initiate technical testing of the Multichambered Autoinjector advanced prototypes. Complete user testing of the Topical Skin Protectant
- (U) Award a contract for formulation development of Nerve Agent Antidote System (HI-6/Atropine)
- (U) Transition a cyanide pretreatment to advanced development

(U) Work Performed By:
D808: Work is performed in-house by U.S. Army Medical Material Development Activity, Fort Detrick, MD; Walter Reed Army Institute of Research, Washington, DC, and its field units in Thailand, Kenya, and Brazil; Naval Medical Research and Development Command, Bethesda, MD; and U.S. Navy Medical Research Unit, Cairo, Egypt and Lima, Peru. Primary civilian contractors: South Florida Research Corporation, Miami, FL; World Wide Biologics, Penndel, PA; University of Illinois, Chicago, IL; and Salk Institute, San Diego, CA.
D809: Work is performed in-house by U.S. Army Medical Material Development Activity, Fort Detrick, MD; U.S. Army Medical Research Institute of Infectious Diseases, Fort Detrick, MD; and Walter Reed Army Institute of Research, Washington, DC. Primary civilian contractors: Porton Products, International, Washington, D.C., and Salk Institute, San Diego, CA.
D811: Work is performed in-house by U.S. Army Medical Material Development Activity, Fort Detrick, MD and Walter Reed Army Institute of Research, Washington, DC, and its field unit in Thailand. Primary civilian contractor: H.M. Jackson Foundation, Bethesda, MD.
D836: Work is performed in-house by U.S. Army Medical Material Development Activity, Fort Detrick, MD; U.S. Army Institute of Dental Research, Washington, DC; and Letterman Army Institute of Research, San Francisco, CA Any residual efforts will transfer to Walter Reed Army Institute of Research (Dental Detachment) and U.S. Army Institute of Surgical Research (Mechanical Trauma Research Division) - - (see page 7 for BRAC impact). Primary civilian contractor: Sterimatics Incorporated, Bedford, MA.
D837: Work is performed in-house by U.S. Army Medical Material Development Activity, Fort Detrick, MD; U.S. Army Biomedical Research and Development Laboratory, Fort Detrick, MD; Letterman Army Institute of Research, San Francisco, CA (see page 7 for Brac Impact); U.S. Army Research Institute of Environmental Medicine, Natick, MA; U.S. Army Aeromedical Research Laboratory, Fort Rucker, AL. Primary civilian contractor is American Optical Corp. Southbridge, MA.
D9 : Work is performed in-house by the following organizations: U.S. Army Medical Material Development Activity, Fort Detrick, MD; Walter Reed Army Institute of Research, Washington, DC; U.S. Army Research Institute of Environmental Medicine, Natick, MA; Uniformed Services University of Health

Program Element: **#0603807A**
PE Title: **Medical Systems - Advanced Development** Budget Activity: **#4**

Sciences, Bethesda, MD; Major contractors include: Battelle Columbus Laboratories, Columbus, OH; Riker Labs, St. Paul, MN; Survival Technology Inc, Bethesda, MD; and Duphar B.V., Amsterdam, The Netherlands.

(U) Related Activities:

PE #0601102A (Defense Medical Sciences)
PE #0602787A (Medical Technology)
PE #0603002A (Medical Advanced Technology)
PE #0603105A (Military HIV Research)
PE #0604807A (Medical Material/Medical Biological Defense Equipment-ED)
PE #0605801A (Programwide Activities, Project MM02)
PE #0605898A (Management Headquarters (R&D), Project MMO3)

There is no unnecessary duplication of efforts in Army or DoD programs. This effort is coordinated with the following agencies annually, or more frequently as required: Department of Defense, Office of the ASD(HA) and of the Deputy Director, Defense Research Engineering (Research and Advanced Technology); All Joint Technology Coordinating Groups of the Armed Services Biomedical Research, Evaluation and Management Committee; Joint Services Container Steering Group; DoD Executive Agent for Land-Based Water Resources; Program Advisory Group for Bulk Petroleum Fuels Distribution; World Health Organization; and Pan American Health Organization. Duplication of effort within the Army is avoided through centralized management of the Medical Chemical Defense Program at U.S. Army Medical Research and Development Command. Inter-Service duplication is avoided by continuing joint service coordination, collaboration and liaison. Army, as executive agent for DoD Medical Chemical Defense, executes formal coordination by Joint Service Agreement, a Memorandum of Agreement with Air Force, and Joint Technology Coordinating Group of the Armed Services Biomedical Research Evaluation and Management Committee. Research efforts are also coordinated with Quadripartite and NATO nations through meetings and data exchanges.

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

(U) International Cooperative Agreements: Not applicable

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0603811A
PE Title: Meteorological Dat. ystems

Budget Activity: #4

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

Project Number Title	FY1992 Actual	FY1993 Estimate	FY1994 Estimate
DAB6 Target Area Meteorological Systems	3353	4055	0

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program provides upper air atmospheric profiles to the field artillery for fire support. Data is collected both forward and behind the Forward Line of Troops. Wind speed and direction, temperature, pressure and relative humidity information is collected for input to artillery error correction calculations. There are two efforts in this program element consisting of: (1) Atmospheric Profiler - Significantly improves the timeliness of Meteorological Data, leading to accuracy improvements. It will provide ballistic corrections out to 45 Kilometer. It will also provide Target Area Meteorological Data out to 200 Kilometers, using Meteorological Sensors. It provides the capability to fuse data from multiple Meteorological Sensors for field artillery applications. (2) Computer Assisted Artillery Meteorological (CAAM) develop software to integrate Q-37 FIREFINDER Radar winds, Unmanned Aerial Vehicle (UAV) Profiles or Artillery Meteorological Upper Air Profiles from up to three Meteorological Data Systems (MDS)/Meteorological Measurement Set (MMS) stations using either radiosonde or atmospheric profiler technology to improve time and space validity of Meteorological information.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) Project Number and Title: DAB6, Target Area Meteorological Systems

(U) FY 1992 Accomplishments:
- (U) Target Area Meteorological System (TAMS)/Advanced Field Artillery Tactical Data System (AFATDS) Study Completed
- (U) CAAM/Software Development On-Going
- (U) Integration of Sensor System Software On-Going
- (U) Radar Size Study On-Going

(U) FY 1993 Planned Program:
- (U) Complete CAAM Software Integration
- (U) Complete the Development of the CAAM Demo Package
- (U) Complete integration of Demo Meteorological Profiler System
- (U) Complete Radar Size Study.

(U) FY 1994 Planned Program: None, project terminated.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0603811A** Budget Activity: **#4**
PE Title: **Meteorological Data Systems**

(U) Work Performed By: In-house development will be conducted by Project Manager, Electronic Warfare/Reconnaissance Surveillance and Target Acquisition, Ft Monmouth, N. J.; the Program Executive Office, Intelligence and Electronic Warfare, Vint Hill Farms Station, Warrenton, VA; and the RDEC Center, Intelligence and Electronic Warfare Directorate (IEWD); and the US Army Research Laboratory, Battlefield Environmental Directorate, White Sands Missile Range (WSMR), NM.

(U) Related Activities: Program Element #0604726A Integrated Meteorological System support this Program Element. There is no unnecessary duplication of effort within the U.S. Army or DoD.

(U) Other Appropriation Funds:

	($ in Thousands)		
Appropriation	**FY 1992 Actual**	**FY 1993 Estimate**	**FY 1994 Estimate**
Other Procurement, Army (K27800)	2764	8064	10764

(U) International Cooperative Agreements: Independent Work Group Meetings (ISWG) are ongoing with NATO on a bi-annual basis.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604201A**
PE Title: **Aircraft Avionics** Budget Activity: **#4**

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

Project Number / Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
DC97 Aircraft Avionics	0	0	5061

B. (U) BRIEF DESCRIPTION OF ELEMENT: This PE funds the evaluation, tests, and engineering of avionics non-developmental items (NDI) for Army aircraft use. Much of the Army's existing avionics equipment are of older technology, difficult to support, not standardized and/or interoperable across combined arms teams and other services.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) Project DC97 - Aircraft Avionics: This project includes the Inertial Navigation System-Global Positioning (INSG) and the Operational Support Cost Reduction (OSCR) effort. The Global Positioning System (GPS) is a satellite based, world-wide, precision navigation system which provides position, velocity, and time information to the pilot and can automatically update self contained navigation systems. Due to weight, space, and power limitations, adding a separate GPS "black box" receiver is not a viable option for many Army aircraft. The Inertial Navigation System (INS) with an embedded Global Positioning System (GPS) printed circuit board is one way of addressing the weight, space and power limitations and still achieve the GPS capability. Additionally, having an integrated GPS capability is cost effective when addressing changes to the security architecture and critical to precision target acquisition. The INSG is the objective system for scout and attack helicopters. The other element in this project is the OSCR effort (FY94 only) which will develop test sets in support of the AH-64, OH-58 and MH-60 helicopters. These sets allow intermediate levels of maintenance to determine whether an/ASN-143 and 145 Heading Attitude Reference System (HARS) should be evacuated to the contractors. The INSG and OSCR efforts are new starts in FY94.

(U) FY 1992 Accomplishments:
- (U) Project not funded

(U) FY 1993 Planned Program:
- (U) Project not funded

(U) FY 1994 Planned Program:
- (U) Prepare/issue Request for Proposal (RFP) for INSG
- (U) Source selection for INSG
- (U) Contract award for INSG (EMD)
- (U) Conduct developmental testing to qualify box for INSG
- (U) Complete OSCR engineering and software programming

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604201A**
PE Title: **Aircraft Avionics** Budget Activity: **#4**

(U) Work Performed By: In-house efforts performed by PM, Aviation Electronic Combat, St. Louis, MO; and AF Common Avionics Directorate, Wright-Patterson AFB, OH; CECOM, Ft. Monmouth, NJ; ATCOM, St. Louis, MO; and, Draper Labs, Boston, MA. Contractors to be determined.

(U) Related Activities: INSG - The Air Force Common Avionics Directorate is the lead service in this effort as designated by DoD. There is no unnecessary duplication of effort within Army or DoD.

(U) Other Appropriation Funds: Not applicable

	($ in Thousands)		
Appropriation	**FY 1992 Actual**	**FY 1993 Estimate**	**FY 1994 Estimate**

(U) International Cooperative Agreements: None.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604220A**
PE Title: **Armed, Deployable OH-58D** Budget Activity: **#4**

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

Project Number / Title		FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D518	Armed, Deployable OH-58D	9171	7659	0

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element funds the integration and testing required for the addition of air-to-ground (ATG) weapons and multi-purpose light helicopter (MPLH) provisions to the OH-58D. Air-to-air Stinger (ATAS) has been a program requirement from the initiation of OH-58D to provide a self-defense capability against airborne threats. The ATG weapons (Hellfire, Hydra 70 rockets, and a .50-caliber machine gun) will allow the OH-58D to provide self-defense against ground threats and to destroy urgent targets in its projected armed reconnaissance role. A fully armed OH-58D will provide forward deployed air cavalry reconnaissance units and contingency units the ability to see, fight, and survive day and night. This addresses some of the current battlefield deficiencies until the fielding of the RAH-66 Comanche.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) Project D518 - Armed, Deployable OH-58D: Completion of the development and qualification testing of the MPLH kits, the Cockpit Procedures Trainer and the Composite Armament Trainer.

(U) FY 1992 Accomplishments:
- (U) Award retrofit contract
- (U) PEO In-Process Review (IPR)
- (U) Initiate development of MPLH kits
- (U) Continued development of Cockpit Procedures Trainer
- (U) Continued development of the Composite Armament Trainer

(U) FY 1993 Planned Program:
- (U) Continue development of Cockpit Procedures Trainer
- (U) Continue development of the Composite Armament Trainer
- (U) Continue development of MPLH and training devices

(U) FY 1994 Planned Program:
- (U) Complete qualification testing
- (U) Complete development of MPLH

(U) Work Performed By: In-house efforts will be performed by PM, Kiowa Warrior and PEO, Aviation, St. Louis, MO. Contractors are: Bell Helicopter Textron, Inc., Ft. Worth, TX; McDonnell Douglas Aerospace West, Monrovin, CA; Honeywell, Inc., Albuquerque, NM; and, General Motors, Allison Gas Turbine Division, Indiannapolis, IN.

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

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604220A**
PE Title: **Armed, Deployable OH-58D** Budget Activity: **#4**

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

	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
APA (AZ2200)	350403	319505	145548

(U) International Cooperative Agreements: Not applicable

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604223A** Budget Activity: **#4**
PE Title: **Comanche**

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

Project Number / Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D327 Comanche	491053	340377	298186
D397 Longbow-Comanche	0	10399	0
DC72 T800 Engine Engineering Development (LH)	23477	44444	68894
PE TOTAL	514530	*395220	367080

* The funding value stated here is accurate. It is inconsistent with the value reflected in the R-1 due to an administrative error.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program provides for the development of the RAH-66 Comanche and development of the T800 growth engine. The Comanche will replace the current light fleet of tactically obsolescent helicopters (AH-1, OH-6 and OH-58). Based on restructure direction from the Defense Acquisition Executive and Office of the Secretary of Defense, the Longbow system will be an integral part of Comanche subsequent to FY 1993; thus, Project D397 will no longer be identified as a separate project.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) Project D397 - Longbow-Comanche: 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, greatly increasing its effectiveness and survivability. The Longbow weapon system will be employable day or night in adverse weather and in obscurants. This project entails integration of the Longbow system onto the Comanche aircraft. Based on restructure direction from the Defense Acquisition Executive and the Office of the Secretary of Defense, the Longbow system will be an integral part of the Comanche subsequent to FY 1993, therefore, Project D397 is terminated after FY93.

(U) FY 1992 Accomplishments:
- (U) Project not funded

(U) FY 1993 Planned Program:
- (U) Initiate Comanche Longbow FCR integration design efforts

(U) FY 1994 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.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604223A** Budget Activity: **#4**
PE Title: **Comanche**

(U) RELATED ACTIVITIES:
PE 0604223A (Comanche T800 Engine - Engineering Development)
PE 0604816A (Longbow)
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 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604223A
PE Title: Comanche
Project Title: Comanche

Project Number: D327
Budget Activity: # 4

POPULAR NAME: Comanche

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

SCHEDULE	FY 1992	FY 1993	FY 1994		
Program Milestones	Program restructure 05/92	Conventional Systems Committee (CSC) 01/93			
Engineering Milestones			Critical Design Review (CDR) 12/93		
T&E Milestones					
Contract Milestones	Begin Restructure Proposal Evaluation Board 11/92	Award restructure mod 01/93 TEMP Update 04/93			
BUDGET ($000)	FY 1992	FY 1993	FY 1994		
Major Contract	466551	323809	281926		
Support Contract	10522	3308	2637		
In-House Support	11984	11910	12623		
GFE/ Other	1996	1350	1000		
Total	491053	340.	298186		

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604223A**
PE Title: **Comanche**
Project Title: **Comanche**

Project Number: **D327**
Budget Activity: **# 4**

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project provides for the development of the RAH-66 Comanche. It will be a lightweight, low cost, twin engine advanced technology helicopter that will retire the current light fleet of AH-1, OH-6 and OH-58A/C helicopters for the primary mission of armed reconnaissance, with attack, and embedded air combat capabilities. Comanche will provide an increase in combat effectiveness and battlefield survivability and will modernize the Army's corps and division scout and light attack fleet assets. Comanche will correct major light fleet deficiencies such as marginal night and adverse weather capability; location/navigation inaccuracies; inability to self-deploy to overseas theaters of operations; inadequate reliability, performance and survivability; and high operating costs. Comanche system improvements include lightweight composite airframe structures; protected anti-torque systems; low vibration, high-reliability rotor systems; reduced signature; built-in diagnostics/prognostics and second generation target acquisition and night vision sensors. The Comanche electronics architecture will be compatible with the Air Force F-22 fighter. The Comanche system will be integrated with the Army aviation force structure to complement the AH-64 attack helicopter.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- **(U)** Program restructured
- **(U)** Continued engineering development
- **(U)** Conducted Restructure Proposal Evaluation Board

(U) FY 1993 Planned Program:
- **(U)** Definitize restructure modification for air vehicle
- **(U)** Continue engineering development

(U) FY 1994 Planned Program:
- **(U)** Continue engineering development

D. (U) WORK PERFORMED BY: First Team (Boeing Helicopter/Sikorsky Aircraft Co.,) Trumbull, CT.

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY: NARRATIVE DESCRIPTION OF CHANGES

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

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

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604223A
PE Title: Comanche
Project Title: Comanche

Project Number: D327
Budget Activity: # 4

G. (U) RELATED ACTIVITIES:
PE #0604816A (Longbow)
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.

H. (U) OTHER APPROPRIATION FUNDS: Not applicable

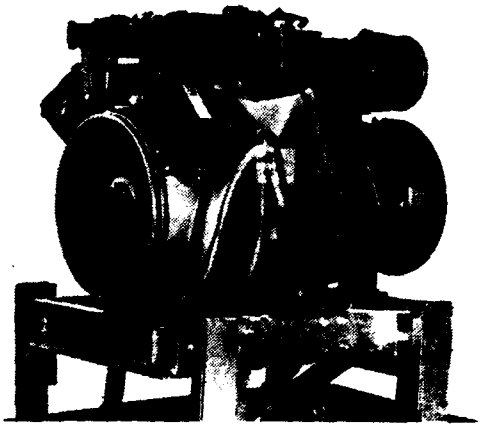
I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

J. (U) TEST AND EVALUATION DATA: Comanche first flights for Dem/Val and integrated MEP, are scheduled for August 1995 and July 1996. A combined test team (CTT), consisting of both contractor and government testers, will provide the framework to ensure all required testing is accomplished in the most economical and efficient manner. The CTT will be tailored to conduct comprehensive testing without duplication between the government and industry. Using the CTT concept, aircraft and MEP testing will consist of demonstrations required to ensure attainment of test objectives, establishment of the flight envelope and maintainability parameters.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604223A**
PE Title: **Comanche**
Project Title: **T800 Engine Engineering Development (LH)**

Project Number: **DC72**
Budget Activity: **# 4**



POPULAR NAME: **T800 Engine**

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

SCHEDULE	FY 1992	FY 1993	FY 1994		
Program Milestones					
Engineering Milestones		Growth Eng PDR 05/93 Qualify Baseline Engine 05/93			
T&E Milestones		Complete Baseline Qual Tests 12/92			
Contract Milestones		Award Restructure Mod 03/93			
BUDGET ($000)	FY 1992	FY 1993	FY 1994		
Major Contract	21133	43835	68312		
Support Contract	436	0	0		
In-House Support	1908	609	582		
GFE/ Other					
Total	23477	44444	68894		

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604223A** Project Number: **DC72**
PE Title: **Comanche** Budget Activity: **# 4**
Project Title: **T800 Engine Engineering Development (LH)**

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project includes tasks to design, develop 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. The Government's requirement allows industry the maximum latitude in design. This competitive development precedes the Comanche program to provide a qualified engine for initial Comanche prototype test and evaluation. The T800 engine will employ the latest state-of-the-art technology to reduce fuel consumption, reduce weight and improve reliability and maintainability relative to existing engines. These improvements are required to achieve the Comanche performance and weight goals with an allowance for system growth. Following preliminary flight rating tests, the Light Helicopter Turbine Engine Co., was selected to continue development and mature the engine to full qualification. Threat, operational requirements and performance parameters are identified with the Comanche aircraft system. The Army elected to exercise an engine growth program of 12% installed power starting in FY1993.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- (U) Completed all qualification testing

(U) FY 1993 Planned Program:
- (U) Deliver flight engines
- (U) Award modification for growth engine
- (U) Conduct Growth Engine Preliminary Design Review
- (U) Qualification of baseline engine

(U) FY 1994 Planned Program:
- (U) Continue growth engine engineering and manufacturing (EMD) development

D. (U) WORK PERFORMED BY: The major contractor is Light Helicopter Turbine Engine Co., Indianapolis, IN; and, Phoenix, AZ.

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY: NARRATIVE DESCRIPTION OF CHANGES

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

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.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604223A**
PE Title: **Comanche**
Project Title: **T800 Engine Engineering Development (LH)**

Project Number: **DC72**
Budget Activity: **# 4**

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

J. (U) TEST AND EVALUATION DATA: RAM validation will be a part of the production phase.

FY 1994 RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604256A**
PE Title: **Threat Simulator Development** Budget Activity: **#6**

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D976 Army Threat Simulator Program (ATSP)	26770	26774	18233

B. (U) BRIEF DESCRIPTION OF ELEMENT: Funding in this program element was realigned 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 the services. Program finances development of realistic mobile threat simulators. Threat simulators represent the threat system with a prescribed degree of fidelity. They are relatively expensive if procured in small numbers and are not destroyed in tests.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) **Project D976 - Army Threat Simulator Program (ATSP).** This is a continuing project which finances development of realistic threat simulators for Army test organizations. These battlefield simulators represent threat systems (e.g. missile systems; command, control, and 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 OSD 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. 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 1992 Accomplishments:**

- (U) Continued development of XM-TAR (previously XM-DES).
- (U) Initiated study on XM-DEWS (low power, medium power and high power)
- (U) Instrumented one XM-06A Surface to Air Missile (SAM) system and initiated validation parameters measurements.
- (U) Completed one XM-HKS jammer package, and initiated integration into MI-17 Helicopter.
- (U) Instrumented two XM-TSA radar systems.
- (U) Instrumented two XM-LTA radar systems.
- (U) Fielded four XM-P12S C3 systems and initiated validation measurements.
- (U) Initiated validation and fielding of Aircraft Survivability Equipment Trainer (ASET) IV Module.
- (U) User tests supported include:
  - Single Channel Ground & Airborne Radio System (SINCGARS)/Integrated Communications Security (COMSEC) Initial Operational Test and Evaluation (IOTE).
  - Unmanned Aerial Vehicle/Short Range Limited User Test Experimentation (LUTE)
  - Army Air Defense Electro-optical System
  - Multiple Subscriber Equipment - Follow on Evaluation (MSE-FOE)

- Night Target System
- Army Tactical Command & Control System Early User Test Experimentation (EUTE)
- Infrared Signature Test (IRID)
- Helicopter Detection
- Chicken Little
- Green Flag
- Advanced Self Protection Jammer (ASPJ)
- Tactical Unmanned Ground Vehicle EUTE

(U) **FY 1993 Planned Program:**

- (U) Complete XM-DEWS study initiated in FY 1992.
- (U) Complete validation and field ten XM-14/16S SAM systems.
- (U) Complete validation and field one XM-HKS.
- (U) Validate and field two XM-TSA Radar systems.
- (U) Validate and field two XM-LTA Radar systems.
- (U) Validate and field one XM-06A system.
- (U) Field one XM-11MS for the Air Force and develop one XM-11MS for the Army.
- (U) Initiate development of one XM-HOKS Helicopter utilizing KA-32 Helicopter.
- (U) Continue development of one XM-TAR
- (U) Initiate validation parameter measurements on XM-TAS.
- (U) Planned user tests requiring threat simulator support include:
  - Forward Area Air Defense Command, Control & Intelligence (FAAD C2I) (Light) Force Development Test and Evaluation (FDTE).
  - MSE-FOE (Corps) Follow-On Test and Evaluation (FOTE).
  - Joint Tactical Information Distribution System IOTE.
  - 155 millimeter Sense and Destroy Armor (SADARM) IOTE.
  - Multiple Launch Rocket System (MLRS) SADARM IOTE.
  - Avenger Non-Cooperative Target Recognition ESM Weapons Version LUTE.

(U) **FY 1994 Planned Program:**

- (U) Continue projects initiated in FY 1993 (XM-11MS; XM HOKS)
- (U) Baseline and instrument one XM-43A AAA gun System.
- (U) Initiate XM-HJS helicopter jammer.
- (U) Continue XM-TAR radar development.
- (U) Complete validation and field XM-TAS radar.
- (U) Planned user tests requiring threat simulator support include:
  - Unmanned Aerial vehicle - SR IOTE.
  - Aircraft Survivability Equipment (ASE) (AIQ-136) (APR-39) Special Electronics Missions Aircraft (SEMA) ASE FDTE.
  - 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 MLRS-SADARM.
  - Special Operations.

FY 1994 RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604256A**
PE Title: **Threat Simulator Development** Budget Activity: **#6**

(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; Ford Aerospace, Newport Beach, CA; GTE, Sanford CA: Electronic Warfare Associates, Huntsville, AL; and Nichols Research Corp., Huntsville, AL. In-house work: 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; and Vulnerability Lab, Albuquerque, NM.

(U) Related Activities: There is no unnecessary duplication of effort within the 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)

	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Other Procurement Army (OPA) MA6700	7306	6131	2520

(U) International Cooperative Agreements: Not applicable.

FY 1994 RDTE DESCRIPTIVE SUMMARY

Program Element: #0604258A
PE Title: Targets Systems Development
Budget Activity: #6

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

Project Number / Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D238	Aerial Targets		
	10780	9221	11898
D459	Ground Targets		
	1361	645	7047
PE TOTAL	12141	9866	18945

B. (U) BRIEF DESCRIPTION OF ELEMENT: Funding in this program element (PE) was realigned 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 all phases of aerial and ground target life cycle management. This includes development, acquisition, operation, maintenance, storage, and modification of realistic surrogate targets; and acquisition, operation, maintenance and updates of foreign assets used in test and evaluation. Targets are developed/acquired to support testing and training, are economical and expendable, are remotely controlled or stationary, and are often destroyed in test. This account also covers in-house support costs as well as matrix support to ensure that current testing capability requirements are met.

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. 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 represents 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 target availability for the test and evaluation customer.

(U) FY 1992 Accomplishments:

- (U) Continued development of Full Scale Rotary Wing Target (HAVOC) (Started in FY 1991).
- (U) Participated in Air Force led joint development of Full Scale Fixed Wing Target (QF4) (Started in FY 1991).
- (U) Refined requirements for Full Scale Rotary Wing Target (HOKUM) (Started in FY 1991).
- (U) Continued enhancement of subscale targets and augmentation devices.
- (U) Continued studies of Aerial Cable Test Capability (ACTC) facility targets (Started in FY 1991).

FY 1994 RDTE DESCRIPTIVE SUMMARY

Program Element: #0604258A
PE Title: **Targets Systems Development** Budget Activity: #6

(U) **FY 1993 Planned Program:**

- (U) Continue Full Scale Rotary Wing Target (HAVOC) development.
- (U) Continue enhancement of subscale targets and augmentation devices.
- (U) Continue participation in Air Force led joint development of Full Scale Fixed Wing Targets (QF-4).
- (U) Initiate development (contract award) of Universal Drone System (UDS) Control Kit
- (U) Perform detailed planning for Full Scale Rotary Wing Target (FSRWT) (HOKUM).
- (U) Prepare Statement of Work (SOW) for development of FSRWT HOKUM target and begin the acquisition process for contract (with options) award.
- (U) Continue maintenance, storage and development/enhancement/update engineering services for all RDTE aerial targets.
- (U) Begin Army participation in development of vector scoring to provide more accuracy and detail about performance relative to the threat aircraft with Navy as lead.

(U) **FY 1994 Planned Program:**

- (U) Begin full scale program development of FSRWT (HOKUM).
- (U) Continue development and begin test of FSRWT (HAVOC).
- (U) Continue development of UDS and begin building prototype for testing.
- (U) Continue enhancement of subscale targets and augmentation devices.
- (U) Continue participation in Air Force led joint development of Full Scale Fixed Wing Target (QF-4).
- (U) Initiate development of overall intensive management plan for helicopter targets and stress enhancements for the MQM-107 sub-scale target.
- (U) Continue development and build prototype cable targets for the Aerial Cable Test Capability at White Sands Missile Range, NM.
- (U) Continue maintenance, storage and development/enhancement/update engineering services for all RDTE aerial targets.
- (U) Implement HAVOC/UDS configuration management program for hardware and software technical data.
- (U) Develop, build, and test prototype Target, Tracking, and Control System (TTCS) mapping via video monitors to replace current plotting boards.
- (U) Develop Drone Formation Control System (DFCS) helicopter integration to enable formation helicopter flights.
- (U) Investigate and test digital and fluidic gyros for t .MQM-107 to increase target reliability and performance.
- (U) Investigate aerodynamic shapes and profiles, fligh ontrols, propulsion, and software for increasing MQM-107 reliability and performance.
- (U) Investigate the safety of MQM-107 development items.
- (U) Continue Army participation in development of vector scoring to provide more accuracy and detail about missile performance relative to the threat aircraft with Navy as lead.
- (U) Implement and maintain configuration control of MQM-107 documentation package at US Army Missile Command (MICOM).

(U) **Project D459 - Ground Targets.** 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 surrogate and acquired targets; continuing maintenance storage, and develoment/enhancement/update engineering services of the developed and acquired threat targets to ensure target availability for the test and evaluation customer.

(U) **FY 1992 Accomplishments:**

- (U) Continued planning for surrogate development of light, medium, and heavy armor targets.
- (U) Completed validation of Main Battle Tank (MBT) target.
- (U) Provided validation support for Smart Weapons targets requirements.
- (U) Initiated action for procurement of MBT target.
- (U) Managed use of MBT surrogate targets for test.
- (U) Continued consolidation of target requirements.
- (U) Established management process for foreign equipment to be used as ground targets.
- (U) Established an inventory and maintained foreign targets for use in test and evaluation.

(U) **FY 1993 Planned Program:**

- (U) Continue support for target validation and accreditation processes.
- (U) Continue consolidation of target requirements.
- (U) Conduct threat target requirements study.
- (U) Manage use of consolidated target assets.
- (U) Continue planning of target development and consolidation.
- (U) Until adequate funding is available in FY 1994, continue the maintenance of ground targets, to include foreign materiel (test targets), through cannabilization to meet current high priority testing requirements.

(U) **FY 1994 Planned Program:**

- (U) Initiate intensive major foreign asset management program (150 plus foreign test targets)
  - Staff up to manage the foreign asset program.
  - Initiate translation to English of operation, maintenance, and spare parts manuals.
  - Implement and fund primary operation centers concept for storage, maintenance and repair of foreign targets.
  - Establish and fund initial first year support to set up centralized spare parts inventory, storage, and control test activity.
  - Acquire spare parts for 150 plus foreign targets being used by test community.
  - Procure foreign asset spares to repair non-operational foreign assets due to previously unavailable spares.
  - Determine US replacement parts acceptable for use on foreign assets and add to the parts inventory.
  - Acquire a foreign asset for test.
- (U) Support validation and accreditation of targets.
- (U) Consolidate near and long-term target requirements and develop plan to satisfy needs for test and evaluation.

FY 1994 RDTE DESCRIPTIVE SUMMARY

Program Element: #0604258A
PE Title: **Targets Systems Development** Budget Activity: #6

- (U) Conduct threat target requirements study.
- (U) Implement and manage configuration control and inventory control of surrogate and foreign targets.
- (U) Initiate development of two surrogate targets: BMP 2/3 and 2S6.
  - Develop level 2 drawing packages.
  - Develop safety plan on each surrogate.
  - Develop production plan, maintenance and operation plan.
  - Produce two of each target type (4 total).

(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 Parie, TX; Nichols Research, Huntsville, AL; Pioneer Aero Corp., South Windsor, CT; Rozendale Associates, El Cajon, CA; Stone Engineering, Huntsville, AL; SW 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, NM; Aviation Technical Test Activity, Fort Rucker, AL; Redstone Technical Test Center, Huntsville, AL; PM ITTS, Huntsville, AL, 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 #0605602A (Army Technical Test Instrumentation)
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 #0605862N (RDT&E Instrumentation and Materiel Support)
PE #0604735F (Range Improvement)
PE #0604940D (Central Test and Evaluation Investment Program)

(U) **Other Appropriation Funds:** ($ In Thousands)

Appropriation	FY 1992	FY 1993	FY 1994
Other Procurement, Army (OPA)	Actual	Estimate	Estimate
Air Defense Targets (C93000)	11155	11125	14967

(U) **International Cooperative Agreements:** Not applicable.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604270A**
PE Title: **Electronic Warfare Development** Budget Activity: **#4**

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D540 Protective Electronic Warfare Systems Engineering Development (Stingray)			
D611 Tactical Deception Army-Wide			
D665 Aircraft Survivability Equipment (ASE) Development			
DL12 Signal Warfare Development			
DL14 Expendable Jammers ED			
DL18 High Value Asset Defense Systems			
PE TOTAL			

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program encompasses advanced and engineering development for tactical electronic warfare (EW), signal 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.) Signal 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 of 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. A multispectral approach using physical decoys, electro-magnetic signals, will portray false target arrays. The High Value Asset System will provide effective protection of personnel and equipment from electronically fused munitions.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) Project Number and Title: Project D540 - STINGRAY Combat Vehicle Protection System AN/VLQ7: STINGRAY is an Electro-Optical Countermeasure (EOCM) system mounted on the Bradley Fighting Vehicle which provides protection from enemy optical and electro-optical (OEO) target acquisition and fire control systems. STINGRAY 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 the STINGRAY. The system provides increased survivability and effectiveness along with added time to engage the threat with conventional armament systems. STINGRAY transitioned to ATD status and is funded in PE #0603270A as of FY 1993.

(U) FY 1992 Accomplishments:
- (U) Advanced Technology Demonstration (ATD) Acquisition Decision Memorandum (ADM) Signed
- (U) ATD Contract Negotiated and awarded

(U) FY 1993 Planned Program: None

(U) FY 1994 Planned Program: None

(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.

Included in this project for FY94, the Army Reprogramming Analysis Team (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

Program Element: **#0604270A**
PE Title: **Electronic Warfare Development** Budget Activity: **#4**

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. This is not a new start. ARAT efforts were previously funded under project DL12, Signal Warfare Development.

(U) FY 1992 Accomplishments:

- **(U)** Combat Support Decoys (CSD). Prepared draft acquisition strategy.
- **(U)** Communication Deception System (CDS). Completed Critical Design Review and conducted a Milestone Decision Review (MDR) III In-Process Review (IPR).
- **(U)** Close Combat Decoys (CCD). Conducing Phase III of the Preproduction Qualification Test (PPQT). Held a Test Integration Working Group (TWIG).

(U) FY 1993 Planned Program:

- **(U)** Conduct Milestone Decision Review III In-Process Review (IPR) on P3I SMOKE/FLASH device for Close Combat Decoys.
- **(U)** Communication Deception System (CDS). Awarded production contract.
- **(U)** Close Combat Decoys (CCD). Held a Test Integration Working Group (TIWG), Operation Test Readiness Review III and initiated Initial Operational Test and Evaluation (IOT&E).

(U) FY 1994 Planned Program:

- **(U)** Prepare for Milestone Decision (MDR) III In-Process Review (IPR) on Close Combat Decoys.
- **(U)** Conduct Critical Design Review on Close Combat Decoys P3I.
- **(U)** Establish the Wide Area Network for the ARAT nodes.
- **(U)** Modernization of Hardware/Software for the critical ARAT nodes.
- **(U)** Participate in Joint Service Software Reprogramming Exercise.
- **(U)** Develop integrated Threat Analysis and Software Reprogramming Tools.
- **(U)** Complete ARAT Commander's Staffs and Field Units Requirements Study.
- **(U)** Develop survivability profile for threat countermeasures.

(U) Project Number and Title: Project DL14 - Expendable Jammers Engineering Development (EXJAM):

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604270A
PE Title: **Electronic Warfare Development** Budget Activity: #4

(U) **FY 1992 Accomplishments:**
- (U) Extend frequency into UHF range.
- (U) Provide for remote activation of jammer devices.
- (U) Increase output power and operating time.
- (U) Transition payload package into Unmanned Aerial Vehicle (UAV) program.
- (U) Demonstrated extended range (from 22km limit to 28km limit).

(U) **FY 1993 Planned Program:** No planned program.

(U) **FY 1994 Planned Program:** No planned program.

(U) **Project Number and Title:** Project DL18 - High Value Asset Defense Systems: The High Value Asset Defense System 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. 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.

(U) **FY 1992 Accomplishments:** Not Applicable

(U) **FY 1993 Planned Program:** Not Applicable

(U) **FY 1994 Planned Program:**
- (U) Complete Engineering and Manufacturing Development (EMD) on Lightweight version of SHORTSTOP.
- (U) Conduct Milestone IA (MS IA) In Process Review (IPR).
- (U) Type classify hardware procured under Limited Procurement Urgent (LRU).

(U) **WORK PERFORMED BY:**

(U) **D611** 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) **D540** The prime contractor for the ATD program will be Martin Marietta Electronics Systems, Orlando, FL. In-house development is conducted by the Project Manager Electronic Warfare/Reconnaissance, Surveillance and Target Acquisition, Fort Monmouth, NJ; the Program Executive Officer, Intelligence and Electronic Warfare, Vint Hill Farms Station, Warenton, VA; and the Communications-Electronics Command Electronic Warfare/Reconnaissance, Surveillance and Target Acquisition Directorate, Fort Monmouth, NJ.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604270A
PE Title: **Electronic Warfare Development** Budget Activity: #4

(U) **DL14** Program Executive Officer Intelligence and Electronic Warfare (PEO IEW) and Project Manager Signals Warfare, Vint Hill Farms Station, Warrenton, VA. Support Contractor is Vitro, Silver Springs, MD. Major development contractor is Loral Syosset, NY (Firm Fixed Price).

(U) **DL18** Program Executive Officer, Intelligence and Electronic Warfare, Vint Hill Farms Station, Warrenton, VA; and the Project Manager FIREFINDER, Ft. Monmouth, NJ; Army Research Laboratory, Adelphi, MD; Night Vision Electronic Sensors Directorate, Ft. Monmouth, NJ; and Intelligence Materiel Management Center, Vint Hill Farms Station, Warrenton, VA. Major Development Contractor - Whittaker Electronic Systems, Simi Valley, CA.

(U) **Related Activities:**

(U) **D611** None

(U) **D540** PE #0602702E Diode Pumped Kilowatt Laser (DARPA)
PE #0603226E Automatic Tracking System (DARPA)
PE #0603270A Electronic Warfare Technology

(U) **DL14** The XM867 Artillery Delivery Expendable Jammer (ADEXJAM) provides a capability not presently available in the Army's inventory. Army Tri-Service Common Module Laser Program - Related EW developments are conducted by the Navy and Air Force. Coordination between the services minimizes duplication of effort and ensures the interchange of technical data. This is accomplished by reviews conducted by Joint Requirements Oversight Group, through exchange of technical reports, attendance at scientific meetings and conferences and joint participation on subgroups and working panels. There is no unnecessary duplication of effort within Army or DOD.

(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)

(U) **Other Appropriation Funds:** None

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

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604270A
PE Title: **Electronic Warfare Development**

Project Number: #D665
Budget Activity: #4

A. (U) RESOURCES: ($ in Thousands)
Project Title: Aircraft Survivability Equipment

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D665 Aircraft Survivability Equipment (ASE) Development			
	34457	28952	35415

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 Light Helicopter and Special Operations Aircraft.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- (U) Continued engineering and manufacturing development (EMD) of AN/APR-39A(XE-2) Radar Signal Detecting Set (RSDS) and AN/APR-48A Radar Frequency Interferometer (RFI)
- (U) Continued demonstration and validation of the Advanced Threat Infrared Countermeasure (ATIRCM) and Advanced Threat Radar Jammer (ATRJ)
- (U) Initiated development of Tri-Service application Infrared (IR) Expendable
- (U) Continued EMD of ASET IV ASE Training Device
- (U) Provided for in-house and software support

(U) FY 1993 Planned Program:
- (U) Continue demonstration and validation of ATIRCM and ATRJ
- (U) Continue demonstration and validation of IR expendables of a decoy for IR threat missiles
- (U) Complete EMD of AN/APR-39A(XE-2) RSDS, AN/APR-48A RFI, ASET IV programs
- (U) Continue integration efforts of ASE systems for most effective use of countermeasures
- (U) Initiate development of Passive IR features for reduction of aircraft signature in all IR band relative to heat seeking missiles
- (U) Continue in-house and software support

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604270A
PE Title: **Electronic Warfare Development**
Project Number: #D665
Budget Activity: #4

(U) **FY 1994 Planned Program:**

- (U) Initiate EMD of the ATRJ and IR Expendables
- (U) Continue demonstration and validation of the ATIRCM
- (U) Continue integration efforts of ASE systems
- (U) Continue Integrated Passive Infrared and Optical Features analysis effort
- (U) Initiate demonstration and validation of Passive Infrared and Optical Features
- (U) Continue effectiveness evaluations and rapid reprogramming
- (U) Continue in-house and software support

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; Night Vision and Electronic Sensors Directorate, 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 Corporation, Nutley, NJ; Litton Systems, San Jose, CA; Lockheed Sanders, Nashua, NH; IBM, Owego, NY; Sierra Research, Buffalo, NY; BHTI, Fort Worth, TX; AEL, Lansdale, PA; Teledyne Brown, Huntsville, AL; CAS, Huntsville, AL.

E. (U) COMPARISON WITH FY 1993 AMENDED 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

H. (U) OTHER APPROPRIATION FUNDS:

		($ in Thousands)	
Appropriation	**FY 1992 Actual**	**FY 1993 Estimate**	**FY 1994 Estimate**
Aircraft Procurement, Army			
AZ3504 ASE	43538	51910	37559
AA0720 ASE Modifications	24911	7106	4180

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. (U) MILESTONE SCHEDULE: Not Applicable

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604270A**
PE Title: **Signals Warfare Development**

Project Number: **DL12**
Budget Activity: **#4**

A. (U) RESOURCES: ($ in Thousands)
Project Title: Signals Warfare Development

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Signals Warfare Development	139,719	62,367	20,860

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project provides for an integrated ground-based and heliborne Intelligence and Electronic Warfare Common Sensor (IEWCS) System. This system will enhance the Division Commander's ability to outmaneuver and defeat the enemy by isolating and suppressing the opposing fire control and command control nets at the critical time of the battle. It will provide electronic overwatch of the entire spectrum, freeze the enemy in place and help eliminate enemy counterfire. The various tasks within this project are:

1.

2. (U) The IEW Ground Based Common Sensor (GBCS) system is the ground-based equivalent of Advanced QUICKFIX. The GBCS will leverage technology to provide a single system to perform the missions of five fielded IEW systems - TRAILBLAZER, TEAMMATE, TACJAM, TRAFFICJAM and TEAMPACK. The GBCS will share common components, architecture, and software with Advanced QUICKFIX and the two systems will be totally interoperable. GBCS is being configured in two variants: one, the GBCS-Light, for Light, Airborne, and Air Assault Divisions utilizing a Heavy High Mobility Multi-Purpose Wheeled Vehicle (HHV); and two, the GBCS-Heavy, for Armored and Mechanized Infantry Divisions utilizing the Electronic Fighting Vehicle System (EFVS), a derivative of the Multiple Launch Rocket System carrier. The United States Marine Corps will utilize common modules and sub-systems developed under this project to integrate into their Mobile Electronic Warfare Support System (MEWSS).

3.

Program Element: **#0604270A** Project Number: **DL12**
PE Title: **Signals Warfare Development** Budget Activity: **#4**

4.

5. (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 IEW Ground Based Common Sensor.

Included in this project in FY92 and FY93 was High Value Asset Defense Systems (SHORTSTOP).

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- (U) Awarded Contract for fabrication of TACJAM-A ESM E&MD subsystems
- (U) Awarded Contract for fabrication of TACJAM-A ECM E&MD subsystems
- (U) Delivered TACJAM-A ESM prototype subsystem in place
- (U) Delivered first EFVS to the IEWCS integration contractor
- (U) Exercised option for two additional EFVS for GBCS-H and continue E&MD
- (U) Delivered first GBCS-L prototype platform to the IEWCS integration contractor
- (U) Conducted Preliminary Design Review (PDR) for IEWCS Contractor
- (U) Delivered one EH-60A platform to IEWCS Contractor
- (U) Initiated risk reduction effort to eliminate mutual interference among SHORTSTOPs.

(U) FY 1993 Planned Program:
- (U) Exercise Option for GBCS-L Operational Need Statement (ONS) systems
- (U) Conduct Critical Design Review (CDR) for IEWCS
- (U) Deliver 3 GBCS-L platforms for integration
- (U) Deliver CHALS-X prototype subsystems for integration
- (U) Deliver TACJAM-A ESM subsystems for integration
- (U) Deliver last two EH-60A Platforms for integration
- (U) Deliver last two EFVS to IEWCS integration contractor
- (U) Customer Test on GBCS-L ONS
- (U) Operational Requirements Document (ORD) initiated for SHORTSTOP.
- (U) SHORTSTOP Engineering and Manufacturing Development (EM&D) Contract Award.
- (U) Training and Doctrine Command (TRADOC) Proponent School assigned for SHORTSTOP.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604270A
PE Title: Signals Warfare Development

Project Number: DL12
Budget Activity: #4

(U) FY 1994 Planned Program:

- (U) Conduct ONS IPR
- (U) Field RDT&E Models of GBCS-L ONS Systems to XVIII Airborne Corps
- (U) Conduct development and operational test (DT/OT) are planned

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, Communications and Electronics Command (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 1993 AMENDED DESCRIPTIVE SUMMARY:
NARRATIVE DESCRIPTION OF CHANGES

1. TECHNICAL CHANGES: None

2. SCHEDULE CHANGES:

- (U) Delay initiation of Block II IEWCS upgrades from FY94 to FY97:
  - TROJAN interface (remote collection)
  - Training devices (maintenance and operator)
  - Embedded training
  - Reduction of multipath effects
  - Connectivity with AN/PRD-12
- (U) Cancel FY94 GBCS-L (ONS) Production

3. COST CHANGES:

- (U) The FY 1993 Congressional appropriation increase of $25 million to the Electronic Warfare program has been offset by a similar reduction in FY 1994. The intent of the redistribution of the FY 1993 increase is that there be no change in the Total Cost/Schedule of this program as a result of the above identified Congressional action.
- (U) Total program R&D cost has increased due to the slowing of subsystem development necessitated by funding profile changes.
- (U) Procurement costs are increased due to the staggered introduction of the capabilities.
- (U) Operations and Maintenance costs are increased due to the requirement for longer support of the current systems resulting from the delay.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604270A** Project Number: **DL12**
PE Title: **Signals Warfare Development** Budget Activity: **#4**

F. (U) PROGRAM DOCUMENTATION:

TACJAM-A Required Operational Capability (ROC)	07/86
82d Airborne Division ONS	07/88
IEW GBCS ROC	10/90
Advanced QUICKFIX Materiel Change	09/91
Advanced QUICKFIX ORD	12/92

G. (U) RELATED ACTIVITIES:

- 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)
- 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 Army or DoD.
- This is a multi-service development effort. The United States Marine Corps is utilizing the IEWCS sensor subsystems and configuring them in their Light Armored Vehicle as a part of their Mobile Electronic Warfare Support System (MEWSS).

H. (U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Procurement (SSN BA6100)	0	0	8,919
(SSN BZ7326)	0	0	0
(SSN BZ9752)	10,407	14,610	6,629
(SSN AB3000)	6,299	393	508
NSA RDTE (PE0303885G)(TCP)	17,524	21,292	22,478
USMC RDTE (PE03038856)(TCP)	0	4,000	4,500

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604270A** Project Number: **DL12**
PE Title: **Signals Warfare Development** Budget Activity: **#4**

J. (U) MILESTONE SCHEDULE:

Milestones	Dates
Started TACJAM-A E&MD ESM prototype effort	07/89
Awarded IEWCS Integration Contract	09/91
Delivered first EH-60A platform to IEWCS Contractor (AQF)	11/91
Delivered first EFVS to IEWCS Contractor (GBCS-H)	02/92
Delivered first GBCS-L prototype platform to IEWCS Contractor	07/92
Exercised Option for EFVS Production Contract	03/92
Delivered first ESM E&MD Prototype to IEWCS Contractor	06/92
Conducted Preliminary Design Review (PDR)	06/92
Exercise Option for GBCS-L/ONS	10/92
Conduct Critical Design Review (CDR)	11/92
Deliver three GBCS-L platforms to IEWCS Contractor	11/92
Deliver last two EH-60A platforms to IEWCS Contractor (AQF)	02/93
Deliver 2nd ESM E&MD Prototype to IEWCS Integration Contractor	03/93
Deliver CHALS-X E&MD prototype to IEWCS Contractor	03/93
Deliver TACJAM-A ESM E&MD subsystems for integration	06/93
GBCS-L/ONS Customer Test	09/93
Field Initial GBCS ONS Systems	09/94
Complete Development and Test of Advanced QUICKFIX/GBCS	11/94
Award contracts for procurement of GBCS subsystems	10/94
Award contract for Advanced QUICKFIX engine upgrade	10/94

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604315A**
PE Title: **Tri-Service Standoff Attack Missile**
Project Title: **TSSAM**

Project Number: **DF08**
Budget Activity: **#4**

POPULAR NAME: **TSSAM**

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

SCHEDULE	FY 1992*	FY 1993*	FY 1994		
Program Milestones					
Engineering Milestones			TSSAM/BAT CDR		
T&E Milestones			Conduct Sled Test BTV-8 Start MTV		
Contract Milestones					
BUDGET ($000)	**FY 1992**	**FY 1993**	**FY 1994**	**FY 1995**	**Program Total (To Complete)**
Major Contract			57900		
Support Contract			0		
In-House Support			7582		
GFE/ Other			24200		
Total			89682		

* THIS DATA IS CLASSIFIED.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604315A**
PE Title: **Tri-Service Standoff Attack Missile**
Project Title: **TSSAM**

Project Number: **DF08**
Budget Activity: **#4**

B.(U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Congressional directed Joint Program with the Air Force as the executive service to develop a Tri-Service Standoff Attack Missile (TSSAM). The TSSAM will be a highly survivable tactical cruise missile capable of stand-off attack against land and sea targets. The Army's TSSAM will be launched from the Multiple Launch Rocket System (MLRS) and dispense BAT submunitions to engage follow-on maneuvering armor forces. Portions of the program were declassified with the FY 1994 President's Budget submission.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
CLASSIFIED

(U) FY 1993 Planned Program:
CLASSIFIED

(U) FY 1994 Planned Program:
- (U) Continue MLRS Test Vehicle (MTV) Flight Tests
- (U) Complete Boost Test Vehicle (BTV) Flight Tests
- (U) Complete Munition Dispense System Dev

D. (U) WORK PERFORMED BY: Northrop Aircraft Division is the prime contractor responsible for total system performance. LVS Corporation is the MLRS M270 Launcher Integration Contractor.

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY:
NARRATIVE DESCRIPTION OF CHANGES

Program was addressed in classified Annex.

1. **(U) TECHNICAL CHANGES:** None
2. **(U) SCHEDULE CHANGES:** None
3. **(U) COST CHANGES:** FY94 funding was adjusted for inflation.

F. (U) PROGRAM DOCUMENTATION:
Army Requirements Operational Capability (ROC), Feb 85
System Threat Assessment Report (STAR), Jan 90
Acquisition Program Baseline approval scheduled for Oct 93
Test and Evaluation Master Plan approval scheduled for Oct 93

G. (U) RELATED ACTIVITIES:
Program Element/Project #64768/641, BAT
Program Element/Project #23802/050, Multiple Launch Rocket System (MLRS)
(U) EMD and development of BAT submunitions. Deep Attack version for MLRS M270 Launcher.
There is no unnecessary duplication of effort within the Army of DoD.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604315A**
PE Title: **Tri-Service Standoff Attack Missile**
Project Title: **TSSAM**

Project Number: **DF08**
Budget Activity: **#4**

H. (U) OTHER APPROPRIATION FUNDS:

	($ in Thousands)		
Appropriation	**FY 1992 Actual**	**FY 1993 Estimate**	**FY 1994 Estimate**
Procurement	NONE	NONE	NONE
Military Construction	NONE	NONE	NONE

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

J. (U) TEST AND EVALUATION DATA: During EMD, the Northrop/Government team has successfully conducted Army Boost Test Vehicle (BTV) launches from M270 MLRS Launcher, with the most recent test demonstrating successful transition from boosted launch to flight including vehicle maneuverability and ability to follow a preplanned route. The BTV series will be completed within the next year followed by the MLRS Test Vehicle (MTV) series which will focus on extending the Army TSSAM envelopes and investigating navigation performance. Dispense Test Vehicles (DTV) will follow, with emphasis on Army TSSAM's ability to successfully dispense BAT submunitions and engage armor. Operational Tests (OT) will demonstrate operational utility.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604321A (TIARA)**
PE Title: **All Source Analysis System (ASAS)** Budget Activity: **#4**

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D926 ASAS-All Source Analysis System Engineering Development	56978	0	0
DB19 ASAS Evolutionary Acquisition	48194	51476	971
PE TOTAL	105172	51476	971

B. (U) **BRIEF DESCRIPTION OF ELEMENT:** Successful execution of military operations requires an intelligence, targeting, and command and control system that provides commanders at all levels a near real-time, common picture of the enemy situation. Currently, there is no fielded automated capability to receive and correlate collected data, develop intelligence and targeting information, and distribute critical intelligence and command and control information in a timely manner from the numerous intelligence collection sensors/sources which produce voluminous amounts of valuable, perishable data. In view of this requirement, under the cognizance of the Program Executive Office for Command and Control Systems, the Program Manager All Source Analysis System (ASAS) is developing and fielding the ASAS, a tactically deployable automated data processing system that will provide Army commanders at division and above a state-of-the-art system for targeting, intelligence and electronic warfare command and control. This program funds evolutionary acquisition/development of initial capabilities in order for ASAS to reach its objective capabilities through evolutionary development and acquisition.

C. (U) **JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:**

Project Number and Title: D926 - All Source Analysis System - Engineering Development: This project funds the Block I development of the Army All Source Analysis System (ASAS). The successful execution of military operations requires an intelligence and targeting system that will provide Army commanders a common view of the battlefield at all levels and a means for gaining a timely and comprehensive understanding of Opposing Forces deployments, capabilities, and potential courses of action. The ASAS is a ground based, mobile, intelligence processing system designed to provide automated support to the combat commander in the areas of intelligence and collections management, all-source target and situation analysis, single and multi-source processing and reporting, electronic warfare, and operational security as well as support to the generation of intelligence products in those areas. Block I ASAS systems are fielded to eleven active Army divisions and corps, and the training base. The ASAS Block I system, which incorporates Balanced Technology Initiative (BTI) for improved timeliness and accuracy of intelligence support to the battlefield commander, is comprised of several hardware modules: the Communications Control Set, AN/TYQ-40 (Common Name: Forward Sensor Interface and Control (FSIC) module) which relays data from ground based sensors/sources in forward areas back to the data processing modules and provides the interface between the data processing modules and the areas communications network; the Data Processor Set, AN/TYQ-36 (Common Name: ASAS Interface Module (AIM) or Dual (DAIM)), which processes intelligence data; the Workstation Color Graphics, AN/TYQ-37 (Common Name: Portable ASAS Workstation

(PAWS)), which is the primary user interface with system; the Technical Control and Analysis Center (TCAC), AN/TSQ-30, which provides centralized communications interface to forward deployed signal intelligence/electronic warfare (SIGINT/EW) assets and provides mission management and support to the SIGINT analyst; the TCAE analyst workstation, AN/TYQ-50, which are computer graphics workstations with intelligence management software; and, the Supplementary Equipment Electronic (SEE), AN/TQY-42, which provides additional enclave equipment and the maintenance capability. Fieldings to Force Package I units begins in FY93.

(U) **FY 1992 Accomplishments:**

- (U) Joint Requirements Oversight Council Validation
- (U) Defense Information Systems Agency (DISA) Communications Certification Tactical Operations Center Support Element
- (U) Office Secretary of Defense (OSD) Command, Control, Communications and Intelligence (C3I) Program Review
- (U) Completed Defense Intelligence Agency (DIA) Accreditation
- (U) Completed Pre-Production prove-out Qualification Testing (PPQT) for Initial Operational Test & Evaluation (IOT&E) system
- (U) Conducted IOT&E using Version 2.0 software

(U) **FY 1993 Accomplishments:** Completion of Block I effort is funded under Project DB19.

(U) **FY 1994 Planned Program:** N/A

(U) **WORK PERFORMED BY:** The Project Manager ASAS under the Program Executive Office for Command and Control Systems (PEO-CCS) is responsible for development and acquisition of ASAS. The prime integrator/contractor is Jet Propulsion Laboratory, Pasadena, CA which is a Federally Funded Research & Development Center (FFRDC). Major subcontractors are: Martin Marietta Corp., Denver, CO; Loral Corp., San Jose, CA; BDM International Corp., Gardena, CA; Fuentez System Concept Inc., Fairfax, VA; and Mantech Advanced Systems International, Fairfax, VA.

(U) **RELATED ACTIVITIES:**
PE #0603745A, Tactical Electronic Support Systems
PE #0604321A, Project DB19, is the ASAS Block Improvement
PE #0604716A, Terrain Information Engineering Development
PE #0604726A, Meteorological Equipment and Systems
There is no unnecessary duplication of effort within the Army or DoD.

