AD-A247 523

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*DA PAM 5-6-1

Supporting Data Amended FY 1992/FY 1993
Biennial Budget Estimate

Submitted to Congress - January 1992

Descriptive Summaries Of The

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RESEARCH, DEVELOPMENT, TEST AND EVALUATION, Army Appropriation

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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, February 1991

92-06940

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REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

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

1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	January 1992	January 1992 - January 1993

4. TITLE AND SUBTITLE Supporting Data Amended FY 1992/1993 Biennial Budget Estimate 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-R)
Pentagon, Room 3D454
Washington, DC 20310-0109

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
HQDA (SAFM-BUI-R)
Pentagon, Room 3D454
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

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		

AMENDED FY 1992/FY 1993 BIENNIAL 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 Amended FY 1992/FY 1993 Biennial Budget to the FY 1992/1993 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
0203806/DB65	HAWK Product Improvement Program	0203801/D690
0303401/D491	Communications Security Equipment Tech	0303140/D491
0603813/DB37	TRACTOR PULL	0602813/DC48
0603002/D995	Soldier Survivability	0503001/DXXA
0603007/A795	Education and Training	0603007/A794
0603393/DB64	TRACTOR TREAD	0603018/DB89
0603645/DB83	TRACTOR DUMP	0603019/DB90
0603808/DB58	TRACTOR CAGE	0603322/AB92
0603808/DB58	TRACTOR CAGE	0603322/AB93
0604813/DB63	TRACTOR PULL	0603813/DB37
0604216/DC72	T-800 Engine	0604223/DC72
0603606/D609	Heavy Assault Bridge	0604649/DG26
0605894/All	Minor Construction	0605876/All
0605894/All	Maintenance and Repair	0605878/All

B. Developmental Transitions of Major Programs

OLD PE/PROJECT	TITLE	NEW PE/PROJECT
0602303/A214	Dual Mode Seeker	0603313/D404
0602782/AH92	Tactical Communications System - AD	0603805/D246

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C. Establishment of New Program Elements

TITLE	NEW PE/PROJECT
Communications Security Equipment	0303140/D491
Modeling and Simulation	0602308/AC99
TRACTOR PULL	0602813/DC48
TRACTOR TREAD	0603018/DB89
TRACTOR DUMP	0603019/DB90
Future Command and Control Vehicle	0603053/DG23
Air Defense/Precision Strike Technology Demonstration	0603238/All
Artillery Propellant Development	0603640/DB91
Engineer Mobility Equipment - Advanced Development	0603649/DG24
TRACTOR PULL	0603813/DB37
Engineer Mobility - Engineering Development	0604649/All
Minor Construction (RPM) - RDT&E	0605876/All
Maintenance and Repair (RPM) - RDT&E	0605878/All

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
0603322A
0603393A
0102814A
0603018A
0603019A
0603808A
0603813A
0604767A
0604769A
0604812A
0203744A
0203806A
0203808A
0301359A
0305127A

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

5. RDTE, Army resources allocated to the Medical Research and Development Command, Fort Detrick, Maryland were transferred to the Defense Health Programs Appropriation effective FY 1993. The program elements involved were:

PE 0601101A, Project A91C
PE 0601102A, Project BS11
Project BS12
Project BS13
Project BS14
Project BS15
Project BS16
Project BS17
PE 0602787A, All Projects
PE 0603002A, All Projects
PE 0603105A, All Projects
PE 0603807A, All Projects
PE 0604807A, All Projects
PE 0605801A, Project MM02
PE 0605898A, Project MM03

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

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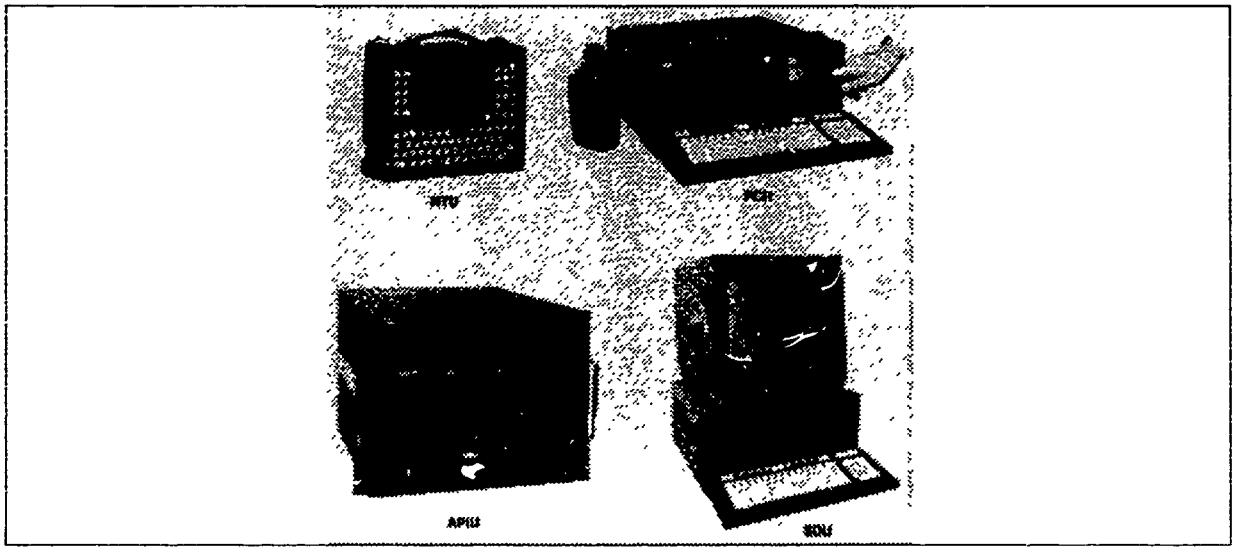
AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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**



POPULAR NAME: **AFATDS**

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

SCHEDULE	FY 1991	FY 1992	FY 1993	To Complete
Program Milestones				ASARC III 4/94 Version 1 IOC 1/95
Engineering Milestones	SDR 11/90 SSR 3/91 Version 1 PDR 6/91			
T&E Milestones			Version 1 SST 6/93 Version 1 FDTE 7/93	Version 1 IOTE 2/94 Version 2 FDTE 3/95
Contract Milestones		Version 2 Option 5/92		
BUDGET ($000)	**FY 1991**	**FY 1992**	**FY 1993**	**Program Total (To Complete)**
Major Contract	20670	24310	25810	Cont
Support Contract	6376	8457	6492	Cont
In-House Support	2987	3425	3740	Cont
GFE/ Other	10030	11951	5590	Cont
Total	40063	48143	41632	Cont

AMENDED FY 1992/1993 BIENNIAL RDTE 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**

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 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, nuclear, non-nuclear and chemical fire planning and the coordination of/and the 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 utilize AFATDS and their unique requirements will be added. AFATDS will interoperate with the German fire support system (ADLER) and British fire support system (BATES).

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- (U) Demonstrated a segment of AFATDS concept evaluation running on ATCCS CHS
- (U) Completed system design; conducted system design review (SDR)
- (U) Analyzed software requirements; conducted software specification review (SSR)
- (U) Conducted preliminary design review (PDR)

(U) FY 1992 Planned Program:
- (U) Conduct critical design review (CDR) of each computer software configuration item (CSCI)
- (U) Start Code, integration, and test of version 1 software
- (U) Version 2 software OPTION decision to be made

(U) FY 1993 Planned Program:
- (U) Conduct operator training for Force Development Test & Evaluation (FDTE)
- (U) Complete code, integration, and test of version 1
- (U) Conduct force development test and experimentation on version 1 software
- (U) Conduct the version 1 formal qualification test and the system software test

(U) Program Plan to Completion:
- (U) AFATDS Army Systems Acquisition Review Council (ASARC) III, 4/94
- (U) Start version 3, 11/94
- (U) Complete version 2, 1/95

AMENDED FY 1992/1993 BIENNIAL RDTE 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**

- **(U)** Version 1 initial operational capability (IOC), 1/95
- **(U)** Conduct follow-on test & evaluation of version 2, 7/95

D. (U) WORK PERFORMED BY: The support contract was awarded to ARC Professional Service Group, Shrewsbury, NJ in August 1986. The version 1 software development contract with option for version 2 for the AFATDS software was awarded to Magnavox Government and Industrial Electronics Company, Ft. Wayne, IN in Apr 1990. The in-house developing agency is the Program Executive Office, Command and Control Systems, Ft Monmouth, NJ.