(U) **OTHER APPROPRIATION FUNDS:**

		($ in Thousands)	
Appropriation	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Other Procurement Army (OPA 2)			
KA4400	58485	48508	29578

(U) **International Cooperative Agreements:** Not applicable.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604321A (TIARA)**
PE Title: **All Source Analysis System (ASAS)**
Project Title: **All Source Analysis System - Engineering Development**

Project Number: **#DB19**
Budget Activity: **#4**

Picture Not Available

POPULAR NAME: **ASAS**

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

SCHEDULE	FY 1992	FY 1993	FY 1994		
Program Milestones	OSD C3I Program Review	ASARC BL-I APR DAB BL-II MAY			
Engineering Milestones		Del of V2.1 S/W BL-I	Phase 1 Prototype Del-Jun 94		
T&E Milestones	TEMP Approved	Complete IOT&E BL-I TT 1 MAR-2 Apr OPS Demo 12-17 Apr	BL-I FOT&E APR Prototype Demo		
Contract Milestones	RFP Released		CECOM Trans & Contract Close BL-I Contract Award BL-II		
BUDGET ($000)	FY 1992	FY 1993	FY 1994		
Major Contract	26425	8641 BL-I 9000 BL-I	971 BL-II		
Support Contract	12113	18506			
In-House Support	8283	9829			
GFE/ Other	1373	5500			
Total	48194	51476	971		

Note: Some DB19 funds will be used for the orderly transition and close-out of Block I ASAS.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604321A (TIARA)** Project Number: **#DB19**
PE Title: **All Source Analysis System (ASAS)** Budget Activity: **#4**
Project Title: **All Source Analysis System - Engineering Development**

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project funds the Army's only tactical intelligence fusion project, the Block II 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 All Source Analysis System (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, reporting, electronic warfare, and operational security as well as automation support to 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 and commercial Non-Developmental Item (NDI) software, reuse of proven Office 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 also keep Block I technology as current as possible, by packaging some of the Block II advances into capability packages that can be applied to Block I. Twenty-eight Block II ASAS systems will be fielded to Army active & reserve armored cavalry regiments, separate brigades, divisions, corps, and echelons-above-corps.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- (U) OSD Command, Control, Communications, and Intelligence (C3I) Program Review
- (U) Project Documentation Approved
- (U) Block II Request For Proposals Released
- (U) Source Selection Conducted

(U) FY 1993 Planned Program:
- (U) Complete Block I Initial Operational Test and Evaluation (IOT&E)
- (U) Deliver Block I Version 2.1 software
- (U) Begin fielding Block I to priority units
- (U) Block I software maintenance transition to Communications and Electronics Command (CECOM)
- (U) Block I Army Selected Acquisition Review Committee (ASARC)
- (U) DA approved Operational Requirements Document (ORD) - January 1993
- (U) Block II Contract Source Selection Conducted
- (U) In-House Phase Zero Prototyping Initiated
- (U) Block II DAB Program Review
- (U) Block II Contract Award
- (U) Initiate incremental Block II prototyping
- (U) Deliver Phase Zero Prototype to Block II Contractor

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604321A (TIARA) Project Number: #DB19
PE Title: All Source Analysis System (ASAS) Budget Activity: #4
Project Title: All Source Analysis System - Engineering Development

(U) FY 1994 Planned Program:
- (U) BlocK I Materiel Release Decision
- (U) Continue fielding of Block I to Priority Units
- (U) Continue Block II incremental prototyping-Deliver Phase 1

D. (U) WORK PERFORMED BY: The Project Manager, ASAS, McLean, VA. Contract award June 1993.

E. (U) COMPARISON WITH FY 1993 AMENDED BUDGET REQUEST:
NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None.

2. (U) SCHEDULE CHANGES: Reduction in FY94 RDT&E funding resulted in a schedule extension of up to 12 months.

3. (U) COST CHANGES: Army funding reductions in FY94 resulted in program restructure and recosting.

E. PROGRAM DOCUMENTATION:

Test and Evaluation Master Plan (TEMP) approved	11/91
Acquisition Strategy Approved	12/91
ORD approved	01/93
Integrated Support Plan	07/93
Block I Acquisition Program Baseline Approved	12/91
Integrated Program Summary Approved	04/93
Block II Acquisition Program Baseline Approved	04/93

G. (U) RELATED ACTIVITIES:
PE #0603745A, Tactical Electronic Support Systems
PE #0604321A, Project DB926, is the ASAS Engineering Development
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) Not applicable.

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

FY 1994 RL/T&E DESCRIPTIVE SUMMARY

Program Element: **#0604321A (TIARA)** Project Number: **#DB19**
PE Title: **All Source Analysis System (ASAS)** Budget Activity: **#4**
Project Title: **All Source Analysis System - Engineering Development**

1992. The PPQT for the Technical Control and Analysis Element (TCAE) was conducted 28 April through 2 July 1992. The purpose of the PPQT was: (1) Reduced performance risk by comprehensively addressing the technical issues necessary to support a materiel release and (2) 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.

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 is scheduled for 1 March 1993-2 April 1993 followed by an Operational Demonstration occurring 5-9 April 1993. A Fiel Operating Test & Evaluation (FOT&E) is scheduled for April 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 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604603A**
PE Title: **Nuclear Munitions Engineering Development** Budget Activity: **#4**

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

Project Number / Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D584 Safety and Security System	1730	4539	0
PE TOTAL	1730	4539	0

B. (U) BRIEF DESCRIPTION OF ELEMENT: The mission of the Nonstrategic Nuclear Force (NSNF) is to deter both nuclear and conventional attack by enemy forces, and, should deterrence fail, to support the defense of the theater. This program element funds the orderly termination of the container program that was initiated to increase safety, security, and survivability of the Army's nuclear munitions.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) Project D584 - Safety and Security System: Supports termination of Survivability Overpack Container development program.

(U) FY 1992 Accomplishments:
- (U) Continued orderly termination of Survivability Overpack Container (SOC) development.

(U) FY 1993 Planned Program:
- (U) Complete termination of project.

(U) FY 1994 Planned Program: Program not funded.

(U) Work Performed By: In-house support includes: Project Manager for Nuclear Munitions and U.S. Army Research, Development and Engineering Center, Picatinny Arsenal, NJ; Harry Diamond Laboratory, Adelphi, MD; Army Materiel and Mechanics Research Center, Watertown, MA; Ballistics Research Laboratory, Aberdeen Proving Ground, MD; and U.S. Army Electronic Warfare/Reconaissance, Surveillance, and Target Acquisition Center, Ft. Monmouth, NJ. Contractor support includes: Ferrulmatics, Inc., Patterson, NJ; Chamberlain Corporation, Waterloo, IA; and Motorola Incorporated, Scottsdale, AZ.

(U) Related Activities: PE #0603604A (Nuclear Munitions Advanced Development). No unnecessary duplication of effort exists in the Army or Department of Defense.

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604604A**
PE Title: **Medium Tactical Vehicles** Budget Activity: **#4**

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
DH07	Family of Medium Tactical Vehicles (FMTV)		
	7217	0	3697
DH08	Medium Truck Service Life Extension Program (SLEP)		
	12892	2781	2851
DH10	HMMWV (Cab Over Engine)		
	2469	0	0
PE TOTAL	22578	2781	6548

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, 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. 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. The High Mobility Multi-purpose Wheeled Vehicle (HMMWV)(Cab Over Engine) is a new HMMWV model which the Army is evaluating to determine its suitability for Army missions.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) Project DH07 - Family of Medium Tactical Vehicles (FMTV): This project supports the development of the FMTV tanker and expansible van models and companion trailers.

(U) FY 1992 Accomplishments:
- **(U)** Initiated Special Body Variant prototype development effort
- **(U)** Awarded Special Body Variant prototype development contract

(U) FY 1993 Planned Program:
- **(U)** Design and build Special Body Variant prototypes using FY92 funding

(U) FY 1994 Planned Program:
- **(U)** Conduct prototype testing and develop Technical Data Package (TDP)

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604604A**
PE Title: **Medium Tactical Vehicles** Budget Activity: **#4**

(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 1992 Accomplishments:
- **(U)** Awarded prototype contracts
- **(U)** Conducted prototype testing

(U) FY 1993 Planned Program:
- **(U)** Complete prototype testing
- **(U)** Award SLEP production contract

(U) FY 1994 Planned Program:
- **(U)** Develop TDP

(U) Project DH10 - HMMWV (Cab Over Engine): This project supports the evaluation of a new HMMWV model to determine its suitability for Army requirements.

(U) FY 1992 Accomplishments:
- **(U)** Initiated program to evaluate HMMWV (Cab Over Engine) prototype

(U) FY 1993 Planned Program:
- **(U)** Initiate prototype testing and evaluation with FY 92 funding

(U) FY 1994 Planned Program:
- **(U)** Program 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. FMTV Prime contractor is Stewart/Stevenson Services, Inc., Houston, Texas. SLEP contractors are AM General, Livonia, Michigan and Cummins Military Systems, Columbia, Indiana.

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

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

	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Other Procurement, Army (OPA 1)			
FMTV (BLIN 5)	181599	253001	25815
SPARES/REPAIR PARTS (BLIN 19)	- 0 -	1589	2320
SLEP (BLIN 9)	- 0 -	- 0 -	17615

(U) International Cooperative Agreements: None

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604609A
PE Title: **Smoke, Obscurant and Target Defeating Systems - Engineering Development**

Project Number: #D200
Budget Activity: #4

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

Project Title: **Smoke/Obscurant Systems - Engineering Development**

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Smoke/Obscurant Systems	13295	10692	17118

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: 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 XM56 Mechanical Smoke Generator (MSG) to provide large area 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. 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, program funding will support the XM1101 Mechanized Smoke Obscurant Carrier to provide manuever 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 MSG on an upgraded M901A chassis.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- (U) Completed Pre-Production Testing (PPT) for XM56
- (U) Completed XM56 redesign; initiated XM56 hardware fabrication for Pre-Production Qualification Testing (PPQT)
- (U) Completed PPT on the XM6
- (U) Completed Operation Requirement Document (ORD) for the XM81
- (U) Completed Milestone I/II In-Process Review (IPR) on the XM81 MMW/IR Screening Grenade

(U) FY 1993 Planned Program:
- (U) Complete hardware fabrication and initiate PPQT on the XM56
- (U) Conduct Milestone III/Type Classification (TC) IPR for the XM6
- (U) Initiate and complete PPT for the XM81

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604609A
PE Title: **Smoke, Obscurant and Target Defeating Systems - Engineering Development**

Project Number: #D200
Budget Activity: #4

(U) FY 1994 Planned Program:

- (U) Complete PPQT and conduct Initial Operational Test and Evaluation (IOT&E) for the XM56
- (U) Conduct Milestone III/TC IPR for the XM56
- (U) Initiate PPQT for the XM81
- (U) Fabricate XM1101 Developmental/Operational prototypes and validate Fire Control Software

D. (U) WORK PERFORMED BY: The Product Manager for Smoke/Obscurants, Aberdeen Proving Ground (APG), MD; U.S. Army Chemical and Biological Defense Agency, APG, MD; U.S. Army Tank and Automotive Command, Warren, Michigan; U.S. Armament Research, Development and Engineering Center, Picatinny, NJ; U.S. Army Test and Evaluation Command, APG, MD. Contractor: MRC, Inc, Hunt Valley, MD.

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY: NARRATIVE DESCRIPTION OF CHANGES

1. **(U) TECHNICAL CHANGES:** None.
2. **(U) SCHEDULE CHANGES:** Type Classification for the XM56 has changed from 05/94 to 08/[illegible], Type Classification for the XM81 has changed from 03/95 to 08/95. A milestone schedule for the XM1101 is included for the first time.
3. **(U) COST CHANGES:** No impact.

F. (U) PROGRAM DOCUMENTATION:

<u>XM56 Mechanical Smoke Generator</u>	
Operational and Organizational (O&O) Plan	02/85
Acquisition Plan (AP)	12/86
Required Operational Capability (ROC)	11/86
Test and Evaluation Master Plan (TEMP)	05/89
<u>XM6 Smoke Grenade Discharger</u>	
O&O	01/87
TEMP	07/89
AP	08/89
ROC	03/90
<u>XM81 Smoke MMW/IR Grenades</u>	
O&O	01/87
Acquisition Strategy (AS)	04/89
ORD	03/92

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604609A
PE Title: **Smoke, Obscurant and Target Defeating Systems - Engineering Development**

Project Number: #D200
Budget Activity: #4

XM1101 Mechanized Smoke Obscurant Carrier	
O&O medium variant	06/90
O&O light variant	03/91
AP	07/92
ORD	08/92

G. (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 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 Army or DoD.

H. (U) OTHER APPROPRIATION FUNDS: Not applicable

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

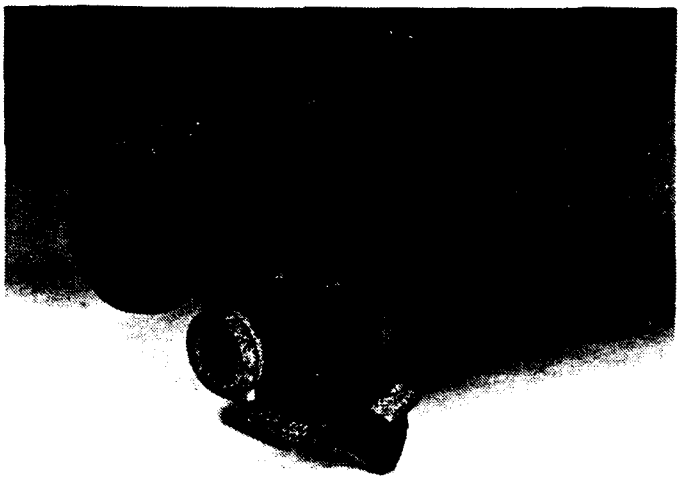
J. (U) MILESTONE SCHEDULE:

Milestone	Milestone Dates
XM56	
Milestone III/TC IPR	08/94
XM6	
Milestone III/TC IPR	08/93
XM81	
Milestone II IPR	03/92
Milestone III/TC IPR	08/95
XM1101	
Milestone I/II IPR	08/93

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604611A**
PE Title: **JAVELIN (AAWS-M)**
Project Title: **JAVELIN (AAWS-M)**

Project Number: **D499**
Budget Activity: **#4**



POPULAR NAME: **JAVELIN (AAWS-M)**

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

SCHEDULE	FY 1992	FY 1993	FY 1994
Program Milestones	Continue EMD Phase	Continue EMD Phase	Initiate Tech Support; Low Rate Production Decision
Engineering Milestones		Prototype deliveries	
T&E Milestones	PPQT Qual; PPT FLTs; PPQT Sys	Initiate IOT&E; Complete PPQT Qual; Conduct FDTE	Complete IOT&E & PPQT Sys Tests
Contract Milestones	Award Second Source FPA Contract	Issue RFP; Award LLTI Contract	Award LRIP I Contract
BUDGET ($000)	**FY 1992**	**FY 1993**	**FY 1994**
Major Contract	102203	74301	28901*
Support Contract	1254	1423	1400
In-House Support	14325	19967	9800
GFE/ Other	515	238	4836
Total	118297	95929	44937

* Includes $10M in FY94 for Enhanced Producibility Program (EPP)

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604611A
PE Title: JAVELIN (AAWS-M)
Project Title: JAVELIN (AAWS-M)

Project Number: D499
Budget Activity: #4

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This program element (PE) provides for the 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 and will have a high kill rate against threat armored vehicles of the 1990s 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:

(U) FY 1992 Accomplishments:
- (U) Continued EMD phase
- (U) Completed nine Production Proveout Test (PPT) Flights
- (U) Performed Production Proveout Qualification Testing (PPQT) component/subsystem qualification testing
- (U) Initiated PPQT system testing
- (U) Awarded 2nd source Focal Plane Array (FPA) contract (LORAL)
- (U) Successfully met OSD directed Milestones for Seeker Focal Plane Array (FPA)

(U) FY 1993 Planned Program:
- (U) Conduct Force Development Test and Experimentation (FDTE)
- (U) Initiate Initial Operational Testing and Evaluation (IOT&E)
- (U) Initiate Procurement of Long Lead Time Items (LLTI) for Low Rate Initial Production LRIP I
- (U) Complete PPQT component/subsystem qualification testing

(U) FY 1994 Planned Program:
- (U) Complete Initial Operational Testing and Evaluation (IOT&E)
- (U) Complete PPQT System Testing
- (U) LRIP Decision
- (U) LRIP I Contract Award
- (U) Initiate Enhanced Producibility Program
- (U) Initiate Tech Support

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.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604611A**
PE Title: **JAVELIN (AAWS-M)**
Project Title: **JAVELIN (AAWS-M)**

Project Number: **D499**
Budget Activity: **#4**

E. (U) COMPARISON WITH FY 1993 AMENDED 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)	07/85
Test and Evaluation Master Plan (TEMP)	09/88
Joint Services Operational Requirement (update)	11/88
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
LRIP Decision	04/94
Milestone III	01/96
FUE	04/96

G. (U) RELATED ACTIVITIES:

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)
PE #^702807E (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 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Missile Procurement, Army			
JAVELIN (SSN CC0007)	-0-	18201*	207268
(QUANTITIES)	(0)	(0)	(1000)

* For Long Lead Time Items

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

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604611A**
PE Title: **JAVELIN (AAWS-M)**
Project Title: **JAVELIN (AAWS-M)**

Project Number: **D499**
Budget Activity: **#4**

J. (U) TEST AND EVALUATION DATA: The JAVELIN EMD test program began in 3QFY89 and is scheduled for completion in 1QFY94. EMD testing will consist of the following:

(1) Production Proveout Test (contractor component/subsystem/system testing/qualification) (Complete)
(2) Preproduction Qualification Test (contractor/government system development testing/qualification) (In process)
(3) Training Force Development Test and Experimentation II (government training concept testing) (In process)
(4) Logistics demonstration (contractor/government evaluation)
(5) Live Fire Component Test (contractor/government)
(6) Initial Operational Test (government)

EMD test program schedule:
Technical test II (PPT, PPQT) - 4QFY89-1QFY94
User test II (FDTE, IOT) - 1QFY93-1QFY94

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604619A**
PE Title: **Landmine Warfare**

Project Number: **D088**
Budget Activity: **#4**

A. (U) RESOURCES: ($ in Thousands)
Project Title: **Wide Area Mine Engineering Development**

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Wide Area Mine (WAM)	34616	22869	21322

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 1992 Accomplishments:
- (U) Conducted program design review.
- (U) Procured and fabricated hand emplaced version hardware.
- (U) Continued contractor development testing.
- (U) Initiated system level testing.

(U) FY 1993 Planned Program:
- (U) Fabricate hardware for technical testing (TT) and user testing (UT).
- (U) Prepare for critical design review.
- (U) Continue engineering design testing.

(U) FY 1994 Planned Program:
- (U) Conduct hand emplaced WAM critical design review.
- (U) Fabricate Hand Emplaced WAM hardware for TT/UT tests.
- (U) Initiate Hand Emplaced (HE) WAM TT/UT tests.

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 1993 AMENDED DESCRIPTIVE SUMMARY:
NARRATIVE DESCRIPTION OF CHANGES

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

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604619A** Project Number: **D088**
PE Title: **Landmine Warfare** Budget Activity: **#4**

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 Landmine Warfare monitor the scatterable mine program to avoid service duplication. No unnecessary duplication exists in the Army or Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS:

		($ in Thousands)	
Appropriation	**FY 1992 Actual**	**FY 1993 Estimate**	**FY 1994 Estimate**
Ammunition Procurement		Begins FY96	

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	1/94
WAM HE Live Fire Report	2/95
WAM HE Milestone IIIA	6/95
WAM Milestone III	6/96
WAM VOLCANO Milestone III	7/99
WAM Missile Milestone III	9/02

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604622A
PE Title: **Family of Heavy Tactical Vehicles** Budget Activity: **#4**

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D659 Family of Heavy Tactical Vehicles (FHTV)	2214	1853	0
DE43 Semi-Trailer Van	0	0	476
PE TOTAL	2214	1853	476

B. (U) BRIEF DESCRIPTION OF ELEMENT: There is a need to develop a fleet of heavy tactical wheeled vehicles to perform specific missions with minimum impact on materiel readiness and maximum commonality of trucks and repair parts. Such a fleet will consist of both high- and low-density vehicles with a common chassis capable of mounting varied special bodies such as dump trucks, bridges, transporters and cement mixers. Such commonality also offers the advantages of reduced fixed acquisition costs, reduced operations and support costs, reduced maintenance burden via standardization and reduced parts/component stockage at all levels. An enhanced flatrack program has been initiated to evaluate additional airlift and sealift capability. The enhanced features will be incorporated into production in FY93 as directed by Congress. Congress has also directed the Army to design, develop and test prototypes of 3,000-3,500 gallon fuel and water tanks as initial variants to the palletized load system. Project DE43 is a New Start (one-time effort) for FY94. There is a need for a standardized fleet of semi-trailer vans to support field maintenance. 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 D659 - Family of Heavy Tactical Vehicles: To develop a fleet of Heavy Tactical Vehicles with commonality of parts to reduce maintenance and increase readiness.

(U) FY 1992 Accomplishments:
- (U) Bought Palletized Loading System (PLS) technical data package
- (U) Began development and testing of the enhanced PLS flatrack which supports intermodal transport requirments.

(U) FY 1993 Planned Program:
- (U) Conduct study of how to integrate heavy vehicle functions into a Family of Heavy Tactical Vehicles
- (U) Complete development and testing of enhanced flatrack and transition to production
- (U) Develop statement of work specification and buy four PLS tanker flatrack protytypes for testing

(U) FY 1994 Planned Program: Project not funded

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604622A
PE Title: **Family of Heavy Tactical Vehicles** Budget Activity: **#4**

(U) Project DE43 - Semi-Trailer Van: To explore a standardized fleet of vans to support field maintenance.

(U) FY 1992 Accomplishments: Project not funded

(U) FY 1993 Planned Program: Project not funded

(U) FY 1994 Planned Program:
- **(U)** Purchase technical data package for the semi-trailer van.

(U) Work Performed By: In-house effort for project D659 will be accomplished by Program Executive Officer for Combat Support 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. Contractor for the study on the FHTV is BDM located in McLean, VA. 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:

Appropriation	(**$ in Thousands**) FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Other Procurement, Army			
FHTV (BLIN 8)	99243	309492	464258
SPARES/REPAIR PARTS (BLIN 19)	- 0 -	930	2137

(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.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604630A**
PE Title: **Advanced Tank Cannon (ATAC)** Budget Activity: **#4**

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

Project Number / Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
DB80 ATAC Ammo	6115	1513	0
DB81 Advanced Tank Cannon (ATAC)	29880	24058	0
PE TOTAL	35995	25571	0

B. (U) BRIEF DESCRIPTION OF ELEMENT: Development of this Tank Main Armament System - composed of gun, automatic loader, fire control, target acquisition and ammunition is mandated by requirements to evolve the full potential of conventional armament systems. The objective of this program is to develop a main armament system of enhanced capability to detect, identify and defeat present and future tanks at ranges greater than now possible. This program element has been restructured in FY 1994.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN 1994:

(U) DB80 ATAC Ammo: This portion of the program specifically addresses the ammunition to complement the potential of the Tank Main Armament system.

(U) FY 1992 Accomplishments:
- (U) Finalized stub base cartridge case and charge configuration for both kinetic energy (KE) and chemical energy (CE) - supported ATAC Proof-of-Principle (POP) demonstration and XM291 gun development
- (U) Initiated propulsion ignition efforts in support of gun development and ammo for the Future Tank Main Armament (FTMA): includes initial ballistic testing of sensor, warhead, and propulsion system: CE and electronic safe and arm technology demonstrators
- (U) Defeated applicable Future Tank Main Armament (FTMA) targets under Phase I international armor tests

(U) FY 1993 Planned Program:
- (U) Conduct Component Advanced Technology Test Bed (CATTB) demonstration
- (U) Continue development of critical ammunition technologies

(U) FY 1994 Planned Program:
- (U) Restructures to PE #0603653A in FY94

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604630A
PE Title: **Advanced Tank Cannon (ATAC)** Budget Activity: #4

(U) **DB81 Advanced Tank Cannon (ATAC):** This part of the program addresses the capabilities to get the ammunition down range and on target. It includes the cannon, target acquisition and fire control, and autoloader efforts.

(U) **FY 1992 Accomplishments:**
- (U) Completed ATAC Proof- of- Principle (POP)
- (U) Continued development of fire control and target acquisition systems for CATTB demonstration
- (U) Delivered XM291 gun hardware in support of CATTB effort

(U) **FY 1993 Planned Program:**
- (U) Continued development of ATAC System Demo to include Second Generation Thermal Sight, Extended Range Gunnery Fire Control w/electric gun turret drive and 120mm XM291 Gun
- (U) Initiated M1A2 Integration Program to include mounting an XM291 Gun, Second Generation Thermal Sight w/Laser Designator, Second Generation Forward Looking Infrared Radar Upgrade for Gunner's Sight and Automatic Target Tracker

(U) **FY 1994 Planned Program:**
- (U) Restructures to PE #0603653A in FY94

(U) **Work Performed By:** Rockwell Inc., Anaheim, CA; Computing Devices of Canada, Ottawa, Ontario, Canada; Cadillac Gage, Warren, MI; Texas Instruments, Dallas, TX; Martin Marrietta, Orlando, FL; Hughes Aircraft, El Segundo, CA; General Dynamics Land Systems, Warren, MI. In-house: PM, Tank Main Armaments Systems, Picatinny Arsenal, NJ; Armament Research Development and Engineering Center, Picatinny Arsenal, NJ; Tank-Automotive Command, Warren, MI; Ballistics Research Laboratories, Aberdeen, MD; Test and Evaluation Command, Aberdeen, MD; Battelle Northwest Laboratory, Richland, WA.

(U) **Related Activities:** PE # 0203735A (M1A1 Block Improvement Program, Project D330) and PE # 0603653A (Advanced Tank Armament System, Project DB99). There is no unnecessary duplication of effort within the Army or Department of Defense.

(U) **Other Appropriation Funds:** None

(U) **International Cooperative Agreements:** Memorandum Of Agreement (MOA) with France, Germany, and Great Britain to harmonize parameters for the Future Tank Main Armament (FTMA).

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604633A**
PE Title: **Air Traffic Control**
Budget Activity: **#4**

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

Project Number / Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D586 Air Traffic Control	3278	2329	5607

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element funds continuously evolving efforts for the development of Air Traffic Control (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 an urgently needed communications and precision/non-precision approach and flight following capability in support of joint operations at Army tactical airfields, remote landing zones, drop zones, pickup zones, and temporary helicopter operating areas worldwide. These are non-developmental item (NDI) programs. FY94-99 ATC programs include the Tactical Airspace Integration System (TAIS) and the Forward Area Shelterized Terminal Tower (FAST). Fixed base ATC efforts funded by this line include Precision Approach Radar (PAR), Communication Console System (CCS), Navigation Aid Systems Modernization, and Communication Systems Modernization.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) Project D586 - Air Traffic Control:

(U) FY 1992 Accomplishments:

(U) Tactical Terminal Control System (TTCS)

- (U) Market analysis for state-of-the-art system
- (U) Evaluation and suitability study and cost saving data
- (U) Analysis of a joint service AF/Army TTCS solution

(U) Air Traffic Navigation, Integration and Coordination System (ATNAVICS)

- (U) Pre-market analysis for state-of-the-art system

(U) FY 1993 Planned Program:

(U) TTCS

- (U) Engineering design/integration analysis

(U) ATNAVICS/Precision Approach Radar (PAR)

- (U) Evaluation and suitability study and cost saving data
- (U) Market analysis for state-of-the-art system

(U) Tactical Airspace Integration System (TAIS)

- (U) Pre-market analysis for state-of-the-art system solution

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604633A**
PE Title: **Air Traffic Control** Budget Activity: **#4**

(U) **FY 1994 Planned Program:**

(U) **TTCS**

- (U) Prototype selection and procurement
- (U) Developmental Testing/Operational Testing

(U) **ATNAVICS/PAR**

- (U) Evaluation and suitability study and cost saving data
- (U) Prototype selection and procurement

(U) **Tactical Airspace Integration System (TAIS)**

- (U) Market analysis for state-of-the-art system

(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 Aviation Research and Development Activity (AVRADA), Fort Monmouth, NJ.

(U) **Related Activities:** The Army participated in this tri-service Air Traffic Control Approach and Landing Aids (ATCALS) joint working group to share technical information and development programs being conducted by each service. There is no unnecessary duplication of effort within the Army or DoD.

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

	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
APA (AA0050) Air Traffic Control (ATC)	1976	5690	8261

(U) **International Cooperative Agreements:** Not applicable

FY 1994 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: **#4**

PICTURE NOT AVAILABLE

POPULAR NAME: **Command and Control Vehicle (C2V)**

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

SCHEDULE	FY 1992	FY 1993	FY 1994		
Program Milestones					
Engineering Milestones			Preproduction Prototype Fab		
T&E Milestones			PPQT		
Contract Milestones					
BUDGET ($000)	FY 1992	FY 1993	FY 1994		
Major Contract			5924		
Support Contract					
In-House Support			360		
GFE/OGA Other			2370		
Total	0	0	8654		

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604640A** Project Number: **DG27**
PE Title: **Advanced Command and Control Vehicle** Budget Activity: **#4**
Project Title: **Advanced Command and Control Vehicle (C2V)**

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 1992 Accomplishments:
- (U) Funded under PE#0603053 in FY 92

(U) FY 1993 Planned Program:
- (U) Funded under PE#0603053 in FY 93

(U) FY 1994 Planned Program:
- (U) Program transitions from PE#0603053, Project Number DG23
- (U) Complete Prototype Production
- (U) Initial Operational Test and Evaluation
- (U) Preproduction Qualification Testing

D. (U) WORK PERFORMED BY: FMC Corp, San Jose, CA

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY:
NARRATIVE DESCRIPTION OF CHANGES

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

F. (U) PROGRAM DOCUMENTATION: Mission Need Statement (MNS) approved by Joint Requirement and Oversight Council 11 Feb 93. MNS is at Department of Defense for review. Operational Requirements Document approved by HQ Department of Army on 26 Mar 93.

G. (U) RELATED ACTIVITIES: The Future Electronic Fighting System is a like system in development. There is no unnecessary duplication of effort within the Army or Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS:

		($ in Thousands)	
Appropriation	**FY 1992 Actual**	**FY 1993 Estimate**	**FY 1994**

Procurement: None
Military Construction: None

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604640A** Project Number: **D 7**
PE Title: **Advanced Command and Control Vehicle** Budget Activity: **#4**
Project Title: **Advanced Command and Control Vehicle (C2V)**

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: None

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604642A
PE Title: **Light Tactical Wheeled Vehicles** Budget Activity: **#4**

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
DE41 Armored Security Vehicles (Combat Support)	- 0 -	- 0 -	2064

B. (U) BRIEF DESCRIPTION OF ELEMENT: Project DE41 is a NEW START for FY94 for 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 and NBC protection to the MP three man team.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) Project DE41 - Armored Security Vehicles (Combat Support): Evaluate the commercially available Armored Security Vehicles (ASV) for use by the Military Police.

(U) FY 1992 Accomplishments:
- **(U)** Project not funded

(U) FY 1993 Planned Program:
- **(U)** Project not funded

(U) FY 1994 Planned Program:
- **(U)** Develop/Release Request for Proposal (RFP)
- **(U)** Initiate prototype source selection evaluation board (SSEB)
- **(U)** Milestone (MS) I/II Decision
- **(U)** Award a minimum of two contracts for hardware demonstration vehicles to support Pre-Production Qualification Test/Early User Test (PPQT/EUT)

(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: None

(U) International Cooperative Agreements: None

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604645A
PE Title: Armored Systems Mode zation (ASM)- Engineering Development
Budget Activity: #4

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D175 Advanced Field Artillery System (AFAS) Multi-Option Fuze for Artillery (MOFA)	5123	4681	7735
D413 Armored Gun System (AGS)	37225	67346	81769
PE TOTAL	42348	72027	89504

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element supports 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 1994:

(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 1992 Accomplishments:
- (U) Successfully completed firings using monolithic microwave integrated circuit (MMIC) chips at Yuma Proving Grounds
- (U) Successfully completed Milestone II
- (U) Initiated and awarded contract for Engineering and Manufacturing Development
- (U) Developed electromagnetic environmental effects design, control plan, and nuclear survivability.
- (U) Developed EMD prototype concept

(U) FY 1993 Planned Program:
- (U) Design and fabricate fuze setters for testing
- (U) Contractor delivery of prototypes and test hardware for ballistic, electromagnetic effects, human engineering and flick ramming tests
- (U) Contractor testing and analysis to satisfy electromagnetic requirements

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604645A**
PE Title: **Armored Systems Modernization (ASM)-Engineering Development**
Budget Activity: **#4**

(U) FY 1994 Planned Program:

- **(U)** Contractor testing of proximity function, explosive train, safety, reliability, and quality assurance.
- **(U)** Initiate preliminary technical data package
- **(U)** Computer modeling of fuze design and proximity target simulation

(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 Polytronix, Incorporated, Richardson, TX.

(U) Related Activities: PE #0603645 (Armored System Modernization - 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 1994 RDT&E DESCI E SUMMARY

Program Element: **#0604645A**
PE Title: **Armored Systems Modernization (A 1)- Engineering Development**
Project Title: **Armored Gun System**

Project Number: **D413**
Budget Activity: **#4**

POPULAR NAME: **Armored Gun System**

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

SCHEDULE	FY 1992	FY 1993	FY 1994		
Program Milestones	MS I/II - May				
Engineering Milestones	Preliminary Des Rev Software Des Rev	Critical Des Rev			
T&E Milestones	TEMP Approved	Armor, Ballistic Hull & Turret Testing	Autoloader Cert Start Tech Testing		
Contract Milestones	EMD Contract Award		LRIP RFP LLI Contract		
BUDGET ($000)	**FY 1992**	**FY 1993**	**FY 1994**		
Major Contract	29660	53009	68995		
Support Contract	54	(0)	(0)		
In-House Support	3074	4491	3607		
GFE Other	4437	9	91 7		
Total	37225	67340	81769		

FY 1994 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: #4

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 US Air Force Operational Tactical Transport Aircraft LVAD, Roll-on/Roll-off C130/C141, 105mm main gun (XM35) with autoloader, 3-man crew, fire control roughly equivalent to M1, and mobility greater than M551 Sheridan.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- (U) Milestone I/II, Program Decision Memorandum to proceed to Engineering and Manufacturing Development (EMD) - May 92
- (U) EMD contract award to FMC - June 92
- (U) Preliminary Design Review (PDR) - Aug 92

(U) FY 1993 Planned Program:
- (U) Initiate fabrication of 6 prototypes
- (U) Produce ballistic hull & turret (BHT) and initiate vulnerability tests on armor plate BHT
- (U) Critical Design Review - Sept 93

(U) FY 1994 Planned Program:
- (U) Complete fabrication of 6 prototypes
- (U) Perform Engineering, Manufacturing, and Development (EMD) Vulnerability Tests
- (U) Begin technical and early user operational testing

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 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 1993 AMENDED DESCRIPTIVE SUMMARY:
NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** Vehicle Specification Established
2. **SCHEDULE CHANGES:** None
3. **COST CHANGES:** Program Funded to Army Cost Position (ACP)

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604645A** Project Number: **D4**
PE Title: **Armored Systems Modernization (ASM)- Engineering Development** Budget Activity: **#4**
Project Title: **Armored Gun System**

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.

H. (U) OTHER APPROPRIATION FUNDS:

	($ in Thousands)		
Appropriation WCTV	**FY 1992 Actual**	**FY 1993 Estimate**	**FY 1994 Estimate**
Armored Gun System (G82800)	-0-	4732	15998
Quantities			
Production Base Support (GA0050)	3013	-0-	-0-
AGS Initial Spares (GA0164)	-0-	-0-	-0-

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. (U) TEST AND EVALUATION DATA:

Milestones	**Dates**
Armor Sample Test	4/93 - 6/93
Autoloader Certification Test	4/93 - 12/93
Ballistic Hull and Turret Test	6/93 - 3/94
Technical Test	5/94 - 6/95
Vulnerability Test	5/94 - 9/94
Early User Test and Experimentation	8/94 - 4/95
Live Fire Test	10/96 - 3/97
Production Qualification Test	1/97 - 9/97
Initial Operational Test and Evaluation	3/97 - 11/97

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604649A
PE Title: **Engineer Mobility Equipment Development**

Project Number: #DG26
Budget Activity: #4

A. (U) RESOURCES: ($ in Thousands)
Project Title: Heavy Assault Bridge

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Heavy Assault Bridge	7900	2116	13304

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. Three contractors are currently competing for an equipment development contract.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS.

(U) FY 1992 Accomplishments:
- (U) Funding for procurement is reinstated (program funding had been cancelled)
- (U) Army Acquisition Executive program designation as Acquisition Category III 1QFY92
- (U) Two competing contractors deliver two prototypes each for testing 1QFY92
- (U) Army Acquisition Executive directs evaluation of third contractor 2QFY92
- (U) Letter contract awarded to third competing contractor 3QFY92
- (U) Acquisition Strategy revised to include 3rd competitor 3QFY92
- (U) Test & Evaluation Master Plan (TEMP) and Integrated Logistics Support Plan (ILSP) approved 3QFY92
- (U) In-Process Review held for Milestone Decision Authority 3QFY92
- (U) Third contractor's two prototypes delivered for testing 4QFY92

(U) FY 1993 Planned Program:
- (U) Completion of Developmental Test
- (U) Completion of Operational Test and Evaluation
- (U) Advanced Planning Brief to industry
- (U) Issue Request for Proposal (RFP) for HAB downselect contract
- (U) Source Selection for downselect initiated

(U) FY 1994 Planned Program:
- (U) Source selection for downselect contract completed 1QFY94
- (U) Engineering & Manufacturing Development (EMD) Phase II contract award 1QFY94
- (U) Two M1 chassis provided to EMD Phase contractor
- (U) Initiate engineering effort to fully integrate Bridge/Launcher onto Abrams Tank chassis
- (U) Initiate source selection activity for Low Rate Initial Production Long Lead Items contract

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604649A
PE Title: Engineer Mobility Equipment Development

Project Number: #DG26
Budget Activity: #4

D. (U) WORK PERFORMED BY: The Combat Mobility Systems (CMS) Project Management Office is assigned responsibility for overall management of the HAB. The major supporting organizations are the Belvoir Research, Development and Engineering Center, the Tank-Automotive Command, 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 1993 AMENDED DESCRIPTIVE SUMMARY:

TECHNICAL CHANGES: No changes from previous submission.
SCHEDULE CHANGES: Schedule slip is attributed to the addition of Southwest Mobile Systems to the competition for the downselect contract.
COST CHANGES: Cost of the EMD phase has been increased by $3.0 million for testing originally budgeted under the Production Phase.

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: Prior years development work by GDLS and BMY was funded from PE #0603804A, Combat Engineering Equipment Advanced Development, Tactical Bridging, from PE #0604804A, Tactical bridging Project, and from NUNN Amendment NATO Cooperative Test Funding. There is no unnecessary duplication of effort within the Army or Department of Defense.

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

Appropriation	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
WTCV, GZ3250	-0-	-0-	-0-

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: A country-to-country loan agreement has been approved allowing the U.S. Army to borrow United Kingdom owned Chieftain bridgelayer. The bridge and launch mechanism for the third competing contractor is being evaluated utilizing the borrowed Chieftain bridgelayers.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604649A
PE Title: **Engineer Mobility Equipment Development**

Project Number: #DG26
Budget Activity: #4

J. (U) TEST AND EVALUATION:

Milestones	Dates
Milestone I/II Review	Completed 1QFY91
Development and Early Operational Tests	1QFY92-2QFY93
Downselect contract In-Process Review	1QFY94
Testing	4QFY95-3QFY96
Low Rate Initial Production I contract	3QFY96
Low Rate Initial Production II option award	3QFY97
Low Rate Initial Production deliveries	2QFY98-1QFY00
Production Qualification Test (PQT)	2QFY98-4QFY98
Initial Operational Test & Evaluation	2QFY98-3QFY98
Milestone III Review	4QFY98
Production contract award	4QFY98
First Unit Equipped (FUE)	1QFY99
Initial Operational Capability (IOC)	2QFY99
Production Contract Option award	3QFY99

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604710A
PE Title: Night Vision Systems - Engineering Development Budget Activity: #4

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
DL69 - Horizontal Technology Integration Second Generation FLIR - Engineering Development	0	0	14364
DL70 - Night Vision Devices -Engineering Development	36544	23955	27463
PE TOTAL	36544	23955	41827

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element contains two projects in support of enhancing US Army night vision capabilities. These are the Night Vision Systems Projects (DL70) and the Horizontal Technology Integration Second Generation Forward Looking Infrared (HTI 2D GEN FLIR) project (DL69). 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 obscurant. The Night Vision Systems Project (DL70) provides equipment required to correct deficiencies in our ability to operate effectively at night. It includes thermal and laser systems which will enable near to long range target acquisition and engagement as well as improve battlefield command and control in "around the clock" combat operations. Current equipment being developed includes the Thermal Weapon Sight (TWS), which uses forward looking infrared (FLIR) for the individual soldier, the non-developmental item (NDI), Laser Countermeasure System (LCMS), the Compass/Vertical Angle Measurement (C/VAM) capability for the Mini Eyesafe Laser Observation Set (MELIOS), the Drivers Vision Enhancer (DVE) which is a FLIR used for driving Combat Service Support vehicles, the Lightweight Laser Designator/Rangefinder (LLD/R), and the Objective Laser Countermeasure System (LCMS). The HTI 2D GEN FLIR Project (DL69) is not a new start. It is a continuation of efforts previously funded under PE #0603774A, project D131 (Night Vision Advanced Development). It will enable the Army to integrate key advanced thermal night vision technology in the highest priority forces across numerous critical combat systems on the battlefield. The opportunity now exists to significantly enhance the capability of the total combat force through the integration of second generation thermal sights. The resulting synergy will significantly enhance the capability and effectiveness of the entire force.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994: N/A

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604710A
PE Title: Night Vision Systems - Engineering Development

Project Number: DL70
Budget Activity: #4

A. (U) RESOURCES: ($ in Thousands)
Project Title: Night Vision Devices - Engineering Development

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Night Vision Devices - Engineering Development	36544	23955	27463

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 project provides equipment required to correct deficiencies in our ability to operate effectively at night. It includes thermal and laser systems which will enable near to long range target acquisition and engagement as well as improve battlefield command and control in "around the clock" combat operations. Current equipment being developed includes the Thermal Weapon Sight (TWS), which uses forward looking infrared (FLIR) for the individual soldier, the non-developmental item (NDI), Laser Countermeasure System (LCMS), the Compass/Vertical Angle Measurement (C/VAM) capability for the Mini Eyesafe Laser Observation Set (MELIOS), the Drivers Vision Enhancer (DVE) which is a FLIR used for driving Combat Service Support vehicles, the Lightweight Laser Designator/Rangefinder (LLD/R), and the Objective Laser Countermeasure System (LCMS).

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- (U) Continued engineering development (ED) for TWS
- (U) Award ED contract for NDI LCMS
- (U) Develop and test Thermal Identification Device (TID)
- (U) Award C/VAM for MELIOS

(U) FY 1993 Planned Program:
- (U) Continue ED for TWS
- (U) Continue ED for NDI LCMS
- (U) Award ED contract for DVE
- (U) Begin and complete testing C/VAM for MELIOS

(U) FY 1994 Planned Program:
- (U) Begin and complete testing for TWS
- (U) Begin and complete testing for NDI LCMS
- (U) Continue ED for DVE
- (U) Award ED contract for LLD/R

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0[illegible]4710A
PE Title: Night Visio[illegible]ystems - Engineering Development
Project Number: DL70
Budget Activity: #4

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. 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 Saunders, Nashua, NH, and IMO OSD, Garland, TX.

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY:
NARRATIVE DESCRIPTION OF CHANGES

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

F. (U) PROGRAM DOCUMENTATION:

Thermal Weapon Sight (TWS)	
Requ. ed 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.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604710A** Project Number: **DL70**
PE Title: **Night Vision Systems - Engineering Development** Budget Activity: **#4**

H. (U) OTHER APPROPRIATION FUNDS:

Appropriation	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
		($ in Thousands)	
Other Procurement Army-2			
Night Vision Devices KA3500	96110	78663	91414

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. (U) MILESTONE SCHEDULE:

Milestones	Dates
TWS ED Contract	FY 1991-93
TWS technical and user test	FY 1994
LCMS ED contract	FY 1992-93
LCMS technical and user test	FY 1994
LCMS Milestone III production decision	FY 1994
DVE ED contract	FY 1993-95

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604710A** Project Number: **DL69**
PE Title: **Night Vision Systems - Engineering Development** Budget Activity: **#4**

A. (U) RESOURCES: ($ in Thousands)
Project Title: Night Vision Engineering Development

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Horizontal Technology Integration Second Generation Forward Looking Infrared Engineering Development (HTI 2D GEN FLIR ED)	0	0	14364

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. The opportunity now exists to significantly enhance the capability of the total combat force through the integration of second generation thermal sights. The HTI 2D GEN FLIR Project will enable the Army to integrate key advanced thermal night vision technology in the highest priority forces across numerous critical combat systems on the battlefield. The resulting synergy will significantly enhance the capability and effectiveness of the entire force. The HTI 2D GEN FLIR is not a new start. It is a continuation of efforts previously funded under PE #0603774A, project D131 (Night Vision Advanced Development).

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments: None

(U) FY 1993 Planned Program: None

(U) FY 1994 Planned Program:
- (U) Award Engineering Development (ED) contract for "A" kit which includes all of the system specific cables and wiring required to integrate the FLIR system
- (U) Award ED contracts for "B" kit which will build the FLIR into system specific packages for the various platforms

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 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, Tactical Missiles and Aviation. Contractors are to be determined.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604710A
PE Title: Night Vision Systems - Engineering Development

Project Number: DL69
Budget Activity: #4

E. (U) COMPARISON WITH FY 1993 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)	9/93
Acquisition Plan (AP)	7/93
Milestone I/II Approval	3/94

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.

H. (U) OTHER APPROPRIATION FUNDS: None

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. (U) MILESTONE SCHEDULE:

Milestones	Dates
GEN II FLIR HTI ED contract	FY 1993-95

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604713A**
PE Title: **Combat Feeding, Clothing a. Equipment** Budget Activity: **#4**

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

Project Number / Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D548 Military Subsistence Systems	1667	1391	1441
D668 Soldier Enhancement Program	21918	20288	19791
DC40 Unit/Organizational Equipment	733	700	1592
DL40 Clothing and Equipment	3582	3585	5601
PE TOTAL	27900	25964	28425

B. (U) BRIEF DESCRIPTION OF ELEMENT: Engineering and Manufacturing Development (EMD) and Non-Developmental Item (NDI) evaluation of items as unit/organizational equipment, weapons/munitions, clothing, individual equipment, fabric shelters, field service equipment, food and food service equipment is an effort to enhance soldier efficiency, survivability, and sustainability. New food items and food service equipment will be developed to reduce food service logistics requirements for all 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 sustain the soldier in the field.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10 MILLION IN FY 1994:

(U) Project D548 - Military Subsistence Systems: Develop, produce and field improved subsistence and subsistence preparation items to enhance soldier mobility, efficiency, sustainment and survivability, and quality of life.

(U) FY 1992 Accomplishments:

- (U) Initiated design phase of Air Force Initial Deployment Kitchen, an all electric, self-contained, rapidly deployable kitchen that will meet initial needs in all climates
- (U) Completed redesign/fabrication of advanced prototype Hospital Ward Food Service Transport System (HWFSTS)
- (U) Completed final development and delivered technical data package (TDP) for the Tray Ration Heating System to the Marine Corps
- (U) Completed concept evaluation of commercially available alternatives to the Mounted Ration

Heating Device (MRHD) based on new performance requirements for use by tracked vehicle crews
- (U) Accomplished design improvements to the Navy Communications Zone (COMMZ) Hospital System food service complex

(U) **FY 1993 Planned Program:**
- (U) Conduct field evaluation of Navy COMMZ hospital food service complex for Army applications
- (U) Complete development of the Navy Hospital Food Service System
- (U) Initiate Engineering and Manufacturing Development (EMD) of Army Containerized Kitchen
- (U) Complete development and Type Classify the HWFSTS

(U) **FY 1994 Planned Program:**
- (U) Complete engineering and manufacturing development of Army Field Feeding System (AFFS) components, preparation of technical data packages and transition to procurement
- (U) Field test the Initial Deployment Kitchen (IDK)
- (U) Conduct technical/operational test and evaluation of the Army Containerized Kitchen

(U) **Project DC40** - Unit/Organizational Equipment: Develop new unit/organizational equipment and tentage to improve soldier mobility, sustainability and survivability.

(U) **FY 1992 Accomplishments:**
- (U) Completed Production Prove-Out Test (PPT) of the Improved Maintenance Shelter (IMS)

(U) **FY 1993 Planned Program:**
- (U) Conduct Initial Operational Test and Evaluation (IOT&E) of the IMS
- (U) Initiate EMD on the Modular General Purpose Tent System (MGPTS)

(U) **FY 1994 Planned Program:**
- (U) Initiate EMD on 35K British Thermal Units (BTU) Convective Space Heater
- (U) Complete Technical Testing of MGPTS
- (U) Initiate Technical Data Package (TDP) for MGPTS

(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 1992 Accomplishments:**
- (U) Conducted test and evaluation on aviation cold weather clothing and artillery and combat vehicle crewman hearing protection
- (U) Type Classified artillery and combat vehicle crewman hearing protection
- (U) Evaluated domestic and foreign chemical suit fabric/designs
- (U) Procured test items for improved chemical and environmental protective boots
- (U) Developed a Joint Service Research, Development and Acquisition program for development of Next Generation Chemical Protective Clothing
- (U) Procured and established test matrix for foreign chemical protective clothing

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604713A
PE Title: **Combat Feeding, Clo ng and Equipment** Budget Activity: **#4**

(U) **FY 1993 Planned Program:**

- (U) Conduct test and evaluation on the infantry soldier anti-mine protective suit; the improved eye protection (ballistic/laser) for armor vehicle crewmen; and improved chemical and environmental protective boots and gloves
- (U) Type Classify ballistic/laser eye protection and auxiliary aviation lighting devices
- (U) Type Classify the aviation cold weather clothing

(U) **FY 1994 Planned Program:**

- (U) Down select fabrics and designs for JS LIST
- (U) Award integrated acquisition contract for test items and first unit equipped optional buys for JS LIST
- (U) Complete design concepts and fabricate prototypes for a dehydration reduction, integrated components system
- (U) Type Classify Body Armor System Individual Countermine and improved chemical and environmental protective boots
- (U) Complete Pre-Planned Product Improvement (P3I) on Intermediate Cold/Wet Glove
- (U) Conduct Technical Test/Unit Test (TT/UT) of Advanced Sun, Wind and Dust Goggle

(U) **Work Performed By:** In-house work performed by U.S. Army Natick Research and Development Center, Natick, MA; Project Manager Soldier, Woodbridge, VA; Project Office, Army Field Feeding, Fort Belvoir, VA; Belvoir Research, Development and Engineering Center, Fort Belvoir, VA; U.S. Army Aviation Research Laboratory, Fort Rucker, AL; Ballistic Research Laboratory, Aberdeen Proving Ground (APG), MD; U.S. Army Test and Evaluation Command, APG, MD; U.S. Army Chemical and Biological Defense Agency, APG, MD; U.S. Armament, Munitions and Chemical Command, Rock Island Arsenal, IL; U.S. Army Communications and Electronics Command, Fort Monmouth, NJ; Oakridge National Laboratories, Oakridge, TN; Contractors are: Kem-Tek, Inc., Linwood, PA; American Optical Corp., South Bridge, MA; Safetech Inc., Newton, PA; Research Inc., Waynesville, NC; Teledyne Inc., Northridge, CA; and Environmental Technologies Group, Inc. Towson, MD.

(U) **Related Activities:** PE #0601102A (Defense Research Sciences); PE #0602786A (Logistics Technology); PE #0603747A (Soldier Support/Survivability); PE #0203751A (Force enhancements-Active); PE #0603802A, Weapons and Munitions Advanced Development. The DOD Food and Nutrition Research, Development, Test, Evaluation, and Engineering Program is established by DODD 3235.2-R. The Army is the Executive Agent for management of this joint service effort. To prevent duplication, coordination is maintained through joint Service working groups, joint Service agreements and circulation of requirements documents. DOD Explosive Ordnance Disposal Board is joint Service monitor of Self-Contained Toxic Environment Protective Outfit (STEPO). Ballistic/Laser Eye Armor is coordinated with the DOD Laser Hardened Materiels and Structures Group; Multi-Service Program for Advanced Concepts in Laser Eye Protection and Annual Conference on Lasers on the Modern Battlefield. There is no unnecessary duplication of effort within the Army or DoD.

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

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604713A**
PE Title: **Combat Feeding, Clothing and Equipment** Budget Activity: **#4**

(U) International Cooperative Agreements: Not applicable.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604713A
PE Title: **Combat Feeding, Clothing and Equipment**

Project Number: #D668
Budget Activity: #4

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

Project Title: Soldier Enhancement Program

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
SEP	21918	20288	19791

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The Soldier Enhancement Program (SEP) program 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 1992 Accomplishments:

- (U) Prototyped Horizontal Form/Fill/Seal (HFFS) Meal, Ready-to-Eat (MRE) menu bag which will enhance assembly of the MRE
- (U) Completed market investigations to identify sources for the Individual Canteen Endothermic-chiller (ICE). Prepared solicitations to purchase a quantity of prototypes for initial tests
- (U) Conducted user acceptance tests for the Self-heating Meal, Operational, Ready-to-Eat (SMORE) to provide the soldier with a traditional meal in a biodegradable tray with self-heating capability
- (U) Completed and coordinated Technical Data Packages (TDP) for 11 new components in MREs
- (U) Type Classified Standard the Five Soldier Crew Tent
- (U) Completed evaluation of small area camouflage covers and digital handheld compass
- (U) Initiated evaluation of components for launched grapnel hook to clear trip wires
- (U) Conducted market survey of voice ducer system for hands-free operation of Army radios
- (U) Type Classified the lightweight helmet, alternative fabrics for cold weather, and improved fabric and design for the Desert Battledress Uniform (BDU) and hot weather BDU
- (U) Procured prototypes for Organizational Clothing and Individual Equipment (OCIE) such as the improved ballistic protective combat vehicle crewman (CVC) helmet; lightweight rainsuit, gloves and boots; improved ballistic helmet suspension system; and improved hot weather boots
- (U) Selected candidates and contracted for 750 automatic weapon soft mounts for test and evaluation
- (U) Developed Laser Protection for the Sniper Rifle Day Optic
- (U) Initiated test a evaluation on lightweight tripods for the M249 Squad Automatic Weapon (SAW), the M2HB ..:G and the MK19; Improved Penetrator Ammo in 5.56mm, 7.62mm and cal. 50; M24 Sniper Rifle night sights, muzzle devices and spotting scopes; M249 SAW Blank Firing Devices; Small Arms Dust Protection Devices; Small Arms Dry Zero Devices; Pocket Binoculars; Collimator Optic Sights for M16 and M249 modular weapons systems

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604713A** Project Number: **#D668**
PE Title: **Combat Feeding, Clothing and Equipment** Budget Activity: **#4**

(U) FY 1993 Planned Program:

- (U) Complete design and testing of selected candidates for destruction/neutralization of anti-personnel mines and boobytraps
- (U) Type classify M249 SAW assault pack, .50 caliber Sabot Launched Armor Penetrator (SLAP) ammunition, M249 blank firing device, and M24 sniper laser hardening protection
- (U) Initiate development of MK19 extended range sight, M249 collapsible buttstock, 40mm infrared illuminator, alternate color tracer, periscope, M4/M16 accurizer, 30mm individual grenade launcher, M4 carbine, optics for M249, and modular weapons system
- (U) Conduct user test of new/improved MRE items and packaging systems
- (U) Evaluate and type classify NDI for the Mounted Water/Ration Heater (MW/RH)
- (U) Conduct technical and user tests of the Insulated Food Container
- (U) Identify, field evaluate and transition to procurement hygiene items for the health and comfort pack
- (U) Conduct in-house performance tests on ICE prototypes, identify deficiencies, make improvements and purchase a quantity sufficient for field trials.
- (U) Continue development of soft mounts and improved munitions for the M2 MG and MK19
- (U) Conduct test and evaluation of OCIE including improved ballistic protective CVC helmet, lightweight rain suit, gloves, hot weather BDU cap, kneepads, and boots
- (U) Initiate work on Lightweight Chemical Protective Overgarment, Improved Chemical Biological (CB) Glove, Improved Mechanics Coveralls and Tropical Loadbearing Vest
- (U) Type classify M249 SAW Assault Pack, .50 cal SLAP Ammunition, M249 SAW blank firing device, neck gaiter, knee pad, knife sheath, CVC helmet, and hot weather BDU cap

(U) FY 1994 Planned Program:

- (U) Prepare MW/RH performance specification and transition to procurement
- (U) Complete small unit health and comfort pack TDP and transition to DLA
- (U) Complete insulated food container TDP and trnasition to DLA
- (U) Conduct test on Lightweight Chemical Protective Overgarment, Improved CB Glove, Improved Mechanics Coveralls and Tropical Loadbearing Vest
- (U) Type classify M24 Sniper Rifle muzzle devices, night sight, and spotting scope, 5.56mm and 7.62mm penetrator ammo, pocket binocular,AT4 night sight bracket, M249/m2/m19 lightweight ground mounts, universal boresight device, M249 collapsible buttstock, and IR illuminating round for M203 Grenade Launcher
- (U) Continue work on MK19 extended range sight, modular weapons system, M4/M16 multiple magazine holder, portable periscope, and M16 close combat optics
- (U) Type classify rainsuit, hot weather boot, ICE, mounted crewman cold weather boot, ghille suit accessory kit, improved socks, compartmented equipment bag, shelter half, mounted crewman cold weather gloves

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; Project Office, Army Field Feeding, Fort Belvoir, VA; Belvoir Research, Development and Engineering Center, Fort

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604713A** Project Number: **#D668**
PE Title: **Combat Feeding, Clothing and Equipment** Budget Activity: **#4**

Belvoir, VA; U.S. Army Aviation Research Laboratory, Fort Rucker, AL; Ballistic Research Laboratory, Aberdeen Proving Ground (APG), MD; U.S. Army Test and Evaluation Command, APG, MD; U.S. 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; Oakridge, TN; Contractors are: Kem-Tek Inc., Linwood, PA; American Optical Corp., South Bridge, MA; Safetech Inc., Newton, PA; and 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; Litton, Tempe, AZ; Olin, St. Petersburg, FL; Nomura 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.

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY: NARRATIVE DESCRIPTION OF CHANGES

1. **(U) TECHNICAL CHANGES:** None
2. **(U) SCHEDULE CHANGES:** 17 new items added
3. **(U) COST CHANGES:** Funding increased to more appropriately fund the program

F. (U) PROGRAM DOCUMENTATION: Each of the 57 separate projects currently within SEP have individual program documentation

G. (U) RELATED ACTIVITIES: PE #0601102A (Defense Research Sciences); PE #0602786A (Logistics Technology); PE #0203751A (Force Enhancements/Active); PE #0603802A (Weapons and Munitions Advanced Development). There is no unnecessary duplication of effort within the Army or DoD.

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

	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Other Procurement, Army BLIN 130 Soldier Enhancement Program	10488	10941	11529

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

J. (U) MILESTONE SCHEDULE: Each of the 57 separate projects currently within SEP has an individual milestone schedule.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604715A
PE Title: Non-System Training Devices - Engineering Development Budget Activity: #4

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D241 Non-System Training Devices Combined Arms	27816	16952	48207
D396 Tactical Simulation	5752	2547	5292
D573 STRICOM and Naval Training System Center Support	8990	8790	9170
D574 Combined Arms Tactical Trainer	23442	14617	(Beginning in FY94, CATT funding is in PE 0604780A D571)
PE TOTAL	66000	42906	62669

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 simulation provide force multipliers that improve combat effectiveness by providing realistic training scenarios 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 D241, Non-System Training Devices-Combined Arms, develops simulation training devices for Army-wide use, including the CTCs, and Fire Support Combined Arms Tactical Trainer (FSCATT). Project D396, Tactical Simulation, 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/NTSC Support, funds in-house costs of project support by STRICOM and Naval Training Systems Center (NTSC). Project D574, Combined Arms Tactical Trainer (CATT), is made up of a family of devices based on the Simulation Networking (SIMNET) concept, including the Close Combat Tactical Trainer (CCTT).

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) Project D396 - Tactical Simulation (TACSIM) - Funds development and testing support of TACSIM.

(U) FY 1992 Accomplishments:

- (U) Integrated TACSIM with the Rapid Scenario Preparation Unit for Intelligence (RASPUTIN) system for improved database and scenario preparation
- (U) Completed Prototype Version 2.1 of TACSIM with improved interface and sensor modeling capabilities

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604715A
PE Title: **Non-System Training Devices - Engineering Development** Budget Activity: **#4**

(U) FY 1993 Planned Program:
- (U) Enhance TACSIM Version 2.1 with corrections and improvements needed for final version release in FY93
- (U) Begin TACSIM Version 2.2, improving sensor modeling and adding a red-on-blue sensor capability
- (U) Improve TACSIM interface to CBS Version 1.4 to support increased unit capability of CBS (15,000 unit icons)
- (U) Interface TACSIM to the Aggregate Level Simulation Protocol (ALSP) Confederation of Models
- (U) Support Army Tactical Command and Control System (ATCCS) testing

(U) FY 1994 Planned Program:
- (U) Complete TACSIM Version 2.2
- (U) Begin development of intelligence simulation to support the next generation Army battle simulation - Warfighter Simulation (WARSIM 2000)
- (U) Provide developmental enhancements to TACSIM to maintain an up to date model compatible with CBS while the WARSIM/new intelligence model is in development
- (U) Continue support of ATCCS testing

(U) Project D573 - Simulation, Training and Instrumentation Command (STRICOM) and Naval Training Systems Center (NTSC) Support: This project funds STRICOM personnel and proportionate Army share of the operating costs of the NTSC through an inter-service support agreement which is reviewed annually.

(U) FY 1992 Accomplishments:
- (U) Funded STRICOM personnel and NTSC support

(U) FY 1993 Planned Program:
- (U) Continue funding STRICOM personnel and NTSC support

(U) FY 1994 Planned Program:
- (U) Continue funding STRICOM personnel and NTSC support

(U) Project D574 - Combined Arms Tactical Trainer (CATT) - This project provides for Engineering and Manufacturing Development (EMD) and pre-planned product improvements for the Close Combat Tactical Trainer (CCTT) to enhance readiness of both active and reserve component forces.

(U) FY 1992 Accomplishments:
- (U) Released Request for Proposal (RFP) and conducted source selection activities

(U) FY 1993 Planned Program:
- (U) Award EMD contract for CCTT
- (U) Continue development of CCTT

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604715A**
PE Title: **Non-System Training Devices - Engineering Development**
Budget Activity: **#4**

(U) FY 1994 Planned Program: See PE #0604780A, Project #D571

(U) Work Performed By: In-house activities are performed by personnel of STRICOM, various Army commands and agencies, the Naval Training System Center (NTSC), Orlando, FL, and other DOD agencies. Contract efforts are performed by various contractors contracted through NTSC.

(U) Related Activities: PE #0604321A (All Source Analysis System); PE #0605603A (Army User Test Instrumentation and Threat Simulators); 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 Training Systems Center in Orlando, FL. There is no unnecessary duplication of effort within the Army or the Department of Defense.

(U) Other Appropriation Funds:

	($ in Thousands)		
Appropriation	**FY 1992 Actual**	**FY 1993 Estimate**	**FY 1994 Estimate**
Non-System Training Devices	88910	85432	79650

(U) International Cooperative Agreements: Not applicable.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604715A** Project Number: **#D241**
PE Title: **Non-System Training Devices - Engineering Development** Budget Activity: **#4**

Project Title: Non-System Training Devices Combined Arms

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
NSTD Combined Arms	27816	16952	48207

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 battalion through echelon-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 t engagement exercises. Additionally, this project provides for the development of maintenance simulator many Army weapon systems. This project funds the development of training devices, simulators, simulations and instrumentation for the Combat Training Centers (CTC), including the MILES Claymore/Grenade, 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 system in their respective battlefield roles. Work on the Fire Support Combined Arms Tactical Trainer (FSCATT) begins in FY94. FSCATT can operate in stand alone mode for initial and sustainment gunnery training, or linked as part of the CATT family.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- (U) Initiated NTC Range Data Management System (RDMS) upgrade
- (U) Initiated development of the CSSTSS
- (U) Initiated Miles Claymore/Grenade
- (U) Continued development of CBS 1.4
- (U) Completed documentation of Live Fire Pyrotechnics for NTC
- (U) Completed CBS 1.3R for REFORGER 92

- (U) Tested SAWE-RF

(U) FY 1993 Planned Program:

- (U) Initiate development of AGES II upgrades
- (U) Initiate development of JRTC Objective Instrumentation System
- (U) Initiate development of After Action Review system to support Battle Command Training Program (BCTP) and CBS/BBS sites
- (U) Complete development of RDMS upgrade for NTC
- (U) Continue development of the CSSTSS
- (U) Continue enhancements of Brigade/Battalion Battle Simulation
- (U) Continue development of devices, simulators and simulations to support training at the National Training Center, Joint Readiness Training Center and the Battle Command Training Program
- (U) Complete Development of CBS 1.4
- (U) Complete testing of SAWE-RF

(U) FY 1994 Planned Program:

- (U) Initiate development of Army Integrated Thermal Signature Targets (AITST)
- (U) Initiate NTC AH-64 instrumentation
- (U) Initiate development of MILES II features for crew served and individual weapons
- (U) Initiate development of FSCATT
- (U) Initiate software development for WARSIM 2000
- (U) Initiate development of Trainer Distributed Interactive Simulation
- (U) Continue development of AGES II upgrades
- (U) Continue development of the CSSTSS
- (U) Continue JRTC Objective Instrumentation System
- (U) Develop modifications to and enhancements of FAMSSIM systems in support of Louisiana Maneuvers exercises and CINC training initiatives
- (U) Complete After Action Review system for BCTP
- (U) Continue development of devices, simulators and simulations to support training at the National Training Center, Joint Readiness Training Center the Battle Command Training Program, and the Combat Maneuver Training Center

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604715A
PE Title: Non-System Training Devices - Engineering Development

Project Number: #D241
Budget Activity: #4

D. (U) WORK PERFORMED BY: In-house STRICOM activities are performed by the Naval Training Systems Center, Orlando, FL. Contractors include Jet Propulsion Laboratories, Pasadena, CA, Loral Electro Optics, Pasadena, CA, software supported by Communication-Electronics Command (CECOM); development of other projects is performed by STRICOM, Orlando, FL.

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY: NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: None
2. (U) SCHEDULE CHANGES: CSSTSS contract award protest has delayed development
3. (U) COST CHANGES: Beginning in FY94, FAMSSIM will move into the next generation with WARSIM 2000 and Distributed Interactive Simulation. Development of the Fire Support Combined Arms Tactical Trainer (formerly Closed Loop Artillery Simulation System) was advanced to FY94.

F. (U) PROGRAM DOCUMENTATION: Not applicable. It is not feasible to list program documentation because of the quantity and variety of training devices in this project.

G. (U) RELATED ACTIVITIES: PE #0605603A (Army User Test Instrumentation and Threat Simulators); PE #0602727A (Non-System Training Device Technology); PE #0604312A (All Source Analysis System). 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 Training Systems Center (NTSC) in Orlando, FL. There is no unnecessary duplication of effort within the Army or the Department of Defense.

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

	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Other Procurement, Army			
NSTD - BLIN 159	88379	90668	94119
CTC - BLIN 158	9012	21948	13475

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

J. (U) MILESTONE SCHEDULE:

Milestone	Milestone Date
CSSTSS Tech/OP Test	2QFY95
WARSIM Contract Award	3QFY94
MILES Testing	2QFY95
FSCATT Contract Award	2QFY94

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604715A** Project Number: **#D241**
PE Title: **Non-System Training Devices - Engineering Development** Budget Activity: **#4**

(U) MILESTONE SCHEDULE (cont'd):

Milestone	Milestone Date
FSCATT Testing	2QFY96
FSCATT Milestone III	4QFY96
AITST Contract Award	2QFY94
NTC AH-64 Inst. Contract Award	1QFY94

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604716A (TIARA)
PE Title: **Terrain Information - Engineering Development**

Project Number: #D579
Budget Activity: #5

A. (U) RESOURCES: ($ in Thousands)
Project Title: Field Army Mapping Systems - Engineering Development

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
DTSS/QRMP	14274	11507	9929

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, increase 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 three phases including: fielding a QRMP prototype (P) printer/copier to engineer battalions for assessment, fielding an interim tactical system based on best available printer/copier technology or Early Field Prototype (EFP) and developing the objective QRMP that fully complies with all user requirements.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- (U) Completed DTSS Technical and Operational Tests
- (U) DTSS Special In Process Review (IPR) approved Low Rate of Initial Production (LRIP)
- (U) DTSS LRIP contract awarded
- (U) Delivered QRMP-P to field unit
- (U) QRMP Acquisition Strategy & Plan approved (revised)

(U) FY 1993 Planned Program:
- (U) DTSS Milestone III IPR
- (U) Complete DTSS Production Qualification Test
- (U) Release DTSS Production request for proposal (RFP)
- (U) Initiate DTSS Block I P3I
- (U) Award QRMP EFP Engineering and Manufacturing Development (EMD) contract
- (U) Delivery Enhancements to QRMP garrison field prototype

(U) FY 1994 Planned Program:
- (U) Award DTSS full rate production contract
- (U) Complete DTSS Material Release
- (U) Achieve DTSS First Unit Equipped (FUE)
- (U) Complete QRMP EFP Design Reviews

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604716A (TIARA) Project Number: #D579
PE Title: **Terrain Information - Engineering Development** Budget Activity: #5

- (U) Conduct test/evaluations of DTSS Block I P3I
- (U) Conduct QRMP EFP technical and operational assessment
- (U) Conduct Special Program Review for QRMP EFP
- (U) Deliver QRMP EFP

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, VA. The DTSS contractor is Loral Defense Systems Division, Akron, OH. Concurrent QRMP efforts are being accomplished by the Jet Propulsion Laboratory, Pasadena, CA; Tooele Army Depot, UT; and General Electric Aerospace, Fort Washington, PA.

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY: NARRATIVE DESCRIPTION OF CHANGES

1. (U) TECHNICAL CHANGES: DTSS/QRMP - QRMP Prototype deliveries reflects an interim field capability.
2. (U) SCHEDULE CHANGES: DTSS/QRMP - Delay in awarding contract. Material release and FUE delayed to 1QTR FY94 and 2QTR FY94 respectively. LRIP systems not available for Production Qualification Test until AUG 93 instead of MAY 93.
3. (U) COST CHANGES: None, program restructure to fit available funding

F. (U) PROGRAM DOCUMENTATION:

Document	Date
DTSS	
Letter of Agreement (LOA)	01/82
Operational &Organizational (O&O) Plan	08/85
Acquisition Strategy	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
QRMP	
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 Army or DoD. Extended coordination is conducted with other services and agencies to avoid duplication of effort within DoD.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604716A (TIARA)** Project Number: **#D579**
PE Title: **Terrain Information - Engineering Development** Budget Activity: **#5**

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

Appropriation	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Other Procurement, Army			
KA2550	7325	9677	14179

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

J. (U) MILESTONE SCHEDULE:

Milestones	Milestones Dates
Digital Topographic Support System (DTSS):	
System Delivery	01/91
Technical Test II	05/92
LRIP Contract Award	05/92
Initial Operational Test and Evaluation (IOT&E)	07/92
Milestone III Decision Review (Type Classification)	04/93
First Article Test (LRIP)	08/93
First Unit Equipped	02/94
Production Contract	02/94
Quick Response Multicolor Printer (QRMP):	
Award EFP EMD contract	01/93
EFP Technical Test	02/94
EFP User Assessment	06/94
Field EFP to Operational Units	11/94

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604726A (TIARA)
PE Title: **Integrated Meteorological Support System** Budget Activity: #4

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
DD85 Integrated Meteorological Support System	4411	905	949

B. (U) BRIEF DESCRIPTION OF ELEMENT: Project #DD85, the Integrated Meteorological Support 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). IMETS was a new start in FY 1992.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) Project Number and Title: Project #DD85, the Integrated Meteorological Support System (IMETS). Army commanders need 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, 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.

(U) FY 1992 Accomplishments:

- (U) Program initiated FY 92
- (U) Acquisition strategy approved
- (U) Milestone Decision Review I/II approved
- (U) Test and Evaluation Master Plan approved
- (U) Systems integration contract awarded, integration initiated
- (U) Air Force software rehost contract awarded, software rehost initiated
- (U) Army Common Hardware/Software acquired
- (U) Outline Test Plan/Technical Test Plan updated/approved
- (U) Integrated Logistics Support Plan revised

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604726A (TIARA)
PE Title: **Integrated Meteorological Support System** Budget Activity: #4

(U) FY 1993 Planned Program:

- (U) Complete Air Force software rehost to Army common hardware
- (U) Complete integration of 3 Systems for technical/operational test
- (U) Conduct contractor integration component tests
- (U) Conduct technical tests
- (U) Conduct operator personnel training
- (U) Conduct logistics demonstration
- (U) Initiate operational tests
- (U) Conduct Pre-Milestone III Special Program Review

(U) FY 1994 Planned Program:

- (U) Complete Operational Tests
- (U) Conduct Milestone III In Process Review
- (U) First Unit Equipped (CONUS)
- (U) Integrate/upgrade common hardware/software
- (U) Integrate/upgrade Target Area 4-Dimensional Meteorological Model; High Resolution Small Weather Satellite Receiver; Air Force Automated Weather System Software and Army Weather Decision Aids

(U) Work Performed By: IMETS In-House developing organizations are: U.S. Army Atmospheric Sciences Laboratory, White Sands Missile Range, NM (Tech Base and Software Development); Program Executive Office - Command and Control Systems, Project Director - IMETS, Fort Monmouth, NJ (Materiel Developer); Communications-Electronics Intelligence Center, Fort Huachuca, AZ (Preparation of Requirements Documents). IMETS contractors are GTE, Westlake, CA (Air Force Software) and RDA/Logicon, Tacoma, WA (System Integrator).

(U) Related Activities:

- (U) PE#0604321A (All Source Analysis System)
- (U) PE#0604716A (Terrain Information - Engineering Development)
- (U) PE#0603811A (Meteorological Data System)
- (U) 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	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Other Procurement Army (OPA 2)			
BW0021	0	5522	6452

(U) International Cooperative Agreements: NONE

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604740A (TIARA)
PE Title: **Tactical Surveillance System - Engineering Development**

Project Number: #D662
Budget Activity: #4

A. (U) **RESOURCES:** ($ in Thousands)
Project Title: Tactical Surveillance System - Engineering Development

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Tactical Surveillance System - Engineering Development	21398	18944	38815

B. (U) **BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:** This project supports 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) program. Efforts include: maintaining sensor interfaces and modernizing the existing imagery exploitation systems (MIES), performing engineering development on the hardware of the Enhanced Tactical Radar Correlator (ETRAC) and common synthetic aperture radar (SAR) processor, and beginning in FY94 development of Engineering Development Model (EDM) of the Imagery Processing and Dissemination System (IPDS) that transfers from PE # 0603730A. The MIES and IPDS systems receive and process imagery from national and tactical sources and present intelligence reports and exploited imagery products to the field commander. The common Synthetic Aperture Radar (SAR) processes the signals from synthetic aperture radars. The Enhanced Tactical Radar Correlator (ETRAC) contains the common SAR processor and is a C-130 drive on/off system capable 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 as well as to support contingency missions and low intensity conflicts. These efforts are all directed at meeting the Army's need for timely information on enemy forces under day, night, and all weather conditions anywhere in the world. Further details may be found at the Top Secret Special Access Level in the Tactical Intelligence and Related Activities (TIARA) Congressional Justification Book, Volume VI, and the TENCAP Master Plan.

C. (U) **PROGRAM ACCOMPLISHMENTS AND PLANS:**

(U) **FY 1992 Accomplishments:**
- (U) Continued MIES program.
- (U) Initiated development of ETRAC system.

(U) **FY 1993 Planned Program:**
- (U) Integrate the MIES into existing IES at XVIII Corps and continue development of MIES for U.S. Army Europe (USAREUR).
- (U) Continue development of ETRAC and common SAR processor.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604740A (TIARA)
PE Title: Tactical Surveillance System - Engineering Development

Project Number: #D662
Budget Activity: #4

(U) FY 1994 Planned Program:

- (U) Complete second MIES and integrate into existing IES at USAREUR.
- (U) Begin development of the EDM IPDS.
- (U) Continue development of ETRAC and common SAR processor.

D. (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.

E. (U) COMPARISON WITH FY 1993 AMENDED 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:
Material needs for Army Tactical Requirements for National Level Reconnaissance, May 73 (S) USAF, USA, USMC memorandum of understanding, establishing Joint Service Imagery Processing System 8 Jan 87.

G. (U) RELATED ACTIVITIES:
PE #0603730A (Tactical Surveillance System - Advanced Development) provides the initial development efforts for timely and accurate tactical receipt, exploitation and dissemination of digital imagery. To ensure no duplication of effort, this work is coordinated with the 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).

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

Appropriation	FY 1992 Actual	FY 1993 Estimate	FY1994 Estimate
Other Procurement Army (OPA 2)			
BA0329	1501	1444	1927

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

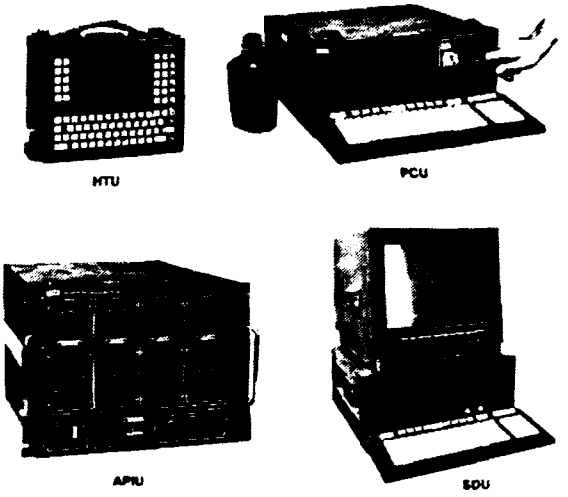
J. (U) MILESTONE SCHEDULE:

Milestones	Milestones Dates
Begin downsized TRAC development (ETRAC)	3Q/FY92
Integrate MIES into XVIII ABC IES	1Q/FY93
Integrate MIES into USAREUR IES	1Q/FY94

FY 1994 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: **#4**



POPULAR NAME: **FAAD C2**

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

SCHEDULE	FY 1992	FY 1993	FY 1994		
Program Milestones		MDR III 5/93 LT FUE 9/93 HVY			
Engineering Milestones		CDR V4 5/93			
T&E Milestones	V3 IA&T 8/92	Block I DT 11/92 FDT&E LUT 2/93	Lt Div Regression Test 3/94 Prototype (V4)GBS Interface 4QFY94		
Contract Milestones	Award Contract V4 Hvy 8/92				
BUDGET ($000)	FY 1992	FY 1993	FY 1994		
Major Contract	18609	22389	5400		
Support Contract	1887	1997	1970		
In-House Support	5554	7312	6964		
GFE/ Other	5365	6643	1090		
Total	31415	38341	15424		

FY 1994 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: **#4**

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES:
The Forward Area Air Defense Command and Control (FAAD C2) program includes the C2 software development and the effort required to integrate this software within: (1) Army Tactical Command and Control Systems Common Hardware/Software (ATCCS CHS) processors, displays, and associated peripherals; (2) Army Data Distribution Systems (ADDS); (3) air defense sensors; (4) FAAD weapon systems; and (5) combined arms interfaces. The Forward Area Air Defense Command, Control, and Intelligence (FAAD C2I) system will provide command and control of FAAD weapon systems, track information to combined arms, and will enable the integration of air defense assets to counter the low altitude air threat over and beyond a division's area of operations. The command and control integrates command posts, weapons air defense-capable combined arms, air defense sensors (ADS) (ground and masked target, using passive and active technologies) with their aircraft identification equipment (active and passive, friendly and hostile identification), and required communications to provide an integrated FAAD System capable of protecting the division from air attack. This architecture supports the commander's scheme of maneuver through vertical integration with force level control systems.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- (U) Awarded Contract for heavy division fielding Version 4 (V4)
- (U) Completed light division Version 3 (V3) Block I Integration, Assembly, & Test (IA&T), & elivery of test system
- (U) Completed Light and Special Division Interim Sensor (LSDIS) Integration
- (U) Conducted software V3 Formal Qualification Test (FQT)
- (U) Accepted delivery of validated technical manuals to support C2 test & instructor & key personnel training
- (U) Approved Program Baseline Mar 91

(U) FY 1993 Planned Program:
- (U) Conduct Block I Development Test (DT)
- (U) Conduct Block I Force Development Test & Experimentation/Limited User Test (LUT)
- (U) Conduct V4 software Critical Design Review (CDR)
- (U) Conduct Program Executive Officer In-Process Review (for light division)
- (U) First Unit Equipped (FUE) for light division

(U) FY 1994 Planned Program:
- (U) Conduct Light Division Regression Test
- (U) Conduct Block II Development Test
- (U) Conduct Block II Force Development Test & Experimentation (FDT&E)
- (U) Continue development of software Version IV at a reduced rate

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604741A** Project Number: **D126**
PE Title: **Air Defense Command, Control and Intelligence Engineering Development** Budget Activity: **#4**
Project Title: **FAAD Command and Control Engineering Development**

D. (U) WORK PERFORMED BY: Program Management is performed by the Project Manager, Air Defense Command and Control Systems, assigned to the Program Executive Office, 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 1993 AMENDED 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 (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
FAAD C2I Required Operational Capability (ROC)	7/92

G. (U) RELATED ACTIVITIES:

PE #0604820A (Radar Development)
PE #0603740A (Air Defense C2I - Advanced Development)
PE #0603757A (FAAD System)
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)
No duplication of work exists within the Army or DoD.

H. (U) OTHER APPROPRIATION FUNDS:

	($ in Thousands)		
Appropriation	**FY 1992 Actual**	**FY 1993 Estimate**	**FY 1994 Estimate**
Other Procurement, Army AD5050	0	0	10800

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604741A** Project Number: **D126**
PE Title: **Air Defense Command, Control and Intelligence Engineering Development** Budget Activity: **#4**
Project Title: **FAAD Command and Control Engineering Development**

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

J. (U) TEST AND EVALUATION DATA:

Conducted FY 90 Block I Software Demonstration (V1)
Conducted FY 91 Block I Software Demonstration (V2)
Completed FY 92 Block I FQT, LSDIS Integration, and IA&T
Conduct FY 92 Early User Innovative Test (EUIT) and LSDIS Demonstration
Conduct FY 93 Block I DT, and Force Development Testing & Experimentation (FDT&E)/LUT
Conduct FY 94 Block I Regression Test

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604746A**
PE Title: **Automatic Test Equipment Development** Budget Activity: **#4**

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

Project Number / Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D537 Integrated Family of Test Equipment (IFTE)	370	1998	3572
DL10 Electro-Optic Test Equipment	6884	3798	7188
DL59 Diagnostics/Expert System Development	10674	10725	3712
PE TOTAL	17928	16521	14472

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 equipments (TMDE) which adequately test and fault isolate weapon systems, their components and assemblies. Meets the required operational readiness for: sophisticated systems, state-of-the-art technology, and modular, reconfigurable automatic test equipment (ATE) that satisfies the largest possible test requirements across each equipment commodity. An urgent requirement exists at all maintenance levels for ATE to support complex communications and electronic-intensive commodities such as missiles, aircraft, combat vehicles; etc. The Integrated Family of Test Equipment (IFTE) meets these missions during 1990-1999 timeframe. It fulfills the requirements for manual and semi-automatic general purpose test equipment to meet maintenance standards at the division level; plus identifies and evaluates non-developmental item (NDI) equipment which satisfies these needs. Expert systems and artificial intelligence applications are being developed to provide paperless maintenance and troubleshooting manuals and procedures, as well as battlefield electronic displays which reduces the Army investment in test program sets (TPS), maintenance publications, and procedures.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) Project D537 - Integrated Family of Test Equipment (IFTE): Supports the development and improvement of ATE that provides automated testing of electronic-intensive weapon systems at all maintenance levels. IFTE will automatically test and verify the operation of line replaceable units (LRU) and screen replaceable units (SRU). It's Pre-Planned Product Improvement (P3I) Program upgrades the software to the new Department of Defense (DoD) standard, A Broad Based Environment for Test (ABBET)0 and upgrades the hardware. The hardware upgrade will be for the inclusion of the latest commercially availabie technology Virtual Memory Extension (VME) bus for Instrumentation (VXI) as well as upgrades in the digital and radio frequency (RF) areas to support new weapon systems.

(U) FY 1992 Accomplishments:

- (U) Supported Homing-All-the-Way-Killer (HAWK) during their integration process with the Base Shop Test Facility (BSTF).

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604746A**
PE Title: **Automatic Test Equipment Development** Budget Activity: **#4**

(U) FY 1993 Planned Program:
- (U) Evaluate potential of VXI implementation.
- (U) Conduct ABBET conversion feasibility study and develop an implementation plan.

(U) FY 1994 Planned Program:
- (U) Start implementation of ABBET for BSTF.
- (U) Commence development of VXI.

(U) Project DL10 - Electro-Optics (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 weapons systems . The IFTE Electro-Optics (EO) Program employs a two-phase approach consisting of an off-system EO Bench (EOB) which will be integrated into the BSTF 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; but 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. 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 the Army policy on standard ATE.

(U) FY 1992 Accomplishments:
- (U) Awarded CTS EOA full scale Engineering and Manufacturing Development (EMD) contract.
- (U) Initiated development of EO TPSs for Abrams and AVENGER.
- (U) Awarded EMD contract to integrate the Navy Consolidated Automated Support System (CASS) EOB with the Army IFTE Commercial Equivalent Equipment (CEE).
- (U) Conducted preliminary design review of CTS EOA.

(U) FY 1993 Planned Program:
- (U) Complete the development of the CTS EOA.
- (U) Complete the EOB integration with the CEE.

(U) FY 1994 Planned Program:
- (U) Conduct technical tests/initial operational test and evaluation (IOTE) of CTS EOA.
- (U) Commence development of EO test capability for BSTF.

(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 TPS for conversion to new standard ATE. State-of-the-art technologies in expert systems and artificial intelligence,

paper less 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 system deficiencies.

(U) FY 1992 Accomplishments:
- (U) Completed the Bradley Fighting Vehicle System (BFVS) Expert System Troubleshooter (BEST).
- (U) Commenced development of expert systems for Heavy Equipment Transport System (HETS).
- (U) Supported TMDE Equipment Modernization (TEMOD) acquisitions in the development of specifications and bid sample test procedures; conducted market surveys and tested bid samples.
- (U) Developed a universal board level interconnecting device (ICD) for the BSTF.
- (U) Commenced development of TEMPEST Contact Test Sets (CTS).
- (U) Rehosted a Computer Language/Abbreviated Test Language for All Systems (C/ATLAS) compiler on CTS.
- (U) Commenced development of Simplified Test Equipment/ Internal Combustion Engine-Reprogrammable (STE/ICE-R) replacement.
- (U) Commenced transition of general support (GS) diagnostic software to IFTE.

(U) FY 1993 Planned Program:
- (U) Complete development and evaluate/verify expert system for the Palletized Load System (PLS).
- (U) Complete test of expert systems for the HETS.
- (U) Complete development of a TEMPEST qualified CTS.
- (U) Test NDI instruments in the CTS.
- (U) Complete, test and field a CTS with STE/ICE-R functionality.
- (U) Support TMDE acquisitions.
- (U) Complete transition of GS diagnostic software programs to standard ATE.
- (U) Test and release a C/ATLAS compiler for CTS.
- (U) Commence development of Electronic Technical Manual (ETM) for BSTF.
- (U) Commence development of BSTF TPS that includes remove capability.
- (U) Assist other materiel system managers in development of their weapon systems.

(U) FY 1994 Planned Program:
- (U) Test and field TEMPEST qualified TEMPEST CTS.
- (U) Continue to support test, measurement, and diagnostic equipment acquisitions.
- (U) Commence development of additional artificial intelligence (AI) tools.
- (U) Commence development of software tools to reduce TPS and Interactive Electronic Technical Manual (IETM) development costs.
- (U) Commence development of software to electronically link IFTE with the logistics system Unit Level Logistic System (ULLS), Standard Army Maintenance System (SAMS) and others.
- (U) Continue development of BSTF TPSs that include remove and replace capability.
- (U) Continue testing of NDI instruments in the CTS.

(U) Work Performed By:
- (U) D537 - Integrated Family of Test Equipment: U.S. Army Test, Measurement, and Diagnostic Equipment Activity, Redstone Arsenal, AL.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604746A**
PE Title: **Automatic Test Equipment Development** Budget Activ : **#4**

- (U) DL10 - Electro-Optic Test Equipment: In-house efforts are performed by US Army TMDE Activity (USATA), Redstone Arsenal, AL. Major contractor for EOA is Pentastar Electronics, Inc., Huntsville, AL., and for EOB, the Grumman Aerospace Corporation, Bethpage, Long Island, NY.
- (U) DL59 - Diagnostics/Expert System Development: In-house efforts are performed by the US Army TMDE Activity (USATA), Redstone Arsenal, AL., Tobyhanna Army Depot (TOAD), Tobyhanna, PA, Picatinny Arsenal Armament Research, Development and Engineering Center, Picatinny, NJ, Department of Energy, Oak Ridge, TN, and 8A competitive contractors.

(U) Related Activities:

- (U) D537 - Integrated Family of Test Equipment: None. There is no unnecessary duplication of effort within the Department of the Army or Department of Defense.
- (U) DL10 - Electro-Optic Test Equipment: P.E. # 0603001A (Logistics Advanced Technology) There is no unnecessary duplication of effort within the Department of the Army or the Department of Defense (DoD). The integration of the Navy developed EOB within the Army IFTE CEE system saved the Army millions of dollars in a similar research and development project.
- (U) DL59 - Diagnostics/Expert System Development: P.E. #063001A (Logistics Advanced Technology) There is no unnecessary duplication of effort within the Department of the Army or DoD.

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

Appropriation	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Integrated Family of Test Equip (IFTE) (KA4000)	61480	49665	47956

International Cooperative Agreements: Not applicable.

FY 1994 RDTE DESCRIPTIVE SUMMARY

Program Element: #0604759A
PE Title: Major Test and Evaluation Investments Budget Activity: #6

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

Project Number / Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
DC55	Distributed Developmental Simulation Technology		
	3935	3719	2896
D983	Major Test and Evaluation Investment - USAKA *		
	2900	5600	0
D984	Major Technical Test Instrumentation **		
	30551	27426	2101
D986	Major User Test Instrumentation		
	18427	17019	23896
PE TOTAL	55813	53764	28893

*** Resources were realigned from PE #0605301A, Project D614 - U.S. Army Kwajalein Atoll (USAKA) to this program element, Project D983 for purchases of major test and evaluation investment (over $2 million per year or $10 million total acquisition cost). The funding reported in D983 for FY 1992 and FY 1993 does not match the R-1, but represents the actual costs associated with the purchase of major test and evaluation investments for USAKA and are displayed for comparability.**

**** Resources were realigned from PE #0605602A, Project D453 - Technical Test Instrumentation to this program element, Project D984 for purchases of major test and evaluation investment (over $2 million per year or $10 million total acquisition cost). The funding reported in D984 for FY 1992 and FY 1993 does not match the R-1, but represents the actual costs associated with the purchase of major test and evaluation investments for Test and Evaluation Command and are displayed for comparability.**

B. (U) BRIEF DESCRIPTION OF ELEMENT: This is not a new start. Major test and evaluation (T&E) investments, previously funded in PE #0605301A - U.S. Army Kwajalein Atoll (USAKA); PE #0605602A - Army Technical Test Instruments and Targets; and PE #0605603A - Army User Test Instrumentation and Threat Simulators, were consolidated into this program by Office, Secretary of Defense (OSD) to improve visibility of T&E resources across the services, prevent unnecessary duplication in test facilities, and improve effectiveness of T&E investments. Program element funds the development and acquisition of major T&E instrumentation investments that cost $2 million in a single year or $10 million in total for Army developmental and operational test activities: USAKA Major Range and Test Facility Base (MRTFB); U.S. Army Test and Evaluation Command (TECOM) MRTFBs and test centers; and U.S. Army Operational Test and Evaluation Command (OPTEC) user test organizations. Distributed Developmental Simulation Technology, realigned from PE #0605604A - Survivability/Lethality Analysis, 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.

FY 1994 RDTE DESCRIPTIVE SUMMARY

Program Element: #0604759A
PE Title: Major Test and Evaluation Investments
Budget Activity: #6

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 which provide virtual combined arms battlefield with the warfighter-in-the-loop to evaluate weapon system concept, tactics and doctrine and test plans.

(U) **FY 1992 Accomplishments:**
- (U) Supported Army M1A1/M1A2 comparative analysis, critical mobile target and combat vehicle command and control experiments.
- (U) Developed training for aviation and armor systems.
- (U) Conducted Line-of-Site-Anti-Tank (LOSAT) systems design test.

(U) **FY 1993 Planned Program:**
- (U) Support Army combined arms command and control, rotary pilot associates linkage, and 50 ton tank experiments.
- (U) Design Non-Line of Site (NLOS) system.
- (U) Continue LOSAT System Design tests.
- (U) Support Louisiana Maneuvers (LAM) initial efforts.

(U) **FY 1994 Planned Program:**
- (U) Support LAM 94.
- (U) Complete linkage of Fort Knox and Tank/Automotive Command (TACOM) simulators.
- (U) Support Army experiments.

(U) **Project D983 - Major Test and Evaluation Investment - U.S. Army Kwajalein Atoll (USAKA).** This project procures major T&E investment items costing $2 million in a single year or items costing $10 million total acquisition for UKAKA. Upgrades to radars, telemetry equipment, optics and other equipment are required to maintain USAKA as a national test range.

(U) **FY 1992 Accomplishments:**
- (U) Installed a Submarine Fiber Optic Transmission System (SFOTS) which connects all eleven (11) islands controlled by USAKA.
- (U) Upgraded instrumentation computer systems, optical data reduction systems, and telemetry receiver/data recording systems.

(U) **FY 1993 Planned Program:**
- (U) Replace and modernize outdated and irreparable subsystems on AN/FPQ-19 and AN/MPS-36 radars, telemetry, and optical systems.

(U) **FY 1994 Planned Program:**
- (U) There are no major instrumentation projects for USAKA funded in FY 1994.

FY 1994 RDTE DESCRIPTIVE SUMMARY

Program Element: #0604759A
PE Title: **Army Test and Evaluation Investments** Budget Activity: #6

(U) **Project D984 - Major Technical Test Instrumentation.** This investment project develops and acquires major developmental test technology costing $2 million in a single year or $10 million total acquisition for performing developmental testing of weapon systems at TECOM MRTFBs and test centers: Yuma Proving Ground (YPG), AZ; Dugway Proving Ground (DPG), UT; White Sands Missile Range (WSMR), NM; Electronic Proving Ground (EPG), AZ; Combat Systems Test Activity (CSTA), MD; Aviation Technical Test Center (ATTC), AL; Redstone Technical Test Center (RTTC), AL; and Cold Regions Test Center (CRTC), AK. This project responds to the rapid advances in weapons systems technology and diversity of systems being developed to assure adequate testing. In-house and matrix support costs for PM, Instrumentation, Targets, and Threat Simulators (PM ITTS) are also paid from this project.

(U) **FY 1992 Accomplishments:**

- (U) Continued development of the Fiber Optic Network (FON) at CSTA (formerly reported as the Broad Coverage Communications Project in the FY 1992/1993 RDDS).
- (U) Continued the development, acquisition, and installation of the Combat Vehicle Measurement System (CVMS) which provides bi-directional data link and telemetry equipment for transmission of performance data from combat vehicles and vehicle based weapon systems operating on automotive test courses at CSTA.
- (U) Continued development, acquisition, and installation of the Combat Vehicle Performance System (CVPS) at CSTA which is an instrumentation suite required to assess the performance of combat vehicles and vehicle based weapon systems.
- (U) Awarded contract for the four phase installation of the Electromagnetic Radiation Effects (EMRE) transmitters at WSMR. This instrumentation provides criteria level radiation environments for weapon system testing.
- (U) Studied the Frequency Surveillance/Analysis System (FSS) acquisition at WSMR which modernizes and enhances the radio frequency monitoring capability and allows for remote operation. Study determined technical feasibility and acquisition strategy.
- (U) Continued planning for Test Support Network (TSN) (formerly reported as the Communications Trunking Program in the FY 1992/1993 RDDS) acquisition documentation at WSMR. This project modernizes antiquated data and voice transport telecommunications over the entire range.
- (U) Initiated the development and acquisition of radar simulation equipment at RTTC for the Radar Electromagnetic Environment Simulation (REES) project. REES project simulates near-field high peak pulsed radar electromagnetic environments generated by friendly and threat radar emitters.
- (U) Received Milestone IIIa decision to proceed with the Low Rate Initial Production (LRIP) of the Army's components of the DoD Global Positioning System (GPS) program which provides test centers precise Time, Space, Positioning Information (TSPI) data using Congressionally mandated Range Applications Joint Program Office (RAJPO) developed hardware and support.

(U) **FY 1993 Planned Program:**

- (U) Continue development of FON at CSTA.
- (U) Complete first two CSTA vehicle test courses as part of the CVMS project; initiate contract development for final phase in FY 1994.
- (U) Acquire high-speed data acquisition system and secured data and video transmission instrumentation as part of the CVPS project at CSTA.
- (U) Complete the acquisition of the REES project at RTTC which includes microwave and millimeter wave test and measurement system and low power microwave sources.

Program Element: **#0604759A**
PE Title: **Army Test and Evaluation Investments** Budget Activity: **#6**

- (U) Complete installation of Phase I (100 - 500 Mhz) of EMRE transmitters program at WSMR; award first contract option for Phase II (of IV) to provide 30 - 100 Mhz frequency radiation. Achieve Initial Operational Capability (IOC).
- (U) Complete technical study and finalize acquisition strategy for the FSS modernization program at WSMR and installation of remote control capability to monitor the low-end (20 Mhz to 1 Ghz) frequencies.
- (U) Continue development of acquisition strategy and technical design for the WSMR TSN.
- (U) Achieve limited IOC using the Army Range GPS at WSMR, EPG, and YPG; continue developing capability across other TECOM test centers.
- (U) Initiate concept exploration for a High Powered Microwave instrumentation suite at WS for determining the effects of radio frequency directed energy environments on U.S. Army weapon systems. System IOC date will be FY 1999.

(U) **FY 1994 Planned Program:**

- (U) Complete study of the next phase of the Combat Vehicle Performance System (CVPS) project.
- (U) Prepare the Test Support Network (TSN) procurement package and seek a milestone decision authority approval for M/S I/II to allow contract award in FY 1995.
- (U) Plan long range fielding deployment and support of the Army's GPS items.
- (U) Develop acquisition documentation in accordance with the DOD 5000 series for current and new major instrumentation projects. Included in this activity is performing milestone reviews for selected programs to ensure these programs' readiness for further development.

(U) **Project D986 - Major User Test Instrumentation.** Project finances the development of field instrumentation for U.S. Army Operational Test and Evaluation Command's (OPTEC) 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 be the interface between live troop units and the Distributed Interactive Simulation (DIS) constructs. This data will provide objective assessment for new materiel acquisition, force structuring, doctrine and tactics modification, and, through the Advanced Research Projects Agency (ARPA) protocol data unit (PDU) format, part of the DIS, provide data with which to validate the future DoD warfighting models and simulations. The MAIS achieved Milestone I/II in FY 1990.

(U) **FY 1992 Accomplishments:**

- (U) Completed MAIS System Design Review (SDR).
- (U) Completed MAIS Software Specification Review (SSR).
- (U) Completed MAIS Preliminary Design Review (PDR).
- (U) Completed engineering change proposal to develop the capability to reformat MAIS data into PDU format for interoperability with the DIS.
- (U) Completed rebaselining program to incorporate ir nation security rec ments and align development with program funding profile.
- (U) Initiated procurement of National Security Agenc NSA) pre-producti.. encryption modules.

(U) **FY 1993 Planned Program:**

- (U) Conduct MAIS Encryption PDR and Critical Design Review (CDR).

Program Element: #0604759A
PE Title: **Army Test and Evaluation Investments** Budget Activity: **#6**

- (U) Conduct MAIS System CDR.
- (U) Demonstrate functionality of key hardware/software MAIS components for defined exit criteria.
- (U) Procure MAIS production lot encryption modules.
- (U) Initiate MAIS system integration.

(U) **FY 1994 Planned Program:**

- (U) Complete MAIS system integration and conduct subsystem and system level test.
- (U) Demonstrate critical functionality of the MAIS data communications network for defined milestone III exit criteria.
- (U) Conduct formal MAIS software qualification tests.
- (U) Conduct MAIS system software Independent Validation and Verification (IV&V).
- (U) Initiate manufacturing of initial MAIS system requirements.

(U) **Work Performed by:** Major contractors are: 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, San Jose, CA and Norfolk, VA; Loral Space and Range Systems, Sunnyvale, CA; Loral Systems, Akron, OH; New Mexico State Univ, NM; Science and Technology Corp, Hampton, VA; Sperry Corporation, Reston, VA; SRI, WSMR, NM; Syndetix, Las Cruces, NM; TVI Corporation, Beltsville, MD; and Westinghouse, Baltimore, MD. 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 organizations include: National Institute of Standard and Technology, Boulder, CO; US Army TECOM, Aberdeen Proving Ground (APG), MD; Missile Command, 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 and Edwards AFB, CA; RTTC, Huntsville, AL; Fort Knox, KY; TACOM, Detroit, MI; OPTEC, Alexandria, VA; Test and Experimentation Command (TEXCOM), Fort Hood, TX; TEXCOM Experimentation Command, Fort Hunter-Liggett, CA; Product Manager for LOSAT, Huntsville, AL; and PM ITTS, Orlando, FL.

(U) **Related Activities:** Tri-services requirements are coordinated and duplication of effort is precluded through the DoD sponsored Reliance process. This program is related to:

PE #0605301A (Army Kwajalein Atoll)
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 #0605712A (Support of Operational Testing)

(U) **Other Appropriation Funds:** Not applicable.

(U) **International Cooperative Agreements:** Not applicable.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604766A (TIARA)** Budget Activity: **#4**
PE Title: **Tactical Electronic Surveillance System - Engineering Development**

A. (U) RESOURCES: ($ in Thousands)
Project Title: Tactical Electronic Surveillance System - Engineering Development

Popular Name	FY 1992 Estimate	FY 1993 Estimate	FY 1994 Estimate
D909 Tactical Electronic Surveillance System - Engineering Development	20451	32275	31001
D113 Joint Tactical Ground Station	0	0	21546
PE TOTAL	20451	32275	52547

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: 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 new start, it is a follow-on to the SDIO funded Tactical Surveillance Demonstration (TSD). Initial development of the Joint Tactical Ground Station (JTAGS) prototype was funded in FY 1993 under Project #D909. Project #D113 develops the Joint Tactical Ground Station, designed for in-theater receipt, processing and dissemination of warning and cueing 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 VI, and in the Army TENCAP Master Plan.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994 :

Not Applicable.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604766A (TIARA)**
PE Title: **Tactical Electronic Surveillance System - Engineering Development**

Project Number: **#D113**
Budget Activity: **#4**

A. (U) RESOURCES: ($ in Thousands)
Project Title: Joint Tactical Ground Station (JTAGS)

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Joint Tactical Ground Station (JTAGS)	0	0	21546

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project develops two ruggedized prototypes of systems designed for in-theater receipt, processing and dissemination of warning and cueing 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. This is not a new start. This project is a follow-on to the Strategic Defence Initiative Organization (SDIO) funded Tactical Surveillance Demonstration (TSD). Initial development of the JTAGS prototype was funded in FY93 under Project #D909. By being located in-theater, the system improves the warning and cueing response time and eliminates several single-point-failure communications relay nodes. The warning and cueing information will be disseminated via Tactical Information Broadcast System (TIBS), Tactical Related Application (TRAP) and other existing in-theater communications nets.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments: FY 1992 efforts funded with SDIO and Navy funds.

(U) FY 1993 Planned Program: Program funded in Project D909 this PE.

(U) FY 1994 Planned Program:
- (U) Complete developmental and phase I operational testing of transportable prototype.
- (U) Support preparations for Milestone II decision review.
- (U) Develop Engineering and Manufacturing Development (EMD) JTAGS ruggedization specifications.
- (U) Engineer and develop two EMD JTAGS prototypes.

D. (U) WORK PERFORMED BY:
The Army Theater Missile Defense Program Office (ATMD PO), Redstone Arsenal, AL, is assigned responsibility for JTAGS development. The US 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.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604766A (TIARA)
PE Title: Tactical Electronic Surveillance System - Engineering Development

Project Number: #D113
Budget Activity: #4

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY: NARRATIVE DESCRIPTION OF CHANGES

1. (U) **TECHNICAL CHANGES:** NA
2. (U) **SCHEDULE CHANGES:** NA
3. (U) **COST CHANGES:** NA

F. (U) PROGRAM DOCUMENTATION:

Mission Need Statement (MNS) Theater Missile Defense (TMD) MNS 07/91
Operational Requirements Document (ORD)- under development.

G. (U) RELATED ACTIVITIES:

This is a cooperative program with the Navy and is governed by an Memorandum of Agreement (MOA). The Army will develop JTAGS to incorporate both Army and Navy Requirements. The Navy program providing funding is Tactical Space Operations, PE: 0603451, Project 1846, Title: Slow Walker/JTAGS. SDIO and the Air Force have a complementary program in the SDIO budget. The two programs form the elements of a hybrid system and receive oversight from an Executive Committee consisting of the PEO Global Protection Against Limited Strike (GPALS) from each service. JTAGS and Talon Shield/Centralized Tactical Processing Program (CTPP), which also evolved from the Army's Tactical Surveillance Demonstration (TSD), form a hybrid architecture wherein Talon Shield/CTPP provides worldwide coverage of tactical events using multiple sensors, while JTAGS provides responsive in-theater coverage. There is no unnecessary duplication of effort within DoD.

H. (U) OTHER APPROPRIATION FUNDS: Not Applicable

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable

J. (U) MILESTONE SCHEDULE:

Milestones	Milestone Dates
Award Tactical Surveillance Demonstration Enhancement (TSDE) Contract	31 Aug 92
Approved Operation Requirement Document (ORD) and Concept of Operations (CONOPS) available	Jul 93
Deliver Transportable Prototype	Aug 93
Contractor/Government Testing	Aug 93-Jan 94
Milestone II In Process Review (IPR)	Feb 94

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604766A (TIARA)
PE Title: Tactical Electronic Surveillance System - Engineering Development

Project Number: #D909
Budget Activity: #4

A. (U) RESOURCES: ($ in Thousands)
Project Title: Tactical Electronic Surveillance System - Engineering Development

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Tactical Electronic Surveillance System - Engineering Development	20451	32275	31001

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. Also supports initial development of the Joint Tactical Ground Station JTAGS in FY93. In FY94 this 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 VI, and in the Army TENCAP Master Plan.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:

- (U) Continued upgrades for the refinement of the Electronic Processing and Dissemination (EPDS) suite of equipment to fully exploit the national capabilities to meet the changing threat environment.
- (U) Continued development of prototype Mobile Integrated Tactical Terminal (MITT) for deployment with light and contingency forces.
- (U) Continued Collection Management Support Tools (CMST) improvements to include a new man-made interface on-line dynamic data base updates and a color printer. CMST Version 3.0 software was developed and initial release to the field has started.
- (U) Continued support to field exercises, Joint Chiefs of Staff special projects, and demonstrations utilizing TENCAP systems and techniques in operational scenarios.

(U) FY 1993 Planned Program:

- (U) Continue upgrades for the refinement of the EPDS suite of equipment to fully exploit the national capabilities to meet the changing threat environment.
- (U) Complete prototype development and support fielding and testing of the initial MITT based on the commercial "open architecture" baseline.
- (U) Continue development of Joint Tactical Ground Station (JTAGS) to permit capability to receive and process data from more than two space based sensors; improve communications connectivity; and incorporate hardware and software upgrades.

Program Element: **#0604766A (TIARA)** Project Number: **#D909**
PE Title: **Tactical Electronic Surveillance System - Engineering Development** Budget Activity: **#4**

- (U) Engineer, develop and deliver for testing a transportable JTAGS prototype which incorporates the enhancements described above.
- (U) Begin developmental testing of transportable JTAGS prototype.

(U) FY 1994 Planned Program:

- (U) Continue upgrades for the refinement of the EPDS suite of equipment.
- (U) Complete the Engineering Development Model (EDM) and fielding of initial six Mobile Integrated Tactical Terminals (MITT).
- (U) Develop and field Forward Area Secondary Imagery Dissemination (SID) and Tactical Related Application (TRAP) (FAST) terminals which put TENCAP capability in a transit case sized system for echelon below corps maneuver units.
- (U) Initiate the retrofit of eight Enhanced Tactical User's Terminals (ETUT) with MITT hardware and software (based on an open architecture baseline).

D. (U) WORK PERFORMED BY:

In-house development agencies: United States Army Strategic Defense Command (USASDC), Huntsville, AL; Communications and Electronics Command (CECOM), Ft. Monmouth, NJ; Harry Diamond Laboratories, Adelphi, MD; Contractor; Gen Corp AEROJET Space Systems Division, Azusa, CA; Aerospace Corporation, El Segundo, CA.

E. (U) COMPARISON WITH FY 1993 AMENDED 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:

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)

	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
OTHER PROCUREMENT, ARMY 2:			
BZ7315	5500	5133	7229

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604766A (TIARA)**
PE Title: **Tactical Electronic Surveillance System - Engineering Development**

Project Number: **#D909**
Budget Activity: **#4**

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

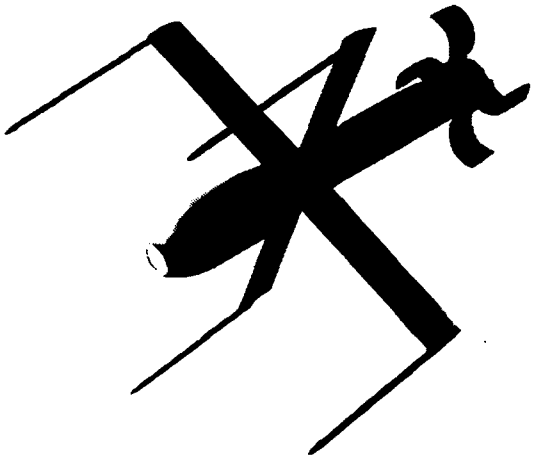
J. (U) MILESTONE SCHEDULE:

Milestones	Milestones Dates
MITT #1-6 Fielding	3QFY93-3QFY94
FAST Development/Fielding	1QFY93-1QFY94
ETUT UNIX Integration/Upgrade	FY94-FY96

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604768A**
PE Title: **BAT**
Project Title: **BAT**

Project Number: **D641**
Budget Activity: **#4**



POPULAR NAME: **Brilliant Anti-Armor Submunition (BAT)**

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

SCHEDULE	FY 1992	FY 1993	FY 1994		
Program Milestones					
Engineering Milestones	CDR May 92	PROTOTYPE START 3RD QTR	SUBSYSTEM QUALIFIED 4TH QTR		
T&E Milestones		1ST DVT 3RD QTR	DVT 4 COMPLETE 2ND QTR		
Contract Milestones		P3I DEVELOPMENT PHASE 1 CA 4TH QTR	P3I DEVELOPMENT PHASE 2 CA 3rd QTR		
BUDGET ($000)	FY 1992	FY 1993	FY 1994		
Major Contract	89948	92442	87963		
Support Contract	3355	4011	3174		
In-House Support	12022	11192	12476		
GFE/ Other	12961	7190	13395		
Total	118286	114835	117008		

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604768A
PE Title: BAT
Project Title: BAT

Project Number: D641
Budget Activity: #4

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The BAT is an antiarmor top attack submunition with acoustic and infrared (IR) seekers working in tandem for autonomous attack of operating armored vehicles. BAT submunitions can be carried deep into enemy territory by either the Army Tactical Missile System (ATACMS) or the Tri-Service Standoff Attack Missile (TSSAM), then dispersed over numerous targets to selectively attack and destroy individual targets. Being a certified round, the BAT submunition has a low sustainment cost. The Army has approved a Pre-Planned Product Improvement (P^3I) program to increase submunition lethality, and allow attack of new target arrays to include cold stationary or dug-in targets (e.g. SSM TELS).

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- (U) Continued Engineering and Manufacturing Development (EMD) Program
- (U) Conducted Data Collection Campaigns
- (U) Conducted Successful Critical Design Review - May 1992
- (U) Conducted Wind Tunnel Testing
- (U) Initiated Prototype Manufacturing
- (U) Initiated Army Tactical Missile System (TACMS) Integration Risk Reduction Activities

(U) FY 1993 Planned Program:
- (U) Continue EMD Program
- (U) Initiate Design Verification Tests (DVTs)
- (U) Prepare Test Range for Submunition Flight Tests
- (U) Award P^3I Development Phase I Contract
- (U) Continue Integration Activities with Alternate Carrier(s)
- (U) Continue Prototype Manufacturing

(U) FY 1994 Planned Program:
- (U) Continue EMD Program
- (U) Continue/Complete DVT Program
- (U) Continue Prototype Manufacturing
- (U) Award P^3I Development Phase II Contract
- (U) Conduct Technology Application Studies
- (U) Continue Range Checkout Operations for Submunition Flight Tests

D. (U) WORK PERFORMED BY: This program will be managed by the Army BAT Project Manager. Northrop Corporation is the prime contractor responsible for total system performance. Raytheon Company is the Infrared Seeker (IR) subsystem subcontractor.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604768A
PE Title: BAT
Project Title: BAT

Project Number: D641
Budget Activity: #4

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY: NARRATIVE DESCRIPTION OF CHANGES

1. TECHNICAL CHANGES: None.

2. SCHEDULE CHANGES: The BAT Program has been realigned to its primary carrier, the Tri-Service Standoff Attack Missile (TSSAM) Schedule. This realignment delayed the start of production and Milestone III approximately one year.

3. COST CHANGES: BAT production costs were reduced in FY 94 due to the one year delay in production start and reduced quantities.

F. (U) PROGRAM DOCUMENTATION:

Test and Evaluation Master Plan (TEMP)	11/90
System Threat Assessment Report (STAR)	11/90
Required Operational Capability (ROC)	03/91
Integrated Program Summary (IPS)	04/91

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

Program Element/Project #64315/DF08, Tri-Service Standoff Attack Missile (TSSAM)
Program Element/Project #63778/D050, D054, Multiple Launch Rocket System (MLRS) PIP
Program Element/Project #23802/D304, Army Tactical Missile System (Army TACMS)

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

H. (U) OTHER APPROPRIATION FUNDS:

($ in Thousands)

Appropriation	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Missile Procurement, Army Budget Activity 2, CA6100	0	0	0

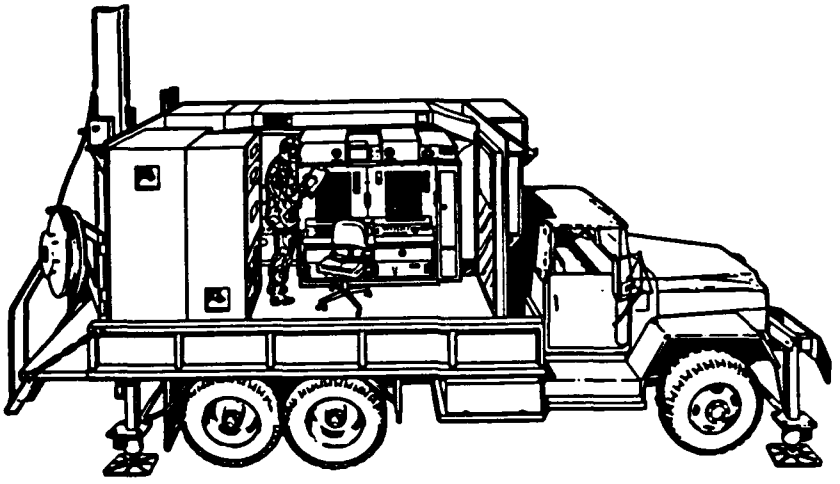
I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None.

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. BAT plans to conduct final Design Verification Tests (DVT) in FY 93/94.