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE 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	03/81
Letter of Agreement	12/84
Approved Required Operational Capability (ROC)	01/89
Approved Operational & Organizational Plan (Updated)	01/89
System specification	12/89
AFATDS Test Evaluation Master Plan (TEMP)	03/90

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 C3I Systems Engineering). AFATDS is part of the overall ATCCS, which is managed by the Program Executive Office Command and Control Systems. No unnecessary duplication exists within the Army or DoD.

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands) None

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

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

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#203735A**
PE Title: **Combat Vehicle Improvement Program** Budget Activity: **#4**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D280	Recovery Vehicle Improvement Program				
	500	- 0 -	10782	16675	27957
D330	M1A1 Block Improvement Program				
	109498	29624	11776	- 0 -	543282
D332	M2/M3 Fighting Vehicle Improvement Program				
	7054	- 0 -	- 0 -	- 0 -	Cont
PE TOTAL	117052	29624	22558		

B. (U) BRIEF DESCRIPTION OF ELEMENT: These programs respond to deficiencies highlighted durning Desert Storm, continue evolutionary technological advancements and enhance the combat capability of toaday, 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 Recovery Vehicle Improvement Program is one initiative to addressing Operation Desert Storm deficiencies.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND 1993:

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D280 Recovery Vehicle Improvement Program	500	- 0 -	10782	16675	27957

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: At 750 HP and 56 tons, the current recovery vehicle (M88A1) lacks tractive power to safely tow the 65+ ton M1A1 Abrams tank without a second M88 or M1A1 tank to act as a brake vehicle. The Improved Recovery Vehicle (IRV) is a product improved M88A1. Improvements include an up-powered engine, increased armor protection, and a heavier weight of 68 tons.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- (U) Contract awarded to BMY for teardown and engineering
- (U) Contract awarded to BMY for final development and refurbishment of prototypes, test support and development of TDP

(U) FY 1992 Planned Program: (Funded with FY 91 carryover)
- (U) Refurbishment of test vehicles
- (U) Application of necessary technical modifications
- (U) Begin planned test program

(U) FY 1993 Planned Program:
- (U) Complete technical and user testing
- (U) Acquire TDP

D. (U) WORK PERFORMED BY: An Engineering and Manufacturing Development (EMD) contract with BMY Company, York, PA will produce 5 prototype vehicles which will be delivered to the government for test in June 1992. Operational and technical testing is scheduled to be completed by August 1993.

E. (U) COMPARISON WITH FY1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. (U) **TECHNICAL CHANGES:** A change to the ROC, dated 29 Jan 92, eliminates the requirement for increased boom and winch capabilities.
2. (U) **SCHEDULE CHANGES:** None
3. (U) **COST CHANGES:** None