FY 1994 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: **#4**



POPULAR NAME: **Joint STARS Ground Station Module (GSM)**

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

SCHEDULE	FY 1992	FY 1993	FY 1994		
Program Milestones		BLK I MEDIUM 5/93			
Engineering Milestones		BLK I LIGHT CDR 5/93	BLK I HEAVY CDR 2/94		
T&E Milestones	BLK I MEDIUM TT 9/93	BLK I MEDIUM LUT 12/92	BLK I Li TT 2/94 BLK I Hvy TT 9/94		
Contract Milestones	BLK I LIGHT EMD AWARD 5/92	BLK I MEDIUM LRIP AWARD 5/93 BLK I HEAVY EMD AWARD 6/93	BLK I MEDIUM LRIP 1ST DELIVERY 11/94		
BUDGET ($000)	**FY 1992**	**FY 1993**	**FY 1994**		
Major Contract	52389	54985	21045		
Support Contract	1505	1045	805		
In-House Support	5513	4260	3025		
GFE/ Other	8383	2335	1385		
Total	67790	62625	26260		

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604770A (TIARA)** Project Number: **D202**
PE Title: **Joint Surveillance Target Attack Radar System** Budget Activity: **#4**
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 a 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 standard S280 shelter and mounted on a 5 ton truck. The Lightweight Block I Light GSM 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)(Bradley variant). Also included in this project is the development of the Block II 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 1992 Accomplishments:
- (U) Integrate, test and accept four Block I Medium Engineering and Manufacturing Development (EMD) models.
- (U) Award Block I Light GSM EMD contract.
- (U) Issue Block I Medium Low Rate Initial Production (LRIP) solicitation.
- (U) Train operators for Block I Medium Limited Users Test (LUT).

(U) FY 1993 Planned Program:
- (U) Conduct Block I Medium Limited Users Test.
- (U) Block I Medium. Conduct Defense Acquisition Board review for LRIP and contract award.
- (U) Award Block I Heavy EMD contract.
- (U) Conduct Block I Light Critical Design Review (CDR).

(U) FY 1994 Planned Program:
- (U) Conduct Block I Heavy CDR.
- (U) Conduct Block I Light Technical Test (TT)/Operational Test (OT).
- (U) Conduct Block I Heavy TT.
- (U) Execute Block I Medium LRIP first delivery and first unit equipped (FUE) Training and Doctrine Command.

FY 1994 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: **#4**

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, 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.

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY: NARRATIVE DESCRIPTION OF CHANGES

1. TECHNICAL CHANGES: The nomenclature of the various GSM models has changed.

Old Designation	New Designation
Block I	Block I Medium
Block IIA	Block I Light
Block II	Block I Heavy
Block III, CGS	Block II, CGS

The FY92 Operational Requirements Document (ORD) update includes requirements for Satellite Communications (SATCOM) and the ability to operate on the move.

2. SCHEDULE CHANGES: Manufacturing two LGSM prototypes for EMD. Accelerated development to meet FY 1995 LGSM LRIP.

3. COST CHANGES: FY 1993 increase of $35M due to Congressional increase and continued direction to accelerate development of Block1 LGSM.

F. (U) PROGRAM DOCUMENTATION:

Operational and Organizational (O&O) Plan	10/88
Acquisition Decision Memorandum (ADM)	3/89
Joint Services Operational Requirements Document (JSORD)	2/92
Army Required Operational Capability (ROC) (Revision)	1/92
Baseline Cost Estimate (BCE)	2/93
Test & Evaluation Master Plan (TEMP)	4/93

G. (U) RELATED ACTIVITIES: The Joint STARS Airborne hardware is funded under PE #0604770F Joint Surveillance Target Attack Radar System. There is no unnecessary duplication of effort within the Army or DoD.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604770A (TIARA)** Project Number: **D202**
PE Title: **Joint Surveillance Target Attack Radar System** Budget Activity: **#4**
Project Title: **Army Joint STARS**

H. (U) OTHER APPROPRIATION FUNDS:

		($ in Thousands)	
Appropriation	**FY 1992 Actual**	**FY 1993 Estimate**	**FY 1994 Estimate**
Other Procurement, Army 2 BA1080 Joint STARS, Army (TIARA)	0	35220	57917

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS:

None Current. Airborne Radar Demonstration System (ARDS) NATO (US, UK, France) program completed FY 91.

J. (U) MILESTONE SCHEDULE:

Milestones	Dates
Block I Light GSM EMD Contract Award	5/92
Block I Medium GSM User Test	1/93
Block I Medium GSM Milestone III LRIP	5/93
Block I Medium GSM LRIP Contract Award	5/93
Block I Heavy GSM EMD Contract Award	6/93

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604778A
PE Title: **Positioning System Development**

Budget Activity: #5

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

Project Number / Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D163 Modular Azimuth and Positioning System (MAPS) Hybrid Product Improvement Program (PIP)	2808	9336	4447
D168 NAVSTAR Global Positioning System (GPS) Equipment	0	0	474
PE TOTAL	2808	9336	4921

B. (U) BRIEF DESCRIPTION OF PROGRAM 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 1994:

(U) 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.

(U) FY 1992 Accomplishments:
- (U) Resolved technical approach
- (U) Prepared and received approval for key program documents
- (U) Prepared Scope of Work and awarded contract
- (U) Developed memorandum of agreement with PM GPS

(U) FY 1993 Planned Program:
- (U) Develop MAPS Dynamic Reference Unit for use with Precision Lightweight GPS Receiver
- (U) Coordinate development with Paladin Automatic Fire Control Syste and Firefinder Radar

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604778A Budget Activity: #5
PE Title: **Positioning System Development**

(U) **FY 1994 Planned Program:**
- (U) Research and develop alternatives related to system integration and application technology
- (U) Review documentation and interface with host systems
- (U) Participate in studies, prototyping and integration of candidate systems
- (U) Support test and evaluation of GPS integrations

(U) **D168 - NAVSTAR GPS Equipment:** GPS is operational and experience has been gained with its use in Operation Desert Storm. 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 is a new start in FY 1994.

(U) **FY 1992 Accomplishments:**
- (U) Project not funded

(U) **FY 1993 Planned Program:**
- (U) Project not funded

(U) **FY 1994 Planned Program:**
- (U) Research and develop alternatives related to system integration of GPS in selected weapons systems
- (U) Review documentation and interface with host systems
- (U) Continue development and testing of GPS anti-jam, differential and embedded applications

(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.

(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.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604778A
PE Title: **Positioning System Development**

Budget Activity: #5

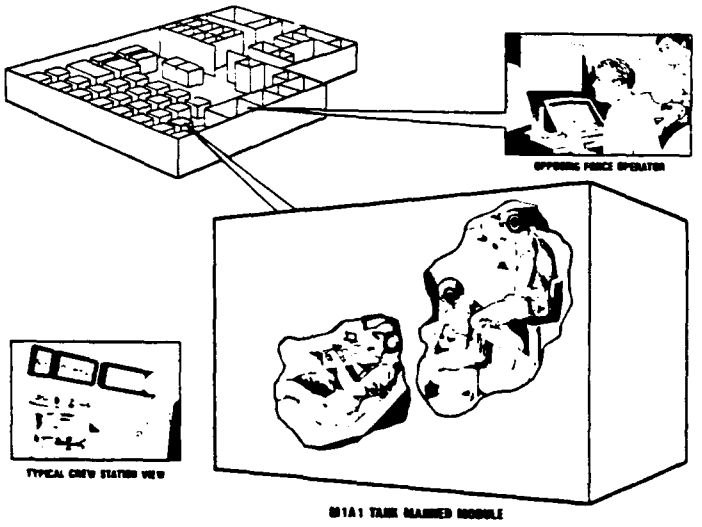
(U) **Other Appropriation Funds:** Not Applicable

(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 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604780A**
PE Title: **Combined Arms Tactical Trainer**
Project Title: **Close Combat Tactical Trainer**

Project Number: **# D571**
Budget Activity: **#4**



POPULAR NAME: **CCTT**

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

SCHEDULE	FY 1992	FY 1993	FY 1994
Program Milestones			
Engineering Milestones			PDR 3Q94 CDR 4Q94
T&E Milestones	Temp App 1Q92		
Contract Milestones	Contract Award 1Q93		
BUDGET ($000)	**FY 1992**	**FY 1993**	**FY 1994**
Major Contract			48493
Support Contract			1064
In-house Support			2431
GFE/ Other			1000
Total			52988

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

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604780A**
PE Title: **Combined Arms Tactical Trainer**
Project Title: **Close Combat Tactical Trainer**

Project Number: **# D571**
Budget Activity: **#4**

simulators, emulators and semi-automated forces that replicate combat vehicles and weapon systems, 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 has been transferred from PE 0604715 D574 in order to separate a major Army program from the non-system training device program beginning in FY94.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments: See PE #0604715A, Project D574

(U) FY 1993 Planned Program: See PE #0604715A, Project D574

(U) FY 1994 Planned Program:
- (U) Perform hardware/software Preliminary Design Review
- (U) Perform hardware/software Critical Design Review
- (U) Perform hardware/software development

D. (U) WORK PERFORMED BY: In-house activities are performed by the U.S. Army Simulation, Training and Instrumentation Command (STRICOM) and the Naval Training Systems Center (NTSC), Orlando, FL. Development contractor is IBM Corporation, Manassas, VA.

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY: NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** None
2. **SCHEDULE CHANGES:** None
3. **COST CHANGES:** Funding changes were made to assure CCTT is fully funded as required by Congress

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 Devices Technology); PE #0604801A (Aviation - Engineering Development); PE #0604715A (Non-System Training Devices), Project D574. To preclude duplication of effort, this project is closely coordinated with other services through Training and Personnel Technology Conferences, a Joint Services Technical Coordinating Group, worldwide staffing of Training Device requirements, and collocation of the Project Manager for Combined Arms Tactical

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604780A**
PE Title: **Combined Arms Tactical Trainer**
Project Title: **Close Combat Tactical Trainer**

Project Number: **# D571**
Budget Activity: **#4**

Trainer with the Naval Training Systems Center (NTSC) in Orlando, FL. 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 SCHEDULE:

Milestones	**Dates**
Pre-Production Qualification Test	2Q96 - 4Q96
Initial Operational Test and Evaluation	1Q97-3Q97

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604801A**
PE Title: **Aviation - Engineering Development** Budget Activity: **#4**

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

Project Number / Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
DC45	Aviation Life Support System (ALSE) - Engineering Development		
	10961	9013	5733
DE70	Aviation Non-System Training Devices		
	2839	0	0
D275	Synthetic Flight Training Systems		
	0	6336	0
PE TOTAL	13800	15349	5733

B. (U) BRIEF DESCRIPTION OF ELEMENT: Provides engineering development to programs associated with air mobility support: Synthetic Flight Training Systems (SFTS), Aviation Life Support Equipment (ALSE), and Aviation Non-Systems Training Devices. 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. Funding for the Aviation Combined Arms Team Trainer (AVCATT), originally funded in Project DE70, have been transferred to Combined Arms Tactical Training (PE 64715 and PE 64780). SFTS (Project D275) has been terminated in FY94.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(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 Light Weight Motor Blower (LIMB) for 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, chemical (NBC) ensemble during desert or tropic operations to prevent incapacitating heat stress; improve 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 to use in escaping from submerging helicopters; and, Pre-Planned Product Improvement (P3I) to the Aircrew Integrated Helmet System to apply to the AH-64.

(U) FY 1992 Accomplishments:

- (U) Fabricated prototype aircrew integrated helmets system (AIHS) integrated with laser protective devices, improved crash protection and night vision sighting devices, and other subsystem components
- (U) Initiated des modification to AIHS to include Apache sighting station components (P3I)
- (U) Fabricated a evaluated advanced laser protective devices
- (U) Initiated eng ering and manufacturing development (EMD) of Aircrw Microclimate Conditioning System (AMC designed and fabricated prototypes
- (U) Conducted f survey and evaluation of "off-the-shelf" LIMB

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604801A
PE Title: Aviation - Engineering Development Budget Activity: #4

(U) FY 1993 Planned Program:
- (U) Complete engineering evaluation and operational testing of AIHS
- (U) Continue AIHS to evaluate Apache helmet components (P3I)
- (U) Test and evaluate AMCS prototypes and initiate engineering design of NBC Cockpit Filtration System
- (U) Initiate planning for Aircraft Modular Survival System (AMSS) P3I

(U) FY 1994 Planned Program:
- (U) Initiate EMD of advanced laser protective visor
- (U) Continue AIHS for follow on improvements with weapon sighting station compatibility
- (U) Complete AMCS development for milestone III production decision
- (U) Fabricate and evaluate Aircraft Modular Survival System (AMSS) P3I items
- (U) Validate technical data package for IBAHRS

(U) Project DE70 - Aviation Non-System Training Devices: This project funds development of generic rotary wing aircraft (RWA) devices which are applicable to more than one aviation system (i.e., AH-1, AH-64, RAH-66, etc.). Development of the aviation network (AIRNET) project was to be completed in FY92. AIRNET was the Defense Advanced Research Projects Agency (DARPA) "proof-of-principle" project which was transitioned to the Army in March 1990. AIRNET was a viable developmental tool and test vehicle which provided the means to explore and emulate new and desired systems or evaluate and adapt current and future doctrine to meet an ever changing threat environment. AIRNET has been replaced by the Aviation Test Bed (AVTB) simulator system that supports realistic force-on-force combat development and training. Currently available resources do not enable the combat developer and trainer to examine present and future requirements in a combined arms environment. RWA devices at the AVTB will provide this capability for scout and attack modules in a realistic, stressful simulated tactical aviation environment.

(U) FY 1992 Accomplishments:
- (U) Continued upgrade of AIRNET/AVTB for enhanced representation of generic helicopters.
- (U) Completed design for reconfigureable modular helicopter simulators.

(U) FY 1993 Planned Program:
- (U) Project not funded

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

(U) Project D275 - Synthetic Flight Training System (SFTS): Initiates development for 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/software commonality among all aviation collective training systems. Also supports development of simulations for aircraft system enhancements to maintain concurrency of flight simulators and the aircraft.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604801A**
PE Title: **Aviation - E: ineering Development** Budget Activity: **#4**

(U) FY 1992 Accompli: ments:
- (U) Project not funded

(U) FY 1993 Planned Program:
- (U) Initiate studies to quantify design, fidelity and acceptability of technology issues for transportable sustainment flight simulator to support existing and future rotorcraft
  - Modular simulator design concept for reconfiguration of cockpits between aircraft models and easy upgrades
  - Investigate hardware, software and time lines required for Army mission preview and rehearsal capabilities
  - Validate modular CRT-based cockpit panel technology suitability for sustainment tasks
  - Evaluate training effectiveness and user acceptance of color helmet mounted display technology
  - Evaluate feasibility of packaging high fidelity flight simulator in a mobile, reliable and maintainable configuration

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

(U) Work Performed By: Project DC45: Major contractors include: Gentex Inc., Carbondale, PA; American Optical, Southbridge, MA; and Midwest Research Institute, Kansas City, MO. In-house work performed by: Aviation Applied Technology Directorate, Ft. Eustis, VA; ERDEC, Aberdeen Proving Ground, MD; NRDEC, Natick, MA; USAARL, Ft. Rucker, AL; and US Army Aviation and Troop Command and ALSE PMO, St. Louis, MO. Project D275: The mobile program will be competitive, best value contracts awarded to two contractors (yet to be determined).

(U) Related Activities: Projects D275: Coordination of training device technology is accomplished with the Air Force and the 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 research and development. Many joint projects are effected between the services to prevent duplication of in-flight simulator development efforts. Project DC45: Aviation Life Support Equipment 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). There is no unnecessary duplication of effort within the Army or DoD.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604801A**
PE Title: **Aviation - Engineering Development** Budget Activity: **#4**

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

Appropriation	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
		($ in Thousands)	
ALSE			
APA (AZ3110)	313	8157	11692
AH-64 Flight/Wpns Simulators APA (AO9000)	72998	20943	0

(U) International Cooperative Agreements: Not applicable.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604802A
PE Title: **Weapons and Munitions - Engineering Development** Budget Activity: #4

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

Project Number / Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D290 Bunker Defeat Munition	0	0	6303
D531 105MM Howitzer Ammunition Improvement	980	4834	4861
D613 120MM Mortar	881	0	4201
PE TOTAL	1861	4834	15365

B. (U) BRIEF DESCRIPTION OF ELEMENT: Provides for engineering development of weapons and munitions systems.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(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.

(U) FY 1992 Accomplishments: Not applicable.

(U) FY 1993 Planned Program: Not applicable.

(U) FY 1994 Planned Program:
- (U) Complete side-by-side tests of candidate systems.
- (U) Down-select to "best value" system.
- (U) Accomplish type classification-limited production (urgent).
- (U) Initiate Technical Test/Operational Test to support type classification standard and material release.

(U) Project D531 - 105MM Howitzer Ammunition Improvement: This project provides for the fielding of an extended range 105MM artillery projectile for the M119 Howitzer; electronic delay fuzing technology; development of a dual purpose improved conventional munition (DPICM) for the M119 Howitzer; and development of self-destruct fuzing technology for submunitions.

(U) FY 1992 Accomplishments:
- (U) Prepared scope of work for Developmental Test and Evaluation (DT&E) hardware.
- (U) Loaded projectiles with inert submunitions and began ballistic testing.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604802A
PE Title: **Weapons and Munitions - Engineering Development** Budget Activity: #4

(U) **FY 1993 Planned Program:**
- (U) Initiate Engineering and Manufacturing Development (EMD) Testing Phase II for 150MM DPICM.
- (U) Design Prove-out and Producibility Engineering and Planning of DPICM self-destruct fuzing technology.

(U) **FY 1994 Planned Program:**
- (U) Complete EMD Phase II testing of 105MM DPICM.
- (U) Continue design effort on DPICM self-destruct fuzing technology.
- (U) Conduct in-process review (IPR) and Physical Configuration Audit of 105MM DPICM.

(U) **Project D613 - 120MM Mortar:** This project provides for the development of software for and the qualification of a new Mortar Ballistic Computer to replace and insure continued maintainability of the nearly obsolescent current version.

(U) **FY 1992 Accomplishments:**
- (U) Completed development of and type-classified 120mm Smoke Projectile XM929.
- (U) Developed 81mm training insert for 120mm Mortar.

(U) **FY 1993 Planned Program:** Program not funded.

(U) **FY 1994 Planned Program:**
- (U) Develop software to provide ballistic data for all existing and planned mortar munitions.
- (U) Integrate software in standard hand held computer unit.
- (U) Initiate and complete Technical Test/User Test.

(U) **Work Performed By:** In-house efforts by the Armaments Research, Development and Engineering Center, Picatinny Arsenal, NJ; Harry Diamond Laboratories, Adelphi, MD; and Aberdeen Proving Ground, Aberdeen, MD. Major contractors are Dayron, Orlando, FL; KDI Electronics, Cincinnati, OH.

(U) **Related Activities:** PE #0603004A (Weapons and Munitions Advanced Technology). No unnecessary duplication of effort exists in the Army or Department of Defense.

(U) **Other Appropriation Funds:**

Appropriation	($ in Thousands) FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Procurement (Ammunition)			
SSN E53700 (HERA)	15059	14803	0
SSN E25504 (XM929)	0	0	4784

(U) **International Cooperative Agreements:** Not applicable.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604804A
PE Title: **Logistics and Engineer Equipment - Engineering Development** Budget Activity: #4

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

Project Number / Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D194 Engine Driven Generators Engineering Development	1668	1197	1525
D279 Airdrop Equipment Engineering Development	4501	4418	4751
D429 Tactical Rigid Wall Shelters Engineering Development	4542	3388	5716
D461 Marine Oriented Logistical Equipment Engineering Development	7901	0	3820
DH01 Combat Engineer Equipment Engineering Development	2316	4392	4904
DH14 Logistics Support Equipment Engineering Development	1	4531	4482
DL39 General Support Equipment Engineering Development	1150	1574	2746
DL41 Fuels Handling Equipment Engineering Development	1463	1392	1428
PE TOTAL	23542	20892	29372

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program supports engineering development (ED) of new and advanced combat support and combat service support equipment. The D194, Engine Driven Generator, project 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 efficiencyof 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 DH01 - The tactical bridging provides dry and wet bridging for the 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 materiel 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.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604804A**
PE Title: **Logistics and Engineer Equipment - Engineering Development** Budget Activity: **#4**

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) Project D194 - Engine Driven Generators Engineering Development: Develop and transition to procurement a series of diesel engine powered generator sets.

(U) FY 1992 Accomplishments:
- (U) Prepared In-Process Review (IPR) package and solicitation documents for less than 3kw program
- (U) Conducted market survey, tested commercial hardware, and reviewed technical documentation for near-future contracts for development of 5kw 28 volts direct current (vdc) set for M577 Tracked Vehicle and Standard Integrated Command Post System (SICPS) 1068 Tracked Vehicle
- (U) Surveyed users and developed data base for auxiliary power units
- (U) Devised documentation and scoped efforts for Materiel Change Management (MCM) for Tactical Quiet Generator (TQG) family
- (U) Initiated cold weather starting kit program Required Operational Capability (ROC) Pre-Planned Product Improvement (P3I) requirements
- (U) Prepared component equivalency program guidelines for support to 5-60kw TQG set program

(U) FY 1993 Planned Program:
- (U) Award development contract for less than 3kw program
- (U) Award development contract for 8kw 20 vdc set
- (U) Initiate Auxiliary Power Units (APU) standardization effort for priority rating

(U) FY 1994 Planned Program:
- (U) Initiate test and evaluation of 5kw 28 vdc Auxiliary Power Unit (APU)
- (U) Initiate test and evaluation of less than 3kw sets
- (U) Test and evaluate high volume APU requirements

(U) Project D279 - Airdrop Equipment Engineering Development: Develop and transition to procurement cargo parachutes, airdrop containers and associated equipment.

(U) FY 1992 Accomplishments:
- (U) Conducted test of 60K Low Velocity Airdrop System (LVADS) using C-5A aircraft and supported USAF C-5A Airdrop Certification efforts
- (U) Completed Technical Testing (TT) and initiated User Testing (UT) of All Purpose Weapons Equipment Container (AIRPAC)
- (U) Type Classified Stinger Missile Jump Pack (SMJP)
- (U) Continued development of 60K LVADS and initiated TT for single platform LVADS utilizing the C-5 aircraft

(U) FY 1993 Planned Program:
- (U) Complete User Testing and hold Type Classification review panel for AIRPAC
- (U) Initiate TT/IOT&E of the single platform 60K LVADS
- (U) Continue analytical support and execution of airdrop tests in the USAF C-17 flight test program

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604804A**
PE Title: **Logistics and Engineer Equipment - Engineering Development** Budget Activity: **#4**

(U) FY 1994 Planned Program:
- **(U)** Complete support of C-17 flight test program
- **(U)** Complete tests of single platform 60K LVADS
- **(U)** Initiate engineering development of low altitude Container Delivery System for C-17 aircraft (CDS/C-17)
- **(U)** Initiate development of 30K Low Altitude Retrorocket System (LARRS)
- **(U)** Initiate engineering development of Tactical Assault Personnel Parachute (TAPP)
- **(U)** Initiate Technical Test of 60K Low Altitude Parachute Extraction System (LAPES)
- **(U)** Type Classify Standard AIRPAC

(U) Project D429 - Tactical Rigid Wall Shelters Engineering Development (ED): Develop and transition to procurement a series of nuclear, biological, and chemical (NBC) hardened rigid wall shelters.

(U) FY 1992 Accomplishments:
- **(U)** Initiated Preplanned Product Improvement (P3I) design changes to Standard Integrated Command Post System (SICPS) Rigid Wall Shelter
- **(U)** Began Engineering Development of SICPS Tent P3I
- **(U)** Initiated Production Prove-Out Test (PPT) of Modular Expandable Rigid Wall Shelter (MERWS)
- **(U)** Completed Fabrication of Electro Magnetic Interference (EMI) Expandable Rigid Wall Shelter
- **(U)** Continued PPT of EMI Hardened Non Expandable Rigid Wall Shelter
- **(U)** Continued PPT of the Intermediate Hardened Shelter
- **(U)** Completed technical testing of Chemically Biologically Protected Shelter (CBPS) at Cold Region Test Center (CRTC)

(U) FY 1993 Planned Program:
- **(U)** Begin Technical Testing of SICPS 5-Ton Expando-Van (E-Van) Installation Kit
- **(U)** Conduct Technical Testing of SICPS Rigid Wall Shelters (RWS)
- **(U)** Complete testing of SICPS RWS P3I components
- **(U)** Complete PPT and prepare Technical Data Package (TDP) for the Intermediate Hardened Shelter
- **(U)** Conduct PPT for MERWS
- **(U)** Conduct PPT of Non Expandable and Expandable EMI Rigid Wall Shelter prototypes
- **(U)** Complete Fabrication of Test Prototypes for CBPS
- **(U)** Initiate Development of CBPS-M577 Integration
- **(U)** Complete Technical Testing of SICPS 5-Ton E-Van
- **(U)** Complete Testing of SICPS Tent P3I
- **(U)** Type Classify - Standard Lightweight Multi-purpose Shelter

(U) FY 1994 Planned Program:
- **(U)** Type Classify the Intermediate Hardened Shelter
- **(U)** Prepare TDP for the MERWS
- **(U)** Prepare TDP for the Non Expandable and Expandable EMI Rigid Wall Shelter
- **(U)** Fabricate Integrated CBPS-M577 prototypes and initiate Technical Testing
- **(U)** Complete development of 5-Ton E-Van SICPS Installation Kit
- **(U)** Complete P3I efforts on SICPS Tent

Program Element: #0604804A
PE Title: **Logistics and Engineer Equipment - Engineering Development** Budget Activity: #4

- (U) Complete P3I efforts on SICPS Shelter components
- (U) Type Classify Standard SICPS Rigid Wall Shelter
- (U) Complete systems testing of Turbine Integrated Power and Environmental Control System (TIPECS)

(U) **Project D461** - Marine Oriented Logistical Equipment Engineering Development: This program supports the design and fabrication of equipment (LARC-60 Upgrade and Causeway Enhancements) to improve the Army's capability to meet the Logistics-Over-The-Shore (LOTS) requirement. The LARC-60 Upgrade will improve beach mobility, water speed, and increase payload. These improvements will provide an amphibian capable of transporting early entry beach preparation equipment. Causeway Enhancements will substantially improve the flexibility of the causeway system by improving lighter interface and providing a better mooring and fendering system to prevent damage in rough weather.

(U) **FY 1992 Accomplishments:**
- (U) Developed plan for LACV-30
- (U) Initiated design of LACV-30 Upgrade
- (U) Developed plan for Enhanced Causeway system improvement
- (U) Initiated design of Enhanced Causeway system

(U) **FY 1993 Planned Program:** No funding in FY93. Tasks listed utilize FY92 funding
- (U) LACV-30 upgrade terminated
- (U) Develop plan for LARC-60 upgrade

(U) **FY 1994 Planned Program:**
- (U) Design and initiate fabrication of LARC-60 upgrade prototype
- (U) Conduct technical and user testing of enhanced causeway system

(U) **Project DH01** - Combat Engineer Equipment - Engineering Development: Development of Dry and Wet Gap Bridging for the Heavy Forces, such as the Heavy Assault Bridge (HAB), the MLC 70 version of the Armored Vehicle Launched Bridge (AVLB) - the AVLB 70, the Improved Ribbon Bridge Transporter (IRBT), the Heavy Dry Support Bridge (HDSB) and the Armored Gun System-Light Assault Bridge (AGS-LAB). Also includes Engineering and Manufacturing Development (EMD) of Low Cost, Low Observable (LCLO) multispectral camouflage systems that reduce/control visual, thermal and radar signatures of high mobility assets, and the adaptation of ultra lightweight camouflage net system (ULCANS), designed specifically for helicopters, to general purpose use. Supports EMD of the Non-Developmental (NDI) Item DEUCE bulldozer.

(U) **FY 1992 Accomplishments:**
- (U) Approved material change documentation for AVLB 70 program
- (U) Initiated development of AVLB 70 prototypes
- (U) Conducted IRBT technical and operational testing for EMD down select decision

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604804A**
PE Title: **Logistics and Engineer Equipment - Engineering Development** Budget Activity: **#4**

(U) FY 1993 Planned Program:
- **(U)** Complete HAB technical testing for EMD phase II down select decision
- **(U)** Finalize HAB EMD phase II source selection plan and request for proposals (RFP)
- **(U)** Conduct AVLB 70 component and prototype testing for production decision and type classify AVLB 70 material change and prepare production contract
- **(U)** Conduct IRBT source selection and award EMD contract

(U) FY 1994 Planned Program:
- **(U)** Select bridging assets for conversion and award AVLB 70 production contract
- **(U)** Complete IRBT modifications and upgrades
- **(U)** Complete Material Change (MC) Engineering Change Proposal (ECP) for ULCANS P3I General Purpose (GP) net
- **(U)** Develop high mobility camouflage systems
- **(U)** Conduct EMD of DEUCE bulldozer

(U) Project DH14 - Logistics Support Equipment Engineering Development: Develop and transition to procurement a series of material handling equipment (MHE) items.

(U) FY 1992 Accomplishments: Program not funded

(U) FY 1993 Planned Program:
- Approve Operational Requirements Document (ORD) or All Terrain Lifter, Articulated System (ATLAS) forklift
- **(U)** Finalization of the Specification for ATLAS
- **(U)** Prepare program documentation for MS I/II In Process Review (IPR) and EMD solicitation for ATLAS
- **(U)** Begin source selection for ATLAS

(U) FY 1994 Planned Program:
- **(U)** Award EMD phase contract for ATLAS
- **(U)** Develop EMD phase logistics for ATLAS

(U) Project DL39 - General Support Equipment Engineering Development: Develop water purification and environmental control equipment and transition to procurement.

(U) FY 1992 Accomplishments:
- **(U)** Continued development of Extreme Environment Water Supply (EEWS) Cold Weather Kit for 600 Gallon Per Hour (GPH) Reverse Osmosis Water Purification Unit (ROWPU)
- **(U)** Continued P3I evaluation of water supply equipment for ROWPU family including investigation of lightweight composite pumps, nuclear, biological and chemical (NBC) post treatment and long term storage effects on reverse osmosis elements
- **(U)** Designed Collective Protective Ensemble for NBC resistance for the 3000 GPH ROWPU and 600 GPH ROWPU

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604804A**
PE Title: **Logistics and Engineer Equipment - Engineering Development** Budget Activity: **#4**

(U) FY 1993 Planned Program:
- **(U)** Continue ROWPU P3I to investigate NBC agent removal by reverse osmosis (RO) and continue investigation into ROWPU chemicals
- **(U)** Complete evaluation of NBC resistant Collective Protective Ensemble for 3000 GPH ROWPU, long term RO element study and lightweight pump
- **(U)** Develop NBC protection for storage and distribution equipment
- **(U)** Evaluate EEWS tactical transport protection system for 600 GPH ROWPU
- **(U)** Initiate development of cold weather kit for 3000 GPH ROWPU

(U) FY 1994 Planned Program:
- **(U)** Complete ROWPU P3I investigation of NBC agent removal by RO, complete investigation into ROWPU chemicals and implement improvements into ROWPU family
- **(U)** Evaluate NBC protection for storage and distribution equipment.
- **(U)** Conduct evaluation of EEWS cold weather kit for 3000 GPH ROWPU
- **(U)** Design and initiate fabrication of Lightweight Water Purification System
- **(U)** Conduct prototype testing for contact maintenance shop equipment and prepare technical data package (TDP)

(U) Project DL41 - Fuels Handling Equipment Engineering Development: Develop and transition to procurement petroleum distribution systems.

(U) FY 1992 Accomplishments:
- **(U)** Finalized initial prototype design for the Lightweight Arctic Forward Area Refueling Equipment (LAFARE)
- **(U)** Initiated fabrication of LAFARE components for system testing
- **(U)** Continued long-term exposure testing in desert environment for coated fabric materials for Tank Life Extension Program

(U) FY 1993 Planned Program:
- **(U)** Conduct component and system testing of initial prototypes for LAFARE
- **(U)** Incorporate system test results into final prototype design for LAFARE
- **(U)** Fabricate prototypes, conduct burn-in tests and deliver hardware to Cold Regions Test Center (CRTC) for government testing
- **(U)** Take delivery of first draft manuals and training package for LAFARE
- **(U)** Initiate the LAFARE final Technical Data Package (TDP)
- **(U)** Continue exposure tests in desert environment to define material specifications for seam joining, ultraviolet (UV) resistance and coated fabric requirements for Tank Life Extension Program

(U) FY 1994 Planned Program:
- **(U)** Develop statement of work for four (4) prototype tactical fuel distribution and storage systems
- **(U)** Conduct Technical Testing/Initial Operational Test and Evaluation (TT/IOT&E), Logistics Demonstration and physical configuration audit for LAFARE
- **(U)** Initiate contract for a prototype Petroleum Quality Analysis System (PQAS)

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604804A**
PE Title: **Logistics and Engineer Equipment - Engineering Development** Budget Activity: **#4**

(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)		
	FY 1992 Actual	**FY 1993 Estimate**	**FY 1994 Estimate**
Other Procurement Army:			
6K Forklift / Side Loader Forklift			
BLIN 156	1000	8289	0
Standard Integrated Command Post System (SICPS)			
BLIN 126	40993	36611	34475
3K Reverse Osmosis Water Purification Unit (ROWPU)			
BLIN 139	16698	12296	0
Generators			
BLIN 155	49204	44279	35685

(U) International Cooperative Agreements: None.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604805A
PE Title: **Command, Control and Communications Systems - Engineering Development**
Budget Activity:#4

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

Project Number / Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D097 C3I Interoperability Network Activity	0	0	1901
D098 Tactical Radio Accessories	0	2267	1338
D282 SINCGARS-V Engineering Development	0	0	1855
D488 Tactical Net Radio Communications	5612	4892	4150
PE TOTAL	5612	7159	9244

B. (U) **BRIEF DESCRIPTION OF ELEMENT:** This program funds Engineering and Manufacturing Development (EMD) and test evaluation of Army Tactical Communications Equipment and the Army Interoperability Network (AIN). Test and evaluation includes command, control, communications and intelligence (C3I) pre-certification and certification interface testing and interoperability. Included is the initiation of selected segments of the Sing Channel Ground and Airborne Radio System (SINCGARS) product improvements identified in the Si GARS System Improvement Plan. These selected segments of the planned product improvement are considered to have low design risk which will allow for hardware fabrication of pilot production models in the FY93-94 timeframe. 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. Also, Army frequency engineering associated with the analysis and engineering assessment of emerging Communications-Electronics (CE) Systems radio frequency parameters and their planned usage within the requirements of the frequency table of allocations. The AIN is a network of distributed communications, sites, and services supporting interoperability for Army C3I systems throughout their lifecycle. It provides the capability to develop, test, and maintain the interoperability of C3I systems through remote access to the actual C3I systems.

C. (U) **JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:**

(U) **Project Number and Title:** D097 - C3I Interoperability Network Activity. A network of distributed communications, sites, and services supporting interoperability for Army C3I systems throughout their life-cycle. AIN provides the capability to develop, test, and maintain the interoperability of C3I systems through remote access to the actual C3I systems. AIN significantly reduces risk, cost, and schedule in integration, interoperability, and life-cycle software support, while improving quality, confidence, and assurance. This is not an FY 1994 a new start. Efforts were funded under PE# 0604805A, Project D488 in FY 1992 and under PE# 0604818A, project DC36 in FY 1991 and FY 1990.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604805A
PE Title: Command, Control Communications Systems - Engineering elopment
Budget Activity:#4

(U) FY 1992 Accomplishments: Efforts funded under project D488.

(U) FY 1993 Planned Program: Project not funded.

(U) FY 1994 Planned Program:
- (U) Begin AIN Block-1 development (supports emerging Army C3I requirements).
- (U) Install six remote tactical field and two national command and control (C2) sites.
- (U) Support Program Executive Office (PEO), Program Managers (PM) and Communications and Electronics Command (CECOM) systems interoperability development.

(U) Project Number and Title: D098 - Tactical Radio Accessories. This project funds development of radio improvements resulting from emerging technologies. This was a new start in FY 1993. Initiates the selected portions of the SINCGARS Radio planned product improvement which are considered to have low design risk. The SINCGARS Packet Switching Applique will provide a means to relay packet 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). Design efforts for the Improved Forward Error Correction (FEC) for Low Speed Data Modes will be available in the Ground SINCGARS RT ECCM/Control and digital processing circuitry. This will be accomplished by modifying these areas to provide new data modes that will provide for significantly improved error correction algorithms at the slower dat rates. This will allow more data to be processed over the net more efficiently. A similar capability for the Airborne SINCGARS is also under investigation.

(U) FY 1992 Accomplishments: Project not funded.

(U) FY 1993 Planned Program:
- (U) Initiate EMD of selected design enhancements to the SINCGARS Combat Net Radios.
- (U) Develop contracts for high priority Phase I improvements.
- (U) Initiate packet data capability improvements
- (U) Initiate improved Forward Error Correction (FEC) improvements

(U) FY 1994 Planned Program:
- (U) Continue SINCGARS Product Improvement effort
- (U) Continue packet data capability improvements
- (U) Continue improved FEC improvements

(U) Project Number and Title: D282 - SINCGARS-V ENG DEV: This program provides for the analysis and implementation of overall product improvements to the SINCGARS Combat Net Radio. The priorities for the product improvement program are Global Positioning System (GPS) interfaces, improved data capability, weight reduction, MANPRINT (ease of operations), vehicular system re-engineering, improved electronic counter-counter measure (ECCM) performance, switched system dial up interfacing and alternate remote control of the manpack radios. This program will provide 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.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604805A
PE Title: Command, Control and Communications Systems - Engineering Development
Budget Activity:#4

(U) **FY 1992 Accomplishments:** None

(U) **FY 1993 Planned Program:** None

(U) **FY 1994 Planned Program:**
- (U) Continue development contracts to both SINCGARS sources for high priority Phase I improvement
- (U) Initiate Phase II (long term) breadboard development efforts
- (U) Initiate pilot production logistics and data development for Phase I improvements.

(U) **Project Number and Title: 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 1992 Accomplishments:**
- (U) Frequency hopping controller portion of channel simulator procured.
- (U) Four frequency hopping multiplexer unit fabricated and tested.
- (U) Completed AIN Block-0 development and three remote sites.
- (U) Completed AIN Block-1 design and supported 26 interoperability tests for Program Executive Office (PEO)/Program Managers (PM) development and Post Development Software Support.

(U) **FY 1993 Planned Program:**
- (U) Continue development effort on the FH MUX.
- (U) Continue development effort of channel simulator.
- (U) Conduct study of Army spectrum needs for the near future.
- (U) Develop tactical Army CE data base of new electromagnetic emitters and initiate necessary Electromagnetic Compatibility (EMC) analysis.

(U) **FY 1994 Planned Program:**

- (U) Continue development effort on the FH MUX.
- (U) Initiate field and Operational Testing and Evaluation of the FH MUX.
- (U) Perform EMC analysis for spectrum certification.
- (U) Perform C3I systems interoperability testing and certification.

(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 the US Army Communications-Electronics Command. The contractor for the Frequency Hopping Multiplexer is Xetron Corp, Cincinnati, Ohio. Spectrum analysis associated with tactical radio utilization is being performed by ECAC, Annapolis, Maryland. The contractors for the SINCGARS Product Improvement Program are ITT Aerospace/Communications, Ft. Wayne, Indiana, and General Dynamics, Tallahassee, Florida. Contractors for the AIN are ARINC, Annapolis, MD and TELOS, Shrewsbury, NJ.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604805A**
PE Title: **Command, Control and Communications Systems - Engineering Development**
Budget Activity:**#4**

(U) Related Activities:

- PE 0603746A relates to Development of the Product Improvement 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 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Other Procurement Army (OPA2)			
BW0006	272641	217077	352465

(U) International Cooperative Agreements: None

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604806A**
PE Title: **NBC Defense Systems - Engineering Development** Budget Activity: **#4**

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

Project Number / Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D017 NBC Protection Systems	2495	0	5788
D019 Chemical Biological Individual Protection Materiel	1993	3828	0
D020 NBC Contamination Avoidance Systems	38227	32221	37110
D517 Radiac Equipment Engineering Development	2501	1985	0
DF97 NBC Decontamination Systems	1846	1256	0
PE TOTAL	47062	39290	42898

B. (U) BRIEF DESCRIPTION OF ELEMENT: US forces must survive and sustain combat operations on the Nuclear, Biological, and Chemical (NBC) contaminated battlefield. Department of Defense Directive 5160.5 designates the Army as Executive Agent for the development of NBC defensive equipment to coordinate Research, Development, and Acquisition and optimize Research, Development, Test and Evaluation efforts aimed at countering the threat. 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 radiological and chemical/biological/toxin agent detection and warning systems; individual and collective protection systems; decontamination solutions and equipment. Funding also provides for NBC survivability assistance and assessments of all Army and Joint Service mission essential equipment.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION FY 1994:

(U) Project D017 - NBC Protection Systems project provides EMD of equipment to protect soldiers from NBC contaminated battlefields. The project resources development of the XM20E1 and XM28 Simplified Collective Protection Equipment (SCPE), which converts enclosed rooms and tents into collective protective enclosures, permitting personnel to conduct operations in a contamination-free area. Project funding also supports ED 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's dependence on forced air and is compatible with helicopter weapon sights and night vision systems.

(U) FY 1992 Accomplishments:

- (U) Completed Technical Testing (TT) for the XM28

- (U) Conducted XM28 Milestone III/Type Classification (TC) Standard In-Process Review (IPR)

(U) **FY 1993 Planned Program**
- (U) Project not funded

(U) **FY 1994 Planned Program**
- (U) Initiate/complete ACPM Pre Production Testing (PPT)
- (U) Conduct ACPM critical design review

(U) **Project D019** - Chemical/Biological Individual Protection Materiel: This effort completes M40/M42 Mask Pre-Planned Product Improvement Program (P^3I). The P^3I addresses the need for increased survivability with the integration of a voice amplifier, laser protective eye lenses, and a second skin and quick-doff hood for simplified decontamination procedures. The program also supports the first year's EMD of the XM45 Aircrew Protective Mask (ACPM).

(U) **FY 1992 Accomplishments:**
- (U) Completed M40/M42 P^3I Technical Testing (TT) and User Testing (UT)
- (U) Conducted Milestone III/Type Classification (TC) IPR for M40/M42 P^3I

(U) **FY 1993 Planned Program:**
- (U) Complete ACPM Technical Testing (TT)
- (U) Work performed in this project is restructured to D017 in FY94

(U) **FY 1994 Planned Program:**
- (U) See PE #0604806A, Project D017

(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 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 1992 Accomplishments:**
- (U) Type Classified and awarded production contract for Alpha Radiac Monitor

(U) **FY 1993 Planned Program:**
- (U) Initiate development on radiation analyzer and complete fabrication and design of AARS prototype
- (U) Initiate integration of radiation detection data into the Automated NBC Information System
- (U) Award EMD contract for AARS
- (U) Complete design and fabrication of first prototype AN/UDR-13

Program Element: #0604806A
PE Title: NBC Defense Systems - Engineering Development Budget Activity: #4

- (U) Work performed in this project is restructured to D020 in FY94

(U) **FY 1994 Planned Program:**
- (U) See PE #0604806A, Project D020

(U) **Project DF97** - NBC Decontamination Systems: Provides EMD of new NBC decontamination chemicals and equipment. Program funding supports the XM295 Individual Equipment Decontamination Kit (IEDK) - a more effective system for decontaminating individual equipment.

(U) **FY 1992 Accomplishments:**
- (U) Completed fabrication and design of XM295 IEDK test prototype
- (U) Initiated and completed TT of the XM295 IEDK

(U) **FY 1993 Planned Program:**
- (U) Award XM295 Production Contract

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

(U) **Work Performed By:** Project Manager NBC Defense, Aberdeen Proving Ground (APG), MD; U.S. Army Chemical and Biological Defense Agency, APG, MD; U.S. Army Tank and Automotive Command, Warren, Michigan; 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, Delano, FL; TRW Defense Systems Group, Redondo, CA; Texas Instruments, Dallas, TX; Nuclear Research Corporation, Warrington, PA. ILC Dover, Dover, DE; Rohm Haas, Trenton, NJ; Donaldson Corp, Minneapolis, MN; and Environmental Technology Group, Inc, Baltimore, MD.

(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 Requirements Group, 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 performed by the services. Joint Service coordination is also enhanced by periodic reviews of the Joint-Chemical Biological Research, Development, Test and Evaluation Program, the Joint Service Coordination Committee, and the Joint Directors of Laboratories' Technology Panel for Chemical and Biological 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

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604806A
PE Title: NBC Defense Systems - Engineering Development Budget Activity: #4

meetings of the North Atlantic Treaty Organization AC/255 (Panel VII), and Quadripartite Working Groups. There is no unnecessary duplication of effort within Army or DoD.

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

Appropriation	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Other Procurement, Army			
BLIN 113, Mask, Protective, NBC M40/42	36778	41250	43795
BLIN 119, Radiation Monitoring System	16485	13938	8291

(U) International Cooperative Agreement: Not Applicable.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604806A
PE Title: NBC Defense Systems - Engineering Development

Project Number: D020
Budget Activity: #4

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

Project Title: NBC Contamination Avoidance Systems

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
NBC Reconnaissance, Detection, and Identification	38227	32221	37110

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project provides for the Engineering and Manufacturing Development (EMD) of new manned and unmanned Nuclear, Biological, and Chemical (NBC) defensive equipment to enhance U.S. capability to detect, provide alarm, and identify threat agents on the battlefield. The project supports the XM21 Remote Sensing Chemical Agent Alarm (RSCAAL), an automatic stand-off detection device capable of locating chemical agent vapor clouds at distances up to 5 kilometers. The project also supports the Automatic Chemical Agent Detector Alarm (ACADA), which is more sensitive and responsive than earlier detectors, and is capable of concurrent nerve and blister agent detection. In addition, the project funds the System Improvement Program (SIP) for the Nuclear, Biological, and Chemical Reconnaissance System (NBCRS). The upgraded NBCRS, designated the XM93E1, meets full Army requirements with the addition of XM21 RSCAAL, integration of an advanced navigation system, jam resistant communications, and sensor/data processing systems to reduce the crew to three soldiers. Project funding supports the AN/UDR-13 Pocket Radiac Set to provide ground troops with a lightweight, user-friendly, tactical device for measuring and detecting radiation. Lastly, project funding will support an 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.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- (U) Awarded RSCAAL production contract
- (U) Initiated fabrication of Technical Testing (TT), User Testing (UT) hardware for ACADA
- (U) Completed first XM93E1 NBCRS prototypes and initiated EMD Testing

(U) FY 1993 Planned Program:
- (U) Award EMD contract for MICAD
- (U) Initiate/complete ACADA Pre-Production Testing (PPT)
- (U) Conduct XM93E1 NBCRS TT Readiness Review
- (U) Initiate Pre-Production Qualification Testing (PPQT) for the XM93E1

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604806A** Project Number: **D020**
PE Title: **NBC Defense Systems - Engineering Development** Budget Activity: **#4**

(U) **FY 1994 Planned Program:**

- (U) Complete TT for AARS
- (U) Complete TT/UT for AN/UDR-13 Radiac Set
- (U) Initiate/complete ACADA PPQT and Initial Operational Test and Evaluation (IOT&E)
- (U) Conduct Milestone III for Type Classification of the ACADA
- (U) Complete PPQT and initiate and complete Initial Operational Test and Evaluation for the XM93E1
- (U) Conduct XM93E1 NBCRS Milestone III for Type Classification
- (U) Conduct AN/UDR-13 TT readiness review

D. (U) WORK PERFORMED BY: Project Manager NBC Defense, Aberdeen Proving Ground (APG), MD; U.S. Army Chemical and Biological Defense Agency, 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 Corp., Delano, FL; General Dynamics Land Systems (GDLS), Sterling Heights, MI; and Environmental Technology Group, Inc., Baltimore, MD.

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: The Milestone III/TC IPR for XM93E1 NBCRS and XM22 ACADA have both been restructured; XM93E1 was changed from 03/94 to 09/94; XM22 changed from 08/94 to 09/94; MICAD ORD was changed from 03/92 to 11/92; TC Standard fro XM21 RSCAAL has been changed from 07/92 to 09/94. Milestone schedules for the AARS, Pocket Radiac, and Biological Detector are included for the first time.
3. COST CHANGES: Funding plus-up in FY94 provides improved profile to accomplish program requirements.

F. (U) PROGRAM DOCUMENTATION:

<u>XM93E1 NBCRS</u>	
Operational and Organizational (O&O) Plan	10/84
Required Operational Capability (ROC)/ Joint Service Operational Requirement (JSOR)	10/88
Acquisition Plan (AP)	10/89
Test and Evaluation Master Plan (TEMP)	12/90
<u>XM21 RSCAAL</u>	
AP	08/84
ROC/JSOR	03/87
TEMP	04/89

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604806A
PE Title: **NBC Defense Systems - Engineering Development**

Project Number: **D020**
Budget Activity: **#4**

XM22 ACADA	
ROC/JSOR	11/78
O&O	05/87
AP	05/89
Revised JSOR	06/91
Pocket Radiac	
O&O Plan	01/85
ROC	07/91
AP	08/91
AARS	
O&O Plan	01/85
AP	07/86
AP Revised	11/91
Operational Requirements Document	06/92
MICAD	
O&O	01/85
AP	11/89
ORD	11/92
Biological Detector	
O&O	06/91
AP	12/91
ORD	09/93

G. (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 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 RDA programs to ensure that essential joint Service requirements are being satisfied, and that duplicative efforts are not being performed by the Services. Joint Service coordination is also enhanced by the periodic reviews of the Joint-Chemical Biological 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.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604806A
PE Title: NBC Defense Systems - Engineering Development
Project Number: D020
Budget Activity: #4

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

Appropriation	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Other Procurement, Army			
BLIN 115 Remote Sensing Chemical Agent Alarm XM21	10111	7097	0
BLIN 119 Radiation Monitoring System	16485	13938	8291

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Currently, the U.S. has undertaken cooperative development efforts for the Biological Chemical Detector (MOU with the UK and Canada).

J. (U) MILESTONE SCHEDULE:

Milestones	Dates
XM93E1 NBCRS	
Milestone III/TC IPR	09/94
XM21 RSCAAL	
Milestone IIIA IPR	02/92
TC Standard	09/94
XM22 ACADA	
Milestone III/TC IPR	09/94
AN/VDR-13 Pocket Radiac	
Milestone III/TC IPR	11/94
AARS	
Milestone III/TC IPR	02/96
MICAD	
Milestone III/TC IPR	09/96

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604807A
PE Title: **Medical Materiel/Medical Biological Defense Equipment-Engineering Development**
Budget Activity: #4

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

Project Number / Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D812 Military Human Immunodeficiency Virus (HIV) Vaccine and Drug-Engineering Development	2941	2553	6303
D832 Combat Medical Materiel - Engineering Development	6042	2890	2743
D834 Soldier System Protection - Engineering Development	26	746	813
D847 Medical Biological Defense - Engineering Development	7386	5895	4739
D848 Medical Chemical Defense Life Support Materiel	1166	1728	1761
D849 Infectious Diseases Drug and Vaccine - Engineering Development	5729	5297	4769
PE TOTAL	23290	19109	21128

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 (PE) also supports the full-scale development of vaccines, prophylactic and therapeutic drugs, resuscitation fluids and drug products, rapid identification and diagnostic systems, and anthropod vector repellent systems for the prevention of naturally occurring diseases and Acquired Immune Deficiency Syndrome (AIDS). Additionally, the PE funds engineering development (ED) of medical equipment which provides measurement of or protection against physiological, psychological or environmental factors which degrade physical performance. This includes ED of vision corrective devices for protective and masks, environmental health monitoring equipment, and medical water quality monitoring equipment.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project D812 - Military Human Immunodeficiency Virus (HIV) Vaccine and Drug - Engineering Development: This project funds the full-scale development of vaccines, chemotherapy regimens and gene therapy for medical defense against human immunodeficiency virus (HIV) infection.

(U) FY 1992 Accomplishments:

- (U) Established field sites for GP160 vaccine Phase III test

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604807A
PE Title: **Medical Materiel/Medical Biological Defense Equipment-Engineering Development** Budget Activity: #4

(U) **FY 1993 Planned Program:**
- (U) Continue preliminary studies for GP160 vaccine field test
- (U) Continue GP160 vaccine immunotherapy efficacy trials

(U) **FY 1994 Planned Program:**
- (U) Initiate Phase III clinical trials of GP160 as a prophylactic vaccine

(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 rate.

(U) **FY 1992 Accomplishments:**
- (U) Completed animal toxicity testing of the blood expander, Hypertonic Saline Dextran (HSD)
- (U) Completed user and technical testing of Resuscitative Fluids Production System (REFLUPS)
- (U) Transitioned Steam Vacuum Sterilizer to procurement
- (U) Completed user testing of Hand-held Dental X-ray System

(U) **FY 1993 Planned Program:**
- (U) Submit New Drug Application (NDA) to the FDA for HSD
- (U) Complete development of REFLUPS
- (U) Transition to procurement of Hand-Held Dental X-ray System
- (U) Transition Field Medical Oxygen Generating System (FMOGDS) to procurement
- (U) Conduct technical testing of Liquid Oxygen Generating System

(U) **FY 1994 Planned Program:**
- (U) Initiate military unique clinical trials for HSD
- (U) Transition REFLUPS to procurement
- (U) Complete development of Life Detector
- (U) Transition LOX to procurement

(U) **Project D834 - Soldier System Protection - Engineering Development:** Supports full scale development of medical materiel, including devices, pharmacologics and other tools, to protect, enhance, or sustain the physiological and psychological capabilities of soldiers in the face of combat operations under all environmental conditions.

(U) **FY 1992 Accomplishments:**
- (U) This project was created to accommodate a FY 92-97 redistribution of funds and does not represent a new start. FY 92 accomplishments are listed under Project D836

(U) **FY 1993 Planned Program:**
- (U) Initiate operational testing of a rapid "dip stick" water quality analysis set to monitor field water for selected chemicals
- (U) Complete operational testing of a water sampling collection and submission kit designed to support field operation

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604807A
PE Title: **Medical Materiel/Medical Biological Defense Equipment-Engineering Development** Budget Activity: #4

(U) **FY 1994 Planned Program:**
- (U) Complete operational testing of a rapid "dip stick" water quality analysis set to monitor field water for selected chemicals
- (U) Initiate full scale development and operational testing of a rapid bacteriological test kit for field water potability analysis
- (U) Complete full scale development and operational testing of an environmental heat strain monitor to support field work/rest cycle and water consumption tactical decision-making

(U) **Project D847 - Medical Biological Defense - Engineering Development:** Use of biological agents by adversaries would have an adverse impact on individual survivability and operational capabilities of U.S. troops on the integrated battlefield. A system of medical defense against biological agents is required to provide individual soldier protection, sustain individual performance in a biological environment and provide self-aid/buddy-aid and medical treatment of biological agents. This project, which addresses joint service and Army-unique requirements, provides engineering development of medical countermeasures against biological agents to include life support equipment and vaccines.

(U) **FY 1992 Accomplishments:**
- (U) Completed clinical testing of tularemia vaccine

(U) **FY 1993 Planned Program:**
- (U) Submit license application for tularemia vaccine
- (U) Transition botulinal toxoid, type F to full scale development
- (U) Transition botulinal immune globulin (human) to production

(U) **FY 1994 Planned Program:**
- (U) Continue field trials of Q-fever vaccine
- (U) Transition tularemia vaccine to production

(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 threat agents for U.S. forces.

(U) **FY 1992 Accomplishments:**
- (U) Transitioned the Medical Aerosolized Nerve Agent Antidote to the Readiness Component
- (U) Transitioned the Convulsant Antidote for Nerve Agents to the Readiness Component
- (U) Completed user/technical testing of the Field Medical Oxygen Generation and Distribution System (FMOGDS)
- (U) Completed development of the FMOGDS
- (U) Conducted user testing of Liquid Oxygen (LOX) System

(U) **FY 1993 Planned Program:**
- (U) Continue extended stability testing of transitioned drugs (e,g., Nerve Agent Pretreatment, Convulsant Antidote Nerve Agent, Medical Aerosolized Nerve Agent Antidote)

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604807A
PE Title: **Medical Materiel/Medical Biological Defense Equipment-Engineering Development** Budget Activity: #4

(U) FY 1994 Planned Program:
- (U) Continue extended stability testing of transitioned drugs (e.g., Nerve Agent Pretreatment, Convulsant Antidote Nerve Agent, Medical Aerosolized Nerve Agent Antidote)

(U) Project D849 - Infectious Diseases Drug and Vaccine - Engineering Development: This project is designed to complete development and field testing of rapid identification systems, drugs and vaccines required to sustain the readiness posture of U.S. forces and provide medical defense against naturally occurring infectious diseases of military significance.

(U) FY 1992 Accomplishments:
- (U) Filed an NDA for antimalarial halofantrine, treatment for malaria
- (U) Concluded a Phase II study on the Schistosome Topical Antipenetrant (TAP) in Egypt and initiated Phase II/III studies in Egypt and Brazil
- (U) Completed field testing of Argentine hemorrhagic fever vaccine
- (U) Completed field testing of hepatitis A killed vaccine (NDA submitted by Smith Kline Beecham)
- (U) Initiated field trials of a whole cell cholera vaccine for both cholera and enterotoxigenic *Escherichia coli* (ETEC) indications

(U) FY 1993 Planned Program:
- (U) Conduct a MS III IPR for antimalarial, halofantrine, treatment and transition to the Readiness Component
- (U) Conclude Phase II/III studies on schistosomal antipenetrant (TAP), conduct a MS IIIA IPR, and submit an NDA to the FDA
- (U) Submit licensure application for Argentine hemorrhagic fever vaccine
- (U) Continue advanced clinical testing of chikungunya and Rift Valley fever live vaccines
- (U) Initiate field testing of Neisseria meningiditis (meningitis) group B vaccine

(U) FY 1994 Planned Program:
- (U) Initiate Phase III clinical trials for halofantrine, prophylactic in Thailand
- (U) Initiate Phase III clinical trials for the antimalarial WR 238605
- (U) Initiate Phase III clinical trials for the antileishmanial WR 6026 in Brazil and Kenya
- (U) Initiate field testing of *Shigella* vaccine
- (U) Initiate field testing of whole cell recombinant B subunit enterotoxigenic Escherichia coli (ETEC) vaccine
- (U) Submit license application for whole cell plus B subunit cholera vaccine

(U) Work Performed By:
D812: Work is performed in-house by U.S. Army Medical Material Development Activity, Fort Detrick, MD; and Walter Reed Army Institute of Research, Washington, DC; and its field unit in Thailand. Primary civilian contractor: H.M. Jackson Foundation, Bethesda, MD.
D832: Work is performed in-house by U.S. Army Medical Development Activity, Fort Detrick, MD; and U.S. Army Institute of Dental Research, Washington, DC. Primary civilian contractor is Sterimatics Corp., New Bedford, MA.
D834: Work is performed in-house by U.S. Army Medical Material Development Activity, Fort Detrick, MD; U.S. Army Biomedical Research and Development Laboratory, Fort Detrick, MD; U.S. Army

Program Element: #0604807A
PE Title: **Medical Materiel/Medical Biological Defense Equipment-Engineering Development** Budget Activity: #4

Occupational Toxicology Research Detachment, Walter Reed Army Institute of Research, Washington, DC; U.S. Army Directed Energy Medical Research Detachment, Brooks Air Force Base, TX; Wright Patterson Air Force Base, OH; U.S. Army Research Institute of Environmental Medicine, Natick, MA; and the U.S. Army Aeromedical Research Laboratory, Fort Rucker, AL. Primary civilian contractor is American Optical Corp., Southbridge, MA.

D847: Work is performed in-house by U.S. Army Medical Material Development Activity, Fort Detrick, MD; and the U.S. Army Medical Research Institute of Infectious Diseases, Fort Detrick, MD. Primary civilian contractors: Porton Products, International, Washington, D.C.; and Salk Institute, San Diego, CA.

D848: Work is conducted in-house at U.S. Army Medical Material Development Activity. The major contractors are Battelle Memorial Laboratories, Columbus, OH; Riker-3M Laboratories, St Paul, MN; and Guild Corporation, Dayton, OH.

D849: Work is performed in-house by U.S. Army Medical Material Development Activity, Fort Detrick, MD; Walter Reed Army Institute of Research, Washington, DC, and its field units in Thailand, Kenya, and Brazil; DoD Medical Centers, Washington, DC, San Antonio, TX, Denver CO, San Diego, CA, and San Francisco, CA; and Naval Medical Research and Development Command, Bethesda, MD. Primary civilian contractors: Hazelton Laboratories, Rockville, MD; Johns Hopkins University Hospital, Baltimore, MD; World Wide Biologics, St Louis, MO; Salk Institute, San Diego, CA; and Connaught Labs, Philadelphia, PA.

(U) Related Activities:

PE #0601102A (Defense Medical Sciences)
PE #0602787A (Medical Technology)
PE #0603002A (Medical Advanced Technology)
PE #0603105A (Military HIV Research)
PE #0603807A (Medical Systems - Advanced Development)
PE #0605801A (Programwide Activities, Project MM02)
PE #0605898A (Management Headquarters (R&D), Project MM03)

There is no unnecessary duplication of efforts in Army or DoD programs. This effort is coordinated with the following agencies annually, or more frequently as required: Department of Defense, Office of the ASD(HA) and of the Deputy Director, Defense Research Engineering (Research and Advanced Technology); All Joint Technology Coordinating Groups of the Armed Services Biomedical Research, Evaluation and Management Committee; Joint Services Container Steering Group; DoD Executive Agent for Land-Based Water Resources; World Health Organization, and Pan American Health Organization. Duplication of effort within the Army is avoided through centralized management of the Medical Chemical Defense Program at U.S. Army Medical Research and Development Command. Inter-Service duplication is avoided by continuing joint service coordination, collaboration and liaison. Army, as executive agent for DoD Medical Chemical Defense, executes formal coordination by Joint Service Agreement, a Memorandum of Agreement with Air Force, and Joint Technology Coordinating Group of the Armed Services Biomedical Research Evaluation and Management Committee. Research efforts are also coordinated with Quadripartite and NATO nations through meetings and data exchanges.

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

(U) International Cooperative Agreements: Not applicable

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604808A
PE Title: Landmine Warfare/Barrier-Engineering Development — Budget Activity: #4

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

Project Number / Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D016 Mine Systems Engineering Development	4605	2787	2957
D415 Mine Neutralization/Detection	5760	-0-	-0-
PE TOTAL	10365	2787	2957

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 the Directed Energy Breacher. It provides a group of mutually supporting 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 1994:

(U) Project D016 - Mine Systems Engineering Development: Provides for engineering and manufacturing development of Scatterable Mines (FASCAM) and new smart mines.

(U) FY 1992 Accomplishments:
- (U) Completed design for Multi-Sensor Electronic Package (MSEP)
- (U) Continued development of MSEP
- (U) Completed integration of MSEP for Multiple Delivery Mine System (VOLCANO) mines

(U) FY 1993 Planned Program:
- (U) Complete development of MSEP

(U) FY 1994 Planned Program:
- (U) Type Classify MSEP

(U) Project D415 - Mine Neutralization/Detection: Provides for engineering and manufacturing development of US countermine systems.

(U) FY 1992 Accomplishments:
- (U) Terminated VEMASID program
- (U) Completed VEMASID technical data package
- (U) Completed coil design

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604808A
PE Title: Landmine Warfare/Barrier-Engineering Development — Budget Activity: #4

(U) FY 1993 Planned Program:
- (U) Program not funded

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

(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. The major contractor is Textron Defense Systems, Wilmington, MA.

(U) Related Activities: Component work and concept exploration/definition phase work for this program are conducted in program elements #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 or 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:

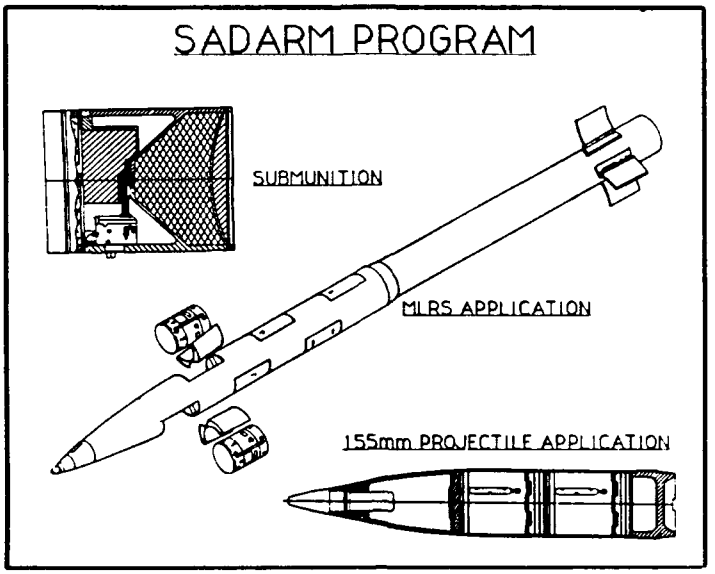
	($ in Thousands)		
Appropriation	**FY 1992 Actual**	**FY 1993 Estimate**	**FY 1994 Estimate**
Procurement Ammunition, Army			
SSN E72190 (VOLCANO)	3012	2953	2466
SSN E72195 (VOLCANO)	0	60000	0
Other Procurement, Army			
VEMASID, BLIN 123	114	0	0

(U) International Cooperative Agreements: Not Applicable.

FY 1994 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: **#4**



POPULAR NAME: **SADARM**

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

SCHEDULE	FY 1992	FY 1993	FY 1994		
Program Milestones		MS IIIA 4Q93			
Engineering Milestones					
T&E Milestones	155mm Tech Test 4Q91-4Q93	MLRS Tech Test 1Q93-4Q93	IOTE 1Q91-1Q95		
Contract Milestones			155mm LRP 1Q94		
BUDGET ($000)	FY 1992	FY 1993	FY 1994		
Major Contract	120743	68887	24249		
Support Contract	3867	3016	1796		
In-House Support	13171	12429	9400		
GFE/ Other	10384	8354	5566		
Total	148165	92686	41011		

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604814A** Project Number: **#D644**
PE Title: **Sense and Destroy Armor (SADARM)-Engineering Development** Budget Activity: **#4**
Project Title: **Generic SADARM Engineering Development**

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:

(U) FY 1992 Accomplishments:
- Continued 155mm SADARM technical testing

(U) FY 1993 Planned Program:
- Begin MLRS-SADARM technical testing
- Complete SADARM technical testing
- Begin 155mm SADARM user testing
- Low rate production decision (4Q93)

(U) FY 1994 Planned Program:
- Engineering and testing of submunition sensor and warhead enhancements (1Q94)
- Complete 155mm user testing

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 principle SADARM contractor is Aerojet Electronic Systems Division, Azusa, CA. The major subcontractor is Alliant Techsystems, Minnetonka, MN. The principal MLRS integration contractor is LVS, Camden, AR.

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY:
1. **TECHNICAL CHANGES:** None
2. **SCHEDULE CHANGES:** None
3. **COST CHANGES:** None

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604814A** Project Number: **#D644**
PE Title: **Sense and Destroy Armor (SADARM)-Engineering Development** Budget Activity: **#4**
Project Title: **Generic SADARM Engineering Development**

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.

H. (U) OTHER APPROPRIATION FUNDS:

	($ in Thousands)		
Appropriation	**FY 1992 Actual**	**FY 1993 Estimate**	**FY 1994 Estimate**
Procurement			
Ammunition	0	0	77661
Missiles	0	0	0

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable

J. (U) MILESTONE SCHEDULE:

Milestones	Dates
DA IPR for Submunition Engineering and Scientific Development (ESD)	9/86
SADARM Full Scale Development Contract Award	9/86
Milestone II (Defense Acquisition Board)	3/88
MLRS Full Scale Integration Contract Award	9/88
Congressional Demo	1-7/89
Contractor Design Select	5/91
155mm Tech Test	4Q91 -4Q93
Critical Design Review	2Q92
MLRS Tech Test	1Q93 -4Q93
Milestone IIIA	4Q93
155mm Low Rate Production (LRP)	1Q94
IOTE - 155mm and MLRS	1Q94 -1Q95
Milestone III - 155mm and MLRS	3Q95
Full Scale Production (FSP)	1Q96
First Unit Equipped (FUE) - 155mm	2Q95
FUE - MLRS	3Q96

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604816A
PE Title: L[illegible]bow

Budget Activity: #4

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

Project Number		FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
DC13	Hellfire Seeker	0	0	107339
DC27	LONGBOW - Engineering Development	175669	200533	82472
DC31	LONGBOW - APACHE	72957	89550	88143
PE TOTAL		248626	290083	277954

B. (U) BRIEF DESCRIPTION OF ELEMENT: Longbow (Project DC27) consists of a mast-mounted Fire Control Radar (FCR) integrated onto the AH-64 (with future application to the RAH-66 Comanche) and a radar frequency (RF) seeker (Project DC13) on the Hellfire missile. Longbow will provide the AH-64 and Comanche (RAH-66) a fire-and-forget Hellfire capability, greatly increasing weapon system effectiveness and aircraft survivability. The weapon system will be employable day/night/obscurants and in adverse weather. The Hellfire missile will effectively engage and destroy advanced threat armor on the air-land battlefield of the late 1990's and into the next century. Project DC31 encompasses efforts necessary to effectively and efficiently integrate the Longbow system onto the Apache C and D series aircraft. It includes the LONGBOW Apache (D-model) aircraft and the baseline AH-64C aircraft that will not have the FCR nor the upgraded 701C engine. Beginning in FY94, the Hellfire Seeker effort will no longer be identified in Longbow - ED (Project DC27), but rather, in Project DC13. Project DC13 is not a new start in FY94.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604816A**
PE Title: **Longbow**
Project Title: **Hellfire Seeker**

Project Number: **DC13**
Budget Activity: **#4**

POPULAR NAME: **Hellfire Seeker**

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

SCHEDULE	FY 1992	FY 1993	FY 1994		
Program Milestones					
Engineering Milestones					
T&E Milestones					
Contract Milestones					
BUDGET ($000)	**FY 1992**	**FY 1993**	**FY 1994**		
Major Contract			79689		
Support Contract			2944		
In-House Support			24706		
GFE/ Other			0		
Tota			107339		

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604816A
PE Title: Longbow
Project Title: Hellfire Seeker

Project Number: DC13
Budget Activity: #4

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The 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. The seeker and inertial measurement system provide a fire-and-forget capability which greatly reduces aircraft exposure time. The seeker utilizes a Hellfire II warhead system to destroy threat armor projected for early into the 21st century.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments: Not applicable; included in Project DC27

(U) FY 1993 Planned Program: Not applicable; included in Project DC27

(U) FY 1994 Planned Program:
- (U) Continue missile deliveries
- (U) Continue engineering tests and missile firings
- (U) Begin qualification tests
- (U) Continue aircraft integration

D. (U) WORK PERFORMED BY: The Longbow RF missile program is being accomplished by a Joint Venture (JV) team comprised of Martin Marietta Corporation, Orlando, Florida, and Westinghouse Electronics Corporation, Baltimore, Maryland.

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY: NARRATIVE DESCRIPTION OF CHANGES

1. **TECHNICAL CHANGES:** Not applicable.
2. **SCHEDULE CHANGES:** Not applicable.
3. **COST CHANGES:** Not applicable. New Project DC13 established in FY94 for missile development.

F. (U) PROGRAM DOCUMENTATION:

Organizational and Operational Plan	8/85
System Concept Paper	10/85
TRADOC Letter of Agreement	1/86
Required Operational Capability	8/90
Acquisition Plan	8/90
Decision Coordinating Paper	12/90

G. (U) RELATED ACTIVITIES: The Longbow Hellfire will be integrated onto the Apache (AH-64) helicopter (PE #0604816A) and the Comanche (PE #0604223A). There is no unnecessary duplication of effort within the Army or DoD.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604816A**
PE Title: **Longbow**
Project Title: **Hellfire Seeker**

Project Number: **DC13**
Budget Activity: **#4**

H. (U) OTHER APPROPRIATION FUNDS: Not Applicable

APPROPRIATION	($ in Thousands) FY 1992 Actual	FY 1993 Estimate	FY 1994

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

J. (U) TEST AND EVALUATION DATA

Event	Dates
Tower Tests	1Q 94
High-Speed Captive Flight Tests	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
IOT&E	2Q 95
Live Fire	2Q 95

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604816A**
PE Title: **Longbow**
Project Title: **Longbow - Engineering Development**

Project Number: **DC27**
Budget Activity: **# 4**

POPULAR NAME: **Fire Control Radar (FCR)**

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

SCHEDULE	FY 1992	FY 1993	FY 1994		
Program Milestones					
Engineering Milestones	Critical Design Review				
T&E Milestones			Technical Test 4Q 94		
Contract Milestones					
BUDGET (\$000)	**FY 1992**	**FY 1993**	**FY 1994**		
Major Contract	162453	186724	71586		
Support Contract	2695	1428	0		
In-House Support	10521	12381	10886		
GFE/ Other	0	0	0		
Total	175669	200533	82472		

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604816A
PE Title: Longbow
Project Title: Longbow - Engineering Development

Project Number: DC27
Budget Activity: # 4

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 into the AH-64 airframe, and a radar frequency (RF) seeker (Project DC13 in FY94) in the Hellfire II missile. Longbow FCR integration will provide the AH-64 and subsequently the RAH-66 (Comanche) 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 Longbow Hellfire will effectively engage and destroy advanced threat armor on the air-land battlefield of the late 1990's 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:

(U) FY 1992 Accomplishments:
- (U) Conducted hardware and software critical design reviews for both the FCR and the RF Hellfire seeker

(U) FY 1993 Planned Program:
- (U) Begin fabrication of FCR prototypes
- (U) Begin fabrication of RF Hellfire missile prototypes
- (U) Begin engineering tests and missile firings
- (U) First flight with Longbow

(U) FY 1994 Planned Program:
- (U) Complete delivery of FCR prototypes; continue missile deliveries
- (U) Conduct qualification tests
- (U) Complete aircraft integration
- (U) Begin Initial Operational Test and Evaluation (IOTE) and Force Development Test and Evaluation (FDTE)

D. (U) WORK PERFORMED BY: The Longbow radar and RF missile programs are being accomplished by a Joint Venture (JV) team comprised of Martin Marietta Corporation, Orlando, Florida, and Westinghouse Electronics Corporation, Baltimore, Maryland.

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY:
NARRATIVE DESCRIPTION OF CHANGES

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: None
3. COST CHANGES: New Project DC13 for missile development was established in FY94 to separate aircraft development and missile development.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604816A**
PE Title: **Longbow**
Project Title: **Longbow - Engineering Development**

Project Number: **DC27**
Budget Activity: **# 4**

F. (U) PROGRAM DOCUMENTATION:

Organization and Operational Plan	8/85
System Concept Paper	10/85
TRADOC Letter of Agreement	1/86
Required Operational Capability	8/90
Decision Coordinating Paper	12/90
Acquisition Decision Memorandum	12/90
Acquisition Plan	6/92

G. (U) RELATED ACTIVITIES: Longbow will be integrated onto the Apache (AH-64) helicopter and is a pre-planned product improvement for the Comanche (PE # 0604223A). AH-64 integration development 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.

H. (U) OTHER APPROPRIATION FUNDS: None

		($ in Thousands)	
Appropriation	**FY 1992 Actual**	**FY 1993 Estimate**	**FY 1994 Estimate**

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not Applicable

J. (U) TEST AND EVALUATION DATA

Event	Dates
FCR Mode Performance Demonstration (verify Prime Item Development Specifications)	3Q 94
Technical Test	4Q 94
Adverse Weather Test	2Q 94
FDTE	1Q 95
IOTE	2Q 95

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604816A
PE Title: **Longbow**
Project Title: **Longbow - Apache**

Project Number: **DC31**
Budget Activity: **#4**

POPULAR NAME: **Longbow**

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

SCHEDULE	FY 1992	FY 1993	FY 1994		
Program Milestones					
Engineering Milestones	Critical Design Review				
T&E Milestones			Technical Test 4Q 94		
Contract Milestones					
BUDGET ($000)	**FY 1992**	**FY 1993**	**FY 1994**		
Major Contract	66523	80248	78634		
Support Contract	0	0	0		
In-House Support	6434	9302	9509		
GFE/ Other	0	0	0		
Total	72957	89550	88143		

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604816A
PE Title: Longbow
Project Title: Longbow - Apache

Project Number: DC31
Budget Activity: #4

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The Longbow program encompasses modifications to the AH-64 necessary to effectively and efficiently integrate the Longbow system into the AH-64 Apache, as well as, upgrade the aircraft systems for the AH-64 C to receive the Longbow 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:

(U) FY 1992 Accomplishments:
- (U) Conducted critical design review
- (U) Continued EMD
- (U) Prototype first flight without Longbow

(U) FY 1993 Planned Program:
- (U) First Longbow fire control radar to aircraft for integration
- (U) Continue EMD
- (U) Conduct first flight with Longbow
- (U) Conduct Initial Production Readiness Review (IPRR)

(U) FY 1994 Planned Program:
- (U) Conduct Qualification Tests
- (U) Complete Aircraft Integration
- (U) Begin Initial Operational Test and Evaluation (IOTE) and Force Development Test and Evaluation (FDTE)

D. (U) WORK PERFORMED BY: McDonnell Douglas Helicopter Company, Mesa, AZ.

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY:
NARRATIVE DESCRIPTION OF CHANGES

1. TECHNICAL CHANGES: Project was restructured to incorporate 2 AH-64C prototypes.

2. SCHEDULE CHANGES: Two AH-64C EMD prototypes will be incorporated into the existing AH-64D EMD schedule.

3. COST CHANGES: Congress appropriated funds over and above the President's Budgets in FY 1992 and FY 1993 for the AH-64C Model Program. FY 1994 RDT&E funding was increased to accommodate extending EMD, changes in the airframe integration, producibility engineering, adjusted labor and overhead rates, and support of the two additional AH-64C prototypes.

F. (U) PROGRAM DOCUMENTATION:

Advanced Attack Helicopter Mission Needs	9/90
Decision Coordinating Paper	9/90
Test and Evaluation Master Plan	4/91
Acquisition Decision Memorandum	12/90
Acquisition Plan	6/92

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0604816A
PE Title: Longbow
Project Title: Longbow - Apache

Project Number: DC31
Budget Activity: #4

G. (U) RELATED ACTIVITIES: Related efforts accomplished in PE #0604223A (Comanche). There is no unnecessary duplication of effort within the Army or DoD.

H. (U) OTHER APPROPRIATION FUNDS: Not applicable

($ in Thousands)

Appropriation	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate

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

J. (U) TEST AND EVALUATION DATA

Event	Dates
Completion of Preliminary Airworthiness Evaluation	2Q 93
Technical Test	4Q 94
FDTE	1Q 95
IOTE	2Q 95

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604817A** Budget Activity: **#4**
PE Title: **Non-Cooperative Target Recognition**

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

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D356 Non-Cooperative Target Recognition-Electronic Support Measures (NCTR-ESM)	16419	17507	20765
D482 Ground Combat Identification (Ground CID)	0	6441	13782
D494 Non-Cooperative Target Recognition-Hostile Aircraft Identification Equipment (NCTR-HAIDE)	11468	586	0
D495 Non-Cooperative Target Recognition-Non-Imaging Sensors (NCTR-NIS)	265	1547	0
PE TOTAL	28152	26081	34547

B. (U) BRIEF DESCRIPTION OF ELEMENT: The ability of weapon systems to detect and 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. Project D482 for Ground Combat Identification was added to this Program Element as part of a comprehensive army program to provide near and long term solutions to the fratricide combat deficiency. Project D482 is a new start FY93 program.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(U) Project Number and Title: 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 positive, non-cooperative identification of modern fighter aircraft. HAIDE is designed for use with the HAWK weapon system (Model 1) and the air defense sensor-Ground Based Sensor (GBS) (Model 2)

(U) FY 1992 Accomplishments:
- (U) Program redirected to accomodate higher funding priorities
- (U) Completed brassboard development (Model 1)
- (U) Began fabrication for 2 units (Model 1)
- (U) Began software/interface rework (Model 2)

(U) FY 1993 Planned Program:
- (U) Complete fabrication (Model 1)
- (U) Complete software/interface rework (Model 2)
- (U) Complete fabrication for 2 units (Model 2)
- (U) Complete integration with GBS (Model 2)
- (U) Complete Engineering Manufacturing Development (EMD) effort

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604817A
PE Title: Non-Cooperative Target Recognition

Budget Activity: #4

(U) FY 1994 Planned Program:
- (U) No planned program

(U) Project Number and Title: 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 Non-Line of Sight (NLOS) and Air Defense Anti-Tank System (ADATS) platforms programs.

(U) FY 1992 Accomplishments:
- (U) Conducted MSII (contractor downselect) IPR
- (U) Program Terminated

(U) FY 1993 Planned Program:
- (U) Transfer funds to higher priority program

(U) FY 1994 Planned Program: None

(U) Work Performed By: 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 Communication and Electronics Command's (CECOM) Night Vision and Electronic Sensor Directorate at Fort Monmouth, NJ and Missile Command's (MICOM) Research and Development Engineering Center at Huntsville, AL.

(U) Related Activities: PE #0603757A (Forward Area Air Defense (FAAD) System) relates to advanced development effort. PE #0604820A (Radar Development) accomplishes engineering development efforts. There is no unnecessary duplication of effort within the Army or the Department of Defense.

(U) Other Appropriated Funds: None.

(U) International Cooperative Agreements: None.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element : #0604817A
PE Title: Non-Coop Target Recognition

Project Number: D356
Budget Activity: #4

A. (U) RESOURCES: ($ in Thousands)
Project Title: Non-Cooperative Target Recognition-Electronic Support Measures (NCTR-ESM)

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
NCTR-ESM	16419	17507	20765

B. (U) BRIEF DESCRIPTION OF THE PROJECT: The dynamic nature of Airland Battle requires that Army forces capitalize on the beyond visual identification range capabilities of air defense weapons yet maintain freedom of maneuver by friendly aviation and air forces. Passive, Hostile and Friendly Identification devices developed by this project will identify foes at a range sufficient to permit maximum weapons range and also preclude engagement of friendly aircraft (fratricide). Emphasis is placed on technologies for Non-Cooperative Target Recognition (NCTR) that exploit the inherent and unique signature of air platforms. NCTR Electronic Support Measures (ESM) passively identifies aircraft by recognizing their electronic emissions. The device collects, processes, and analyzes data for comparison to a signature library to positively identify the aircraft. The NCTR device will be physically and electronically integrated into air defense weapons and/or sensors. The identification data will be added to radar track messages and/or displayed on the fire control display of air defense weapons.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- (U) Continued development of NCTR-ESM (AVENGER/Model 1)
- (U) Continued integration effort for NCTR-ESM (AVENGER/Model 1)
- (U) Initiated integration effort with NCTR-ESM (GBS/Model 2)

(U) FY 1993 Planned Program:
- (U) Complete development of NCTR-ESM (AVENGER/Model 1)
- (U) Initiate NCTR-ESM (AVENGER/Model 1) Pre-Production Qualification Test (PPQT)/Limited User Test (LUT)
- (U) Complete integration of NCTR-ESM (AVENGER/Model 1) units with host platform

(U) FY 1994 Planned Program:
- (U) Complete NCTR-ESM (AVENGER/Model 1) PPQT/LUT
- (U) Award Contract Mod for NCTR-ESM (GBS/Model 2) development
- (U) Conduct Preliminary Design Review (PDR) for NCTR-ESM (GBS/Model 2)
- (U) Conduct Critical Design Review (CDR) for NCTR-ESM (GBS/Model 2)
- (U) Continue integration of NCTR-ESM (GBS/Model 2) with host platform
- (U) Release Low Rate Initial Production (LRIP) Request for Proposal (RFP) for NCTR-ESM AVENGER/Model 1)

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element : #0604817A
PE Title: Non-Coop Target Recognition

Project Number: D356
Budget Activity: #4

D. (U) WORK PERFORMED BY: 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 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.

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY: NARRATIVE DESCRIPTION OF CHANGES

1. TECHNICAL CHANGES: None
2. SCHEDULE CHANGES: Development of NCTR-ESM (GBS-Model 2) had been delayed until contractor can demonstrate improvements in cost and schedule controls for the NCTR-ESM (AVENGER/Model 1) program. Milestones have been revised accordingly.

3. COST CHANGES: Cost growth has been experienced on the NCTR-ESM (AVENGER/Model 1) effort due to Engineering Change Proposal (ECP) to correct deficiency highlighted during Desert Storm.

F. (U) PROGRAM DOCUMENTATION: Forward Area Air Defense System Capstone Required Operation Capability (ROC), 02/88 and NCTR-ESM ROC Tab D approved 12/91.

G. (U) RELATED ACTIVITIES: PE #0603757A (Forward Area Air Defense (FAAD) System) relates to advanced development. PE #0604820A (Radar Development ·omplishes engineering development efforts. There is no unnecessary duplication of effort within the Army ·. the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS: Not Applicable

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. (U) MILESTONE SCHEDULE:

Milestones	Dates
Acquisition Plan Approved	08/88
Required Operational Capability (ROC) Validated	12/91
AVENGER/Model 1 EMD Contract Award	03/91
Conduct PPQT/LUT (AVENGER/Model 1)	09/93-11/93
GBS/Model 2 EMD Contract Mod Award	11/93
LRIP IPR (AVENGER/Model 1)	10/94
LRIP Award (AVENGER/Model 1)	11/94

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604817A
PE Title: Non-Coop Target Recognition

Project Number: #D482
Budget Activity: #4

A. (U) RESOURCES: ($ in Thousands)
Project Title: Ground Combat Identification (GCID)

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Battlefield Combat Identification System (BCIS)	0	6441	13782

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 high, mid, and low intensity 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 selected Force Package 1 units, with priority to those which operate forward of the Brigade Support Area (24th Infantry Division). This effort was an FY93 new start.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments: Not Applicable

(U) FY 1993 Planned Program:
- (U) Operational Requirements Document (ORD) Approved
- (U) RFP Released
- (U) Conduct MSII Army Selected Acquisition Review Committee (ASARC) Review (IPR)
- (U) EMD Contract Award

(U) FY 1994 Planned Program:
- (U) Conduct Preliminary Design Review (PDR)
- (U) Conduct Critical Design Review (CDR)
- (U) Conduct Dismounted Soldier Study
- (U) Conduct Fixed Wing Study

D. (U) WORK PERFORMED BY: The Prime Contractor is to be determined. 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 Fort Monmouth, NJ. Integration with host platforms is coordinated with platform Program Managers. Technical assistance is provided by the CECOM Night Vision and Electronic Sensor Directorate at Ft. Monmouth, NJ.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604817A
PE Title: Non-Coop Target Recognition

Project Number: #D482
Budget Activity: #4

E. (U) COMPARISON WITH FY 1993 AMENDED 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), 30 Nov 92.

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) MILESTONE SCHEDULE:

Milestones	Dates
Operation Requirements Document (ORD) Validated	11/92
Acquisition Plan Approved	12/92
RFP Released	01/93
Milestone II/ASARC	05/93
EMD Contract Award	07/93

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604818A
PE Title: **Army Tactical Command and Control (C2) Hardware and Software**
Budget Activity: #4

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D323	Common Hardware Software (CHS)		
	13218	10105	23548
DC34	Army Tactical C2 Systems (ATCCS) Engineering		
	12178	9379	11778
DC36	C3I Interoperability Test Suite		
	0	0	1901
PE TOTAL	25396	19484	37227

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) the Maneuver Control System (MCS); (2) the Advanced Field Artillery Tactical Data System (AFATDS); (3) the All Source Analysis System (ASAS) for Intelligence/Electronic Warfare; (4) the Forward Area Air Defense Command, Control and Intelligence System (FAADC2I); and (5) the Combat Service Support Control System (CSSCS). 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 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.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994 :
(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.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604818A
PE Title: **Army Tactical Command and Control (C2) Hardware and Software**
Budget Activity: #4

(U) FY 1992 Accomplishments:
- (U) Funded under OMA

(U) FY 1993 Planned Program:
- (U) Funded under OMA

(U) FY 1994 Planned Program:
- (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 & 2.
- (U) Execute follow-on ATCCS logistics demonstration with Standardized Integrated Command Post System (SICPS) and common hardware software (CHS) 2.
- (U) Execute ATCCS confidence demonstration to determine the operational and technical readiness of ATCCS to proceed to ATCCS follow-on test and evaluation (FOTE) I .
- (U) Experimentation in support of BFA developments, to include FAADC2 V4 (Heavy), CSSCS V4 and AFATDS V2.
- (U) Evaluate methods and implementation of common ATCCS support software (CASS) V2 into ATCCS and BFA's.

(U) Work Performed By: US Army Communications-Electronics Command (CECOM), FT Monmouth, NJ; US Army Test and Evaluation Command (TECOM), FT Huachuca, AZ; Communications Electronics Board (C4B), FT Gordon, GA.

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

(U) Other Appropriation Funds: Not applicable

(U) International Cooperative Agreements: Not applicable

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604818A
PE Title: Common Hardware/Software

Project Number: #D323
Budget Activity: #4

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

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Common Hardware Software (CHS)	13218	10105	23548

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Common Hardware Software (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., handheld, portable, transportable, and Lightweight Computer Unit (LCU).

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- (U) Continued to provide support to CHS users to develop and field battlefield automated system.
- (U) Continued to manage the Common Software Reuse Program .
- (U) Funding increases as actions are initiated to award a contract for the second generation of CHS.
- (U) Conducted test on LCU equipment.

(U) FY 1993 Planned Program:
- (U) Continue to manage the Software Reuse Program.
- (U) Continue to manage the Command and Control Vehicle (C2V), and Standard Integrated Command Post System (SICPS) program.
- (U) Continue to support users in identification of CHS requirements.
- (U) Continue to deliver CHS-1/LCU to meet customers needs.

(U) FY 1994 Planned Program:
- (U) Continue to deliver CHS-1/LCU to meet customers needs.
- (U) Conduct testing on CHS-2 Equipment.
- (U) Continue to manage the Software Reuse, SICPS, and C2V Programs.
- (U) The CHS contract will be recompeted for CHS-2 (+15.0M FY94 non-recurring cost for CHS-2 Contract Award).

D. (U) Work Performed By: CHS 1 Contractor: MILTOPE Corporation, Melville, NY; LCU Contractor: Science Applications International Corporation (SAIC), San Diego, CA. The in-house developing agency is Project Manager, Common Hardware Software (PM, CHS), Program Executive Office, Command and Control Systems (PEO, CCS), Fort Monmouth, NJ. Program support is provided by U.S. Army Communications-Electronics Command (CECOM) functional activities, MITRE Corporation, Ventronnix Incorporated, R&D Associates, COMCON Incorporated, and General Electric provided PM support.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604818A
PE Title: Common Hardware/Software

Project Number: #D323
Budget Activity: #4

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY:
NARRATIVE DESCRIPTION OF CHANGES:

1. (U) TECHNICAL CHANGES: None
2. (U) SCHEDULE CHANGES: CHS-2 Acquisition pending OSD approval to release RFP.
3. (U) COST CHANGES: None

F. (U) PROGRAM DOCUMENTATION:

Baseline	3/89
Acquisition Plan	8/90
Required Operational Capability (ROC)	9/90
Test Plan	
CHS-1	3/90
LCU	4/91
Update Approved	8/92
Addition of CHS-2 Approved	9/92

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

H. (U) Other Appropriation Funds: Not applicable

I. (U) International Cooperative Agreements: Not applicable

J. (U) MILESTONE SCHEDULE:

Milestones	Milestone Dates
Program Initiated	12/85
ATCCS ROC	12/86
Request For Proposal Issued	05/87
User Demo Test	01/88
Army Systems Acquisition Review Counsel I/III (CHS 1)	04/88
OSD C3I Review	07/88
DAB	07/88
CHS 1 Contract Award	08/88
Initial Delivery V1, Program Support Environment V2 Prototypes	11/88
Initial Delivery V2	08/89
CHS 1 Final User Check Test Completed	11/90
LCU RFP Issue	08/90
ATCCS ROC update (w/LCU)	09/90

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604818A
PE Title: Common Hardware/Software

Project Number: #D323
Budget Activity: #4

LCU Contract Award	05/91
Initial Delivery LCU V1	07/91
Initial Delivery LCU V2	05/91
CHS 1 Production Delivery (FED)	10/91
CHS 2 RFP Issue	TBD*
OSD C3I Production Review (MCS/CHS 1)	TBD*
CHS 2 Contract Award	TBD*
CHS 2 Production Delivery V1 (Start)	TBD*
CHS 2 Production Delivery V2 (Start)	TBD*

* CHS-2 Acquisition (RFP) selected for formal OSD Review. Actual schedule date upon Department of Defense (DoD) authority to release the RFP.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604818A
PE Title: Army Tactical Command and Control (C2) Hardware and Software

Project Number #DC34
Budget Activity: #4

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

Popular Name	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Army Tactical C2 Systems Engineering	12178	9379	11778

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 1992 Accomplishments:
- (U) Initiated ATCCS compatibility demonstrations.
- (U) Conducted/supported preliminary system configuration operational confidence demonstration and the first of two early user test and experimentation (EUTE I).
- (U) Updated ATCCS System specification and ATCCS cross functional interface specification
- (U) Integrated ATCCS BFA systems into common hardware software (CHS) in Standardized Integrated Command Post System (SICPS) shelters.

(U) FY 1993 Planned Program:
- (U) Prototype and demonstrate battalion and below command and control (B2C2) rapid prototype to meet identified B2C2 functions.
- (U) Continue the system configuration confidence demonstrations in conjunction with EUTE II.
- (U) Update ATCCS specification and ATCCS cross functional interface specification.
- (U) Update the command post analysis to finalize follow-on test and evaluation (FOTE) I command post/hardware layouts.
- (U) Initiate a tech insertion program voice recognition Global Positioning System (GPS) and terrain evaluation.
- (U) Continue system interface compatibility demonstrations.
- (U) Demonstrate weather tactical decision aids.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604818A
PE Title: **Army Tactical Command and Control (C2) Hardware and Software**

Project Number #DC34
Budget Activity: #4

(U) FY 1994 Planned Program:

- (U) Perform functional analysis and update Command Post analysis to allow FOTE/fieldings.
- (U) Establish an ATCCS data architecture and standardization program.
- (U) Incorporate terrain visualization into the common ATCCS software terrain evaluation map module.
- (U) Update ATCCS and cross functional specifications.
- (U) Produce and test voice recognition and GPS prototypes.
- (U) Continue B2C2 applications, including Brigade/Battalion task force and Operation Plan/Operations Order, and refine communications interface.
- (U) Conduct/support system configuration developmental/operational demonstrations in conjunction with FOTE I.

D. (U) WORK PERFORMED BY: In house organization: Program Executive Officer for Command and Control Systems, Fort Monmouth, NJ. Contractor: General Electric Aerospace Military and Data Systems Operations Division, Ft. Washington, PA.

E. (U) COMPARISON WITH FY 1993 AMENDED 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)	3/93
Force Level Control System	

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

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

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604818A**
PE Title: **Army Tactical Command and Control (C2) Hardware and Software**

Project Number **#DC34**
Budget Activity: **#4**

J. (U) MILESTONE SCHEDULE:

Milestones	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	10/92
ATCCS (Manual) Force Level Early User Test and Experimentation (EUT&E)	03/92
ATCCS SE&I Contractor Automated Target System Confidence Demonstration	01/93
ATCCS System Confidence Demonstration	01/94
ATCCS Follow-on Operational Test & Evaluation (FOT&E) I	04/94
ATCCS FOTE II System Field Test at III Corps	07/94
Finalize Objective ATCCS Specification	08/94
Finalize design, development, test and fielding of Objective ATCCS	10/94-12/97

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604820A**
PE Title: **Radar Development**
Project Title: **FAAD Ground Based Sensor**

Project Number: **DE10**
Budget Activity: **#4**

POPULAR NAME: **FAAD Ground Based Sensor**

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

SCHEDULE	FY 1992	FY 1993	FY 1994		
Program Milestones					
Engineering Milestones	Begin Fabrication	Technical Review			
T&E Milestones		Technical Test Phase I	Technical Test Phase II		
Contract Milestones	Award Pre-Prod				
BUDGET ($000)	**FY 1992**	**FY 1993**	**FY 1994**		
Major Contract	30564	12775	18135		
Support Contract	3493	1610	1392		
In-House Support	5321	3271	3561		
GFE/ Other	*(1028)				
Total	39378	17656	25834		

* Data Interchange from TROSCOM/TACOM/CECOM: ($1048 for Technical Da· Packages of the GFE provided by these AMC MACOMs, per BOIP #DO15AFC.) This is not included in the GBS funding line.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604820A
PE Title: **Radar Development**
Project Title: **FAAD Ground Based Sensor**

Project Number: **DE10**
Budget Activity: **#4**

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 is a Non-Developmental Item, derived from Hughes Aircraft Company's successful FIREFINDER radar. 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 (C2I) interfaces. The sensor is an advanced three dimensional battlefield air defense radar which uses modern phased-array antenna. The GBS automatically detects, tracks, classifies, identifies and reports targets (fixed and rotary wing aircraft). 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.

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 C2I system. The FAAD GBS is the only planned Army air defense radar that has the range and accuracy, plus Electronic Counter Measures and Anti-spectrum of conflict in support of light and heavy forces. The FAAD GBS has the ability to expand its capability to keep current with evolving threat.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1992 Accomplishments:
- (U) Selected "Best Value" sensor and awarded pre-production contract.
- (U) Began fabrication of six research, development, test and evaluation (RDTE).
- (U) Initiated Integrated Logistics Support (ILS) refinement through a tailored Logistics Support Analysis Process
- (U) Tailored the test program to maximize use of existing test data and minimize test costs.

(U) FY 1993 Planned Program:
- (U) Begin accepting pre-production sensors.
- (U) Begin pre-production qualification and technical tests.
- (U) Complete development of system support packages.
- (U) Start operator/maintainer training courses.

(U) FY 1994 Planned Program:
- (U) Begin logistics and maintainability demonstrations.
- (U) Complete technical testing.
- (U) Acquire Technical Data Package f: ıares and repair co:
- (U) Begin development of Test Prograı: .ts for organic mair ıce capability.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0604820A
PE Title: **Radar Development**
Project Title: **FAAD Ground Based Sensor**

Project Number: **DE10**
Budget Activity: **#4**

D. (U) WORK PERFORMED BY:

In-house: FAAD Sensors Product Office, Redstone Arsenal, AL; PEO Intelligence & Electronic Warfare, Vint Hill Farms, Warrenton, VA; assisted by the U.S. Army Communications-Electronics Command's (CECOM) Electronic Warfare/Reconnaissance Surveillance and Target Acquisition (EW/RSTA) Center, Ft. 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.

E. (U) COMPARISON WITH FY 1993 AMENDED DESCRIPTIVE SUMMARY:

NARRATIVE DESCRIPTION OF CHANGES

1. TECHNICAL CHANGES: A prime contractor was selected in February 1992 from seven competitors. The system selected is a three dimensional, phased array radar built by Hughes Aircraft Company. Current configuration has the power generator and signal processor shelter mounted on a 5-ton truck with the sensor towed on a trailer. The current design is derived from the AN/TPQ-36 FIREFINDER system resulting in low technical risk and high commonality.

2. SCHEDULE CHANGES: On the basis of the maturity of the winning system, the previous test plan was revised to accelerate test activities. Technical test will begin in July 1993 utilizing a refurbished system previously tested during the source selection process.

3. COST CHANGES: The program cost has been reduced by decreasing preproduction systems from eight to six, tailoring the test program, and from savings associated with competition. The FY94 funding was increased to allow acceleration and coordinated testing with the FAAD C2 program.

F. (U) PROGRAM DOCUMENTATION:

ROC, 11/89, Revision #2
Acquisition Plan, 2/90
TEMP, 8/90
APB, 3/91
BCE, 7/92

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 DOD.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0604820A**
PE Title: **Radar Development**
Project Title: **FAAD Ground Based Sensor**

Project Number: **DE10**
Budget Activity: **#4**

H. (U) OTHER APPROPRIATION FUNDS: None

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS:

The Norwegian Air Force procured, through direct sales, and deployed twenty-four TPQ-36A radars for use with their HAWK missile systems. Six additional TPQ-36As have been ordered for deployment as HAWK is replaced by ground launched AAMRAM. Norway is seeking to upgrade their TPQ-36 to the GBS configuration. A Data Exchange Agreement through the U.S. Air Force has been established to facilitate discussions.

J. (U) MILESTONE SCHEDULE:

Milestones	Dates
Milestone II/IIA Review (JRMB)	7/86
Request for Proposal (RFP) Issued	5/90
Seven Proposals Received	9/90
Evaluation Complete	12/91
Pre-Production Contract Award	2/92

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605103A
PE Title: RAND Arroyo Center

Budget Activity: #6

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D732	Arroyo Center Support		
	16737	19111	15492

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 some 560 professionals trained in a broad range of disciplines. About 90 percent of RAND's staff work at corporate headquarters in Santa Monica, California; the remainder are based at RAND's Washington 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, his Assistant Secretaries, the Chief of Staff and Vice Chief of the Army, the Deputy Chiefs of Staff at the Departmental Headquarters, 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, Army and the Assistant Secretary of the Army (Research, Development, and Acquisition). The ACPC reviews, monitors, and approves all RAND Arroyo Center research efforts - both the annual Arroyo Center research plan and 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 multidisciplinary 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.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project D732 Arroyo Center Support

(U) FY 1992 Accomplishments:

- (U) Concluded the Alternative Structures Project. This work supports Army decisions about Special Repair Activities and rapid transportation systems.
- (U) Assisted in field tests of Readiness-Based Maintenance System and the VISION Assessment System.
- (U) Quantified the size of a ground-based ballistic missile defense system needed to defend against accidental, unauthorized, or third-world ballistic missile attack.
- (U) Designed a capability-based planning system for generating force requirements, which links national security objectives to specific force elements.
- (U) Designed and assessed new recruiting programs for combined Active-Reserve service, leading to enactment by Congress of authority for the Army's 2+2+4 enlistment program.
- (U) Researched how advanced technology could enhance the combat effectiveness of US light forces.
- (U) Made recommendations about structure of future US forces in Europe.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605103A
PE Title: RAND Arroyo Center

Budget Activity: #6

(U) FY 1993 Planned Program:

- (U) Research on the strategic environment and regional deterrence strategies in Europe, the Middle East, and Korea.
- (U) Research on the Army of the 21st century, including relationship between combat and support forces, and between active and reserve components.
- (U) Research on how the Army of the future should be equipped.
- (U) Research on Army training practices, including study of reserve component peacetime and post-mobilization training, and analysis of National Training Center results.
- (U) Research on the Army infrastructure (e.g., installations, schools, hospitals).
- (U) Research on personnel planning for the total Army and managing the active personnel drawdown.

(U) FY 1994 Planned Program:

- (U) Research on combat/support force risk assessment.
- (U) Research on military operations short of war.
- (U) Assessing the impact of the changing defense environment on the acquisition and requirements process.
- (U) Evaluating logistics management systems.

(U) Work Performed By: Work primarily performed by the RAND Arroyo Center or their contractors.

(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. Two other FFRDCs are also housed at RAND, Project Air Force (PAF) and The National Defense Research Institute (NDRI). 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. 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 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605301A
PE Title: Army Kwajalein Atoll
Budget Activity: #6

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

Project Number / Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
MAC2 Host Nation Compliance - U.S. Army Kwajalein Atoll (USAKA)	5428	4622	4773
D614 Army Kwajalein Atoll *	186929	171677	166607
PE TOTAL	192357	176299	171380

*** Resources were realigned from Project D614 to PE #0604759A, Project D983 - Major Test and Evaluation Investment - USAKA (over $2 million per year or $10 million total acquisition cost). The funding reported in D614 for FY 1992 and FY 1993 does not match the R-1, but represents the direct operating cost of USAKA, less the major test and evaluation investment. The actual costs associated with the purchase of major test and evaluation investment for USAKA in FY 1992 and FY 1993 are reported in PE #0604759A, Project D983 for comparability.**

B. (U) BRIEF DESCRIPTION OF ELEMENT: U.S. Army Kwajalein Atoll (USAKA) is a remote (located in the Marshall Islands), secure activity of the Major Range and Test Facility Base as constituted by DoD Directive 3200.11. Its function within that entity is to support test and evaluation of major Army and DoD missile systems, Army space, surveillance and object identification, and NASA scientific and space programs. Programs supported include Army missile defense, Strategic Defense Initiative Organization (SDIO) functional, integrated technology, and Global Protection Against Limited Strikes (GPALS) element demonstration/validation tests, Navy Sea-Launched and Air Force Intercontinental Ballistic Missile (ICBM) development and operational tests, U.S. Space Command Space Surveillance Network, and NASA Space Transportation System - Shuttle - and crustal dynamics experiments. USAKA supports the DoD's strategic missile operational and developmental testing programs required to support the Missile Defense Act of 1991 to put in place a Ground Based Defense System by 1996 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. In addition to customer support, the KREMS continues to develop its capabilities on the leading edge of metric signature and imaging radar technology under the scientific direction of Massachusetts Institute of Technology/Lincoln Laboratory, a Federally Funded Research and Development Center. This element provides salaries and personnel benefits for civilian personnel and their associated administrative support. USAKA is contractor operated and is therefore totally dependent upon its associated support contractors. Program also provides funds for the contractors to accomplish range instrumentation modernization and improvement; and installation maintenance, repair and operation. This program element has been restructured to provide for continued funding of environmental compliance and disposal of hazardous waste at USAKA to ensure host nation compliance with Republic of the Marshall Islands environmental laws and regulations.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605301A
PE Title: Army Kwajalein Atoll
Budget Activity: #6

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. It does not fund Defense Environmental Restoration Account (DERA) funded environmental restoration. Resources were transferred to this program from PE #0605856A (Environmental Compliance - RDT&E), to provide continued funding of environmental compliance and disposal of hazardous waste at USAKA. This zero-sum realignment ensures host nation compliance with U.S. and Republic of the Marshall Islands environmental laws and regulations.

(U) FY 1992 Accomplishments:
- (U) Installed diesel engine generator crank case oil recycling equipment.
- (U) Screened construction sites for giant clams (an endangered species) and transplanted the clams to other areas of the lagoon.
- (U) Conducted numerous environmental studies and developed environmental response procedures based on the data collected.
- (U) Retrograded lead-acid batteries to Defense Reutilization Marketing Office (DRMO) in Hawaii.

(U) FY 1993 Planned Program:
- (U) Begin to remove waste oil from closed burn pits, remove contaminated soil, package soil and ship to DRMO.
- (U) Install oil water separators in motorpool area.
- (U) Ship hazardous wastes to DRMO.
- (U) Begin identification, removal, shipping and disposal of PCB laden oil and PCB contaminated equipment.

(U) FY 1994 Planned Program:
- (U) Complete removal of waste oil from closed burn pits, complete removal of contaminated soil, packaging and shipment to DRMO.
- (U) Continue routine shipment of hazardous wastes to DRMO.
- (U) Maintain Hazardous Materials Dispensing Area to standards required by the Resource Conservation and Recovery Act.
- (U) Continue the identification, removal, shipping and disposal of PCB laden oil and equipment.

(U) **Project D614 - Army Kwajalein Atoll.** The Army, Air Force, Navy and SDIO 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. SDIO 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 Defense Advanced Research Project Agency Long-Range Tracking and Instrumentation Radar, located at USAKA, is one of only three sensors world-wide that has deep-space tracking capability.

(U) FY 1992 Accomplishments:
- (U) Continued to support strategic operational and developmental testing for all services; Air Force programs such as Peacekeeper and Minuteman III; the Army's Exoatmospheric Re-entry Vehicle

Interceptor Subsystem (ERIS) and Airborne Surveillance Testbed (AST) programs; the U.S. Air Force Ballistic Missile Organization's Have Jeep Sounding Rocket program and NASA's Space Transportation System (STS) program. Mission support was highlighted by the successful launch of the second ERIS Flight Test Vehicle.

- (U) Continued improvement and modernization of range instrumentation to ensure continued supportability. Included were upgrades to communications, command and control, safety, telemetry, radar systems development of new Kwajalein Mission Control Center.
- (U) Continued contractual action to compete range engineering contract which will combine all technical support under a single contractor.
- (U) Completed third year of the Threat Assessment and Countermeasure Program to enhance USAKA Security Fix-It Plan. Funding to date to identify and counter USAKA's security and intelligence vulnerabilities totals $35.8 million.
- (U) Began damage repairs caused by tropical storm Zelda.
- (U) Backlog of Maintenance and Repair (BMAR) increased to $60 million.

(U) **FY 1993 Planned Program:**

- (U) Continue to support strategic operational and developmental testing for all services; Air Force programs such as Peacekeeper, Minuteman III, and Titan; the Army's Ground Based Interceptor and AST programs; NASA's STS program; and the Air Force Ballistic Missile Organization's associated operations.
- (U) Continue improvement and modernization of range facilities for most cost-effective testing and to support the continuous update of range requirements and facilities. Complete development of new Kwajalein Missile Control Center; bring new systems on-line.
- (U) Award the integrated range engineering contract.
- (U) Begin planning to support GPALS initial deployment and system integration testing.
- (U) Execute the fourth year of the Security Fix-It Plan. Encrypt all range radios and complete preliminary design efforts for a new USAKA electronic security system. Implement a USAKA-wide Operation Security (OPSEC) program which will impact on range operations and tests conducted at KMR. Complete Submarine Fiber-Optic Telecommunications System (SFOTS) installation.
- (U) Complete extensive damage repairs caused by Tropical Storm Zelda.
- (U) BMAR estimated at $67.2 million.

(U) **FY 1994 Planned Program:**

- (U) Continue to support strategic operational and developmental testing for all services.
- (U) Continue improvement and modernization of range instrumentation and facilities.
- (U) Award new contract for USAKA logistical support.
- (U) Conduct GPALS logistical system integration test using element surrogates.
- (U) Execute fifth year of Security Fix-It Plan at reduced levels. Complete installation of USAKA electronic security system.
- (U) Support physical security upgrades to existing USAKA facilities.
- (U) BMAR estimated at $75.3 million.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605301A
PE Title: **Army Kwajalein Atoll** Budget Activity: #6

(U) Work Performed By: 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; GE Corporation, Moorestown, NJ; GTE Government Systems Corporation, Needham Heights, MA; Am Pro Protective Agency, Inc., Columbia, SC; and Aeromet Inc., Tulsa OK.

(U) Related Activities: U.S. Army Kwajalein Atoll is essential to accomplishment of the Strategic Defense Initiative GPALS program and the operational and developmental testing of deployed strategic ICBM systems such as Minuteman and Peacekeeper. There is no unnecessary duplication of effort within the Army or the DoD.

(U) Other Appropriation Funds:

Appropriation	($ in Thousands) FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
Military Construction, Army	72000	0	21200
Other Procurement, Army (BCE)	816	1250	2475
Real Property Maintenance, Defense	5185	-	-

(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 1994 RDTE DESCRIPTIVE SUMMARY

Program Element: #0605601A
PE Title: **Army Test Ranges and Facilities** Budget Activity: #6

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

Project Number / Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
DE90 Yuma Proving Ground	21361	15430	17099
DE91 Combat Systems Test Activity	41826	30168	36504
DE92 Dugway Proving Ground	12780	12266	13272
DE93 White Sands Missile Range	65730	64595	42632
DE94 Army Electronic Proving Ground	11471	11259	9797
D452 Cold Regions Test Center	3568	2636	4290
D618 Aviation Technical Test Center	14167	15795	17427
D630 TECOM Test Design and Evaluation	3432	2668	3399
D632 Redstone Technical Test Center *	-0-	-0-	995
PE TOTAL	174335	154817	145415

* Effective FY 1994, program was restructured and funds transferred from project DE93 to D632 to support Redstone Technical Test Center efforts.

B. (U) BRIEF DESCRIPTION OF ELEMENT: Sustains a technical test capability for development, production acceptance, and product improvement testing of materiel, weapons, and weapon systems at five DoD major range and test facility bases (Yuma Proving Ground, AZ; Combat Systems Test Activity, Aberdeen Proving Ground, MD; Dugway Proving Ground, UT; White Sands Missile Range, NM; Electronic Proving Gr .nd, Ft. Huachuca, AZ). Also funds the following test centers: Cold Regions Test Center, Ft. Greeley, AK; Aviation Technical Test Center, Ft. Rucker, AL; and Redstone Technical Test Center, Redstone Arsenal, AL. Other subordinate testing sites are located in New Jersey, California, and Panama. Program also provides a capability to perform test design and evaluation functions. Each test activity has an established capability uniquely required to assure technical performance, adherence to safety requirements, reliability, supportability, and quality of materiel under development or procurement. Current testing capabilities are focused on technology areas and are non-mission duplicative; they represent the absolute baseline required to assure acceptable risk in development of current and new Army technology and selected other service capabilities. Program finances indirect operations/maintenance costs of test facilities, replacement of test support equipment, and test range improvements to maintain current testing capability and accommodate technological advances. It does not finance reimbursable costs directly identified to a user of the facility. Direct costs are reimbursed by materiel developers and

project/product managers in accordance with DoD funding policies. FY 1994 funding includes the cost of reshaping the workforce in line with Army's downsizing policies, plans and programs.

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 and ground-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 assume the munitions production acceptance testing mission from Jefferson Proving Ground by FY 1995 under the Base Realignment and Closure Act (BRAC).

(U) **FY 1992 Accomplishments:**

- (U) Approximately 355 tests were accomplished. Systems tested included:
  - Military tires
  - XM953 staff round
  - M1A1 ABRAMS production improvements (PIPS)
  - Palletized Loading System
  - Sense & Destroy Armor (SADARM), 155MM Projectile
  - Air Force C-17 (Globemaster III)
  - OH-58 Helicopter
  - RAH-66 COMANCHE
  - M230 Chain Gun
  - M2 Bradley Production Improvements
- (U) Began phase-in of Jefferson Proving Ground mission
- (U) Established a weapons accuracy range for aircraft and tanks
- (U) Improved gun positions, safety bunker, and air drop staging facility.
- (U) Conducted initial test of the weapons firing chamber (65km range)

(U) **FY 1993 Planned Program:**

- (U) Approximately 340 tests will be accomplished. Some of the systems to be tested include:
  - Military tires
  - Advanced Field Artillery System (AFAS)
  - M1A1 ABRAMS production improvements (PIPS)
  - Palletized Loading System
  - Sense & Destroy Armor (SADARM), 155MM Projectile
  - OH-58D Kiowa Warrior Armed Helicopter
  - RAH-66 COMANCHE
  - U.S. Marine Light Armored Vehicle (LAV)

- AC-130 Gunship (Armed C-130)
- C-17 Globemaster III

- (U) Reshape workforce in line with Army's downsizing policies, plans and programs.
- (U) Initiate transfer of Jefferson Proving Ground mission.

(U) **FY 1994 Planned Program:**

- (U) Approximately 340 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
  - Field Artillery Resupply Vehicle-Ammunition (FARV-A)
  - AH-64C APACHE - LONGBOW
  - Family of Scatterable Mines (FASCAM)
  - U.S. Marine Light Armored Vehicle (LAV)
  - Electromagnetic Gun
  - C-17 Globemaster III
- (U) Complete Jefferson Proving Ground (BRAC) transfer of mission.
- (U) Continue reshape initiatives in line with Army's downsizing policies, plans and programs.

(U) **Project DE91 - Combat Systems Test Activity (CSTA), Aberdeen Proving Ground, Maryland.** 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, a multitude of 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.

(U) **FY 1992 Accomplishments:**

- (U) Approximately 685 tests were accomplished. Systems tested included:
  - HELLFIRE live fire lethality
  - Navy ship structures
  - PALADIN live fire
  - Reactive armor designs
  - M831E2 cartridge
  - Applique armor

- M1A2 ABRAMS
- Unmanned Ground Vehicles (UGV)

- (U) Improvements accomplished include: safety and operational upgrades to ammunition plants, automotive courses, main front target and sabot recovery area.