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

Project Number: **#D280**
Budget Activity: **#4**

F. (U) PROGRAM DOCUMENTATION:

ROC 01/92
TEMP 10/92

G. (U) RELATED ACTIVITIES: None

H. (U) OTHER APPROPRIATION FUNDS:
Weapons and Tracked Combat Vehicles
SSN - GA0570

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

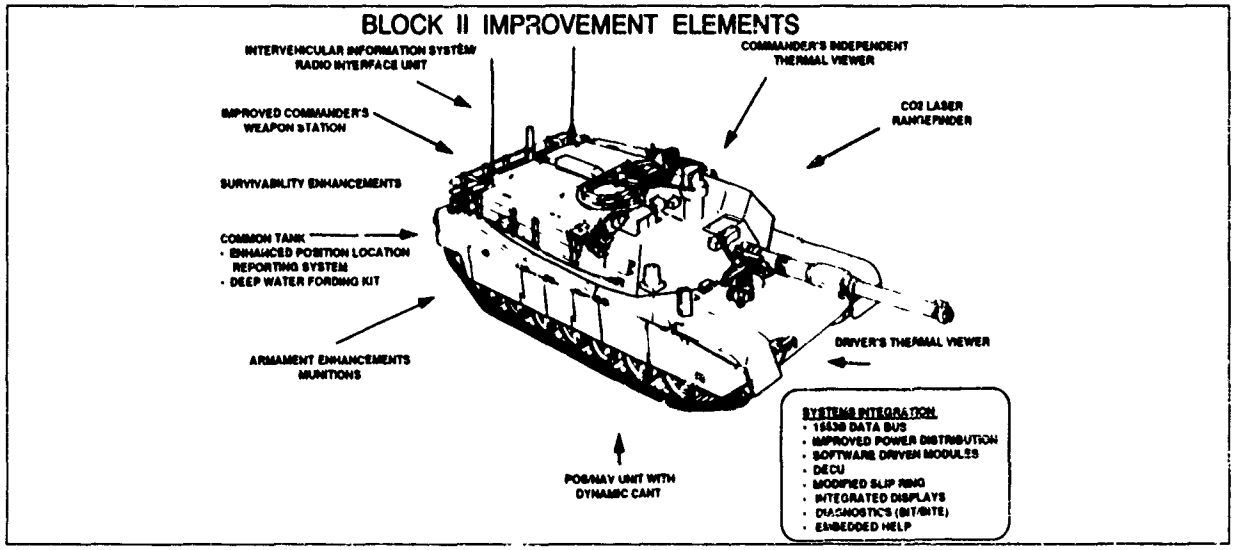
J. (U) MILESTONE SCHEDULE:

MILESTONE	MILESTONE SCHEDULE
Congress reinstated the IRV Program	Jan90
IRV testing began at APG	Aug90
AS/AP approved by HQDA	Oct90
BMY contract award for teardown	Mar91
BMY contract 2 award for TT/UT & TDP	Sep91
Baseline test begins	Jun92
TT/UT commences	Oct92
TT/UT completed	Aug93
Milestone IIIA decision	Oct93

AMENDED FY 1992/1993 RIENNIAL RDTE DESCRIPTIVE SUMMARY

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

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



POPULAR NAME: **Abrams Tank**

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

SCHEDULE	FY 1991	FY 1992	FY 1993	To Complete
Program Milestones	M1A2 MSIIIA 3/92	First M1A2 Delivery 11/92		
Engineering Milestones	First Proto Delivery 12/90			
T&E Milesones	User Test 08/91 Tech Test 01/91		Live Fire Test 11/92	
Contract Milestones				
BUDGET ($000)	**FY 1991**	**FY 1992**	**FY 1993**	**Program Total (To Complete)**
Major Contract	85468	24224	- 0 -	(- 0 -)
Support Contract	10248	3900	10276	(- 0 -)
In House support	1531	1500	1500	(- 0 -)
GFE/ other	12251		- 0 -	(- 0 -)
Total	109498	29624	11776	(- 0 -)

AMENDED FY 1992/1993 RIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0203735A** Project Number: **#D330**
PE Title: **Combat Vehicle Improvement Program** 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) provides for timely initiation of evolutionary improvements which anticipate threat changes and capitalizes on technological opportunities. The BIP introduces time-phased product improvements to the production line in groups called "Blocks" to minimize production costs while providing effective configuration control. The FY1985 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 1985-1993 block improvement (Block II) includes a Commander's Independent Thermal Viewer, Improved Commander's Weapons Station, position navigation unit and a digital data power bused electronics architecture. These improvements will provide lethality, fight ability and survivability, along with improvements and cost reductions in both maintenance and operations and support (O&S). 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 updates. The effort includes a modest weight reduction program. This BIP will significantly enhance the Abrams' survivability and overall effectiveness on the battlefield.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- **(U)** Delivered 10 M1A2 prototypes
- **(U)** Began development and qualification testing of the M1A2 tank

(U) FY 1992 Planned Program:
- **(U)** Complete user and technical testing to support milestone IIIA
- **(U)** Conduct milestone IIIA ASARC and award low-rate initial production contract for 62 M1A2 tanks

(U) FY 1993 Planned Program:
- **(U)** Conduct production demonstration of 62 tanks and distribute per Basis of Issue Plan
- **(U)** Complete technical testing
- **(U)** Conduct weight reduction program
- **(U)** Complete and shelve the technical data package

(U) Program Plan to Completion:
- **(U)** Program ends in FY93

D. (U) WORK PERFORMED BY: In-house efforts accomplished by Tank Automotive Command, Warren, MI. Primary contractor is Land Systems Division, General Dynamics Corporation, Sterling Heights, MI.

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: None
2. (U) SCHEDULE CHANGES: A 4-6 month slip is caused by development cost increase and the decision to terminate program following FY91 procurement buy.
3. (U) COST CHANGES: $17.4M reprogrammed into PE from procurement line in FY91 to cover cost growth in full-scale development contract.

AMENDED FY 1992/1993 RIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0203735A** Project Number: **#D330**
PE Title: **Combat Vehicle Improvement Program** Budget Activity: **#4**

F. (U) PROGRAM DOCUMENTATION:

Abrams Block II Program Approval-HQDA In-Process Review	2/85
Preliminary Design Review	12/85
Critical Design Review -ICWS	3/87
System Requirements Review	3/88
System Design Review	6/88
Chief of Staff Army Decision Review	9/88
Defense Acquisition Board	12/88
Preliminary Design Review	4/89
Defense Acquisition Board	8/89
Critical Design Review	9/89
Army Program Review	3/90

G. (U) RELATED ACTIVITIES:
PE #0602601A (Combat Vehicle and Automotive Technology)
PE #0603005A (Combat Vehicle and Automotive Advanced Technology)
PE #0603645A (Armored Systems Modernization - Futurc)
There is no unnecessary duplication of effort within the Army or Department of Defense

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

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
WEAPONS & TRACKED COMBAT VEHICLES (Procurement)			
SSN G82917 M1A1 Abrams Tank Series (MYP)	696424	106568	32397
SSN GA0700 M1 Abrams Tank (Modifications)	110177	79343	25202

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS:

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

B. US/GE Agreement concerning the harmonization of Abrams and Leopard 2 MBT to include the 120mm smoothbore gun and ammo; Addendum 3 adds emerging technologies to the areas of cooperation.

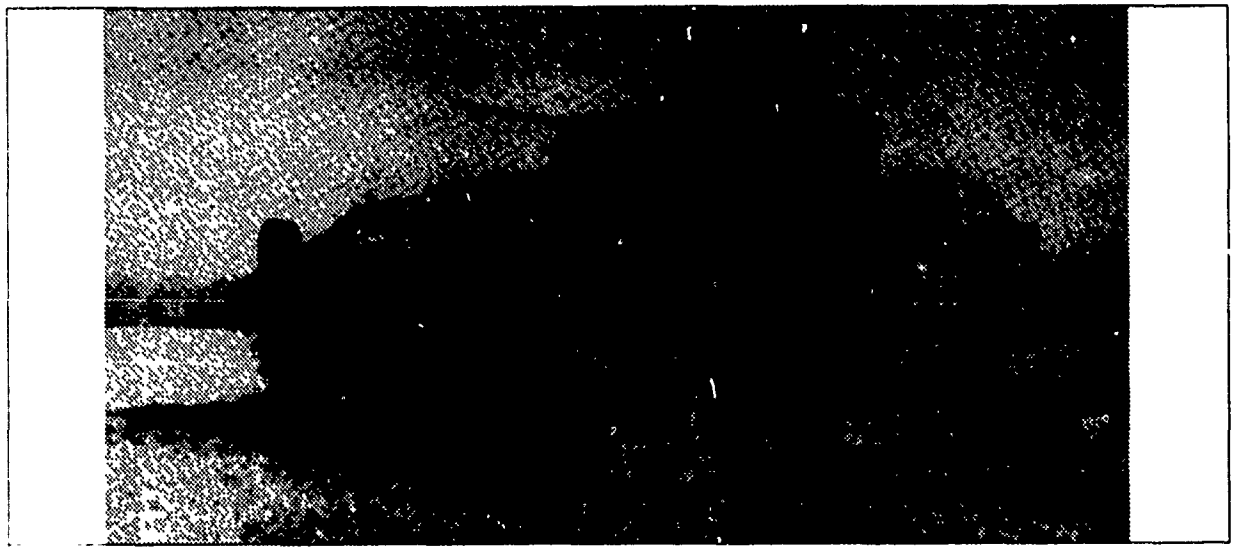
C. US/GE Combat Vehicle Command and Control (CVC2) MOU, 12 Sep 88, to define symbology, development abilateral concept, conduct joint simulation experiments, maximize interoperability and possibly develop common hardware.