(U) FY 1993 Planned Program:

- (U) Approximately 600 tests will be accomplished. Some of the systems to be tested include:
  - Navy shock testing
  - R&D armor designs
  - Navy ship structures
  - Applique armor
  - Armored Gun System (AGS)
  - M1A2 ABRAMS
  - Unmanned Ground Vehicles (UGV)
  - Family of Medium Tactical Vehicles (FMTV)
  - Experiments with robotic vehicles
  - Defense Nuclear Agency/Strategic Defense Initiative Office (DNA/SDIO) OT (Operate Through)
  - Armored vehicle radiation shielding

(U) FY 1994 Planned Program:

- (U) Approximately 590 tests will be accomplished. Some of the systems to be tested include:
  - Sense & Destroy Armor (SADARM)
  - Navy ship structures shock testing
  - Ground Combat Identification (CID)
  - Unmanned Ground Vehicles (UGV)
  - Soldier Enhancement
  - 2 1/2 Ton Service Life Extension Program (SLEP)
  - Wide Area Mine
  - Combat Vehicle Common Chassis
  - Javelin live fire
  - HELLFIRE LONGBOW live fire
- (U) Reshape workforce in line with Army's downsizing policies, plans and programs.

(U) **Project DE92 - Dugway Proving Ground (DPG), UT.** 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. This project also finances a capability to conduct tropical environment testing in Panama and expertise to design, monitor and conduct testing on a safari basis.

(U) FY 1992 Accomplishments:

- (U) Approximately 275 tests were accomplished. Systems tested included:
  - Millimeter Screening Smoke Grenade

- Cryofracture of explosives
- Smoke/Illumination Munitions Acceptance
- Advance Air Filtration System
- Joint Chemical Biological Contact Point
- Improved Chemical Agent Monitor
- Verification of Chemical Warfare Treaty
- Nuclear/Biological/Chemical (NBC) Reconnaissance Vehicle

(U) **FY 1993 Planned Program:**

- (U) Approximately 240 tests will be accomplished. Some of the systems to be tested include:
  - Smoke/Illumination Munitions Acceptance
  - Joint Chemical Biological Contact Point
  - Verification of Chemical Warfare Treaty
  - Nuclear/Biological/Chemical (NBC) Reconnaissance Vehicle
  - Improved Chemical Agent Monitor (ICAM)
  - XM21 RSCAAL Chemical Agent Alarm
  - Concept Model, Biological-Chemical Detector

(U) **FY 1994 Planned Program:**

- (U) Approximately 220 tests will be accomplished. Some of the systems to be tested include:
  - Smoke/Obscurant System
  - Joint Chemical Biological Contact Point
  - Collective Protection Systems
  - Nuclear/Biological/Chemical (NBC) Contamination Avoidance System
  - Smoke/Illumination Munitions Acceptance
  - Verification of Chemical Warfare Treaty
  - Nuclear/Biological/Chemical (NBC) Decontamination Systems
  - Nuclear/Biological/Chemical (NBC) Protective Equipment
- (U) Reshape workforce in line with Army's downsizing policies, plans and programs.

(U) **Project DE93 - White Sands Missile Range (WSMR), NM.** WSMR is the largest, all-purpose, overland test range within DoD. This project tests military strategic and tactical systems throughout the system/equipment life cycle. WSMR is primarily a missile range for testing ballistic and guided missiles, air defense systems, and artillery missiles. It is the DoD designated primary test facility for overland surface-to-air testing under Project Reliance. Other capabilities exist for performing a variety of tests including artillery, command and control systems, aircraft armament, and ground vehicles. 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. It is a primary test facility in support of the nuclear effects testing under Project Reliance. Test capabilities includ temperature, shock, vibration, and electromagnetic effects. WSMR facilities and services are extensively ut. ized by the Tri-Services, National Aeronautics and Space Administration, other government agencies, etc.

FY 1994 RDTE DESCRIPTIVE SUMMARY

Program Element: #0605601A
PE Title: **Army Test Ranges and Facilities** Budget Activity: #6

(U) FY 1992 Accomplishments:

- (U) Approximately 285 tests were accomplished. Systems tested included:
  - Project MEMO
  - Army Tactical Missile (ATACMS)
  - Multiple Launch Rocket System (MLRS)
  - High Altitude Endo-Atmospheric Defense Interceptor (HEDI)
  - PATRIOT
  - Extended Range Interceptor (ERINT)
  - STINGER
  - ABRAMS Tank Nuclear Hardness
- (U) Implemented first phase of reshape initiatives in line with Army's downsizing policies.
- (U) Range improvements accomplished includes operational upgrades to range scheduling systems and the nuclear effects test facilities.

(U) FY 1993 Planned Program:

- (U) Approximately 250 tests will be accomplished. Some of the systems to be tested include:
  - Project MEMO
  - Army Tactical Missile (ATACMS)
  - Navy Standard Missile
  - Multiple Launch Rocket System (MLRS) SADARM
  - Light Weight Exo-Atmospheric Projectile (LEAP)
  - CHAPARRAL Seeker
  - Extended Range Interceptor (ERINT)
  - ABRAMS Tank Nuclear Hardness
  - PATRIOT
- (U) Continue reshape initiatives in line with Army's downsizing policies, plans, and programs.

(U) FY 1994 Planned Program:

- (U) Approximately 230 tests will be accomplished. Some of the systems to be tested include:
  - Nuclear hardness of equipment
  - PATRIOT production improvements (PIPS)
  - Air Force Advanced Medium Range Air-to-Air Missile (AMRAAM)
  - Line of Sight Anti-Tank (LOSAT) Demo
  - Multiple Launch Rocket System (MLRS)
  - Non-Line of Sight (NLOS) Demo
  - Theater Missile Defense (TMD)
- (U) Continue reshape initiatives in line with Army's downsizing policies, plans, and programs.

(U) Project DE94 - Army Electronic Proving Ground (EPG), Fort Huachuca, AZ. EPG is unique within DoD because of it's electromagnetically "clean" environment, extensive real estate, low annual rainfall, and special facilities required to perform development/development-type tests 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 unattended aerial vehicle facility, antenna test facility, EMI/EMC/TEMPEST test facility, environmental test

facility, a systems test facility, a systems interoperability and computer software testing facility, an electronic realistic battlefield environmental 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.

(U) **FY 1992 Accomplishments:**

- (U) Approximately 165 tests were accomplished. Systems tested included:
  - Unmanned Aerial Vehicle (UAV) Short Range
  - Single Channel Ground and Airborne Radio Systems (SINCGARS)
  - Enhanced Position Locating & Reporting System (EPLRS)
  - Global Positioning System (GPS) Receivers
  - Digital Topographic (TOPO) Support System
  - Joint Tactical Information Distribution System (JTIDS)
  - GUARDRAIL
  - All Source Analysis System (ASAS)

(U) **FY 1993 Planned Program:**

- (U) Approximately 145 tests will be accomplished. Some of the systems to be tested include:
  - Global Positioning System (GPS) Receivers
  - Unmanned Aerial Vehicle (UAV) Short Range
  - Integrated Survey Instrumentation
  - Enhanced Position Locating & Reporting System (EPLRS)
  - GUARDRAIL
  - All Source Analysis System (ASAS)
  - Joint Tactical Information Distribution System (JTIDS)
  - Army Tactical Command & Control System (ATCCS)

(U) **FY 1994 Planned Program:**

- (U) Approximately 140 tests will be accomplished. Some of the systems to be tested include:
  - Advanced C2 Vehicle
  - Army Tactical Command and Control System (ATCCS)
  - Secure, Mobile Anti-Jam Reliable Tactical Terminal (SMART-T)
  - Single Channel Anti-Jam Man Portable Terminal (SCAMP)
  - Defense Satellite Communications System-Defense Communications System (DSCS-DCS)
  - Army Joint Surveillance Target Acquisition Radar System (JSTARS)
  - Unmanned Aerial Vehicle (UAV) Short/Close Range
  - Single Channel Ground and Airborne Radio Systems Corps (SINCGARS)-V
- (U) Reshape workforce in line with Army's downsizing policies, plans and programs.

(U) **Project D452 - Cold Regions Test Center (CRTC), Fort Greeley, AK.** CRTC is the only cold region environmental test center within DoD. s program includes developmental and production acceptance testing to determine the effects of extreme co eather, wind, and snow on the performance of weapon systems and materiel and the man/materiel interface as well as the performance of extreme cold weather specific equipment. CRTC is a specialty site for natural cold weather environmental testing under DoD Project Reliance.

FY 1994 RDTE DESCRIPTIVE SUMMARY

Program Element: #0605601A
PE Title: **Army Test Ranges and Facilities** Budget Activity: #6

(U) **FY 1992 Accomplishments**
- (U) Approximately 75 tests were accomplished. Systems tested included:
  - BRADLEY Infantry Fighting Vehicle
  - Heavy equipment transport
  - Cold weather clothing
  - M1A1 Cold Weather Production Improvements (PIPS)
  - Mobile Over the Snow Transport (MOST)
  - M734 Fuze
  - AH-64A APACHE
  - Light Weight Decontamination System

(U) **FY 1993 Planned Program:**
- (U) Approximately 55 tests will be accomplished. Some of the systems to be tested include:
  - Standardized Integrated Command Post System (SICPS)
  - Chemical Agent Detector Network (CADNET)
  - Cold weather glove
  - OH-58D Army Helicopter Improvement Program (AHIP)
  - Body Armor Suit, Individual Countermine (BASIC)
  - M913 105mm Rocket Assisted Projectile
  - Protective eyewear

(U) **FY 1994 Planned Program:**
- (U) Approximately 50 tests will be accomplished. Some of the systems to be tested include:
  - Soldier Enhancement Program
  - Modular Decon System
  - Arctic fueling systems
  - M1A2 Abrams Tank
  - 2-1/2 Ton Service Life Extension Program (SLEP)
  - Standard Integrated Command Post Shelter (SICPS)
  - Sense & Destroy Armor (SADARM)

(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 as early as possible on the newer aircraft systems/subsystems in controlled high flying hour rate flight test programs in order to identify problems affecting fleet availability, flight safety and verify attendant solutions. 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.

(U) **FY 1992 Accomplishments:**
- (U) Approximately 160 tests were accomplished. Systems tested included:
  - Combat identification technology
  - RC-12K aircraft

- Lead-The-Fleet
- AH-64A APACHE
- OH-58 Series Helicopter
- RAH-66 COMANCHE
- Rotary wing targets
- A/MH-6N Helicopter
- Foreign aircraft exploitation

- (U) Quick response and safety testing of fielded systems.
- (U) Managed technical and air worthiness qualification test and evaluation mission of all Army aircraft.

(U) **FY 1993 Planned Program:**

- (U) Approximately 130 tests will be accomplished. Some of the systems to be tested include:
  - Lead-the-Fleet
  - AH-64A APACHE
  - OH-58 Series Helicopter
  - RAH-66 COMANCHE
  - Special Operations Aircraft
  - LONGBOW AH-64D APACHE
  - Ultralight Camouflage Net System (ULCANS)
  - A/MH-6N Helicopter
  - MH-47E/MH-60K Helicopters
  - Foreign aircraft exploitation
- (U) Quick response and safety testing of fielded systems.
- (U) Manage technical and air worthiness qualification test and evaluation mission of all Army aircraft.

(U) **FY 1994 Planned Program:**

- (U) Approximately 125 tests will be accomplished. Some of the systems to be tested include:
  - Lead-the-Fleet
  - Aviation life support equipment
  - Aircraft survival equipment
  - UH-60A BLACK HAWK modifications
  - CH-47 CHINOOK modifications
  - LONGBOW AH-64D APACHE
  - Airborne C2 consoles
  - OH-58D AHIP Helicopter
  - MH-47E/MH-60K Helicopters
- (U) Quick response and safety testing of fielded systems.
- (U) Manage technical and air worthiness qualification test and evaluation mission of all Army aircraft.
- (U) Reshape workforce in line with Army's downsizing policies, plans and programs.

(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.

FY 1994 RDTE DESCRIPTIVE SUMMARY

Program Element: #0605601A
PE Title: **Army Test Ranges and Facilities** Budget Activity: #6

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 1992 Accomplishments:

- (U) Completed over 35 independent assessment plans. Included were plans addressing the following items:
  - Multi-Purpose Overboot
  - Heavy Assault Bridge
  - Body Armor Set, Individual Countermine
  - Light and Special Division Interim Sensor
  - Arctic Forward Area Refueling System
  - Chemical Agent Monitors - Improved
  - Modular General Purpose Tent System
  - AN/PDR-77 Alpha Monitor
- (U) Completed 110 independent assessment reports, including reports on the following items:
  - Desert Battledress Uniform
  - Lightweight Extreme Weather Shelter
  - Mounted Ration Heating Device
  - Power Pack Transporter, XM1073
  - 3000 Gal/Hour Reverse Osmosis Water Purification Unit
  - Family of Tactical Quiet Generators
  - Digital Topographic Support System
  - Time Delay Firing Device, XM147
  - Field Medical Oxygen Generating & Distribution System
  - Automatic Reserve Ripcord Release
  - Automatic COMSEC Management and Engineering System
  - Remote Sensing Chemical Agent Alarm
  - Truck, Tractor, M916A1
  - Chemical Protective Undergarment

(U) FY 1993 Planned Program:

- (U) Continue test design and assessment program, addressing new developments, production, and materiel changes. Programmed items include:
  - Mobile Automated Instrumentation System
  - U.S. Air Force C-17 Transport - Army Interface
  - HAWK Mobility Enhancement
  - Multi-Spectral Close Combat Decoys
  - Tactical Quiet 3KW Generator Set
  - TRACKWOLF
  - 60000 LB Capacity Airdrop System
  - Aircrew Integrated Helmet System
  - Bio-Chemical Detector
  - Front/Side Loading Forklift, 6000 LB

- Heavy Equipment Transporter Truck Tractor, M1070
- Modular Collective Protection Equipment

(U) FY 1994 Planned Program:

- (U) Continue test design and evaluation program to assess developmental systems, initial production items and equipment modernization programs. Programmed items include:
  - Echelons Above Core (EAC) Small Extension Node Switch
  - Airborne Standoff Minefield Detection System
  - Intelligence Electronic Warfare (IEW) Common Sensor
  - Laser Detecting Set AN/AVR-2
  - Laser Standoff Chemical Detector
  - Alarm Automatic Chemical Agent XM22
  - Digital Topographic Support System
  - Aircraft Maintenance Vehicle (AMV)
  - Close Combat Tactical Trainer (CCTT)
  - Anti Tank Guid· ł Missile (ATGM) Simulator, XM27
  - HYDRA 70 XM.255E1 Flechette
  - Aircrew Microclimate Cooling System
  - Tactical Terminal Control System
  - Bunker Defeat Munition

(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. Funds to support RTTC efforts in FY 1992 and FY 1993 were programmed in project DE93. Effective FY 1994, program was restructured and funds transferred from project DE93 to project D632 for the RTTC efforts.

(U) FY 1992 Accomp..shments:

- (U) Efforts were funded in Project DE93. Approximately 170 tests were accomplished. Systems tested included:
  - HELLFIRE
  - TOW BRADLEY
  - JAVELIN
  - STINGER
  - Brilliant Anti-Armor Projectile (BAT)
  - Light & Special Division Interim Sensor (LSDIS)
  - TOW BRADLEY

(U) FY 1993 Planned Program:

- (U) Efforts were funded in Project DE93. Approximately 180 tests will be accomplished. Some of the systems to be tested include:
  - 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) FY 1994 Planned Program:

- (U) Approximately 175 tests will be accomplished. Some of the systems to be tested include:
  - JAVELIN
  - LONGBOW/HELLFIRE
  - Brilliant Anti-Armor Projectile (BAT)
  - Unmanned Aerial Vehicle (UAV) Short Range
  - Insensitive Propellant
  - Line of Sight Anti-Tank (LOSAT)
  - Non-Line of Sight (NLOS)

(U) Work Performed By: In-house testing is performed largely by personnel assigned to facilities augmented by temporarily assigned military personnel from Forces Command and the Reserve Component. Support functions are performed 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 Corporation, Philadelphia, PA ; Cincinnati Business Information Systems, Fairfax, VA; VEDA, Inc, Lexington Park, MD and TERO TEK International, Inc, Delano, CA.

(U) Related Activities: The five US Army Test and Evaluation Command 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 Director Test and Evaluation reviews management of all DoD test facilities to avoid unnecessary duplication of capabilities, to ensure that highest priority capabilities are established expeditiously and suitably maintained, to insure integration of testing by the services. The Army's production acceptance testing mission at Jefferson Proving Ground, IN. is reimbursed from the Procurement, Army appropriation. This program, with its general emphasis on testing, 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)

FY 1994 RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605601A**
PE Title: **Army Test Ranges and Facilities** Budget Activity: **#6**

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 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
MILITARY CONSTRUCTION Army:			
Yuma Proving Ground:			
Mine Test Range	1500		
Combat Systems Test Activity:			
Upgrade Vulnerability Range			4400
Dugway Proving Ground:			
Life Science Test Facility			17000
White Sands Missile Range			
Aerial Cable Range	9600		
Target Track Upgrade (BAT)			3400

(U) International Cooperative Agreements: Not applicable.

FY 1994 RDTE DESCRIPTIVE SUMMARY

Program Element: #0605602A
PE Title: Army Technical Test Instrumentation
Budget Activity: #6

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D453 Technical Test Instrumentation *	6190	6050	0
D628 Test Technology & Sustaining Instrumentation	39852	29035	25540
PE TOTAL	46042	35085	25540

*** Resources were realigned 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 1992 and 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 1992 and FY 1993 are reported in PE #0604759A, Project D984 for comparability.**

B. (U) BRIEF DESCRIPTION OF ELEMENT: Funds development, acquisition and sustainment of developmental 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], 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. Projects D238 - Aerial Targets and D459 - Ground Targets, previously funded in this program, have been realigned to PE 0604258A - Targets System Development. Effective FY 1994, all major test and evaluation investment projects (over $2 million per year or $10 million total), previously funded in project D453, have been realigned to PE 0604759A - Major Test and Evaluation Investments, Project D984.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) **Project D453 - Technical Test Instrumentation.** This project is an investment account which 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). Technical test instrumentation is defined as that with one or more of the following attributes: joint service requirements, used by multiple commands, high risk, or produces a new developmental testing capability. Any major projects exceeding $2 million per year or $10 million acquisition cost will be funded under PE #0604759A (Major Test and Evaluation Investments) Project D984.

Program Element: #0605602A
PE Title: Army Technical Test Instrumentation Budget Activity: #6

(U) FY 1992 Accomplishments:

- (U) Continued acquisition of Mobile Conditioning Chambers at DPG to provide on-site environmental conditioning of test items.
- (U) Completed telemetry, receipt, processing and transmission project at ATTC.
- (U) Achieved Full Operational Capability (FOC) of the Airspace Surveillance Radar Project at WSMR. Replaced three obsolete AN/TPS-48 radars with new ASR-9 radars and display systems with a new Air Space Display and Control System (ASDCS).
- (U) Continued development/acquisition of instrumentation for system level tests of tactical command and control systems under the Army Tactical Command and Control System (ATCCS) at EPG.
- (U) Initiated the Direct Fire Productivity Improvement (DFPI) program at CSTA to provide instrumentation for more efficient and accurate testing of direct fire weapon systems.
- (U) Completed procurement of the remote controlled video system optical tracking mount fleet.
- (U) Completed studies of Range Signal Security at YPG.
- (U) Continued development of phase III of the Micro-Test Item Stimulator (TIS) acquisition consisting of computer based Command, Control, Communications and Intelligence (C3I) stimulators with new communications boards for universal data link for C3I systems.

(U) FY 1993 Planned Program:

- (U) Complete CSTA's Main Front Direct Fire Test range under the DFPI program by procuring high-speed photography, flash x-ray, and radar instrumentation in position for testing munitions up to 155 millimeters.
- (U) Complete phase III of the acquisition of Micro-TIS program.
- (U) Complete development of the Technical Control Center as part of the capability for system level 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 data.
- (U) Initiate Advanced Armor Instrumentation (AAI) project at CSTA. This program will provide the instrumentation required to test active armor and advanced materials used for combat vehicle protection systems. FOC to be achieved in FY 1999.
- (U) Initiate and complete 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.
- (U) Initiate 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.
- (U) Conduct feasibility study for the final phase of the Combat Vehicle Measurement System (CVMS) project to determine transmission signal strength in rolling terrain.

(U) FY 1994 Planned Program:

- (U) There are no technical test instrumentation projects funded in FY 1994.

(U) **Project D628 - Test Technology and Sustaining Instrumentation.** Test technology provides critical front-end efforts for development of new test methodologies and test standards, development and formulation of advanced test technology concepts for future test capabilities, and development of advanced technology instrumentation prototypes and test capabilities. Sustaining instrumentation maintains required

existing technical testing adequacy and cost effectiveness to support test execution at Army test facilities. Sustaining instrumentation provides for replacement of unreliable and irreparable instrumentation and incremental upgrade of instrumentation.

(U) FY 1992 Accomplishments

- (U) Expanded capabilities for sensor fusion system testing into additional spectrums and bandwidths consistent with new weapon system developments.
- (U) Completed artificial intelligence projects for range scheduling, environmental assessment, and security planning.
- (U) Maintained capability for replacement of obsolete equipment/instrumentation at Army ranges, e.g. refurbished the AN/MPS-25 instrumentation radar at YPG.
- (U) Initiated system design of a high power microwave test capability. This project will be acquired under PE #0604759A, project D984.
- (U) Established prototype firing facilities and continued test technology development to support electric gun development.
- (U) Developed new and improved test methodologies for nuclear effects and Congressionally mandated live fire vulnerability testing, and for testing battlefield systems in a smoke/obscurant environment.
- (U) Upgraded existing capability to track projectiles in support of munitions testing programs at Army ranges.
- (U) Acquired ruggedized high-speed, high-reliability transducers and on-board digital data acquisition systems to provide/enhance capability for Congressionally-mandated live fire vulnerability testing at CSTA.
- (U) Acquired subminiature telemetry to provide/enhance capability for lethality testing of non hypervelocity munitions at YPG.
- (U) Completed the development of the launch area theodolite systems and remote control instrumentation systems at WSMR.
- (U) Completed acquisition for a weapons accuracy range using virtual targets capable of scoring accuracy to within 1.4 centimeters accuracy for tank and aircraft weapons
- (U) Continued to develop Test Operations Procedures (TOPs) and International TOPs (ITOP) to ensure quality and consistency of test results throughout Army and for international cooperative applications.

(U) FY 1993 Planned Program

- (U) Maintain existing capability by replacement of obsolete equipment/instrumentation at Army major ranges, e.g., upgrade computer software for threat radio frequency simulation, simulation and modeling at EPG.
- (U) Maintain instrumentation and develop methodologies for US Army RDTE meteorological support.
- (U) Expand methodologies and test instrumentation development in support of hypervelocity projectiles from the electric gun; focus on application of simulation to testing such as virtual reality; strengthen linkage to technology base technologies and next generation/future systems; and initiate supporting advance test technologies to include expanded electromagnetic environmental effects, robotics, and directed energy testing methods and capabilities.

Program Element: #0605602A
PE Title: Army Technical Test Instrumentation Budget Activity: #6

- (U) Acquire upgrades for instrumentation/equipment for security, safety, and efficient operation of test ranges and computer enhancements to include data recording and reduction instrumentation at ATTC, computer workstations for chemical data acquisition at DPG, and optical tracking systems for flight time/space/position data acquisition at WSMR.
- (U) Upgrade of existing capability to provide digital signal simulation for communication network evaluation, EPG, AZ; and system level chemical protective clothing testing, e.g., upgrade of robotics manikin, DPG.
- (U) Acquire photo-optics, high speed video camera and portable X-ray which will enhance ballistic testing of munitions.
- (U) Continue to develop TOPs and ITOP to ensure quality and consistency of test results throughout Army and for international cooperative applications.

(U) FY 1994 Planned Program

- (U) Instrumentation sustainment efforts will focus on maintaining minimum testing capability for highest priority missions.
- (U) Maintain existing capability for highest priority missions by replacement of obsolete equipment/instrumentation at Army ranges.
- (U) Upgrade existing data acquisition capability for evaluation and testing of laser counter measure systems and upgrade of instrumentation for combat vehicle vulnerability/survivability.
- (U) Develop new radar signal processing techniques to extract additional data from existing systems to provide flight performance data and miss distance measurements at extremely long ranges.
- (U) Continue to develop Test Operations Procedures (TOPs) and International TOPs (ITOP) to ensure quality and consistency of test results throughout Army and for international cooperative applications.

(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; OdetPrecTime 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. 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; and SRS Technologies, Huntsville, AL. In-house organizations include: 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 TECOM, APG, MD; Missile Command (MICOM), Redstone Arsenal, AL; CSTA,

FY 1994 RDTE DESCRIPTIVE SUMMARY

Program Element: #0605602A
PE Title: **Army Technical Test Instrumentation** Budget Activity: #6

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 and Edwards Air Force Base, CA; RTTC, Huntsville, AL; Project Manager for Instrumentation, Targets and Threat Simulators at Simulation, Training and Instrumentation Command, Orlando, FL..

(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 Investment)
PE #0604759F (Major Test and Evaluation Investment
PE #0604759N (Major Test and Evaluation Investment
PE #0604940D (Central Test and Evaluation Investmen. rrogram)

(U) **Other Appropriation Funds:** Not applicable.

(U) **International Cooperative Agreements:** Not applicable.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605604A
PE Title: Survivability/Lethality Analysis
Budget Activity: #6

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

Project Number / Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
DC10 Aviation System Survivability/Lethality/Vulnerability	14073	5780	4195
D067 Airworthiness Qualification Support	4742	3460	2847
D181 Antiradiation Missile Counter/Countermeasures	0	1420	0
D190 Integrated Analysis	6628	6440	6388
D234 Close Combat/Fire Support Survivability/Lethality	5480	5302	6864
D235 Missile Counter/Countermeasure Technology	974	931	671
D267 Air Defense/Missile Defense Survivability/Lethality	6873	6677	6469
D462 Technical Vulnerability Reduction	2913	2818	0
D626 C4I Survivability	5878	5657	5745
PE TOTAL	47561	38485	33179

B. (U) BRIEF DESCRIPTION OF ELEMENT: The objects 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 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 measurements, sensor/signal processing, and vulnerability/survivability/lethality. 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 US Army systems and thereby enhance Army system/soldier survivability on the battlefield.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project DC10 - Aviation Systems Survivability/Lethality/Vulnerability. Project investigates the survivability, lethality, and vulnerability (SLV) of Army aviation systems to the full spectrum of battlefield threats to include conventional ballistic, electronic warfare, directed energy, and chemical, biological, and nuclear.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605604A
PE Title: **Survivability/Lethality Analysis** Budget Activity: #6

Aircraft SLV deficiencies are identified and hardening fixes identified as appropriate. SLV analysis directly support major decision milestone reviews, acquisition documentation, test and evaluation master plans, and cost/operational effectiveness analysis. Conducts independent assessment of signature, sensors and signal processing related technology issues. Also funds salaries, travel, equipment/facilities, and general management and administrative support.

(U) **FY 1992 Accomplishments:**
- (U) Establish IAT pilot program for AFAS, Comanche, ATCCS, THAAD, and BAT.
- (U) Managed U.S. Army RF threat to fuze program.
- (U) Performed SLV assessments on Unmanned Aerial Vehicle (UAV)-Close, THAAD, GPS, AGS, AFAS, Comanche, ATCCS, BAT, and SCAMP/SMART-T.
- (U) Supported development of/improvement of SLV capabilities in Army Research Laboratory models, simulations and instrumentation.
- (U) Conducted analysis and trade-off study of advanced tracking algorithms for acoustic detection systems.
- (U) Completed an analysis of technical progress on ATR algorithms and signal processor technology.
- (U) Formulated the joint sensor program plan for the joint directors of laboratories.
- (U) Assessed algorithms for correlation of multiple sensor data.

(U) **FY 1993 Planned Program:**
- (U) Continue to support the Army Integrated S/L Analysis Program for the Comanche helicopter.
- (U) Expand the Integrated SLV Analysis Program to address additional Army aviation systems as appropriate.
- (U) Provide ballistic vulnerability analysis support, EWVA support and live fire test planning for the Longbow Apache program.
- (U) Assess signature technology efforts and capability at the Army Research Laboratory (ARL).
- (U) Analyze acoustic sensor data obtained from the Acoustic Detection System experiments.
- (U) Assess the role of ATR technology to solve combat identification problem.

(U) **FY 1994 Planned Program:**
- (U) Continue to support the Army Integrated S/L Analysis Program for the Comanche helicopter modifications.
- (U) Expand the Integrated SLV Analysis Program to address additional Army aviation systems
- (U) Support development and execution of live fire test and evaluation for the Comanche and the Special Operations helicopter modification programs (MH-60k and MH-47E).

(U) **Project D067 - Airworthiness Qualification Support.** 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 and executes the Aeronautical Design Standards (ADS) program and new vendor qualification/testing on fielded aviation systems. ADS is a continuously evolving process incorporating revisions for each change to the standard design of an aircraft system. Manages airworthiness approval of new vendor qualification/testing on fielded aircraft and material changes for all assigned Army aircraft systems. Provides airworthiness engineering support to the Aviation Program Executive Office (PEO) and U.S. Army Aviation and Troop Command Product Manager requirements for major development/modification and any future systems and subsystems.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #060[illegible]4A
PE Title: Survivability/ [illegible]nality Analysis Budget Activity: #6

(U) FY 1992 Accomplishments:
- (U) Managed/executed technical and airworthiness qualification mission for all assigned aircraft.
- (U) Performed safety-of-flight investigations/assessments for all assigned aircraft.
- (U) Developed/managed Army Aeronautical Design Standards Program, including engine component alternate source qualification/testing requirements.
- (U) Qualification of the Longbow Apache prototype aircraft.
- (U) Qualification of Special Operations Command MH-47E/MH-60K

(U) FY 1993 Planned Program:
- (U) Manage/execute technical and airworthiness qualification missions for PEO Aviation force modernization systems.
- (U) Continue to ensure safety-of-flight investigations/assessments for PEO Aviation force modernization aircraft.
- (U) Manage/execute the Army Aeronautical Design Standards Program.
- (U) Provide continuing support for emerging technology upgrades to PEO Aviation force modernization aircraft systems.
- (U) Develop integrated testing concepts for complex integrated software oriented PEO Aviation systems.
- (U) Continue to provide test management capability for PEO Aviation and program/project/product managers.

(U) FY 1994 Planned Program:
- (U) Manage/execute technical and airworthiness qualification missions for PEO Aviation force modernization systems.
- (U) Continue to ensure safety-of-flight investigations/assessments for PEO Aviation force modernization aircraft.
- (U) Manage/execute the Army Aeronautical Design Standards Program.
- (U) Provide continuing support for emerging technology upgrades to PEO Aviation force modernization aircraft systems.
- (U) Develop integrated testing concepts for complex integrated software oriented PEO Aviation systems.
- (U) Continue to provide test management capability for PEO Aviation and program/project/product managers.

(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 wor[illegible] to provide simulation and hardware test tools for both proposed and fielded ARM countermeasures and to provide techniques, technologies and testing which support ARM-CCM.

(U) FY 1992 Accomplishments: Project not funded.

(U) FY 1993 Planned Program:
- (U) Terminate the Advanced Flyable Arm Seeker (AFGAS) program due to funding limitations.
- (U) Transition the ARM-CCM survivability program to the Survivability Lethality Analysis Directorate of Army Research Laboratory (ARL).

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605604A
PE Title: Survivability/Lethality Analysis Budget Activity: #6

(U) FY 1994 Planned Program:
- (U) Program has transitioned to Projects D267 and D626.

(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 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.

(U) FY 1992 Accomplishments:
- (U) Conducted special electromagnetic interference (SEMI) investigation of U.S. Army fuzes and two advanced anti-tank weapon systems.
- (U) Conducted high powered microwave (HPM) investigation of generic missiles.
- (U) Conducted special RF susceptibility investigations of four foreign systems, one U.S. Air Force system and two U.S. Army helicopters.
- (U) Provided laser vulnerability assessments to support EW CCM hardening.
- (U) Performed EW investigations of Combat Identification Technology Program through analyses and field experiments of candidate systems.
- (U) Continued EO, infrared (IR), ultraviolet (UV), and RF signature measurements to support Army weapon system and electronic countermeasures/electro-optics countermeasures (ECM/EOCM) technology development activities and foreign material exploitation.

(U) FY 1993 Planned Program:
- (U) Expand the Survivability/Lethality (S/L) Integrated Analysis Program to additional Army systems.
- (U) Conduct RF susceptibility investigations of Brilliant Anti-Armor Submunition (BAT) and Sense and Destroy Armor (SADARM) and HPM investigations as appropriate.
- (U) Conduct special RF susceptibility investigations of selected systems.
- (U) Provide data and conduct laser CM investigations to support EW CCM laser hardening of land combat systems such as Javelin and Line-of-Sight Anti-Tank (LOSAT).
- (U) Perform survivability analysis of combat identification systems.
- (U) Continue EO, IR, UV, and RF signature measurements to support Army development activities, (i.e., Big Crow) and foreign material exploitation.

(U) FY 1994 Planned Program:
- (U) Expand the S/L Integrated Analysis Program to all required Army systems.
- (U) Conduct RF susceptibility investigations on selected Army systems.
- (U) Provide survivability analysis and live fire test and evaluation support to BAT, Wide Area Mine (WAM), Javelin, etc.
- (U) Continue EO, IR, UV, and RF signature measurements to support Army development activities (i.e., Big Crow) and foreign material exploitation.

Program Element: #0605604A
PE Title: **Survivability/Lethality Analysis** Budget Activity: #6

- (U) Continue analysis of the survivability of selected Army systems to new/advanced threat technology.

(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.

(U) **FY 1992 Accomplishments:**
- (U) Initiated the S/L Integrated Analysis Program for the Advanced Field Artillery System/Future Armored Resupply Vehicle (AFAS\FARV) and BAT programs.
- (U) Conducted susceptibility and/or laboratory/captive-carry EW analysis on BAT, SADARM, Wide Area Mine (WAM), and Multiple Launch Rocket System - Terminally Guided Warhead (MLRS-TGW).
- (U) Continue upgrades on millimeter wave (MMW), acoustic, seismic, EO, and IR capabilities and improved ballistic V/L methodology and data bases.
- (U) Initiated the S/L Integrated Analysis Program for the RAH-66 Comanche helicopter.
- (U) Provided EW technical support for Longbow Apache and combat identification.

(U) **FY 1993 Planned Program:**
- (U) Expand the S/L Integrated Analysis Program to include additional ground combat and fire support systems.
- (U) Conduct acoustic, seismic, IR, EO, SEMI, HPM, etc., susceptibility/vulnerability analysis, as required, for the BAT, WAM, SADARM, Non-Line of Sight (NLOS), Javelin, AFAS/FARV, Smart Target Activated Fire-and-Forget (STAFF), and Line-of-Sight Antitank (LOSAT).
- (U) Provide upgrades of MMW, acoustic, seismic, EO, and IR capabilities and improve ballistic vulnerability/lethality methodologies and data bases.
- (U) Provide vulnerability/vulnerability reduction and lethality/lethality enhancements analyses, as required to support AFAS/FARV, Armored Gun System (AGS), Armored Systems Modernization (ASM), Comanche, BAT, NLOS, WAM, and Combat Identification System.
- (U) Provide live fire test and evaluation support for Paladin, SADARM, BAT, Javelin, Comanche, and TOW IIB.
- (U) Provide guidance/support to development community in the areas of nuclear survivability/hardening and nuclear, biological chemical survivability.

(U) **FY 1994 Planned Program:**
- (U) Expand the S/L Integrated Analysis Program to include all appropriate ground combat and fire support systems.
- (U) Continue upgrades of MMW, acoustic, seismic, EO, and IR capabilities and improve ballistic vulnerability methodologies and data bases.
- (U) Continue to provide survivability analysis and live fire test and evaluation support to AFAS/FARV, M1 Breacher, C2V, and combat identification systems.
- (U) Continue to provide nuclear survivability/hardening and nuclear, biological and chemical survivability support to the development community.
- (U) Provide data and conduct laser CM investigations to support EW CCM laser hardening of land combat systems.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605604A
PE Title: **Survivability/Lethality Analysis** Budget Activity: #6

(U) Project D235 - Missile Counter/Countermeasure Technology. Project supports development of CCM to harden missile systems 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.

(U) FY 1992 Accomplishments:
- (U) Performed Unintentional Radiation Emissions (URE) on domestic and foreign systems.
- (U) Developed NLOS thin film dome coating and initiated development of new hardening technique (surface current dissipation) coating.
- (U) Designed frequency selective/heater filter for Longbow.

(U) FY 1993 Planned Program:
- (U) Continue research on surface current dissipation coatings and evaluation of patterning techniques.
- (U) Assess missile system CM/CCM requirements for current/future system threats and conduct missile performance analysis in CM/CCM environment.
- (U) Continue testing and analysis on missile systems and subcomponents for radar cross section (RCS), URE, environmental, high power microwave and special electromagnetic interference (SEMI).

(U) FY 1994 Planned Program:
- (U) Continue research on surface current dissipation coatings and evaluation of patterning techniques.
- (U) Assess missile system CM/CCM requirements for current/future system threats and conduct missile performance analysis in CM/CCM environment.
- (U) Continue CCM testing and analysis on missile systems and subcomponents for RCS, URE, environmental, high power microwave and SEMI.

(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 the weapon system development efforts and to structure product improvement programs, by the user to develop doctrine and tactics, and by decision makers in formulating program/production decision. Also funds, salaries, travel, equipment/facilities, and management/administrative support.

(U) FY 1992 Accomplishments:
- (U) Initiated the S/L Integrated Analysis Program for Theater High Altitude Area Defense/Ground Based Radar (THAAD/GBR).
- (U) Updated the Radio Electronic Combat (REC) and penetration aid threats for electronic warfare vulnerability assessment (EWVA) investigations of air defense and strategic defense systems.
- (U) Initiated EW vulnerability assessment of Corps Surface-to-Air Missile(SAM) and HAWK Hostile Aircraft Identification Equipment (HAIDE).
- (U) Performed EW susceptibility studies and threat characterization for THAAD and PATRIOT
- (U) Completed EW performance assessment report for Stinger reprogrammable microprocessor (RMP) Mod IV.
- (U) Completed susceptibility study to ARMs for Ground Base Sensor (GBS) and developed EW field experiment plans for Multiple Role Survivable Radar (MRSR).

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605604A
PE Title: Survivability/Lethality Analysis Budget Activity: #6

(U) FY 1993 Planned Program:

- (U) Expand the S/L Integrated Analysis Program to include additional air defense/missile defense systems.
- (U) Provide live fire test and evaluation support as required.
- (U) Provide guidance/support in the areas of nuclear survivability/hardening and nuclear and chemical/biological contamination effects as required.
- (U) Perform theoretical analysis, conduct field experiments and validate missile flight simulation model for Stinger-RMP Block I Mod V IRCCM upgrades.
- (U) Provide EWVA conclusions and recommendations of the Corps SAM design concept to support the MS-I decision.
- (U) Conduct theoretical studies, field experiments, and analyses of PATRIOT PDB-4, multimode seeker, and radar/guidance enhancement improvements.
- (U) Initiate EW susceptibility investigations of THAAD, National Missile Defense systems, GBS and MRSR.

(U) FY 1994 Planned Program:

- (U) Expand the S/L Integrated Analysis Program to include all appropriate air defense/missile defense systems.
- (U) Provide live fire test and evaluation support as required.
- (U) Provide guidance/support in the areas of nuclear survivability/hardening and nuclear and chemical/biological contamination effects as required.
- (U) Validate the missile simulation model using field experiment data and conduct EW performance assessment of Stinger-RMP Block I Mod VI.
- (U) Conduct EW susceptibility investigation and prepare for field experiments of Corps SAM and analyze NATO HAWK missile firing data.
- (U) Produce technical report on the EW aspects of PATRIOT.
- (U) Produce interim EWVA report on THAAD System and Global Protection Against Limited Strikes (GPALS) National Missile Defense.
- (U) Provide EWVA results and ECCM recommendations for Ground Based Sensor MS-IIIA decision and performance reactive threat study for Multiple Role Survivable Radar.

(U) **Project D462 - Technical Vulnerability Reduction.** 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 system operation. The goal is to assist the material developer in achieving balance survivability in the system. 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. 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 to ensure that survivability performance issues are developed for testing.

(U) FY 1992 Accomplishments:

- (U) Managed the Optical Improvement Program (OIP) and Advanced Laser Protection Program (ALPP).
- (U) Conducted Enhanced Position Location and Reporting System (EPLRS) and Mobile Subscriber Equipment (MSE) network survivability analysis in support of the Program Managers.

Program Element: #0605604A
PE Title: **Survivability/Lethality Analysis** Budget Activity: #6

- (U) Developed/updated survivability/CCM annexes for Longbow, Corps SAM and RAH 66 update and Automatic Target Recognition (ATR) CM/CCM.
- (U) Plan for transition of work to Army Research Laboratory, Survivability/Lethality Analysis Directorate or other activities.

(U) FY 1993 Planned Program:
- (U) Compete plan for transition of work to Army Research Laboratory, Survivability/Lethality Analysis Directorate or other activities.
- (U) Terminate or transition all tasks to other projects within this PE.

(U) FY 1994 Planned Program:
- (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. Analyzes vulnerabilities of foreign threat weapons and command, control, communications, computers and intelligence (C4I) systems against blue EW systems. Provides threat weapon electronic design data to countermeasure developers and technical capability information to the intelligence community. Supports Army initiative in vulnerability reduction of C4 systems against the full spectrum of battlefield threats. Also funds salaries, travel, equipment/facilities, and general management/administrative support.

(U) FY 1992 Accomplishments:
- (U) Initiated the Survivability/Lethality (S/L) Integrated Analysis Program for Army Tactical Command and Control System/Maneuver Control System (ATCCS/MCS).
- (U) Completed MSE network deployment optimization analysis for MCS and ATCCS.
- (U) Completed Army Research Laboratory Computer Vulnerability Study team report.
- (U) Provided Joint Surveillance and Target Attack Radar System (JSTARS) vulnerability reports and hardening re. mmendations for EW, Nuclear, Biochemical and vulnerability/validation post-test analysis.
- (U) Provided EW environments for the vulnerability assessments of MSE, Joint Tactical Information Distribution System (JTIDS), Global Positioning System (GPS), JSTARS, AEGIS and Single Channel Ground and Airborne Radio Systems (SINCGARS-V).

(U) FY 1993 Planned Program:
- (U) Continue to support S/L Integrated Analysis Program for ATCCS/MCS.
- (U) Expand the S/L Integrated Analysis Program to include additional C4I systems as appropriate.
- (U) Perform MSE network performance and nuclear effects analysis.

(U) FY 1994 Planned Program:
- (U) Continue to support S/L Integrated Analysis Program for ATCCS and all its functional area systems.
- (U) Continue ATCCS information vulnerability analysis.
- (U) Support validation and verification of EPLRS System Performance Model.
- (U) Perform integrated vulnerability analysis of EPLRS.
- (U) Continue integrated vulnerability analysis of Secure Mobile Anti-Jam Reliable Tactical Terminal (SMART-T).

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0605604A**
PE Title: **Survivability/Lethality . lysis** Budget Activity: **#6**

- (U) Perform integrated su. .vability analysis for Advanced Field Artillery Tactical Data System (AFATDS) and All Source Analysis System (ASAS) to support MS III decision.
- (U) Continue expansion of the S/L Integrated Analysis Program to include all ATCCS functional areas.

(U) **Work Performed By:** In-house work performed by: Army Research Laboratory, U.S. Army Missile Command, Countermeasures/Counter-Countermeasures Center, Huntsville, AL; 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 Planning, El Paso, TX; RTA, Arlington, 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 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 Structures)
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)

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0605604A**
PE Title: **Survivability/Lethality Analysis** Budget Activity: **#6**

PE #0604270A (Electronic Warfare Development)

- (U) Tri-Service Signature Working Group
- (U) Tri-Service ATR Working Group
- (U) EWVA Tri-Service Working Group
- (U) Tri-Service Joint Working Group on Electronic Warfare
- (U) Tri-Service Joint Technical Coordinating Group for Munitions Effectiveness
- (U) NATO Directed Energy Working Group
- (U) Laser Hardened Materials-structures Group (OSD)
- (U) Battlefield Laser Management Panel (JCG-C-E)
- (U) Tri-Service Joint Working Group on Antiradiation Missile Countermeasures

(U) Other Appropriation Funds: Not applicable

(U) International Cooperative Agreements: Not applicable

FY 1994 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 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
DE97 DoD High Energy Laser Systems Test Facility (HELSTF)	27902	26405	4808

B. (U) BRIEF DESCRIPTION OF ELEMENT: HELSTF provides a unique broad-based high energy laser (HEL) RDTE capability at White Sands Missile Range, NM, to support tri-service HEL research and development and damage, vulnerability, and lethality laser testing. As the only megawatt class high energy laser system in the U.S., this facility provides unique DoD capabilities for assessing damage, vulnerability, susceptibility and lethality of various systems and materials to lasers. The site is the only fully integrated laser test facility in the world, combining several lasers with an extensive array of instrumented test sites and the Sea Lite Beam Director (SLBD). This multiple use facility supports testing of laser effects at any power level against any type of target, from scaled laboratory up through full scale flying target tests. Assisted with the command and control link to Army Space Command, any type of engagement scenario concept may be tested including integrated kinetic energy (missile) and directed energy (laser) engagements. Primary emphasis of the facility supports Army tactical damage and vulnerability assessments and Army RDTE of anti-satellite/anti-missile technologies and systems. Funding through FY 1993 provides for facility operations, including optics and diagnostic instrumentation common to all ongoing programs supported by the facility. That funding also supports adaptation of single purpose, user installed equipment to support the broad range of test requirements, ensuring efficient use of DoD investments. Upgrades include activation of the threat surrogate Pulsed Laser Vulnerability Test System (PLVTS), the medium power chemical Laser Development Device (LDD), and improvements to the Effects Test Area. Projected programs support Army damage and vulnerability testing, smoke and obscurant research, and tactical laser weapons research. The Mid-Infrared Advanced Chemical Laser (MIRACL) and the SLBD represent the only integrated high power laser system in the free world. It provides the National Command Authority with a functional anti-satellite contingency capability. However, given our current budget environment, the Army has been forced to re-examine the need for continued operation of all Army test facilities based on utilization and workload forecasts. Even though HELSTF is a unique, one of-a-kind facility, utilization has diminished in recent years and reimbursable income from testing has fallen dramatically. In addition, alternative low-power laser testing capabilities exist within DoD to satisfy most of the known damage and vulnerability assessment testing needs. The forecast of high-power laser test events through FY 1999 do not allow for a rational return on the facility investment, therefore the Army plans to close HELSTF.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project DE97 - DoD High Energy Laser Systems Test Facility.

(U) FY 1992 Accomplishments:

- (U) Continued to operate and maintain HELSTF RDTE capability
- (U) Continued to streamline site operations
- (U) Initiated studies to examine effects of adverse weather on beam propagation
- (U) Successfully supported NASA ASTRO-D X-ray telescope tests

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605605A Budget Activity: #6
PE Title: DoD High Energy Laser Systems Test Facility (HELSTF)

- (U) Successfully supported ASAT Joint Program Office Kinetic Kill Deployment Tests
- (U) Continued damage and vulnerability testing of MI Tank ammunition and optics
- (U) Completed installation and test of the CO2 laser threat surrogate, the Pulsed Laser Vulnerability Test System (PLVTS)
- (U) Continued installation of the Laser Development Device (LDD), a medium power chemical laser
- (U) Initiated installation plans for visible wavelength lasers for damage and vulnerability testing
- (U) Supported Advanced Research Projects Agency (ARPA) deployment tests in a simulated space environment (PEGASUS)
- (U) Supported source selection process for Tank Weapons Gunnery Simulation System (TWGSS) sponsored by the Army PM TRADE
- (U) Initiated installation of an atmospheric compensation system using components obtained from residual SDIO programs

(U) FY 1993 Planned Program:

- (U) Curtail the operation and maintenance of HELSTF RDTE capability
- (U) Begin shutdown procedures for the high energy laser system
- (U) Initiate reduction-in-force for civilian personnel to be effective 1 October 1993
- (U) Continue operation and maintenance of the PLVTS
- (U) Complete installation of Laser Development Device (LDD)
- (U) Complete installation of an atmospheric compensation system
- (U) Continue coordination for SDIO Space Test Facility Development
- (U) Continue test support program:
  - Navy/UK ship point - defense test
  - TWGSS first article tests
  - PERSEUS (DEMON) device tests (explosive laser)
  - Effluent tracking experiments
  - ARPA PEGASUS fairing deployment tests
  - ARPA Taurus fairing deployment tests
  - Tracor Comet payload fairing deployment tests
  - University of Colorado payload tests
  - NASA X-ray mirror tests
  - Continue MI Tank periscope damage and vulnerability tests
  - Continue M1 Tank ammunition damage and vulnerability tests
  - ERINT and Navy LEAP tracking tests
  - Black Brant IR tracking tests
  - Navy Standard Missile tracking tests
  - Storm TMD target tracking tests
  - NASA Space Station Systems Deployment tests
  - NASA Space Power Beaming experiments

(U) FY 1994 Planned Program:

- (U) Finalize closing of the facility

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605605A Budget Activity: #6
PE Title: **DoD High Energy Laser Systems Test Facility (HELSTF)**

(U) **Work Performed By:** In-house work is performed by the U.S. Army Space and Strategic Defense Command at the High Energy Laser Systems Test Facility, White Sands Missile Range (WSMR), NM. Supporting efforts are provided by the U.S. Navy Space and Naval Warfare Systems Command (SPAWAR 232) and the Naval Ordnance Missile Test Station (NOMTS), WSMR, NM. Contractors are: Aerotherm; TRW; Hughes Aircraft Company; United Technologies Optical Sciences; PARAMAX; Science and Technology Corp; and Massachusetts Institute of Technology/Lincoln Laboratory.

(U) **Related Activities:** A Memorandum of Agreement between the Army Vulnerability Assessment Laboratory and HELSTF defines the supporting roles for vulnerability testing and assessment regarding high energy lasers. An informal agreement exists between the Office of the Test Director (OTD), for OSD and the Director HELSTF on high energy laser testing roles, reducing any possible duplication between these agencies. The AF Phillips Laboratory operates two laboratories that test materials against laser effects. Current laser devices in operation do not duplicate HELSTF capabilities. 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 1994 RDTE 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 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D127 Meteorological Support to LABCOM Activities	9940	9557	9576
D128 Meteorological Support to TECOM Activities	10431	8442	8394
PE TOTAL	20371	17999	17970

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 atmospheric measurements and analyses critical to the testing of high priority Army weapon systems and materiel. Provides assessment of system design performance parameters operating in realistic environments. Provides highly specialized instrumentation required for characterizing the natural atmosphere and battlefield smokes/obscurants to support test and evaluation of Army smart munitions. Provides funds to conduct measurements, maintain databases, and provide computational capabilities necessary for: system designers and testers; simulation models; and electro-optical propagation codes. Supports live fire tests of Army systems in real-world environments.

(U) **FY 1992 Accomplishments:**
- (U) Developed millimeter transmission and imaging capability
- (U) Provided smoke dynamics, transmittance and meteorological measurements to U.S. Army Chemical Biological Defense Agency, Smoke Week XIV, and other tests
- (U) Integrated profiler measurement capabilities and developed a continuous, surface to 20-Km, wind and optical turbulence profile updated every three to six minutes
- (U) Supported Directed Energy Weapon (DEW) programs with propagation code predictions, site characterization data analysis and consultation on met effects on DE systems

(U) **FY 1993 Planned Program:**
- (U) Provide field characterization during acoustic experiments and system tests
- (U) Develop millimeter wave (MMW) transmissometer capability
- (U) Add capability for ground-based slant path characterization of smoke/obscurants for RDT&E and electro-optics (EO) propagation model validation
- (U) Provide support to Technology Exploitation Weather Testbed demonstration/evaluation and laboratory experiments

Program Element: #0605702A
PE Title: **Meteorological Support to RDT&E Activities** Budget Activity: #6

- (U) Initiate development of program to provide atmospheric slant path transmission measurements from airborne platforms
- (U) Extend capacity to measure transmission through obscured atmospheres using imaging techniques
- (U) Develop horizontal path integrated turbulence measurement capacity
- (U) Provide assessment and analysis support to selected Army Project Managers (PMs), to include PM Brilliant Anti-Armor Projectile (BAT), PM PATRIOT and PM CHEM DEMIL

(U) **FY 1994 Planned Program:**
- (U) Incorporate real-time data reduction capabilities into the Research Visible/Infrared Transmissometer (REVIRT) system
- (U) Assess atmospheric turbulence and wind degradation effects on BAT smart sensors
- (U) Assess the susceptibility of MMW sensors to atmospheric obscurants
- (U) Provide smoke dynamics, transmittance and meteorological measurements to Smoke Week and other tests as required
- (U) Provide assessment and analysis support to selected Army PMs

(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), PMs and the Army test ranges. Develop methodologies and acquire instrumentation/systems that allow meteorological teams to support Army/DoD RDTE requirements.

(U) **FY 1992 Accomplishments:**
- (U) Integrated Army Research Laboratory profiler measurement capabilities for operational application by White Sands Missile Range meteorological team.
- (U) Provided weather forecasts, severe weather advisories/warnings, staff meteorological services, and atmospheric measurements in support of Army/DoD tests and projects at 14 Army test sites/ranges.
- (U) Modernized operational support equipment for meteorological teams to meet customer requirements:
  - Evaluated the Small Portable Transmissometers for application at Ft. Belvoir.
  - Upgraded Vaisala upper air systems with LORAN-C, potential to increase spatial resolution.
  - Installed Vaisala MARWIN-12s' for selected meteorological teams (up to five).
  - Upgraded radio theodolites to employ digital sondes
  - Installed field mills for lightning detection
- (U) Provided program management for meteorological support to RDTE and technical review/assistance to ranges and meteorological teams:
  - Evaluated GPS upper air measurement capability for potential spatial/temporal resolution improvements.
  - Evaluated follow-on data management systems for analysis and forecast/warning support to test sites and ranges.

(U) **FY 1993 Planned Program:**
- (U) Provide weather forecasts, severe weather advisories, staff meteorological services, and atmospheric measurements in support of Army/DoD tests and projects at 14 Army test sites/ranges.
- (U) Modernize operational support equipment at the meteorological teams to meet customer requirements:

Program Element: #0605702A
PE Title: **Meteorological Support to RDT&E Activities** Budget Activity: #6

- Replace/upgrade meteorological teams Surface Atmospheric Meteorological Systems to provide increased sampling rate to satisfy evolving test Army/DoD requirements
- Evaluate the suitability of expanding the U.S. Department of Commerce National Weather Service, Automated Weather Information Processing System to meet range forecast support requirements

- (U) Provide program management for meteorological support to RDTE and technical review/assistance to ranges and meteorological teams:
  - Evaluate GPS upper air measurement capability for potential spatial/temporal resolution improvements.
  - Evaluate follow-on data management systems for analysis and forecast/warning support to test sites and ranges.

(U) **FY 1994 Planned Program:**

- (U) Provide weather forecasts, severe weather/advisories, staff meteorological services, and atmospheric measurements in support of Army/DoD tests and projects at 14 Army test sites/ranges.
- (U) Modernize operational support equipment at the meteorological teams to meet customer requirements:
  - Upgrade selected upper air systems with LORAN-C, which will increase resolution.
  - Upgrade Surface Automated Meteorological System (SAMS).
  - Evaluate Mobile Operational Meteorological Support System (MOMSS).
- (U) Provide program management for meteorological support to RDTE and technical review/assistance to ranges and meteorological teams:
  - Evaluate GPS upper air measurement capability for potential spatial/temporal resolution improvements.
  - Evaluate follow-on data management systems for analysis and forecast/warning support to test sites and ranges.

(U) **Work Performed By:** Approximately 95% is performed in-house. In-house organizations are located at Army Test and Evaluation Command, 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.

(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 1994 RDTE DESCRIPTIVE SUMMARY

Program Element: #0605706A
PE Title: **Materiel Systems Analysis** Budget Activity: #6

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
D026 Test Design and Evaluation	7212	6651	6420
M541 Materiel Systems Analysis	16660	15350	13080
PE TOTAL	23872	22001	19500

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 independent technical capability for the conduct of materiel systems analysis. AMSAA evaluates the performance effectiveness and survivability 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 (for testing and training range facilities such as Test and Evaluation Command, National Training Center, etc.) AMSAA supports the Army Model Improvement Program 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 testing 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 include all factors pertinent to the decision process such as: technical risks, trade-off analyses, development and operational test results, producibility, and logistics factors. 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. Such 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 Army Acquisition Executive between major milestones to highlight emerging issues which can be resolved to minimize program impacts at milestone reviews. Funds the salaries of civilian employees assigned to the test design and evaluation mission.

(U) **FY 1992 Accomplishments:**

- (U) Evaluation reports in support of AAE decisions for: M1A2 Abrams, Light Firefinder, Forward Area Air Defense System - Ground Based Sensor, Intermediate Forward Test Equipment, Improved Remote Battlefield Sensor System, and MK19 MOD 3 Grenade. Continuous evaluation support for 60

Acquisition Category I & II systems including PATRIOT Advanced Capability, Joint Unmanned Aerial Vehicle-Short Range, Special Operations Aircraft, and Light TACFIRE.

- (U) Developed test design and evaluation plans for technical tests to be evaluated in FY 1993 through FY 1997 including the All Source Analysis System, Laser Countermeasure System, Tactical Unmanned Ground Vehicle, Combat Supply Support System, and Global Positioning System.
- (U) Developed live fire test design and evaluation plans; and evaluated live fire test results to determine wartime performance and survivability of Army materiel.

(U) **FY 1993 Planned Program:**

- (U) Evaluation in support of AAE decisions for: All Source Analysis System, Joint Surveillance and Target Acquisition System - Block I and Improved Ground Station Module, Special Operations Aircraft, Improved Remote Battlefield Sensor System, Guardrail Common Sensor, Howitzer Improvement Program, Bradley Fighting Vehicle System High Survivability Improvements, 155mm Sense and Destroy Armor, Palletized Loading System and Joint Tactical Information Distribution System.
- (U) Develop test design and evaluation plans for technical tests to be evaluated in FY 1994 through FY 1998
- (U) Develop live fire test design plans; and evaluate live fire test results to determine wartime performance and survivability of Army materiel systems

(U) **FY 1994 Planned Program:**

- (U) Evaluation in support of AAE decisions for: Advanced Field Artillery System, Armored Gun System, Brilliant Armor-Tank Sub-Munition, Combat Service Support Control System, Future Armored Resupply Vehicle, Enhanced Position Location and Reporting System and Family of Medium Tactical Vehicles.
- (U) Develop test design and evaluation plans for technical tests to be evaluated in FY95 through FY 1999.
- (U) Develop live fire test design and evaluation plans; and evaluate live fire test results to determine wartime performance and survivability of Army materiel.

(U) **Project M541 - Materiel Systems Analysis.** This project funds Army Materiel Systems Analysis Activity (AMSAA) primary mission of independent systems analysis and effectiveness evaluations for major materiel systems. AMSAA evaluates the performance and survivability of existing, developmental and conceptual systems to support HQDA, Army Materiel Command (AMC), and other major Army commands in the conduct of Cost and Operational Effectiveness Analyses (COEAs), Force Structure Studies, Trade-Off Analyses, and Casualty Assessment Criteria for testing and training range facilities (Test and Evaluation Command, National Training Center, etc.). AMSAA conducts materiel systems analyses in support of HQDA, AMC, PEOs, PMs, and 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 results and assure a sound basis for acquisition decisions.

FY 1994 RDTE DESCRIPTIVE SUMMARY

Program Element: #0605706A
PE Title: **Materiel Systems Analysis** Budget Activity: #6

(U) **FY 1992 Accomplishments:**

- (U) Supported Army COEAs, Force Structure Studies and Theater Level Studies with U.S. and foreign system performance data to include: Theater High Altitude Air Defense, PATRIOT PAC3, Line-of-Sight Anti-Tank (LOSAT), and Non-Line-of-Sight (NLOS) Anti-Tank
- (U) Provided materiel systems analyses of performance effectiveness and survivability in support of HQDA, AMC and PEOs/PMs/R&D Centers including campaign analyses, trade-off analyses and risk analyses (technical risk assessments performed for HQDA on the Advanced Field Artillery System, Wide Area Mine System and Armored Gun System). Developed methodologies to characterize the performance and survivability of conceptual, developmental, and fielded systems in a variety of scenarios and conditions for support of force-on-force analyses and war games (including new methodologies for Crew Casualty Assessment and Combat Identification using lessons learned from Operation Desert Storm).
- (U) Supported shifting emphasis to light forces/low intensity, from procurement oriented programs to research and development oriented programs, and from the focus on a single, Soviet-block threat to a broad, world-wide set of scenarios and types of threat (and equipment).

(U) **FY 1993 Planned Program:**

- (U) Support Army COEAs, Force Structure Studies and Theater Level Studies with U.S. and foreign system performance data including kinetic energy anti-satellite, Corps Surface-to-Air Missile System COMANCHE update, Multiple Launch Rocket System - Terminally Guided Warhead update, and the tactical Unmanned Ground Vehicle. Develop performance data in support of distributed interactive simulators to assure appropriate fidelity for operational planning, training, and research programs.
- (U) Provide materiel systems and analyses of performance, effectiveness and survivability in support of HQDA, AMC and PEOs/PMs/R&D Centers
- (U) Develop methodologies to characterize the performance and survivability of conceptual, developmental, and fielded systems in a variety of scenarios and conditions for support of force-on-force analyses and war games
- (U) Support shifting emphasis to light forces/low intensity, from procurement oriented programs to research and development oriented programs, and from the focus on a single, Soviet-block threat to a broad, world-wide scoped set of scenarios and types of threat (and equipment).

(U) **FY 1994 Planned Program:**

- (U) Support Army COEAs, Force Structure Studies and Theater Level Studies with U.S. and foreign system performance data. Provide materiel systems analysis of performance, effectiveness and survivability in support of HQDA, AMC, PEOs/PMs/R&D Centers. Develop performance data in support of distributed interactive simulators to assure appropriate fidelity for operational planning, training, and research programs.
- (U) Develop methodologies to characterize the performance and survivability of conceptual, developmental, and fielded systems in a variety of scenarios and conditions for support of force-on-force analyses and war games.
- (U) Support shifting emphasis to light forces/low intensity, from procurement oriented programs to research and development oriented programs, and from the focus on a single, Soviet-block threat to a broad, world-wide scoped set of scenarios and types of threat (and equipment).

FY 1994 RDTE DESCRIPTIVE SUMMARY

Program Element: #0605706A
PE Title: Materiel Systems Analysis Budget Activity: #6

(U) **Work Performed By:** In-house work is performed by AMSAA, Aberdeen Proving Ground, MD. Contractors include Armament Systems International, Orange, CA; KETRON Inc., Malvern, PA; and SURVICE Engineering, Aberdeen, 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 1994 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 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
DC28 Acquisition/Exploitation of Threat Items	25901	15161	14722
D650 Exploitation of Foreign Items	4254	3420	4057
PE TOTAL	30155	18581	18779

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 and manhours, enhance and 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 1992 Accomplishments:

- (U) Acquired threat foreign materiel in excess of $15 million and initiated exploitation of threat systems identified and prioritized in the Army Foreign Materiel Program FY 1992 Five Year Plan update.
- (U) Supported developmental testing, operational testing, and other Army and DoD requirements for threat systems on hand.
-
- (U) Acquired and exploited rest of world (non-Soviet) threat equipment to prevent technological surprise.
- (U) Exploited over 87 items of equipment and published in excess of 161 exploitation reports.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605709A (TIARA)
PE Title: **Exploitation of Foreign Items** Budget Activity: #6

(U) FY 1993 Planned Program:
- (U) Acquire and initiate exploitation of threat systems identified and prioritized in the Army Foreign Materiel Program FY 1993 Five Year Plan update at the reduced funding level.
- (U) Continue or complete exploitations of systems acquired in FY 1992 and prior.
- (U) Support developmental testing, operational testing, and other Army and DoD requirements for threat systems on hand.

(U) FY 1994 Planned Program:
- (U) Acquire and initiate exploitation of threat systems identified and prioritized in the Army Foreign Materiel Program FY 1994 Five Year Plan update.
- (U) Continue or complete exploitations of systems acquired in FY 1993 and prior.
- (U) Support developmental testing, operational testing, and other Army and DoD requirements for threat systems on hand.

(U) Project D650 - Exploitation of Foreign Items. Acquisition and exploitation of leading edge technology, worldwide, on a sole source basis, in order to prevent technological surprise and shorten the research and development cycle, thereby saving time and funds.

(U) FY 1992 Accomplishments:
- (U) Continued/completed work on 29 exploitation projects started in FY 1992, and 32 projects from FY 1991.
- (U) Acquired over 29 new items of equipment.
- (U) Completed and published over 28 exploitation reports.
- (U) Continued support of research and development and intelligence communities by providing results of technology gains to materiel developers.

(U) FY 1993 Planned Program:
- (U) Continue/complete exploitation of over 62 exploitation projects.
- (U) Prioritize and initiate actions to acquire 28 items of equipment (new starts) for FY 1993.
- (U) Publish reports on completed exploitations.

(U) FY 1994 Planned Program:
- (U) Continue/complete exploitation of items already acquired.
- (U) Prioritize and initiate acquisition of new items.
- (U) Publish reports on completed exploitations.

(U) Work Performed By: The Army Deputy Chief of Staff for Intelligence, with the advice of the Army Foreign Materiel Review Board (AFMRB), provides Army Staff management of the Army's Foreign Materiel Program (FMP). In addition, the Deputy Chief of Staff for Intelligence 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). The Commander, Foreign Science and Technology Center is responsible for executing the exploitation program with 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.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0605709A (TIARA)**
PE Title: **Exploitation of Foreign Items**

Budget Activity: **#6**

(U) Related Activities:

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable.

FY 1994 RDTE 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 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
DJ30 NBC Survivability	5012	4690	3037
D049 Joint Chemical/Biological Contact Point and Test	2297	2162	1804
D204 Field Smoke Assessment	3456	3230	2563
PE TOTAL	10765	10082	7404

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 design and analysis support to numerous weapons systems to insure that NBC survivability concepts are adequately addressed during the acquisition cycle.

(U) **FY 1992 Accomplishments:**
- (U) Initiated NBC survivability assessment of the M109A2/A3 Howitzer Battalion.
- (U) Established industry/DoD forum to standardize NBC survivability testing methods.
- (U) Provided NBC survivability support to 25 developing systems.
- (U) Sponsored second NBC contamination survivability symposium.

(U) **FY 1993 Planned Program:**
- (U) Initiate development of predictive techniques of the effects of agents and decontaminants against materials.
- (U) Insure that survivability requirements are valid and that U.S. Army Nuclear Chemical Agency (USANCA) criteria are effectively met by system developers.

FY 1994 RDTE 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) Assist Program Executive Officers, Project Managers, and Research, Development and Engineering Centers (PEOs/PMs/RDECs) in meeting their NBC survivability requirements and in fielding mission sustainable equipment.
- (U) Provide NBC survivability support to over 25 separate development programs.
- (U) Continue update of American Society for Testing and Materials (ASTM) test standards for chemical agents against materials.
- (U) Complete M109A2/A3 Howitzer Battalion fielded system assessment.
- (U) Continue generation of chemical resistant test data for inclusion into Chemical Defense Materials Database.

(U) **FY 1994 Planned Program:**
- (U) Continue development of predictive techniques of the effects of agents and decontaminants against materials.
- (U) Continue to insure that survivability requirements are valid and that USANCA criteria are effectively met by system developers.
- (U) Continue to assist PEOs/PMs/RDECs in meeting their NBC survivability requirements and in fielding mission sustainable equipment.
- (U) Continue to provide NBC survivability support to over 25 separate development programs.
- (U) Continue update of ASTM test standards for chemical agents against materials.
- (U) Initiate NBC fielded system assessment of Combat Aviation Battalion.
- (U) Continue generation of chemical resistant test data for inclusion into Chemical Defense Materials Database.

(U) **Project D049 - Joint Chemical/Biological Contact Point and Test.** Conducts CB tests and maintains repository of CB information for multiple users.

(U) **FY 1992 Accomplishments:**
- (U) Completed three field trials, seven laboratory tests and ten assessments.
- (U) Updated CB source book: Mustard (generic); Coxella Brunetti (LM); canopy penetration.
- (U) Continued automation of Joint Technical Information Center.

(U) **FY 1993 Planned Program:**
- (U) Continue to update CB source book: general models; LM and Lewisite (L); change to Mustard (generic) (HL/HN).
- (U) Execute four field trials, fourteen laboratory tests and eleven assessments.
- (U) Continue automation of Joint Technical Information Center.

(U) **FY 1994 Planned Program:**
- (U) Initiate five studies, two field trials and four laboratory tests evaluating performance and procedure in a chemical environment.
- (U) Update CB Source Book for Nitrogen Mustard 1,2,3(HNX), Oxygen Mustard (O), Sesqui-mustard (T) and decontamination.
- (U) Continue automation of Joint Technical Information Center.

FY 1994 RDTE 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) **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 1992 Accomplishments:**
- (U) Provided field test support for Hellfire Optimize Missile System (HOMS) and continued evaluation of Javelin and Line-of-Sight Anti-Tank (LOSAT).
- (U) Conducted Smoke Week 14 at Eglin AFB, FL.
- (U) Conducted Smoke Symposium 16 at Laurel, MD.
- (U) Field tested a third generation obscuration-producing capability.

(U) **FY 1993 Planned Program:**
- (U) Provide field test support and evaluations for HOMS, Javelin and other major weapons systems.
- (U) Conduct Smoke Week 15 at Eglin AFB, FL.

(U) **FY 1994 Planned Program:**
- (U) Provide field test support and evaluations for LOSAT and other major weapons systems.
- (U) Support integrated survivability/lethality assessments of major weapons systems.

(U) **Work Performed By:** In-house efforts accomplished by U.S. Army Research Laboratory, Aberdeen Proving Ground, MD; U.S. Army Research Laboratory, White Sands Missile Range, NM; U.S. Army Dugway Proving Ground, UT; and Naval Weapon 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 1994 RDTE DESCRIPTIVE SUMMARY

Program Element: #0605712A
PE Title: Support of Operational Testing — Budget Activity: #6

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

Project Number / Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
DV02 Test Directorates	21975	19885	17060
DV03 TRADOC P2NBC2	2155	1738	1440
D001 OPTEC IOTE	38135	34478	36701
D985 Concepts Evaluation of Materiel	2547	1434	2221
D987 OPTEC Instrumentation Sustainment & Development	0	0	1011
PE TOTAL	64812	57535	58433

B. (U) BRIEF DESCRIPTION OF ELEMENT: 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. Project D985 enables US Army Training and Doctrine Command (TRADOC) battle labs and schools to evaluate emerging technologies and readily available equipment to define Army mission needs and operational requirements. 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 provides for replacement and improvements of existing inventory and for the development of new technologies to keep abreast of new weapon advancements. Project D987 is realigned to this program element as part of the Office of the Secretary of Defense (OSD) restructure of all Army test and evaluation instrumentation programs. It is not a new start.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project DV02 - Test Directorates: This project finances the recurring costs (salaries, supplies, etc.) 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; Intelligence and Electronic Warfare Test Directorate, Fort Huachuca, AZ. The following test directorates are located at Fort Hood, TX: Aviation; Armor; Infantry; Engineer/Combat Support; and Command, Control, and Communications. The primary mission of these test directorates is to conduct operational testing of developmental materiel, joint testing, and force development test and experimentation (FDTE).

FY 1994 RDTE DESCRIPTIVE SUMMARY

Program Element: #0605712A
PE Title: **Support of Operational Testing** Budget Activity: #6

(U) FY 1992 Accomplishments:

- (U) Program financed the operational costs for test directorates, including civilian pay, support contracts, temporary duty, supplies, and equipment. Systems tested listed under Project D001.

(U) FY 1993 Planned Program:

- (U) Program finances the operational costs for test directorates, including civilian pay, support contracts, temporary duty, supplies, and equipment. Systems tested listed under Project D001.

(U) FY 1994 Planned Program:

- (U) Program finances the operational costs for test directorates, including civilian pay, support contracts, temporary duty, supplies, and equipment. Systems to be tested listed under Project D001.

(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 1992 Accomplishments:

- (U) Tests conducted for the following systems:
  - Forward Area Air Defense (FAAD) team test
  - Light Division Decon Operations - night test
  - Heat tolerance prediction in Mission Oriented Protective Posture (MOPP) 4
  - Female soldier performance in MOPP 4
  - Towed artillery test
  - Nuclear Biological Chemical (NBC) environment on tank and infantry maintenance support team
  - Metabolic taxonomy of military activities in MOPP 4
  - Heat strain model
  - Mechanical smoke generator test

(U) FY 1993 Planned Program:

- (U) Tests planned:
  - Female soldier performance in MOPP 4 (continued)
  - Metabolic taxonomy of military activities in MOPP 4 (continued)
  - Effects of microclimate conditioning on tactical performance
  - Dual purpose chemical company operations test
  - Modeling of soldier performance in NBC operations
  - Impact of MOPP on respiratory function and capacities during work
  - Development of a noninvasive measure of physiological and psychological stress
  - Cardiovascular hemodynamics and state of hydration during aircrew, uniform, integrated battlefield wear

FY 1994 RDTE DESCRIPTIVE SUMMARY

Program Element: #0605712A
PE Title: **Support of Operational Testing** Budget Activity: **#6**

(U) FY 1994 Planned Program:

- (U) FY 1994 P2NBC2 program to be developed July 1993.

(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, limited user or an IOTE on major and nonmajor materiel systems. 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 1992 Accomplishments:

- (U) Tests conducted for the following systems:
  - C17 Aircraft Multi-Service Initial Operational Test and Evaluation (MIOTE)
  - M1 Block II Abrams Tank System (M1 Block II) Early User Test and Evaluation (EUTE)
  - Heavy Equipment Transporter System (HETS XM) IOTE
  - All Source Analysis System (ASAS) IOTE
  - Army Tactical Command & Control System (ATCCS) EUTE I
  - Unmanned Aerial Vehicle-Short Range (UAV-SR) Limited User Test (LUT)
  - Resuscitation Fluids Production and Reconstitution System (REFLUPS) IOTE
  - Palletized Loading System (PLS) IOTE
  - Multiple Launch Rocket System Fire Direction System (MLRS FDS) IOTE
  - Forward Entry Device-Forward Observer Command & Control (FED-FOCC) IOTE
  - M40 Series CB Protective Mask Preplanned Product Improvement (M40 P3I) IOTE
  - Family of Electronic Deception Devices - Communication Deception System (FEDD-CDS) IOTE
  - Improved Ribbon Bridge/Folding Float Bridge 2000 (IRB/FFB) IOTE
  - Aerosol Generator Ultra Low Volume, Electric (AGULVE) IOTE
  - Parachutist's Individual Equipment Rapid Release (PIE/R2) IOTE
  - All-Purpose Weapons and Equipment Container System (AIRPAC) IOTE
  - Light and Special Division Interim Sensor (LSDIS) IOTE
- (U) Test preparation conducted for the following systems:
  - Single Channel Ground and Airborne Radio System Integrated COMSEC (SINCGARS ICOM) IOTE
  - Line-of-Sight Forward Heavy (LOS-F-H) LUTE
  - Ground Station Module Block I (GSM BLK I) LUTE
  - Family of Medium Tactical Vehicles-Phase A (FMTV-A) IOTE
  - Joint Tactical Information Distribution System (JTIDS) IOTE
  - Army Field Artillery Tactical Data System (AFATDS) IOTE
  - High Frequency Intercept and Direction-Finding System, AN/TSQ-152 (TRACKWOLF) IOTE
  - 155mm Sense and Destroy Armor (155mm SADARM) IOTE
  - Single Channel Objective Tactical Terminal, AN/TCS-124 (SCOTT) IOTE
  - Multiple Launch Rocket System SADARM (MLRS SADARM) IOTE
  - Armored Gun System (AGS) EUTE
  - Field Artillery Tactical Data System Tapes, Version 10 (FATDS TAPE PKG 10) IOTE
  - Commanders Tactical Terminal (CTT) LUT

- Radio Receiving Set, AN/TRQ-32(V)2 Materiel Change (TEAMMATE MC) IOTE
- Tactical Unmanned Ground Vehicle (TUGV) EUTE

(U) **FY 1993 Planned Program:**

- (U) Tests planned:
  - Ground Station Module Block I (GSM BLK I) LUT
  - C-17 Aircraft MIOTE
  - Army Tactical Command & Control System (ATCCS) EUTE I (continued)
  - Army Tactical Command & Control System (ATCCS) EUTE II
  - All Source Analysis System (ASAS) IOTE (continued)
  - M1 BLOCK II IOTE
  - Family of Medium Tactical Vehicles-Phase A (FMTV-A) IOTE
  - Advanced Anti-Armor Weapons System-Medium (JAVELIN) IOTE
  - Commanders Tactical Terminal (CTT) LUT
  - Improved Recovery Vehicle (IRV) IOTE
  - Multispectral Close Combat Decoy (MCCD) IOTE
  - Single Channel Ground and Airborne Radio System Integrated COMSEC (SINCGARS ICOM) IOTE
  - Parachutist's Individual Equipment Rapid Release (PIE/R2 IOTE) (continued)
  - All Purpose Weapon and Equipment Container System (AIRPAC) IOTE (continued)
  - Field Artillery Tactical Data System Tapes, Version 10 (FATDS TAPE PKG 10) IOTE
  - Radio Receiving Set , AN/TRQ-32(V)2 Materiel Change (TEAMMATE MC) IOTE
  - Forward Entry Device-Meteorological, Survey and Radar (FED MSR) IOTE
  - 60,000 lb Capacity Low Velocity Airdrop System (60K LVADS) IOTE
  - Avenger Electronic Support Measures, Non-Cooperative Target Recognition (ESM NCTR-1) IOTE
  - Aircrew Integrated Helmet System (AIHS) IOTE
  - Inflatable Body and Head Restraint System (IBAHRS) IOTE
  - Integrated Meteorological System (IMETS) IOTE
  - Ranger Anti-Armor/Anti-Personnel Weapon System High Explosive Dual Purpose Round (RAAWS HEDP) LUT
  - Small Arms Soldier Enhancement Program (SASEP) IOTE
  - Mobile Microwave Landing System (MMLS) IOTE
- (U) Test preparation planned:
  - Army Field Artillery Tactical Data System (AFATDS) IOTE
  - Armored Gun System (AGS) EUTE
  - Resuscitation Fluids Production and Reconstitution System (REFLUPS) IOTE
  - Joint Surveillance and Target Attack Radar System (JSTARS) MIOTE
  - NAVSTAR Global Positioning System Precision Receiver (PLGR) IOTE
  - 155mm Sense and Destroy Armor (155mm SADARM) IOTE
  - Joint Tactical Information Distribution System (JTIDS) IOTE
  - Guardrail Common Sensor System I (GR/CS (SYS I)) IOTE
  - XM56 Motorized Smoke System (XM56 MSS) IOTE
  - Guard Unit Armory Device Full-Crew Integrated Simu .on Trainer for Armor (GUARDFIST I) IOTE
  - Forward Area Air Defense Ground Based Sensor (FAAD GBS) IOTE
  - Chemically and Biologically Protected Shelter (CBPS) IOTE
  - Nuclear, Biological and Chemical Reconnaissance System (NBCRS) IOTE

- Unit Maintenance Aerial Recovery Kit (UMARK) IOTE
- MLRS Sense and Destroy Armor (MLRS SADARM) IOTE
- Laser Countermeasure System (LCMS) IOTE
- Lightweight Forward Area Refueling Equipment (LAFARE) IOTE
- MLRS Improved Fire Control System (MLRS-IFCS) IOTE
- Field Medical Oxygen Generating and Disbursement System (FMOGDS) IOTE
- Miniature Multiband Beacon (MMB) IOTE
- Intelligence and Electronic Warfare Common Sensor (IEWCS) IOTE
- Force Provider (FP) IOTE
- Thermal Weapon Sight (AN/PAS-13) (TWS) IOTE
- Firefinder AN/TPQ-36(V)8 Electronics Upgrade (FF(V)8) IOTE
- Bunker Defeat Munition (BDM) IOTE
- LONGBOW APACHE (LBA) IOTE

(U) **FY 1994 Planned Program:**

- (U) Tests planned:
  - Advanced Field Artillery Tactical Data System (AFATDS) IOTE
  - Enhanced Position Location Reporting System (EPLRS) IOTE
  - Armored Gun System (AGS) EUTE
  - 155mm Sense and Destroy Armor (155MM SADARM) IOTE
  - Nuclear, Biological, and Chemical Reconnaissance System (NBCRS) IOTE
  - Integrated Meteorological System (IMETS) IOTE
  - XM56 Motorized Smoke System (XM56 MSS) IOTE
  - Guard Unit Armory Device Full-Crew Integrated Simulation Trainer for Armor (GUARDFIST I) IOTE
  - Miniature Multiband Beacon (MMB) IOTE
  - Chemically and Biologically Protected Shelter (CBPS) IOTE
  - Integrated Commercial Intrusion Detection System (ICIDS) IOTE
  - Aircrew Microclimate Conditioning System (AMCS) IOTE
  - Laser Countermeasure System (LCMS) IOTE
  - Intelligence Electronic Warfare Common Sensor (IEWCS) IOTE
  - Field Medical Oxygen Generating and Disbursement System (FMOGDS) IOTE
  - Advanced Anti-Armor Weapons System-Medium (JAVELIN) IOTE (continued)
  - NAVSTAR Global Positioning System Precision Receiver (PLGR) IOTE
  - C17 MIOTE (continued)
  - Army Tactical Command & Control System (ATCCS) EUTE II (continued)
  - Joint Tactical Information Distribution System (JTIDS) IOTE
  - 60,000 lb Capacity Low Velocity Airdrop System (60K LVADS) IOTE (continued)
  - Avenger Electronic Support Measures, Non-Cooperative Target Recognition IOTE (continued)
  - Family of Medium Tactical Vehicles-Phase A (FMTV-A) IOTE (continued)
  - M1 BLOCK II IOTE (continued)
  - Force Provider (FP) IOTE
  - Thermal Weapon Sight (AN/PAS-13) (TWS) IOTE
  - Containerized Kitchen (CK) IOTE
  - Bunker Defeat Munition (BDM) IOTE
  - Guardrail Common Sensor System I (GR/CS(SYS I)) IOTE

- Resuscitation Fluids Production and Reconstitution System (REFLUPS) IOTE
- Ranger Anti-Armor/Anti-Personnel Weapon System High Explosive Dual Purpose Round (RAAWS HEDP) LUT

- (U) Test Preparation Planned:
  - MLRS Sense and Destroy Armor (MLRS SADARM) IOTE
  - Lightweight Arctic Forward Area Refueling Equipment (LAFARE) IOTE
  - Brilliant Anti-Armor (BAT) Submunitions IOTE
  - Advanced Boresight Equipment (ABE) EUTE
  - Low Altitude Retro-Rocket System, 20,000 lb Capacity (20K LARRS) IOTE
  - Joint Surveillance and Target Attack Radar System (JSTARS) MIOTE
  - Tactical Unmanned Ground Vehicle (TUGV) EUTE
  - LONGBOW APACHE (LBA) IOTE
  - Firefinder AN/TPQ-36(v)8 (FF(V) 8) IOTE
  - Combat Protection System (STINGRAY) EUTE
  - Forward Area Air Defense Command, Control and Intelligence (Heavy) (FAAD C2I (H)) IOTE
  - MLRS Improved Fire Control System (MLRS - IFCS) IOTE
  - Unit Maintenance Aerial Recovery Kit (UMARK) IOTE
  - Commanders Tactical Terminal 3- Channel (CTT 3-Channel) IOTE
  - Forward Area Air Defense Ground Based Sensor (FAAD GBS) IOTE
  - Unmanned Aerial Vehicle-Short Range (UAV-SR) IOTE
  - Intelligence and Electronic Warfare Common Sensor (IEWCS) IOTE
  - Advanced Airborne Radiac System (AARS) IOTE
  - All Source Analysis System (ASAS) LUT
  - Avenger Electronic Support Measures, Non-Cooperative Target Recognition (B) IOTE
  - Army Field Artillery Tactical Data System Version 2 (AFATDS VERS 2) IOTE

(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 limited duration tests to determine military utility or potential to satisfy Army materiel 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. These quick reaction tests and analyses provide up-front early validation of system utility for military use or, more importantly, lack of military utility - thus saving time and money later.

(U) FY 1992 Accomplishments:

- (U) Tests conducted for the following systems:
  - Maneuver Control System (MCS) Army Nuclear Biological & Chemical Information System (ANBACIS)
  - MCS ANBACIS Interface with ATCCS
  - Bradley Fighting Vehicle Laser Range Finder
  - Night Fighting System
  - Command and Control (C2) on the Move
  - Voice Recognition on the Move
  - Mobile Subscriber Equipment (MSE) Packet Network with Combat Net Radio (CNR)
  - Signal Link
  - Royal Ordnance Lightweight Howitzer

Program Element: #0605712A
PE Title: **Support of Operational Testing** Budget Activity: #6

- Low Altitude Parachute Extraction System (LAPS)
- Flying Plates
- Theater Construction Management System

(U) **FY 1993 Planned Program:**

- (U) Tests planned:
  - Heavy Sniper Rifle
  - Auto Track for M1A1
  - Battle Dress Uniform (BDU) Thermal Signature
  - C2 on the Move
  - Battle Damage and Repair Kits
  - M1A2 Differential Distribution
  - LAPS FA Phase II
  - Small Unit Lightweight Sensor
  - Precise Lightweight Global Positioning System (GPS) - Survey Vehicle
  - Precision Strike

(U) **FY 1994 Planned Program:**

- (U) Tests planned:
  - Combat Service Support Battle Support Task Force (split ops)
  - Night Fighting System
  - Command and Control on the Move
  - Battlefield Aviation Logistics System
  - Battle Simulation Linkage
- (U) Remainder of FY 1994 CEP Program to be developed July/August 1993.

(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. 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). This project is not a new start, resources were realigned from PE #0605602.D628 (Test Technology and Sustaining Instrumentation).

(U) **FY 1992 Accomplishments:** Not applicable.

(U) **FY 1993 Planned Program:** Not applicable.

(U) **FY 1994 Planned Program:**

- (U) Acquire instrumentation to support tests funded in projects D001 and D985.
- (U) Acquire equipment and software to provide interim RTCA capability until the Mobile Automated Instrumentation Suite (MAIS) is fielded to support the LONGBOW Apache IOTE.
- (U) Provide short response development of instrumentation and support to meet last minute test data requirements mandated by Headquarters, Department of the Army (HQDA) and DoD.

FY 1994 RDTE DESCRIPTIVE SUMMARY

Program Element: #0605712A
PE Title: **Support of Operational Testing** Budget Activity: #6

(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, 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; Vrelus Research Corporation, Thousand Oak. 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 assured by coordination with PM-ITTS, the Operational Test & Evaluation Coordinating Committee (OTECC), review by the Army Test and Evaluation Committee and by coordination with the Test Scheduling and Review Committee (TSARC).

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

Appropriation	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
MA6700	2000	6029	2408
Other Procurement Army			
Special Equipment for User Testing			

(U) International Cooperative Agreements: Not applicable.

FY 1994 RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605801A**
PE Title: **Programwide Activities** Budget Activity: **#6**

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
M881 RDTE Command/Center/General Administrative Support	95720	86765	81860
MAC3 Ozone Depleting Chemicals Elimination	0	0	14151
TOTAL PE	95720	86765	96011

B. (U) **BRIEF DESCRIPTION OF ELEMENT:** This program funds the 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 the Army program to eliminate the use of ozone depleting chemicals on/for weapons systems.

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 Medical Research Acquisition Activity (USAMRAA), Ft. Detrick, MD; 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 Agency, 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 five international RDTE Standardization Groups located in Australia, Canada, Germany, United Kingdom, and Japan. Requested resources finance salaries and related costs for civilian personnel. This program is central to efficient management of the total Army RDTE program.

(U) **FY 1992 Accomplishments:**

- (U) Provided 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
- (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)
- (U) Funded travel of the Army Science Board
- (U) Funded quick reaction capability for accident investigations at Aviation Systems Command and unique costs related to tenant support

- (U) Provided continued contract and acquisition management and administrative functions performed by USAMRAA in support of the U.S. Army Medical Research and Development Command (USAMRDC), Ft Detrick, MD and its tenant organizations, and Walter Reed Army Institute of Research (WRAIR).

(U) **FY 1993 Planned Program:**

- (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
- (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)
- (U) Fund travel of the Army Science Board
- (U) Fund quick reaction capability for accident investigations at Aviation Systems Command and unique costs related to tenant support
- (U) Provides continued contract and acquisition management and administrative functions performed by USAMRAA in support of USAMRDC, Ft Detrick, MD and its tenant organizations, and WRAIR.

(U) **FY 1994 Planned Program:**

- (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
- (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)
- (U) Fund travel of the Army Science Board
- (U) Fund quick reaction capability for accident investigations at Aviation Systems Command and unique costs related to tenant support
- (U) Procurement and standardization functions transferred from Operation and Maintenance, Army, effective FY 1994
- (U) Provide continued contract and acquisition management and administrative functions performed by USAMRAA in support of USAMRDC, Ft Detrick, MD and its tenant organization, and WRAIR.

(U) **Project MAC3 - Ozone Depleting Chemicals Elimination.** Develop and implement the Army program to eliminate the use of ozone depleting chemicals (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 1992 Accomplishments:** Project not funded.

(U) **FY 1993 Planned Program:** Project not funded.

(U) **FY 1994 Planned Program:**

- (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.

(U) **Work Performed By:** Headquarters, U.S. Army Materiel Command, Alexandria, VA; U.S. Army Medical Research Acquisition Activity (USAMRAA), Ft. Detrick, MD; U.S. Army Research Institute for the Behavioral and Social Sciences, Alexandria, VA; U.S. Army Armament Research, Development and Engineering

Program Element: **#0605801A**
PE Title: **Programwide Activities** Budget Activity: **#6**

(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 Agency, 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 five international RDTE Standardization Groups located in Australia, Canada, Germany, United Kingdom, and Japan.

(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 1994 RDTE DESCRIPTIVE SUMMARY

Program Element: #0605802A
PE Title: **International Cooperative Research and Development** Budget Activity #6

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
M798 International Cooperative Research and Development- Army Research Institute	1485	1820	1861

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, translation and equipment) 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 1992 Accomplishments:

- (U) Continued domestic and international travel linked to scientific and technological exchanges having military application and mutual benefit for the United States and its allies.
- (U) Continued funding of the entire United States' share of the NIAG and Special Fund for Cooperative Planning budget.
- (U) Continued supporting regular attendance at meetings of the fourteen NATO panels, sixteen ABCA working groups, annual meetings of the SNR(A), staff talks, and numerous sub-panels and working group meetings.
- (U) Continued funding travel to support cooperative R&D initiatives.
- (U) Funded travel to support US Army participation in the Farnborough Air Show.
- (U) Funded travel to support US Army participation in the Eurosatory '92 Show.

(U) FY 1993 Planned Program:

- (U) Continue domestic and international travel linked to scientific and technological exchanges that have military application and mutual benefit for the United States and its allies.
- (U) Continue funding for the United States' share (843K) of the NIAG and Special Fund for Cooperative Planning budget.
- (U) Continue supporting regular attendance at meetings of fourteen NATO panels, sixteen ABCA working groups, annual meetings of the SNR(A), staff talks, and numerous sub-panels and working group meetings.
- (U) Continue funding travel to support cooperative R&D initiatives.

FY 1994 RDTE DESCRIPTIVE SUMMARY

Program Element: #0605802A
PE Title: **International Cooperative Research and Development** Budget Activity #6

(U) FY 1994 Planned Program:

- (U) Continue domestic and international travel linked to scientific and technological exchanges that have military application and mutual benefit for the United States and its allies.
- (U) Continue funding for the United States' share (850K) of the NIAG and Special Fund for Cooperative Planning budget.
- (U) Continue supporting regular attendance at meetings of the fourteen NATO panels, sixteen ABCA working groups, staff talks, and numerous sub-panels and working group meetings and host the annual meeting of the SNR(A).
- (U) Continue funding travel to support cooperative R&D initiatives.

(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 meetings of these international fora further cooperative research and development efforts. These discussions 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 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605803A
PE Title: **Technical Information Activities** Budget Activity: #6

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
DC16 Field Assistance in Science and Technology (FAST)	1992	2895	2596
DC18 Board on Army Science Technology (BAST)	610	304	664
MZ85 DBOF - Information Analysis Centers (IAC)	3155	3706	0
MZ86 DBOF - Defense Technical Information Center (DTIC)	7198	6577	0
M720 Technical Information Functional Activities	1205	1196	1431
M727 Technical Information Activities	2343	1772	2267
M729 Youth Science Activities	1572	1967	1720
D730 Personnel and Training Analysis Activities	3257	3217	3077
M731 Government/Industry Data Exchange Program/Advisory Group on Electronic Devices (GIDEP/AGED)	209	526	252
PE TOTAL	21541	22160	12007

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program 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. This program provides Army information to all Defense Technical Information Center data banks. This program also funds, in Project D730, 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.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project DC16 - Field Assistance in Science and Technology (FAST): Composed of a director's office staff of four (4) with eighteen (18) science advisers recruited from Army Materiel Command (AMC) laboratories/centers serving Commanders-in-Chief (CINCs) and major Army commanders world-wide and supported by assigned Quick Reaction Coordinators (QRCs) within each AMC laboratory/center and other Army agencies. Program director reports to Commanding General, AMC. Effort focuses AMC resources to rapidly identify and solve field Army technical problems affecting improved readiness, safety, training and operations & 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. All science ... iser salaries are funded by AMC labs/centers who supply the science advisers for two year tours. Project cost ave required significant below-threshold reprogramming actions at AMC Headquarters because of the high p...ority 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 1992 Accomplishments:

- (U) Provided continuous activity on over 225 projects, completing 100 and starting 125 new projects of major interest to commanders
- (U) Defined, tested, and recommended technology solutions to materiel problems identified by CINCs worldwide. Prepared operational needs statements, test results, and other supporting docume...s for approximately 12 of the CINCs' highest priority programs. Submited major programs, with high dollar funding requirements, to the Department of Army CINC Initiatives Program (ARCIP) Board of Dir...ors.
- (U) Provided science adviser to Special Operations Command (SOCOM) (newly established posi...on).
- (U) Assisted the Air Force with initiation of their FAST type program.
- (U) Provided professional growth opportunity for 19 science advisers on two year tours and 50 FAST-junior scientists and engineers on two 8-week tours.

(U) FY 1993 Planned Program:

- (U) Provide continuous activity on over 235 projects, completing 100 and starting 135 new projects of major interest to commanders
- (U) Define, test ar recommend technology solutions to materiel problems identified by CINCs worldwide. Prepare operational needs statements, test results and other supporting documents for the CINCs' highest priority programs. Submit major programs, with high dollar funding requirements to the ARCIP Board of Directors.
- (U) Provide science adviser to Training and Doctrine Command (TRADOC) headquarters and schools in order to improve communication links between AMC and TRADOC, provide technical support to Commandants, better coordinate concept evaluation programs and staffing of requirements documentation.
- (U) Provide professional growth opportunity for 19 science advisers on two year tours and 50 FAST-junior scientists and engineers on two 8-week tours.
- (U) Provide professional growth opportunity for 50 personnel in the Scientists and Engineers Field Experience with Soldiers (SEFEWS) program.

(U) FY 1994 Planned Program:

- (U) Provide continuous activity on over 250 projects, completing 110 and starting 140 new projects of major interest to commanders.
- (U) Define, test and recommend technology solutions to materiel problems identified by CINCs worldwide. Prepare operational needs statements, test results and other supporting documents for the CINCs' highest priority programs. Submit major programs, with high dollar funding requirements, to the ARCIP Board of Directors.
-) Provide professional growth opportunity for 19 science advisers on two year tours and 50 FAST-ior scientists and engineers on two 8-week tours.
-) Provide professional growth opportunity for 100 personnel in the SEFEWS program.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605803A
PE Title: **Technical Information Activities** Budget Activity: #6

(U) Project DC18 - Board on Army Science Technology (BAST): Standing panel of the National Academy of Sciences, initially convened at the request of the Under Secretary of Army, and currently serves as a Technical/Management Advisory Panel for the Assistant Secretary of the Army, Research, Development and Acquisition. This type of effort was previously funded from other RDTE,A resources. It became imperative to integrate resources and institutionalize the program to accord it stability and productivity.

(U) FY 1992 Accomplishments:
- (U) Provided support for forecast of Army science and technology needs and opportunities.
- (U) Responded to immediate science and technology requirements.
- (U) Provided personnel for annual In-House Laboratory Independent Research (ILIR) and Research, Development and Acquisition (RDA) awards review.

(U) FY 1993 Planned Program:
- (U) Provide support for forecast of Army science and technology needs and opportunities.
- (U) Respond to immediate science and technology requirements.
- (U) Provide personnel for annual ILIR and RDA awards review.
- (U) Provide special panel to study Army Laboratory Management.

(U) FY 1994 Planned Program:
- (U) Provide support for forecast of Army science and technology needs.
- (U) Respond to immediate science and technology requirements.
- (U) Provide personnel panel for annual ILIR and RDA awards review.
- (U) Provide a special panel to study manufacturing.

(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.

(U) FY 1992 Accomplishments:
- (U) Maintained goal level of IAC services.
- (U) Invested in IAC capability to leverage science and technology.
- (U) Developed DoD-required test result databases.
- (U) Created defense management support resources.
- (U) Networked technical information sources for defense needs.
- (U) Assisted science and math education (K-12) program.

(U) FY 1993 Planned Program:
- (U) Maintain goal level of IAC services.
- (U) Support defense acquisition community analysis needs.

Program Element: #0605803A
PE Title: **Technical Information Activities** Budget Activity: #6

- (U) Address documented DoD studies and analysis efforts.
- (U) Provide analytical support to weapon systems research and development.
- (U) Augment military specifications and standards evolution.
- (U) Analyze DoD critical technology areas.

(U) FY 1994 Planned Program: The operations of the Information Analysis Centers (IACs) were funded by direct appropriation (through the Defense Logistics Agency and later the three services) through FY 1993. Effective FY 1994, direct funds were withdrawn and the Office of the Secretary of Defense directed that the operation of IACs be transferred to the Defense Business Operations Fund (DBOF). At that time, customers will be charged the total cost for IACs products and services.

(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 1992 Accomplishments:
- (U) Maintained goal level of services in support of defense acquisition community information needs.
- (U) Provided DoD information services to leverage science and technology.
- (U) Created defense management support resources.
- (U) Networked technical information sources for dDefense needs.
- (U) Made enhancements to Work Unit Information System (WUIS).
- (U) Implemented a Cost Allocation Information System (CAIS).
- (U) Began implementation of Electronic Document System (EDS).

(U) FY 1993 Planned Program:
- (U) Maintain goal level of services in support of Defense Acquisition community information needs.
- (U) Replacement of Defense Gateway Information System (DGIS) and development minicomputers.
- (U) Acquire an online registration system to replace the current manual system.
- (U) Develop a secure gateway to broaden the scope of DGIS to classified databases with standard search language.

(U) FY 1994 Planned Program: The operation of the Defense Technical Information Center (DTIC) was funded by direct appropriation (through the Defense Logistics Agency and later the three Services) through FY 1993. Effective FY 1994, direct funds were withdrawn and the Office of the Secretary of Defense directed that the operation of DTIC be transferred to the DBOF. At that time, customers will be charged the total cost for DTIC products and services.

(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; and (4) 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 1992 Accomplishments:
- (U) Continued enhancement for WUIS input system.
- (U) Provided training, training materials, and support for the WUIS input via PC-based software, batch process, or electronic transfer of data.
- (U) Continued managerial, programming, data base, clerical and personnel support to process, store, control and report the WUIS.
- (U) Continued the annual data collection and printing of the DoD Tri-Service annual "DoD In-House RDT&E Facilities Report".
- (U) Provided Army funding support for FLC as required by Public Law 99-502.
- (U) Supported laboratory management study.

(U) FY 1993 Planned Program:
- (U) Continue enhancement for WUIS input system.
- (U) Improve training, training materials, and support for the WUIS input via PC-based software, batch process, or electronic transfer of data.
- (U) Continue managerial, programming, data base, clerical and personnel support to process, store, control and report the WUIS.
- (U) Provide Army funding support for FLC as required by Public Law 99-502.
- (U) Support laboratory management study.
- (U) Provide administrative and contractual support for the Army Science Board (ASB).

(U) FY 1994 Planned Program:
- (U) Continue enhancement for WUIS input system.
- (U) Improve training, training materials, and support for the WUIS input via PC-based software, batch process, or electronic transfer of data.
- (U) Continue managerial, programming, data base, clerical and personnel support to process, store, control and report the WUIS.
- (U) Provide Army funding support for FLC as required by Public Law 99-502.
- (U) Support laboratory management study.
- (U) Provide administrative and contractual support for the Army Science Board (ASB).

(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 Strategic Planning initiatives including the Army Science and Technology Master Plan that previously were funded from other RDTE,A resources. Integration of these resources was imperative to afford the annual effort with stability, continuity and efficiency.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605803A
PE Title: **Technical Information Activities** Budget Activity: #6

(U) FY 1992 Accomplishments:

- (U) Continued the Science and Technology (S&T) Base computer engineering support contract.
- (U) Provided AMC support/input, as required, to Army level consolidation efforts.
- (U) Provided automation support for international program to include cooperative efforts.
- (U) Provided updates to the Army Science and Technology Master Plan.
- (U) Provided support to Army S&T strategic planning, analysis and prioritization.
- (U) Provided Army wide input to the OSD S&T thrusts.
- (U) Provided support to Army leadership for Thrust #5, Advanced Land Combat.
- (U) Provided contract support for the AMC O&S cost savings initiative.
- (U) Provided technical/contractor support for the Long Range Research Development Acquisition Plan (LRRDAP)/Planning, Programming, Budgeting, and Execution System (PPBES) actions.
- (U) Maintained/updated Army S&T data at the workpackage level.
- (U) Provided easier access to S&T data by the Army community.
- (U) Provided technical staff support for the Acquisition Management System Review Committee.
- (U) Provided support to the Army Science Board.
- (U) Provided support to Army S&T conferences and studies.

(U) FY 1993 Planned Program:

- (U) Continue the Science and Technology Base computer engineering support contract.
- (U) Continue development/improvements to the S&T databases.
- (U) Maintain/update Army S&T data at the workpackage level.
- (U) Improve the quality and accessibility of S&T data to the Army community.
- (U) Provide technical/contractor support for LRRDAP/PPBES actions.
- (U) Provide updates/support to the Army Science and Technology Master Plan.
- (U) Continue support to Army S&T strategic planning, analysis, and prioritization.
- (U) Continue support to Army leadership relative to the OSD S&T thrusts.
- (U) Continue support to Army conferences and studies.
- (U) Provide guidance and policy relative to the content, utilization, and requirements of current and future acquisition management systems.

(U) FY 1994 Planned Program:

- (U) Continue the Science and Technology Base computer engineering support contract.
- (U) Continue development/improvements to the S&T databases.
- (U) Maintain/update Army S&T data at the workpackage level.
- (U) Improve the quality and accessibility of S&T data to the Army community.
- (U) Provide technical/contractor support for LRRDAP/PPBES actions.
- (U) Provide updates/support to the Army Science and Technology Master Plan.
- (U) Continue support to Army S&T strategic planning, analysis, and prioritization.
- (U) Continue support to Army leadership relative to the OSD S&T thrusts.
- (U) Continue support to Army conferences and studies.
- (U) Provide guidance and policy relative to the content, utilization, and requirements of current and future acquisition management systems.

(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 1992 Accomplishments:

- (U) Continued to foster high school student interest in science, mathematics, engineering and computer science, nationally, through: International Science and Engineering Fair (ISEF), Junior Science and Humanities Symposia (JSHS), Research Engineering Apprenticeship Program (REAP), Uninitiated Introduction to Engineering (UNITE), and the International Mathematics Olympiad (IMO).
- (U) Continued the Joint Army/Navy Washington Regional Area Summer Apprenticeship Program.
- (U) Integrated Training and Doctrine Command (TRADOC) and US Army Recruiting Command (USAREC) in the more than 350 science and engineering fairs with which the Army is involved annually.
- (U) Increased participation of minorities in Army sponsored science and technology fairs, symposia, studies and competitions.
- (U) Increased participation at Army laboratories/R&D centers in youth focused science and technology activities.
- (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.

- **(U) FY 1993 Planned Program:**
- (U) Continue to foster high school student interest in science, mathematics, engineering and computer science, nationally, through: ISEF, JSHS, REAP, UNITE and the IMO.
- (U) Continue the Joint Army/Navy Washington Regional Area Summer Apprenticeship Program.
- (U) Integrate TRADOC and USAREC in the more than 350 science and engineering fairs with which the Army is involved annually.
- (U) Increase participation of minorities in Army sponsored science and technology fairs, symposia, studies and competitions.
- (U) Increase participation at Army laboratories/R&D centers in youth focused science and technology activities.
- (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.

(U) FY 1994 Planned Program:

- (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.
- (U) Continue the Joint Army/Navy Washington Regional Area Summer Apprenticeship Program.
- (U) Integrate TRADOC and USAREC in the more than 350 science and engineering fairs with which the Army is involved annually.
- (U) Increase participation of minorities in Army sponsored science and technology fairs, symposia, studies and competitions.

Program Element: #0605803A
PE Title: **Technical Information Activities** Budget Activity: #6

- (U) Increase participation at Army laboratories/R&D centers in youth focused science and technology activities.
- (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.

(U) **Project D730 - Personnel & Training Analysis Activities:** This project provides for the application of behavioral science-based analytical technologies by the U.S. Army Research Institute (ARI) for the Behavioral and Social Sciences to current and near-term soldier-related issues. The program is focused on policy issues designed 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 "downsizing" on retention and readiness of quality soldiers.

(U) **FY 1992 Accomplishments:**

- (U) Research-based training systems analyses: Analyzed Combat Training Center (CTC) data (hits, misses, weapon system location, etc) contained in CTC-ARI Training Data Archive to evaluate performance strengths and weaknesses of maneuver battle operating systems (e.g., direct and indirect fire units). A CTC Observer/Controller (O/C) oral history database was established and content analysis initiated.
- (U) Research-based manpower and personnel analyses: Analyzed effects of alternative personnel policies and economic/demographic variables on soldier enlistment, reenlistment, attrition and separation. Developed predictors of Voluntary Separation Incentive/Selective Separation Benefits (VSI/SSB) takers and analyzed impacts of differential separation and retention bonus policies on decisions to stay or leave the Army. Developed data-based recommendations for improved Army decisions about individual enlisted soldier promotion and retention.

(U) **FY 1993 Planned Program:**

- (U) Research-based training systems analyses: Continue analyses of Combat Training Center (CTC) data contained in CTC-ARI Training Data Archive to determine major areas of common unit performance strengths and weaknesses related to battlefield operating systems. Conduct analyses using O/C oral history database. Complete analyses of commander survivability at CTC.
- (U) Research-based manpower and personnel analyses: Continue analyses of impact of alternative downsizing strategies on individual retention decisions and on the costs of alternative force structures. Update enlisted cost and compensation models to evaluate costs and impact on force of permanent change of station policy alternatives. Continue to determine force-wide and long-term effects of changes in enlistment standards.

(U) **FY 1994 Planned Program:**

- (U) Research-based training systems analyses: Continue analyses of CTC data in the CTC-ARI Training Data Archive to provide profiles of task force strengths and weaknesses related to critical combat functions and combat tasks. Complete analysis of overall accuracy, quality and thoroughness of CTC data.
- (U) Research-based manpower and personnel analyses: Continue analyses of attitude and opinion data of soldiers who transition from Army to assist in determination of transition policies. Continue to develop database tracking soldier attitude and opinions and their impact on performance and retention during downsizing.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605803A
PE Title: Technical Information Activities
Budget Activity: #6

(U) Project M731 - Government/Industry Data Exchange Program (GIDEP) and the Advisory Group on Electronic Devices (AGED): The Government/Industry Data Exchange Program is a joint government/industry effort for the exchange of data to enhance development, design, engineering logistics and cost of defense weapon systems equipment. Funds support GIDEP reliability, maintainability and failure experience interchange data bases. Provides technical information required for energy design handbooks; hydraulic fluids, helicopter qualification assurance, safety energy application for missiles and rockets, safety energy application for aircraft, safety energy guide for armament, and bonding adhesive information for research and design.

(U) FY 1992 Accomplishments:

- (U) Continued information exchange data between industry and government and expansion of the program covering Army elements (industry and government) not currently participating.
- (U) Compiled technical information for engineering design handbooks.

(U) FY 1993 Planned Program:

- (U) Continue information exchange data between industry and government and expansion of the program covering Army elements (industry and government) not currently participating.
- (U) Improve the turn-around-time and concurrently reduce the unit cost of Engineering Design Handbooks by improving the processes involved in preparation of the manuscripts during every phase of development.
- (U) Focus the efforts of the Engineering Design Handbook Program (EDHP) on documenting engineering design information for Military Critical Technologies that are not commercially available.
- (U) Improve management of the EDHP. The EDHP transferred from the Army Management Engineering College to the Industrial Engineering Activity (IEA) in April 1991. IEA has undertaken several initiatives already, and has several more initiatives in the planning stages, that are geared to attaining the IEA vision to make the EDHP the premiere source for military critical design information.

(U) FY 1994 Planned Program:

- (U) Continue information exchange data between industry and government and expansion of the program covering Army elements (industry and government) not currently participating.
- (U) Improve the turn-around-time and concurrently reduce the unit cost of Engineering Design Handbooks by improving the processes involved in preparation of the manuscripts during every phase of development.
- (U) Focus the efforts of the Engineering Design Handbook Program (EDHP) on documenting engineering design information for Military Critical Technologies that are not commercially available.
- (U) Improve management of the EDHP. The EDHP transferred from the Army Management Engineering College to the Industrial Engineering Activity (IEA) in April 1991. IEA has undertaken several initiatives already, and has several more initiatives in the planning stages, that are geared to attaining the IEA vision to make the EDHP the premiere source for military critical design information.

(U) Work Performed By: 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. Contractors include: Information Systems and Networks Corporation, Bethesda, MD; Universal Hightech Development, Rockville, MD; Institute for Defense Analyses, Arlington, VA; 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.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: #0605803A
PE Title: **Technical Information Activities** Budget Activity: #6

(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.

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

(U) International Cooperative Agreements: Not applicable.

FY 1994 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 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
DC38 CHICKEN LITTLE Follow-On	3435	4556	3796
DF21 North Atlantic Treaty Organization (NATO) Small Arms Evaluation	249	311	326
DF24 Conventional Ammunition Demilitarization	983	1856	712
D293 Field Artillery Ammunition (NATO) Engineering Development	124	279	285
D620 DOD Munitions Effectiveness	7391	8057	8169
M857 Explosive Safety Standards	681	816	475
PE TOTAL	12863	15875	13763

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.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN FY 1994:

(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 develc ıental 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 1992 Accomplishments:

- (U) Conducted captive flight tests (CFT) to evaluate various seeker/sensor technologies in support of SADARM, BAT, and Comanche.
- (U) Completed Hellfire warhead test program.
- (U) Completed testing and analyses of explosively formed penetrator (EFP) and shaped charge warheads.
- (U) Implemented technologies to reduce cost of evaluating EFPs by a factor of ten.

Program Element: # 0605805A
PE Title: **Munitions Standardization, Effectiveness and Safety** Budget Activity: #6

(U) FY 1993 Planned Program:
- (U) Continue development and operation of primary signature measurement facility for DoD.
- (U) Plan and conduct captive flight tests to support smart weapons producers.
- (U) Evaluate effects of advanced warheads against ceramic laminate armors to refine spall models.
- (U) Upgrade signature database through use of common standardized format in concert with Army laboratories and the intelligence community.
- (U) Continue assessment of EFP warhead technologies.

(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.

(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. It involves development, maintenance, and testing compliance of NATO Standardization Agreements (STANAGs) and staffing of the North American Regional Test Center (NARTC).

(U) FY 1992 Accomplishments:
- (U) Completed review and update of D/14, Evaluation Procedure for NATO Small Arms Weapon Systems.
- (U) Drafted STANAGs on 35 X 228mm and 5.7 X 28mm ammunition.
- (U) Completed first qualification test for 25mm ammunition.

(U) FY 1993 Planned Program:
- (U) Continue to staff, equip, and maintain the NARTC.
- (U) Complete STANAG and MOPI for 12.7mm ammunition.
- (U) Initiate efforts to replace the NATO pressure transducer.
- (U) Complete Reference Ammunition Assessment.
- (U) Complete first NATO production test of 5.56mm M855 ball ammunition.

(U) FY 1994 Planned Program:
- (U) Relocate the NARTC from Ft. Dix, NJ to Lake City Army Ammunition Plant in MO.
- (U) Complete STANAGs and MOPIs for 40mm high velocity ammunition.
- (U) Draft STANAG for 5.57mm ammunition.
- (U) Initiate replacement of NATO pressure transducer.

FY 1994 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.

(U) **FY 1992 Accomplishments:**
- (U) Initiated feasibility evaluation of supercritical water oxidation technology for colored smoke and dye compositions.
- (U) Initiated evaluation of plasma arc furnace for pyrotechnic materials.
- (U) Initiated development of a pilot line for recycling red phosphorus/butyl rubber material.
- (U) Completed an assessment of new technologies as alternatives of open burning/detonation for potential application to demilitarization of conventional munitions.

(U) **FY 1993 Planned Program:**
- (U) Complete feasibility studies of supercritical water oxidation technology for smoke/dye compositions.
- (U) Initiate design of a pilot supercritical water oxidation system.
- (U) Continue evaluation of plasma arc furnace for pyrotechnic materials.
- (U) Continue development of a pilot line for recycling red phosphorus/butyl rubber materials.
- (U) Complete design and fabrication of a carbon dioxide blastout system for removal and recovery of pressable explosives.

(U) **FY 1994 Planned Program:**
- (U) Complete development of a pilot line for recovery/recycling red phosphorus/butyl rubber materials.
- (U) Continue evaluation of a pilot system for removal/recovery of pressable explosives.
- (U) Complete design, fabrication, and initiate testing/operational verification of pilot supercritical water oxidation system.
- (U) Complete evaluation of plasma arc furnace for pyrotechnic materials and inject the technology into a demilitarization facility.

(U) **Project D293 - Field Artillery Systems (NATO) Engineering Development:** Project supports US/NATO howitzer and ammunition compatability and interoperability.

(U) **FY 1992 Accomplishments:**
- (U) Prepared NATO ammunition interchangeability firings with French, German, Italian and United Kingdom munitions.

(U) **FY 1993 Planned Program:**
- (U) Continue NATO ammunition interchangeability firings.

(U) **FY 1994 Planned Program:**
- (U) Continue NATO ammunition interchangeability firings.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0605805A
PE Title: **Munitions Standardization, Effectiveness and Safety** Budget Activity: #6

(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 asssociated 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.

(U) FY 1992 Accomplishments:
- (U) Completed near-zero Concept Evaluation Program (CEP) methodology development.
- (U) Completed surface-to-air missile JMEMs.
- (U) Revised air-to-surface, surface-to-air, and anti-air JMEMs.
- (U) Continued target description/vulnerability analysis of threat weapon systems.
- (U) Supported joint service weapons system effectiveness analysis.

(U) FY 1993 Planned Program:
- (U) Computerization of Joint Technical Coordinating Group (JTCG) manuals and reports.
- (U) Support the Defense Nuclear Agency conventional weapons effects program.
- (U) Continue incorporation of DESERT STORM data into JMEMs and JTCG computer models.
- (U) Complete TOMAHAWK JMEM and high-speed maneuvering target model.
- (U) Maintain and update a library of over 450 JMEMs and technical reports for the JLC.

(U) FY 1994 Planned Program:
- (U) Support the Special Operations Forces.
- (U) Continue computerization of JTCG manuals and reports.
- (U) Continue support of the DoD non-nuclear Strategic Capability Program.
- (U) Complete incorporation of DESERT STORM data into JMEMs and JTCG computer models.