J. (U) TEST AND EVALUATION DATA: Data contained in Procurement Descriptive Summary.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

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



POPULAR NAME: **BRADLEY**

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

SCHEDULE	FY 1991	FY 1992	FY 1993	TO COMPLETE
Program Milestones				
Engineering Milestones	Final Design Rev Armor Upgd 4/91	Govt Test/Prod Decision		
T&E Milestones				
Contract Milstones				
Budget ($000)	**FY 1991**	**FY 1992**	**FY 1993**	**Program Total (To Complete)**
Major Contract	1310	-0-	-0-	Cont
Support Contract	1000			
In-House Spt	954	-0-	-0-	Cont
GFE/OTHER	3790			
TOTAL	7054	-0-	-0-	Cont

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0203735A** Project Number: **#D332**
PE Title: **Combat Vehicle Improvement Program** Budget Activity: **#4**

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Evolutionary improvement program to maintain the combat advantage of the Bradley Fighting Vehicles (M2-Infantry Fighting Vehicle and M3-Cavalry Fighting Vehicle). In the combined arms task force, the Bradley is the primary companion to the Abrams Main Battle Tank. This project will enhance the combat effectiveness of the Bradley through a series of product improvements. The current development program includes continued survivability improvement efforts, optical improvements, biological and chemical protection, and improved lethality.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- **(U)** Continued survivability improvement efforts

(U) FY 1992 Planned Program:
- **(U)** Program terminated. Project not funded.

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

(U) Program Plan to Completion: Project not funded.

D. (U) WORK PERFORMED BY: Prime Contractor: FMC Corporation, San Jose, CA. In-house developing Organization: Project Manager for BFVS, Warren, MI; U.S. Army Tank-Automotive Command, Warren, MI; U.S. Army Ballistic Research Lab, Aberdeen Proving Ground, MD; U.S. Army Armament, Research, Development and Engineering Center, Dover, NJ.; U.S. Army Missile Command Redstone Arsenal, AL.

E. (U) COMPARISON WITH FY 92/93 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** None.
2. **(U) SCHEDULE CHANGES:** Change in Armor Tile Milestone Schedule.
3. **(U) COST CHANGES:** None.

F. (U) PROGRAM DOCUMENTATION:

M2A2/M3A2 Program Approval- Army Acquisition Executive Memorandum, subject: Bradley Fighting Vehicle System (BFVS)	9/87
Decision Coordinating Paper for M2A1E1/M3A1E1 High Survivability BFVS	10/87
Test and Evaluation Master Plan (TEMP) for BFVS	9/88

G. (U) RELATED ACTIVITIES:
PE #0604802A (Weapons and Munitions-Engineering Development).
Within this PE is Project D031 for 25mm Ammo Development. This effort is managed by the U.S. Army Armament, Research, Development and Engineering Center and consists of improvements to the 25mm rounds of ammunition. There is no unnecessary duplication of effort within the Army or the Department of Defense.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0203735A** Project Number: **#D332**
PE Title: **Combat Vehicle Improvement Program** Budget Activity: **#4**

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

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
WEAPONS AND TRACKED COMBAT VEHICLES (Procurement)			
Bradley Fighting Vehicle Family (MYP) (SSN GA7000)	667260	108684	103921
BFVS Series (Modification) (SSN GZ2400)	88163	109691	34459