(U) Project M857 - Explosive Safety Standards: Supports explosive effects research and testing to quantify hazards and to develop techniques to mitigate these hazards in all DoD manufacturing, testing, main-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 1992 Accomplishments:
- (U) Completed review of lightning protection systems and prepared revision to DoD 6055.9-M.
- (U) Prepared simplified method for assessing radiant flux hazards for UN hazard division 1.3 ammunition.
- (U) Developed improved overpressure-distance curves for accidental explosions inside earth-covered magazines.
- (U) Developed models for hardened aircraft shelters and underwater explosions.
- (U) Administered DoD Explosive Safety Seminar.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 0605805A
PE Title: **Munitions Standardization, Effectiveness and Safety** Budget Activity: #6

(U) FY 1993 Planned Program:

- (U) Improve US hazard classification testing protocol based on UN prodecures.
- (U) Continue development of improved tri-service and NATO hazard division 1.2 explosion hazard characteristics.
- (U) Develop improved guidelines for hazard division 1.3 dividing walls.
- (U) Develop improved computer codes for calculating debris and structural response from accidental explosions.

(U) FY 1994 Planned Program:

- (U) Complete development of improved tri-service and NATO hazard division 1.2 explosion hazard characteristics.
- (U) Develop improved tri-service design procedures for explosion-resistant structures.
- (U) Develop automated text-based management system for DoD Explosives Safety Board minutes.

(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 1994 RDTE 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 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
DE65 NDI Testing	5655	4817	4924
D125 NDI Market Investigation	2386	948	957
PE TOTAL	8041	5765	5881

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element encompasses the Army's non-developmental items (NDI). NDI is a generic term that covers materiel available from a variety of sources for use in the Army with little or no developmental effort. This program utilizes materiels/items that are available from the commercial market place, 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 RDTE 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 requirement. 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. This normally occurs when a fielded item is no longer available and/or supportable and the opportunity then exists to field the current technology as available from the marketplace.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project DE65 - NDI Testing. The operational testing portion conducts operational 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.

(U) FY 1992 Accomplishments:

- (U) Army Watercraft Program - Conducted operational testing and finalized program management documents for the crane barge and the mechanized landing craft.
- (U) Chip resistant chemical agent resistant coating (CARC) undercoating - conducted preliminary live agent testing on several materials.
- (U) Ultra Lightweight Camouflage Net System (ULCANS) - Finalized technical data package for production of the ULCANS, supported production qualification testing and first article testing.

(U) FY 1993 Planned Program:

- (U) Modernized Environmental Control Units (ECUs) - This task will test commercial ECU components, i.e., heat exchangers, efficient fans/motors, scroll/rotary variable capacity compressors. Test results will be used to enhance and update the ECU performance specification.

Program Element: **#0605810A**
PE Title: **RDT&E Support for Non-Developmental Items (NDI)** Budget Activity: **#6**

- (U) Commercial Equipment Program for Material Handing Equipment - Test, evaluate and complete specification data for 10,000 pound warehouse crane.
- (U) Combat Propulsion Systems - Conduct durability test evaluation on the medium integrated propulsion systems, i.e., engines, transmissions, axles, that will be used in medium combat vehicles.

(U) FY 1994 Planned Program:

- (U) Modernized Environmental Control Units (ECUs) - Continue testing commercial ECU components, i.e., heat exchangers, efficient fans/motors, scroll/rotary variable capacity compressors. Redesign of these components may be necessary to meet Army requirements. Test results will be used to enhance and update the ECU performance specification.
- (U) Commercial Equipment Program for Material Handing Equipment - Test, evaluate and complete specification data for 10,000 pound warehouse crane.
- (U) Combat Propulsion Systems - Continue to conduct durability test evaluation on the medium integrated propulsion systems, i.e., engines, transmissions, axles, that will be used in medium combat vehicles.

(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. These tasks include a wide variety of applications including but not limited to: different sizes of engines, generators, trucks, air conditioners, materiels handling equipment, construction equipment, computers, micro processors, and watercraft. Examples of tasks are identified below.

(U) FY 1992 Accomplishments:

- (U) Army Watercraft Program - Prepared questionnaire, conducted market investigation and prepared technical reports for the liquid cargo barge, deck cargo barge and selected commercial marine components.
- (U) Heavy Dry Support Bridge - Conducted a market investigation to identify dry support bridge developments that could meet Army requirements.
- (U) Containerized Kitchen Systems - Conducted a market investigation of system and component level hardware which may serve the needs of the Army into the 21st century.

(U) FY 1993 Planned Program:

- (U) Commercial Construction Equipment - conduct a market investigation by questionnaire, literature search and survey of both government and non-government sources. End products will be technical reports and specification parameters for use in planned future procurements for compressors and pneumatic drills.
- (U) Army Watercraft Program - Conduct a market investigation and prepare technical reports for air cushion vehicle cargo handling system.

(U) FY 1994 Planned Program:

- (U) Construction Equipment - Prepare questionnaire, conduct market investigation and prepare technical reports for the 25 ton all terrain cranes, 40 ton cranes, and high mobility mobile handler.
- (U) Tactical Propulsion Systems - Conduct a market investigation to identify and prepare technical reports for an advanced technology demonstrator and tactical truck driveline, stress/life analysis
- (U) Helicopter Collision Avoidance System - Explore available radar technology developed in the commercial market place.

FY 1994 RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605810A**
PE Title: **RDT&E Support for Non-Developmental (NDI)** Budget A ity: **#6**

(U) Work Performed By: These projects provic or 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; Missile Command, Redstone Arsenal, AL; and Aviation and Troop Support Command, St. Louis, MO. Private contractors will be 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 1994 RDTE DESCRIPTIVE SUMMARY

Program Element: #0605856A
PE Title: **Environmental Compliance - RDT&E** Budget Activity: #6

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
MAB9	Environmental Compliance - AMC Test Ranges		
	24960	22382	31494
MAC1	Environmental Compliance - AMC Major Subordinate Commands/Laboratories		
	21710	13258	12520
PE TOTAL	46670	35640	44014

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. 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.

C. (U) **JUSTIFICATION FOR PROJECTS:**

(U) **Project MAB9 - Environmental Compliance - Army Materiel Command (AMC) Test Ranges.** Resources in this project ensure an adequate level of funding for environmental compliance requirements at Yuma Proving Ground, AZ; Aberdeen Proving Ground, MD; Dugway Proving Ground, UT; and White Sands Missile Range, NM. These operations are critical to the infrastructure of the Army testing mission.

(U) **FY 1992 Accomplishments:**

- (U) Funded legally mandated environmental compliance activities/functions discussed in paragraph B
- (U) Environmental Class I projects funded include compliance with underground storage tank requirements, consent orders/interagency agreements, and environmental permit requirements; funded a portion of the Environmental Class II projects expected to become Class I during current budget cycle;

did not fund any Class III projects other than environmental salaries and hazardous waste disposal. Major project examples are asbestos removal and underground storage tank removal/remediation at Aberdeen Proving Ground (APG), MD; Resource Conservation Recovery Act (RCRA) closures at Dugway Proving Ground (DPG), UT; Installation Environmental Impact Statement at White Sands Missile Range (WSMR), NM; and underground storage tanks/removal/remediation action at Yuma Proving Ground (YPG), AZ.

(U) FY 1993 Planned Program:

- (U) Funds legally mandated environmental compliance activities/functions discussed in paragraph B.
- (U) Environmental Class I projects funded include compliance with underground storage tank requirements and solid waste management units studies and remediation; funds a portion of previous year Class II projects expected to become Class I by start of FY 1993, and emerging Class II that could become Class I before funding could be requested again; funds only those Class III projects for hazardous waste disposal and environmental staff salaries. Major project examples are: asbestos abatement and underground storage tank removal/remediation at APG; solid waste management units, closure and wastewater treatment systems compliance at DPG; High Energy Laser System Test Facility (HELSTF) ground water contamination at WSMR; and underground storage tank removal/remediation at YPG.

(U) FY 1994 Planned Program:

- (U) Funds legally mandated environmental compliance activities/functions discussed in paragraph B.
- (U) Environmental Class I projects include compliance with aboveground and underground storage tank requirements, PCB requirements, and RCRA closure requirements; funds Class II projects expected to become Class I by the end of the FY 1994 and emerging Class II that could become Class I before funding could be requested again; funds only those Class III projects for hazardous waste disposal and environmental staff salaries. Major project examples are: testing, repair, removal, replacement, and remediation of aboveground and underground storage tanks at APG; stormwater permit requirements at APG; RCRA closures at DPG; operation of groundwater treatment system at WSMR.

(U) **Project MAC1 - Environmental Compliance - Army Materiel Command (AMC) Major Subordinate Commands/Laboratories.** Resources in this project ensure an adequate level of funding for environmental compliance requirements at Army Research Laboratory (ARL), Adelphi, MD; Armament Research, Development and Engineering Center (ARDEC), Dover, NJ; Natick Research, Development and Engineering Center (NRDEC), Natick, MA; and Army Research Laboratory Materials Technology Directorate (ARLMTD), Watertown, MA.

(U) FY 1992 Accomplishments:

- (U) Funds legally mandated environmental compliance activities/functions discussed in paragraph B
- (U) Funded Class I requirements, Class II requirements which would have become Class I by the end of FY 1992, funded only Class III projects for hazardous waste disposal and environmental staff salaries. Major project examples are: repair of leaking sewers and RCRA closures at ARDEC; replacement of PCB transformers at ARL; began repair of leaking CFCs and decontamination of sanitary sewers at NRDEC.

(U) FY 1993 Planned Program:

- (U) Funds legally mandated environmental compliance activities/functions discussed in paragraph B
- (U) Funds Class I requirements, Class II requirements which would become Class I by the end of FY 1993, funds only Class III projects for hazardous waste disposal and environmental staff salaries.

FY 1994 RDTE DESCRIPTIVE SUMMARY

Program Element: #0605856A
PE Title: **Environmental Compliance - RDT&E** Budget Activity: #6

Major project examples are: repairs to drinking water storage tank at ARDEC; air pollution inventories at ALC and MTL; complete repairs to leaking CFC facility at NRDEC.

(U) **FY 1994 Planned Program:**

- (U) Funds legally mandated environmental compliance activities/functions discussed in paragraph B
- (U) Funds Class I requirements, Class II requirements which would become Class I by the end of FY 1994, funds only Class III projects for hazardous waste disposal and environmental staff salaries. Major project examples are: Remediation of burning grounds at ARDEC; replace last PCB transformers at ARL; upgrade cooling towers and install back flow preventer valves at NRDEC.

(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 1992 Actual	FY 1993 Estimate
DERA: APG, MD	27649	49738
DERA: DPG, UT	2199	11881
DERA: ARDEC, NJ	2692	8346
DERA: NRDEC, MA	914	1845
DERA: WSMR, NM	650	2118

(U) **International Cooperative Agreements:** Not applicable.

FY 1994 RDTE DESCRIPTIVE SUMMARY

Program Element #0605872A
PE Title: **Productivity Investments** Budget Activity #6

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
DE13 OSD PIF - COE	3882	- 0 -	- 0 -
DE89 QRIP & PECIP - AMC	7601	6176	- 0 -
DE98 OSD PIF - AMC	4987	- 0 -	- 0 -
DW02 QRIP & PECIP - SDC	3604	1297	- 0 -
D851 QRIP & PECIP - COE	1210	3635	- 0 -
PE TOTAL	21284	11108	- 0 -

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element finances Army research and development support of productivity improvements through investment in productivity-enhancing capital equipment and productivity-enhancing management initiatives in accordance with DoDI 5010.36, Department of Defense (DoD) Productivity-Enhancing Capital Investment Program; DoDD 3201.1, Management of DoD Research and Development Laboratories; and DoDI 3201.3, DoD Research and Development Laboratories.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project DE13 - Office, Secretary of Defense, Productivity Investment Funding (OSD PIF) - Corps of Engineers (COE). This program finances Army research and development support of productivity improvement through investment in productivity-enhancing capital equipment and productivity-enhancing management initiatives at COE. Purpose is to improve personnel productivity through expanded capital investment in productivity-enhancing equipment. Post-investment analysis is conducted to identify the benefits achieved, to include the impact on productivity of the organizations involved and the disposition of manpower savings.

(U) FY 1992 Accomplishments:

- (U) Example: Replaced the explosive test data recording analog equipment with a digital system at the Waterways Experiment Station, MS. The previous analog system required several thousand feet of cabling and tape machines to record data. The digital system will eliminate these costs and reduce the manpower assigned to the testing program by 3 man years. The project entails the design and development of a small, shock-hardened, self-contained digital data recorder which requires no external power or data cables. Equipment to be acquired consists of circuit components, printed circuit boards, batteries, and potting compounds. The investment cost of $200 thousand will achieve savings of approximately $458 thousand in manpower, supplies and materials in the first full year of operation.

(U) FY 1993 Planned Program: Program terminated effective FY 1993.

FY 1994 RDTE DESCRIPTIVE SUMMARY

Program Element #0605872A
PE Title: **Productivity Investments** Budget Activity #6

(U) **Project DE89 - Quick Return on Investment Program and Productivity Enhancing Capital Investment Program - US Army Material Command (QRIP & PECIP - AMC).** This program finances Army research and development support of productivity improvement through investment in productivity-enhancing capital equipment and management initiatives at AMC. Fiscal management controls have been established to ensure that projects are funded as planned. Post-investment analyses are conducted to identify the benefits achieved, to include the impact on productivity of the organizations involved and the disposition of manpower savings.

(U) **FY 1992 Planned Program:**

- (U) Example: Acquisitions included the purchase of a Real Time Toxicological Blood Analysis System, a computer controlled system which permits the real time study of chemical and biological absorption through blood chemistry analysis. System will take blood samples from single or multiple test animals and send them directly to the mass spectrometer for analysis and identification. The U.S. Army Chemical Research Biological Defense Agency, Aberdeen Proving Ground expects the cost of $538 thousand to amortize in 7 months.

(U) **FY 1993 Planned Program:**

- (U) Plans include the funding of equipment for automating procedures associated with pulse calibration of accelerometers, vibration sensors and microphones located at Army activities worldwide. The investment cost of $234K is expected to be amortized in 17 months.

(U) **FY 1994 Planned Program:** Program terminated effective FY 1994.

(U) **Project DE98 - Office, Secretary of Defense, Productivity Investment Funding (OSD PIF) - Army Materiel Command (AMC).** Finances Army research and development support of productivity improvement through investment in productivity-enhancing capital equipment and productivity-enhancing management initiatives at AMC in accordance with DoDI 5010.36, Department of Defense (DoD) Productivity-Enhancing Capital Investment Program; DoDD 3201.1, Management of DoD Research and Development Laboratories; and DoDI 3201.3 DoD Research and Development Laboratories. OSD established the program in FY 1981 for the express purpose of improving personnel productivity through expanded capital investment in productivity-enhancing equipment. Post-investment analysis is conducted to identify the benefits achieved, to include the impact on productivity of the organizations involved and the disposition of manpower savings.

(U) **FY 1992 Accomplishments:**

- (U) Acquisitions included the purchase of a Combined Environmental Reliability Test/Environmental Stress Screening/Productivity Recovery Chamber. By using this cham to simultaneously test for vibration, temperature and humidity, the U.S. Army Communications tronics Command at Fort Monmouth, NJ expects the cost of $832 thousand to amortize in 6 months.

(U) **FY 1993 Planned Program:** Program terminated effective FY 1993.

(U) **Project DW02 - Quick Return on Investment Program and Productivity-Enhancing Capital Investment Programs - U.S. Army Strategic Defense Command (QRIP & PECIP - USASDC).** This program finances Army research and development support of productivity improvement through investment in productivity-enhancing capital equipment and productivity-enhancing management initiatives at USASDC. Fiscal

management controls have been established to ensure that projects are funded as planned. Post-investment analyses are conducted to identify the benefits achieved, to include the impact on productivity of the organizations involved and the disposition of manpower savings.

(U) **FY 1992 Accomplishments:**

- (U) An example of one of the many efforts undertaken in FY 1992 is the procurement of a Metal Compactor/Bailer for U.S. Army Kwajalein Atoll (USAKA). A predominant problem at USAKA is the inability to store and dispose of all types of scrap metals in an efficient and cost effective way. The Metal Compactor/Bailer will not only reduce the size of an average item by 75%, but would also decrease the number of shipments of scrap metal from two each year to one every two years. The savings attributed to the reduction in transportation costs would be significant. An investment of $500K will realize a projected annual savings of $1.38M over 15 years.

(U) **FY 1993 Planned Program:**

- (U) Planned acquisitions for FY 1993 include upgrading of the Advanced Research Center (ARC), US Army Strategic Defense Command (USASDC) video/graphic capability to a professional quality video/graphic capability. Currently, all the major USASDC programs pay film companies to develop video tapes for the projects. Each program spends an average of $10,000 per product. This excess cost constrains most projects from keeping the tapes up to date. The ARC has a basic graphics/video development resource which could be upgraded to provide the USASDC programs full access to update tapes and needed. This would include the full capability of creating sound tracks. Investment cost of 46,000 is expected to produce annual savings of $1.4M over a seven year period.

(U) **FY 1994 Planned Program:** Program terminated effective FY 1994.

(U) **Project D851 - Quick Return on Investment Program and Productivity Enhancing Capital Investment Programs - Corps of Engineers (QRIP & PECIP - COE).** Program finances Army research and development of productivity improvement through investment in productivity-enhancing capital equipment and management initiatives at COE. Fiscal management controls have been established to ensure that projects are funded as planned. Post-investment analyses are conducted to identify the benefits achieved, to include the impact on productivity of the organizations involved and the disposition of manpower savings.

(U) **FY 1992 Accomplishments:**

- (U) Example: Control System for Heating, Ventilation and Air Conditioning (HVAC) Test Facility ($48,000). The U.S. Army Construction Engineering Research Laboratory, Champaign, IL, operates a full-scale HVAC test facility, used to develop new HVAC control systems for use in Army facilities. The current control system installed on the facility is a combination pneumatic/electric control system which is difficult to operate and maintain. Future use of the test facility is to develop operations and maintenance requirements for HVAC components of interest to the Army. This system would significantly reduce the maintenance required to keep the test facility operational and would improve the productivity of the researchers investigating HVAC component performance. Annual savings are estimated at $40 thousand.

(U) **FY 1993 Planned Program:**

- (U) Example: Anti-Fouling Salinity Meter. The Waterways Experiment Station, Vicksburg, MS, performs military projects for the Department of Defense and Department of the Navy related to the

environmental impact, maintenance, and navigational aspects of military terminals and Navy ports. For each of these studies, a large percentage of the study cost is for prototype field data collection. Bad data sets cause project delays and inaccurate predictions. The primary problem in bad data is sensor fouling. An improved method for salinity data collection would generate tangible savings of $44 thousand per year with an investment cost of $35 thousand.

(U) **FY 1994 Planned Program:** Program terminated effective FY 1994.

(U) **Work Performed By:** This project provides for procurement of equipment by contract and, when appropriate, for in-house personnel costs throughout the Army to provide peak demand labor hours on an economical basis.

(U) **Related Activities:** The OSD Productivity Investment Program encompasses efforts in all three services and selected Defense Agencies. 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 1994 RDTE DESCRIPTIVE SUMMARY

Program Element: #0605876A
PE Title: Minor Construction - (RPM) RDTE
Budget Activity: #6

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
M6XX Minor Construction - Test and Evaluation Command	4850	5381	-0-
M6YY Minor Construction - AMC Major Subordinate Commands and Laboratories	1524	1173	1284
M6ZZ Minor Construction - Corps of Engineers	400	1576	589
PE TOTAL	6774	8130	1873

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.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project M6XX - Minor Construction - Test and Evaluation Command (TECOM). 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.

(U) FY 1992 Accomplishments:
- (U) Funded minor construction projects at U.S. Army Materiel Command test ranges.

(U) FY 1993 Planned Program:
- (U) Continue to fund minor construction projects at U.S. Army Materiel Command test ranges at minimum level

(U) FY 1994 Planned Program:
- (U) Minor construction projects at U.S. Army Materiel Command test ranges not funded.

(U) Project M6YY - 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, Adelphi, MD; Picatinny Arsenal, Dover, NJ; and Natick Research, Development and Engineering Center, 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.

(U) FY 1992 Accomplishments:
- (U) Funded essential minor construction projects.

(U) FY 1993 Planned Program:
- (U) Continue to minimally fund minor construction projects at AMC major subordinate commands and laboratories.

(U) FY 1994 Planned Program:
- (U) Continue to minimally fund minor construction projects at AMC major subordinate commands and laboratories.

(U) Project M6ZZ - Minor Construction - Corps of Engineers. This project finances those minor construction projects (described in paragraph B) for U.S. Army Corps of Engineers (COE) RDTE laboratories located at Waterways Experiment Station, Vicksburg, MS; Cold Regions Research and Engineering Laboratory, Hanover, NH; Construction Engineering Research Laboratory, Champaign, IL, and Topographic Engineering Center, Ft Belvoir, VA.

(U) FY 1992 Accomplishments:
- (U) Funded essential minor construction projects.

(U) FY 1993 Planned Program:
- (U) Continue to fund minor construction projects at U.S. Army Corps of Engineers RDTE laboratories.

(U) FY 1994 Planned Program:
- (U) Continue to minimally fund minor construction projects at U.S. Army Corps of Engineers RDTE laboratories

(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 #0605301A (Army Kwajalein Atoll)
PE #0605878A (Maintenance & Repair - RPM)

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable

FY 1994 RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605878A**
PE Title: **Maintenance and Repair - (RPM) RDTE** Budget Activity: ***#6***

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
M5XX	Maintenance and Repair - AMC Test and Evaluation Command Ranges		
	53504	61234	47322
M5YY	Maintenance and Repair - AMC Major Subordinate Commands/Laboratories		
	18542	12966	11438
M5ZZ	Maintenance and Repair - U.S. Army Corps of Engineers		
	2710	2566	2688
PE TOTAL	74756	76766	61448

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 repair incurred by building trade shops, construction units, grounds and pavement units, and machine shops. These projects substantially prolong the useful life of the facility, and are all actually facility investments.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project M5XX - Maintenance and Repair - AMC Test and Evaluation Command 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 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. 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.

(U) FY 1992 Accomplishments:
- (U) Funded less than essential maintenance and repair projects to meet AMC test ranges infrastructure requirements. Facility deterioration increased.
- (U) BMAR increased to $218 million

(U) FY 1993 Planned Program:
- (U) Continue to fund less than essential maintenance and repair projects at AMC test ranges at minimum level.
- (U) Facility deterioration continues to increase.
- (U) BMAR increases to $278 million

FY 1994 RDTE DESCRIPTIVE SUMMARY

Program Element: #0605878A
PE Title: **Maintenance and Repair - (RPM) RDTE** Budget Activity: #6

(U) FY 1994 Planned Program:
- (U) Continue to fund less than essential maintenance and repair projects at AMC test ranges at minimum level with minus growth to program.
- (U) Facility deterioration continues to increase
- (U) BMAR increases to $311 million

(U) Project M5YY - 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 subordinate command RDTE installations and laboratories, i.e. Army Research Labortary, Adelphi, Maryland; Picatinny Arsenal, Dover, New Jersey; and Natick Research, Development and Engineering 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.

(U) FY 1992 Accomplishments:
- (U) Funded essential maintenance and repair projects to meet infrastructure requirements at AMC major subordinate command RDTE installations and laboratories.
- (U) BMAR increased to $48 million.

(U) FY 1993 Planned Program:
- (U) Continue to minimally fund maintenance and repair activities and functions at AMC major subordinate command RDTE installations and laboratories.
- (U) BMAR reported at $31 million (under new reporting criteria).

(U) FY 1994 Planned Program:
- (U) Continue to minimally fund maintenance and repair activities and functions at AMC major subordinate command RDTE installations and laboratories.
- (U) BMAR reported at $35 million.

(U) Project M5ZZ - Maintenance and Repair - U.S. Army Corps of Engineers. 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, Vicksburg, MS; Cold Regions Research and Engineering Laboratory, Hanover, NH; Construction Engineering Research Laboratory, Champaign, IL, and Engineer Topographic Laboratories, Ft Belvoir, VA.

(U) FY 1992 Accomplishments:
- (U) Funded essential maintenance and repair projects to meet infrastructure requirements. BMAR continued to grow.

(U) FY 1993 Planned Program:
- (U) Continue to fund essential maintenance and repair projects at U.S. Army Corps of Engineers RDTE laboratories. BMAR continues to grow.

FY 1994 RDTE DESCRIPTIVF SUMMARY

Program Element: **#0605878A**
PE Title: **Maintenance and Repair - (RPM) RDTE** Budget Activity: **#6**

(U) FY 1994 Planned Program:

- **(U)** Continue to fund essential maintenance and repair projects at U.S. Army Corps of Engineers RDTE laboratories. BMAR continues to grow.

(U) Work Performed By: Subordinate commands and other activities of the U.S. Army Materiel Command and the U.S. Army Corps of Engineers R&D activities.

(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)
PE #0970131D (DOD RPM Fund)

(U) Other Appropriation Funds: Not applicable.

(U) International Cooperative Agreements: Not applicable

FY 1994 RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605896A**
PE Title: **Base Operations - RDT&E** Budget Activity: **#6**

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

Project Number / Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
M0ZZ	Base Operations - Army Materiel Command (AMC) Test Ranges		
	195238	188082	179682
M1ZZ	Base Operations - AMC Major Subordinate Commands and Laboratories		
	99994	91449	75744
M4ZZ	Base Operations - Corps of Engineers		
	16593	17943	18983
PE TOTAL	311825	297474	274409

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. The FY 1994 funding reflects a reduction to the workforce and infrastructure support at Picatinny Arsenal, NJ, in line with the Army's downsizing plans.

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 Agency; Ordnance Center and School; Army Material Systems Analysis Activity; and beginning with FY 1993, Ballistics Research Laboratory, Human Engineering Laboratory and Vulnerability Assessment Laboratory, reorganized under Army Research Laboratory. This project supports a combined population of nearly 40,000 military, civilians, contractors, and military dependents.

FY 1994 RDTE DESCRIPTIVE SUMMARY

Program Element: #0605896A
PE Title: **Base Operations - RDT&E** Budget Activity: #6

(U) **FY 1992 Accomplishments:**
- (U) Supported BASEOPS activities and functions for TECOM Test Ranges and tenant/satellite activities
- (U) Funded specific security projects on TECOM RDTE installations
- (U) Management initiatives were implemented to improve efficiency and reduce costs, i.e., graphic support, publications, security activities, official mail, and budget functions
- (U) GSA conversion of non-tactical vehicles was implemented at Aberdeen Proving Ground, MD, and White Sands Missile Range, NM.

(U) **FY 1993 Planned Program:**
- (U) This project continues to fund BASEOPS activities and functions for TECOM Test Ranges and tenant/satellite activities as described in paragraph B.
- (U) Funds specific security projects on TECOM RDTE installations

(U) **FY 1994 Planned Program:**
- (U) This project continues to fund BASEOPS activities and functions for TECOM Test Ranges and tenant/satellite activities as described in paragraph B.
- (U) Funds specific security projects on TECOM RDTE installations

(U) **Project M1ZZ - Base Operations - AMC Major Subordinate Commands and Laboratories:** Finances installation management for operating and maintaining other U.S. Army Materiel Command RDTE installations and laboratories, i.e., Army Research Laboratory, Adelphi, MD (previously known as Harry Diamond Laboratories), Picatinny Arsenal, NJ, and Natick Research, Development and Engineering Center, MA. Provides for the infrastructure base support along with common service base support to tenants and satellites.

(U) **FY 1992 Accomplishments:**
- (U) Supported the BASEOPS activities and functions for AMC RDTE Major Subordinate Command installations, laboratories and tenant/satellite activities.
- (U) Management initiatives were implemented to improve efficiency through reductions in graphic support; reductions in publications; restructure security activities; consolidation of official mail and mail personnel; consolidation of budget functions

(U) **FY 1993 Planned Program:**
- (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.

(U) **FY 1994 Planned Program:**
- (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.
- (U) The FY 1994 funding reflects a reduction to the workforce and infrastructure support at Picatinny Arsenal, NJ, in line with the Army's downsizing plans.

(U) **Project M4ZZ - Base Operations - Corps of Engineers:** Finances those BASEOPS activities and functions necessary for operating and maintaining U.S. Army Corps of Engineers RDTE laboratories; i.e., Waterways Experiment Station, Vicksburg, MS; Cold Regions Research and Engineering Laboratories, Hanover, NH; Construction Engineering Research Laboratory, Champaign, IL; and Topographic Engineering Center, Ft. Belvoir, VA.

FY 1994 RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605896A**
PE Title: **Base Operations - RDT&E** Budget Activity: **#6**

(U) FY 1992 Accomplishments:
- **(U)** Supported the BASEOPS activities and functions for the U.S. Army Corps of Engineers RDTE,A Laboratories.

(U) FY 1993 Planned Program:
- **(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.

(U) FY 1994 Planned Program:
- **(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.

(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 1994 RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605898A**
PE Title: **Management Headquarters (Research and Development)** Budget Activity: *#6*

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

Project Number / Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
MM03 Command Headquarters - TSG	5844	5155	3873
MM65 Laboratory Command (AMHA only)	8577	8329	8078
M831 AKAMAI	0	6712	0
PE TOTAL	14421	20196	11951

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 for the Akamai health project at Tripler Army Medical Center, HI.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project MM03 - Command Headquarters, The Surgeon General: This project funds the operation of the RDTE Army Management Headquarters Activities at the U.S. Army Medical Research and Development Command (USAMRDC), Ft Detrick, MD, including salaries and related personnel benefits for authorized civilian personnel and the associated administrative support.

(U) FY 1992 Accomplishments:
- (U) Performed long-range planning, programming and budgeting.
- (U) Developed policy and guidance.
- (U) Provided for the management and distribution of resources.

(U) FY 1993 Planned Program:
- (U) Perform long-range planning, programming and budgeting.
- (U) Develop policy and guidance.
- (U) Provide for the management and distribution of resources.

(U) FY 1994 Planned Program:
- (U) Perform long-range planning, programming and budgeting.
- (U) Develop policy and guidance.
- (U) Provide for the management and distribution of resources.

FY 1994 RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605898A**
PE Title: **Management Headquarters (Research and Development)** Budget Activity: **#6**

(U) **Project MM65 - Laboratory Command (AMHA Only):** This project funds the operation of the RDTE Army Management Headquarters Activities at the U.S. Army Research Laboratory (ARL), Adelphi, MD, including salaries and related personnel benefits for authorized civilian personnel and the associated administrative support.

(U) **FY 1992 Accomplishments:**
- (U) Performed long-range planning, programming and budgeting.
- (U) Developed policy and guidance.
- (U) Provided for the management and distribution of resources.

(U) **FY 1993 Planned Program:**
- (U) Perform long-range planning, programming and budgeting.
- (U) Develop policy and guidance.
- (U) Provide for the management and distribution of resources.

(U) **FY 1994 Planned Program:**
- (U) Perform long-range planning, programming and budgeting.
- (U) Develop policy and guidance.
- (U) Provide for the management and distribution of resources.

(U) **Project M831 - AKAMAI:** Project funds the Akamai health project to implement the medical diagnostic imaging support system (MDIS) at Tripler Army Medical Center, HI and to continue the clinical evaluation of MDIS technology.

(U) **FY 1992 Accomplishments:** Project not funded.

(U) **FY 1993 Planned Program:**
- (U) The Senate Appropriations Committee provided FY 1993 RDTE, Army funds for the Akamai health project to implement the medical diagnostic imaging support system (MDIS) at Tripler Army Medical Center, HI and to continue the clinical evaluation of MDIS technology.

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

(U) **Work Performed By:** The U.S. Army Research Laboratory, Adelphi, MD and the U.S. Army Medical Research and Development Command, Ft Detrick, MD.

(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 1994 RDTE DESCRIPTIVE SUMMARY

Program Element: #0708045A
PE Title: **Industrial Preparedness** Budget Activity: #6

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
DE71 Single Issue Tasks	1039	2689	0
DE74 Chemical Processes	944	2898	0
DE77 Electronics Manufacturing	1776	0	0
DE87 Manufacturing Process Control	0	1070	0
DE99 Environmentally Acceptable Processes	5140	15251	0
DF03 Optics/Electro-Optics	7035	0	0
DF04 Non-Metallic Materials	993	2811	0
DF05 Metals	11000	7873	0
PE TOTAL	27927	32592	0

B. (U) BRIEF DESCRIPTION OF ELEMENT: Supports the Army Manufacturing Technology (MANTECH) 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 MANTECH 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. The technologies selected have the potential for high payoff across the spectrum of Army weapon systems as well as a significant impacts on national manufacturing issues and the U.S. industrial base. The Army MANTECH Strategic Plan definitizes projected requirements, objectives and technical approaches to removing barriers to cost effective production. Effective FY 1994, Army MANTECH projects and funding will be consolidated within the Office of the Under Secretary of Defense (Acquisition) (OUSD(A)).

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 supp[orts] a wide variety of quick reaction, low cost efforts with significant paybacks to the Army in reduced insp[ection] costs and lower product variability.

(U) FY 1992 Accomplishments:

- (U) Started development of new metal removal process (broaching) for special purpose metal alloy (UDIMET 720).

Program Element: #0708045A
PE Title: **Industrial Preparedness** Budget Activity: #6

- (U) Material testing technologies: telemetry test system, uncooled focal plane arrays (sensors), road wheel endurance tester (complete), semiconductor device tester, process testing of lithium manganese batteries and microburst test apparatus (complete).
- (U) Completed initial Army MANTECH Strategic Plan.

(U) FY 1993 Planned Program:
- (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.
- (U) Restart efforts in stitchless seam technology required for troop uniform manufacture and advanced food processing.
- (U) Continue development of automated tools to analyze designs for potential production problems of new equipment.
- (U) Complete development of broaching process for UDIMET 720.
- (U) Complete development of sputtering process to extend cannon tube life.
- (U) Continue Army MANTECH strategic planning process.
- (U) Continue design of multi-axis vibration test system to enhance reliability prediction.

(U) FY 1994 Planned Program:
- (U) Program and funding consolidated within OUSD(A).

(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 1992 Accomplishments:
- (U) Continued advanced process development for nitramine propellants.
- (U) Filed patent for liquid energetic material sampling system.
- (U) Completed development of cryogenic process to manufacture explosive materials with less hazard to human operators and the environment.

(U) FY 1993 Planned Program:
- (U) Continue development of non-organic and non-polluting process for extruded and molded energetic materials.
- (U) Restart development of processes for enzymes used in protection and detection systems against chemical weapons.
- (U) Complete process development for chemical absorbing materials.
- (U) Restart process development for chemical defense antibodies.

(U) FY 1994 Planned Program:
- (U) Program and funding consolidated within OUSD(A).

(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 1992 Accomplishments:**
- (U) Completed automated testing process for monolithic microwave integrated circuits.
- (U) Completed development of first composite solders which have better performance characteristics but lower lead content than conventional solders.
- (U) Filed three patent applications for soldering technology.
- (U) Completed software for low cost, automated test equipment for use especially by lower tier electronics vendors.
- (U) Completed proof of principal for x-ray laminography and 3-d laser imaging.
- (U) Completed development of Solderability Tester which has potential to reduce DOD soldering costs by $200M annually.

(U) **FY 1993 Planned Program:**
- (U) Program transferred to Defense Conversion under the Director, Defense Research and Engineering (DDR&E).

(U) **FY 1994 Planned Program:**
- (U) Program and funding consolidated within OUSD(A).

(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 1992 Accomplishments:** Project not funded.

(U) **FY 1993 Planned Program:**
- (U) Complete development of a system for dimensional gauging of engine components to automate in-process inspection of physical features
- (U) Complete development of automated inspection/part recognition to digitize optical images for reverse engineering and inspection.
- (U) Continue application of novel sensors to evaluating bond quality of adhesive joints during manufacture and in field operations.
- (U) Complete development of ultrasonic method for measuring cannon tube thickness.
- (U) Continue developing process to evaluate the quality of high cost infrared detector array materials.

(U) **FY 1994 Planned Program:**
- (U) Program and funding consolidated within OUSD(A).

(U) **Project DE99 - Environmentally Acceptable Processes.** Validate or ensure environmental regulatory compliance, and increase worker safety while maintaining current industrial capability.

FY 1994 RDTE DESCRIPTIVE SUMMARY

Program Element: #0708045A
PE Title: **Industrial Preparedness** Budget Activity: #6

(U) **FY 1992 Planned Program:**
- (U) Supported the establishment of the National Defense Center for Environmental Excellence with funds directed by the FY 1992 Defense Appropriation.

(U) **FY 1993 Planned Program:**
- (U) Funds the Army in-house technical support.

(U) **FY 1994 Planned Program:**
- (U) Program and funding consolidated within OUSD(A).

(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 1992 Accomplishments:**
- (U) Continued manufacturing process development for missile seekers (94 GHz transceiver)
- (U) Continued development of an optical machine for the manufacture of spherical lenses.
- (U) Initiated industry/academia partnering in advance photonics processes.
- (U) Continued development of an optical machine for the finish polishing of optical lenses.
- (U) Continued efforts to improve the manufacturing processes of the infrared focal plane array DEWAR assembly.
- (U) Developed processes for single stage thermal electric cooler manufacture and assembly.
- (U) Continued efforts in the magneto-optical mapper for the manufacture of semi-conductor wafers for high performance missile sensors

(U) **FY 1993 Planned Program:**
- (U) Program transferred to Defense Conversion, under DDR&E.

(U) **FY 1994 Planned Program:**
- (U) Program and funding consolidated within OUSD(A).

(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 1992 Accomplishments:**
- (U) Continued to develop processes, controls and materials for adhesive bonding problems in optical fibers, helicopter blades and broad applications in joining problems

(U) **FY 1993 Planned Program:**
- (U) Complete development of manufacturing processes for advanced composite structures used in aircraft.
- (U) Complete development of process to automatically apply adhesive to fiber optic for guided missiles.

Program Element: **#0708045A**
PE Title: **Industrial Preparedness** Budget Activity: **#6**

- (U) Continue to develop processes, controls and materials for adhesive bonding problems in military applications of joining problems.
- (U) Complete development of process for molding composite sabots for ammunition.

(U) FY 1994 Planned Program:
- (U) Program and funding consolidated within OUSD(A).

(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 development of processes to economically use high performance materials in the design of engines, structural components and other high stress applications.

(U) FY 1992 Accomplishments:
- (U) Funding and technical objectives were directed in FY 1992 Defense Appropriation.
- (U) Initiated multi-faceted program to explore the application of austempered cast ductile iron to military equipment including ammunition, weapons, and armored vehicles. Initiated development of basic engineering tools to support further engineering analysis.
- (U) Developed process for producing track of the Abrams tank, Bradley fighting vehicle and future armored vehicles using ductile iron.
- (U) Developed and demonstrated application of ductile iron to M864 ammunition.

(U) FY 1993 Planned Program:
- (U) Complete directed effort in austempered ductile iron.
- (U) Initiate planning for Thrust Areas in Joining/Forming/Machining and High Performance Materials as funding becomes available.

(U) FY 1994 Planned Program:
- (U) Program and funding consolidated within OUSD(A).

(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.

(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 MANTECH 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 MANTECH tasks.

FY 1994 RDTE DESCRIPTIVE SUMMARY

Program Element: #0708045A
PE Title: **Industrial Preparedness** Budget Activity: #6

- (U) Other government agencies like NASA, the 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, which is funded with procurement appropriations.

(U) **Other Appropriation Funds:** Not applicable.

(U) **International Cooperative Agreements:** Not applicable.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0901600A**
PE Title: **Contract Administration/Audit** Budget Activity: **#6**

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

Project Number Title	FY 1992 Actual	FY 1993 Estimate	FY 1994 Estimate
MM70 Contract Administration/Audit	0	0	92012

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Department of Defense (DoD) transferred the Defense Contract Management Command (DCMC) and the Defense Contract Audit Agency (DCAA) from the Defense Agencies appropriations to the Defense Business Operations Fund (DBOF) effective FY 1994. The mission of DCAA is to perform all necessary contract audits for DoD and provide accounting and financial advisory services for negotiation, administration, and settlement of contracts and subcontracts. The mission of DCMC is to ensure contractor compliance with cost, delivery, technical, quality and other terms of the contract; to accept products on behalf of the government; to provide program management support; and to ensure contractors are paid. The incorporation of DCMC/DCAA activities in the DBOF allows those activities to be funded based on the requirement for their services instead of a direct appropriation. The FY 1994 budget reflects DoD's estimate of Army's requirement for contract audit and management services that will be incurred as a result of contract awards made in the RDTE, Army appropriation. These funds will be used to finance DCAA and DCMC services that are performed in support of programs budgeted in this appropriation. This represents a change from the way the budget was presented last year and reflects a Congressional and Departmental initiative to move toward mission budgeting which calls for an improved method of budgeting and justifying resources. The visibility of total costs related to contract awards and administrative requirements is improved in this presentation because support service funding for related contracts is included in this appropriation.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project MM70 - Contract Administration/Audit:

(U) FY 1992 Accomplishments:
- (U) DCMC and DCAA were funded primarily through annual Operation and Maintenance Appropriations.

(U) FY 1993 Planned Program:
- (U) DCMC and DCAA are currently funded primarily through annual Operation and Maintenance Appropriations.

(U) FY 1994 Planned Program:
- (U) Funds audit/management efforts on RDTE, Army contracts at DCMC/DCAA activities.

FY 1994 RDT&E DESCRIPTIVE SUMMARY

Program Element: **#0901600A**
PE Title: **Contract Administration/Audit** Budget Activity: **#6**

(U) Work Performed By: The Defense Contract Audit Agency is a separate agency under the direction, authority, and control of the DoD Comptroller. The Defense Contract Management Command is a separate command under the direction, authority, and control of the Director, Defense Logistics Agency.

(U) Related Activities: 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

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
1	ASD (RA), Pentagon, Room 3E325, Washington, DC 20310
1	ASD (C3I), Pentagon, Room 3C200, Washington, DC 20310
1	ASD C3I(IS)/R&A, Pentagon, Room 1C535, Washington, DC 20310
1	ASD (ISP), Pentagon, Room 1D469, Washington, DC 20310
1	ASD (ISA), Pentagon, Room 4B938, Washington, DC 20310
1	ASD (LA), Pentagon, Room 3D918, Washington, DC 20310
2	ASD (SO/LIC-F&A), Pentagon, Room 1A674, Washington, DC 20310
2	ASD (FM&P)RM&S/PPBS S&L, Pentagon, Room 4C761, Washington, DC 20310
1	ASD (HA), Pentagon, Room 3E321, Washington, DC 20310
1	ASD (PA&E)/GPP/LFD, Pentagon, Room 2B256, Washington, DC 20310
1	ASD (PA&E), Pentagon, Room 2E313, Washington, DC 20310
15	JCS (J-8), Pentagon, Room 1E963, Washington, DC 20310
1	HQDA (SAUS-OR), Pentagon, Room 2E660, Washington, DC 20310
1	HQDA (SAIL), Pentagon, Room 2E614, Washington, DC 20310
1	HQDA (SARDA), Pentagon, Room 2E673, Washington, DC 20310
1	HQDA (SAFM-CA), 1900 Half Street, S.W., Washington, DC 20324-2500
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
1	HQDA (DACS-DMP), Pentagon, Room 1C460, Washington, DC 20310
7	HQDA (SAIS-PPG), Pentagon, Room 1D679, Washington, DC 20310
6	HQDA (DACS-DPA), Pentagon, Room 3C747, Washington, DC 20310
1	HQDA (DACS-DMC), Pentagon, Room 3D631, Washington, DC 20310
1	HQDA (DACS-DMO), Pentagon, Room 3C567, Washington, DC 20310
2	HQDA (DACS-TE), Pentagon, Room 3C571, Washington, DC 20310
1	HQDA (ASNS-OPM-S), Pentagon, Room 2B486, Washington, DC 20310
1	HQDA (DAMI-CIS), Pentagon, Room 2D481, Washington, DC 20310
1	HQDA (DAMI-PBB), Pentagon, Room 2E477, Washington, DC 20310
2	HQDA (DAPE-ZXO), Pentagon, Room 2D735, Washington, DC 20310
2	HQDA (DALO-RMP), Pentagon, Room 1E565, Washington, DC 20310
1	HQDA (DALO-ZA), Pentagon, Room 3E560, Washington, DC 20310
2	HQDA (DAMO-ZR), Pentagon, Room 3D526, Washington, DC 20310
1	HQDA (DAMO-ZX-DAP), Pentagon, Room 3C471, Washington, DC 20310
9	HQDA (DAMO-FDR), Pentagon, Room 2D570, Washington, DC 20310-0460
1	HQDA (DAMO-SSL), Pentagon, Room 3B521, Washington, DC 20310
1	HQDA (DAMO-SWC), Pentagon, Room 3C549, Washington, DC 20310
1	HQDA (DAAR-ZX), Pentagon, Room 3E390, Washington, DC 20310
1	HQDA (NGB-ZA), Pentagon, Room 2E394, Washington, DC 20310
1	HQDA (NGB-ARC), Pentagon, Room 2D400, Washington, DC 20310

APPENDIX A

RDT&E CONGRESSIONAL DESCRIPTIVE SUMMARIES
MAILING LIST - Continued

PRINT	ADDRESS
1	HQDA (DASG-ZA), 5111 Leesburg Pike, Room 638, Falls Church, VA 22041
1	HQDA (DASG-RMZ), 5111 Leesburg Pike, Room 554, Falls Church, VA 22041-3258
2	HQDA (DASG-RDZ), Pentagon, Room 3E474, Washington, DC 20310-2300
1	HQDA (DAEN-ZCM), Pentagon, Room 1E682, Washington, DC 20310
1	HQDA (DAEN-ZCP), Pentagon, Room 1E665, Washington, DC 20310
1	HQDA (SAPA-MR), Pentagon, Room 2E641, Washington, DC 20310
2	HQDA (CSSD-RM), P.O. Box 15280, Arlington, VA 22215-0150
2	HQDA (SAAG-PRP), Room 1309, 3101 Park Center Drive, Alexandria, VA 22302-1596
1	HQDA (SAAA-PP), Pentagon, Room 3E741, Washington, DC 20310
1	HQDA (DAMH-ZB), Pulaski Bldg, Room 4229, 20 Massachusetts Avenue, Washington, DC 20314
1	HQDA, US Army Cost and Economic Analysis Center, ATTN: CACC-FD, Pentagon, Room 2A680, Washington, DC 20310-2080
2	SDIO/RM, 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
2	Commander, US Army Intelligence and Security Command, ATTN: IARM-PB, Fort Belvoir, VA 22060-5370
2	Commander, US Army Information Systems Command, ATTN: ASRM-PB-I, Fort Huachuca, Arizona 85613-5000
1	Commander, US Army Nuclear and Chemical Agency, ATTN: MONA-OPS, Bldg 2073, Backlick Road, Springfield, VA 22150
1	Commander, US Army Medical R&D Command, ATTN: SGRD-RMC, Fort Detrick, Frederick, MD 21701-5012
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
1	Commander, US Army Operational Test and Evaluation Agency, ATTN: CSTE-RMD-S, 4501 Ford Avenue, Alexandria, VA 22302-1458
1	Commander, US Army Operational Test and Evaluation Agency, ATTN: CSTE-MIS-T, 4501 Ford Avenue, Alexandria, VA 22302-1458
1	Commander, US Army Operational Test and Evaluation Agency, ATTN: CSTE-RMD-B, 4501 Ford Avenue, Alexandria, VA 22302-1458
1	Commander, US Army Operational Test and Evaluation Agency, ATTN: CSTE-RMD-M, 4501 Ford Avenue, Alexandria, VA 22302-1458
25	Commander, US Army Materiel Command, ATTN: AMCRD-AB, 5001 Eisenhower Avenue, Alexandria, VA 22333-0001
2	Commander, US Army Materiel Command, ATTN: AMCAE-P, 5001 Eisenhower Avenue, Alexandria, VA 22333-0001

APPENDIX A

RDT&E CONGRESSIONAL DESCRIPTIVE SUMMARIES
MAILING LIST - Continued

PRINT	ADDRESS
10	Commander, US Army Materiel Command, ATTN: AMCLD-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 Aviation Systems Command, ATTN: AMSAV-CG, St. Louis, MO 63120-1798
2	Commander, US Army Troop Support Command, ATTN: AMSTR-CG, St. Louis, MO 63120-1798
2	Commander, US Army Communications-Electronics Command, ATTN: AMSEL-CG, Ft. Monmouth, NJ 07703-5000
5	Commander, US Army Missile Command, ATTN: AMSMI-AS (Library), Bldg 5250, RMC-147, Redstone Arsenal, AL 35898-5000
2	Commander, US Army Test and Evaluation Command, ATTN: AMSTE-RM, Aberdeen Proving Ground, MD 21005-5055
2	Commander, US Army Tank-Automotive Command, ATTN: AMSTA-CG, Warren, MI 48397-5000
2	Commander, US Army Laboratory Command, ATTN: AMSLC-CG, Adelphi, MD 20783-1145
1	Commander, US Army Armament Research, Development and Engineering Center, ATTN: SMCAR-CO, Dover, NJ 07806-5000
1	Commander, US Army Toxic & Hazards Material Agency, ATTN: CETHA-RM, Edgewood Area, Aberdeen Proving Ground, MD 21010-5055
2	Commander, US Army Materiel Systems Analysis Activity, ATTN: AMXSY-PB, Aberdeen Proving Ground, MD 21005-5071
1	Commander, US Army Chemical Research, Development and Engineering Center, ATTN: SMCCR-CG, Aberdeen Proving Ground, MD 21010-5423
1	Commander, US Army Chemical Research, Development and Engineering Center, ATTN: SMCCR-PMP, Aberdeen Proving Ground, MD 21010-5423
1	Commander, US Army Chemical Research, Development and Engineering Center, ATTN: SMCCR-FP, Aberdeen Proving Ground, MD 21010-5423
1	Program Manager, Instrumentation, Targets and Threat Simulators, ATTN: AMCPM-ITTS-P, 12350 Research Parkway, Orlando, FL 32826-3276
1	Program Manager, Tank Main Armament Systems, ATTN: AMCPM-TMD PMD, Picatinny Arsenal, NJ 07806-5000
2	Program Executive Officer, Global Protection Against Limited Strikes, ATTN: SFAE-GPL-HSV-R, P.O.Box 1500, Huntsville, AL 35807-3801
2	Program Executive Officer, Armaments, ATTN: SFAE-AR, Building 171, Picatinny Arsenal, Picatinny, NJ 07806-5000
2	Program Executive Officer, Armored Systems Modernization, ATTN: SFAE-HFM-P, Warren, MI 48397-5000

APPENDIX A

RDT&E CONGRESSIONAL DESCRIPTIVE SUMMARIES
MAILING LIST - Continued

PRINT	ADDRESS
2	Program Executive Officer, Aviation, ATTN: SFAE-AV, 4300 Goodfellow Boulevard, St. Louis, MO 63120-1798
2	Program Executive Officer, Combat Support, ATTN: SFAE-CS, Warren, MI 48397-5000
2	Program Executive Officer, Command and Control Systems, ATTN: SFAE-CC-PMO, Ft. Monmouth, NJ 07703-5000
2	Program Executive Officer, Communication Systems, ATTN: SFAE-COM, Ft. Monmouth, NJ 07703-5000
2	Program Executive Officer, Tactical Missiles, ATTN: SFAE-MSL, Redstone Arsenal, AL 35898-8000
2	Program Executive Officer, Intelligence and Electronic Warfare, ATTN: SFAE-IEW-BM, Ft. Monmouth, NJ 07703
2	Program Executive Officer, Standard Army Management Information System, ATTN: AS PES, Stop C-3, Ft. Belvoir, VA 22060-5456
3	Commander, US Army Space and Strategic Defense Command, ATTN: CSSD-CO-BP, P.O. Box 1500, Huntsville, AL 35807-3801
1	Commander, US Army Corps of Engineers, ATTN: CERD-M, Washington, DC 20314
1	Commander, US Army Force Integration Support Agency, ATTN: MOFI-TRED-O, Building 2588, Fort Belvoir, VA 22060-5587
4	Commander, 902d MI Group, ATTN: IAGPA-OPOP, Ft. Meade, MD 20755-5910
1	Commander, HQ US Army Missile & Space Intelligence Center, ATTN: AIAMS-YCC, Redstone Arsenal, AL 35898-5000
1	Commander, US Army Countermeasures/Counter Countermeasures Center, ATTN: AMX-CM-RF, 2800 Powder Mill Road, Adelphi, MD 20783
1	Commander, US Army Belvoir Research, Development & Engineering Center, ATTN: STRBE-Z, Ft. Belvoir, VA 22060-5606
2	Commander, US Army Research Office, ATTN: SLCRO-AO (Security Officer), P.O. Box 12211, Research Triangle Park, NC 27709
1	Commander, Combined Arms Center, ATTN: ATZL-CAM-I, Ft. Leavenworth, Kansas 66027-5000
1	Director, DMA Aerospace Center, ATTN: STT, 3200 South Second Street, St. Louis, MO 63118
1	Director, DMA Hydrographic/Topographic Center, ATTN: ST (STT), 6500 Brookes Lane, Washington, DC 20315
1	Director, US Army Materiel Command Support Activity, ATTN: AMXTB-D, Ft. Lewis, WA 98433-5000
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
1	DOD Explosives Safety Board, Hoffman Building 1, Room 856C, 2461 Eisenhower Avenue, Alexandria, VA 22331-0600
3	Executive Office of the President, Office of Management and Budget, National Security Division, Room 10001, Washington, DC 20503

APPENDIX A

RDT&E CONGRESSIONAL DESCRIPTIVE SUMMARIES
MAILING LIST - Continued

PRINT	ADDRESS
1	Director, Joint Tactical Command, Control & Communications Agency, ATTN: C3A-PPBA, Ft. Monmouth, NJ 07703-5513
1	Headquarters, Central Intelligence Agency, ATTN: OGI/CTID/DI, Room 3G30, Washington, DC 20505
1	Central Intelligence Agency, ATTN: OSWR/SDT, P.O. Box 1925, Washington, DC 20505
1	DOD Assistant Inspector General for Auditing, AM Division, Room 725, 400 Army-Navy Drive, Arlington, VA 222021
2	Inspector General, Department of Defense, Pentagon, Room 1E482, Washington, DC 20310
2	US General Accounting Office, ATTN: NSIAD, Room 5001, 441 G Street, N.W., Washington, DC 20548
1	US General Accounting Office, ATTN: IMTEC/DAMS, Room 6067, 441 G Street, N.W., Washington, DC 20548
1	NAVCOMPT (NCB-2), ATTN: NCB-922E2, Pentagon, Room 4C640, Washington, DC 20350
1	NAVCOMPT (NCBG-2), ATTN: NCBG-27, Pentagon, Room 4C640, Washington, DC 20350
1	Chief of Naval Operations, Navy Department, ATTN: OP-987, Pentagon, Room 5D760, Washington, DC 20350-2000
1	Office of Chief of Naval Research, Office of Naval Technology, ATTN: ONT 20P3, 800 North Quincy Street, Arlington, VA 22217-5000
1	Office of Chief of Naval Research, Office of Advanced Technology, Navy, ATTN: OCNR Code 30, 800 North Quincy Street, Arlington, VA 22217-5000
1	Office of Chief of Naval Research, ATTN: OCNR Code 01122, 800 North Quincy Street, Arlington, CA 22217-5000
2	Commander, Naval Weapons Center, ATTN: Code 128 (R&D Planning Program Director), China Lake, CA 93555
2	Commander, Naval Surface Weapons Center, ATTN: Technical Library E432, White Oak, Silver Spring, MD 20910
1	Department of the Air Force, Wright Aeronautical Laboratories, Avionics Laboratory, ATTN: AFWAL/GLXRA, Wright-Patterson AFB, Ohio 45433
1	SAF/AQT, Pentagon, Room BD944, Washington, DC 20330-1000
2	HQ USAF/FMBMC, Pentagon, Room 5C129, Washington, DC 20330-5012
4	HQ US Marine Corps, Deputy Chief of Staff for RD&S, Code (MC-RDP-30), Washington, DC 20380
2	Commandant, US Army War College, ATTN: Classified Library, Carlisle Barracks, PA 17013-5050
2	HQ Defense Mapping Agency, ATTN: RE, 8613 Lee Highway, Fairfax, VA 22031-2137
1	Defense Nuclear Agency, ATTN: COMP-2.2, 6801 Telegraph Road, Alexandria, VA 22310
1	Defense Advanced Research Projects Agency Library, 3701 North Fairfax Drive, Arlington VA 22203-1714
1	National Defence Headquarters, ATTN: DLPC (TRADOC LO), 101 Colonel By Drive, Ottawa, Ontario Canada K1A 0K2
1	Institute for Defense Analyses, 1801 North Beauregard Street, Alexandria, VA 22311

APPENDIX A

RDT&E CONGRESSIONAL DESCRIPTIVE SUMMARIES
MAILING LIST - Continued

PRINT	ADDRESS
1	Headquarters, National Aeronautical and Space Administration, Code XD, ATTN: Deputy DOD Affairs, Washington, DC 20546
1	ACDA/NWC/DPA, Room 5741, 320 21st Street, N.W., Washington, DC 20451
2	Pentagon Library, ATTN: Army Studies, Room 1A518, Washington, DC 20310
2	System Planning Corporation, Technical Library, 1500 Wilson Boulevard, Arlington, VA 22209
1	Director, Defense Finance and Accounting Service-Indianapolis Center, ATTN: DFAS-I-PA, Indianapolis, IN 46249-0001

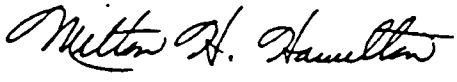
Any changes to this distribution list should be provided to HQDA (SAFM-BUI-S), Washington, DC 20310, Autovon 225-3138 or 225-5384.

The proponent agency of this pamphlet is the Office of the Assistant Secretary of Army (Financial Management). Users are invited to send comments and suggested improvements to (SAFM-BUI-S), Washington, DC 20310-0103.

By Order of the Secretary of the Army:

GORDON R. SULLIVAN
General, United States Army
Chief of Staff

Official:



MILTON H. HAMILTON
Administrative Assistant to the
Secretary of the Army

Distribution: Special Distribution