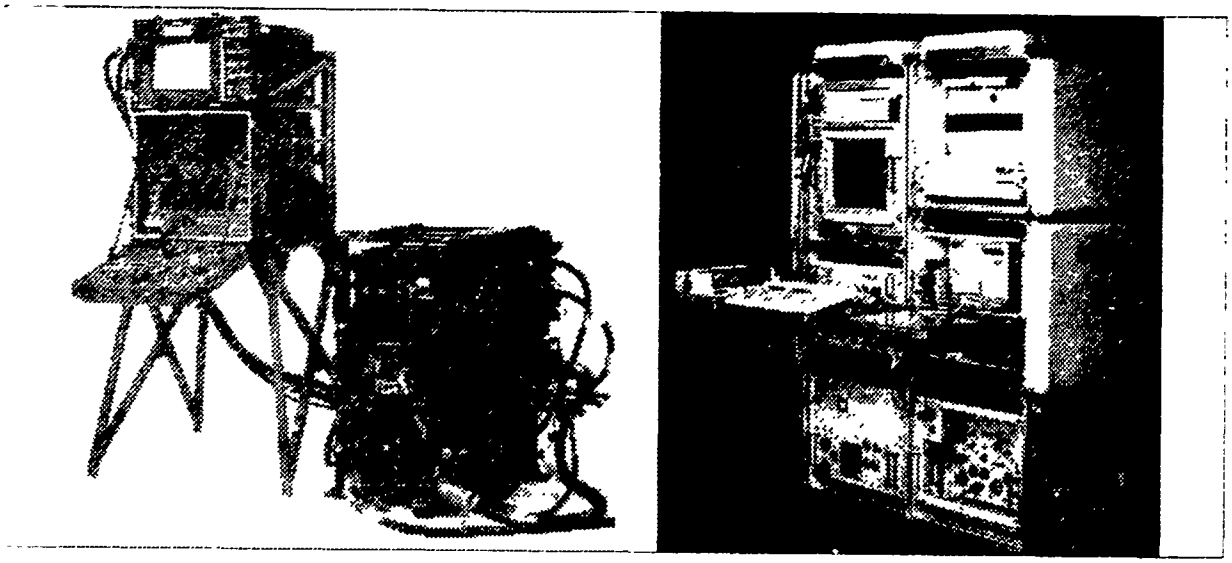
I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable.

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

AMENDED FY 1992/1993 BIENNIAL RDTE 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**

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

SCHEDULE	FY 1991	FY 1992	FY 1993	To Complete
Program Milestones			ASARC III(CHS) 1/93	
Engineering Milestones	V10 03 1 Software Release 1/91		V11 Software Release	
T&E Milestones		IOT&E (CHS) 9/92	IOT&E (MCS)	
Contract Milestones	System Engr Option Award 8/91	Software Develop/Syst Engineering Competitive Award 6/92	Software Develop/Sys Eng Option Award 6/93	
BUDGET ($000)	**FY 1991**	**FY 1992**	**FY 1993**	**Program Total (To Complete)**
Major Contract	14526	31404	24018	Cont
Support Contract	524	200	220	Cont
In-House Support	2755	4489	4229	Cont
GFE/ Other	30	300		
Total	17835	36393	28467	Cont

AMENDED FY 1992/1993 BIENNIAL RDTE 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 more efficient command and control of tactical operations on the battlefield. MCS provides commanders and staffs, at corps through battalion, more accurate, up-to-date information for quicker decisions and more 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, an evolutionary development. The MCS capability continues to expand in pre-planned, time-phased steps toward the objective system in the mid 1990s. 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 and 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 and the existing Command and Control Unit vehicle.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:

- (U) Continued system engineering/integration for MCS
- (U) Continued development, integration/testing of common hardware and Standardized Integrated Command Post Shelter (SICPS) for MCS
- (U) Continued software porting on common hardware
- (U) Prepared for operational testing using common hardware for production decision
- (U) Developed common software architecture modules that will be handed off to other battlefield areas which will preclude duplicate development efforts
- (U) Prepared for segment 11 system software acceptance testing
- (U) Prepared for common hardware/software verification tests
- (U) Continued evolutionary MCS software development

(U) FY 1992 Planned Program:

- (U) Conduct segment 11 system software acceptance testing
- (U) Conduct common hardware/software verification tests
- (U) Continue system integration/engineering for the objective MCS and transition to the Army Tactical Command and Control System common hardware provided by Project Manager, Common Hardware/Software
- (U) Conduct force development test & evaluation (FDTE) on MCS using CHS hardware
- (U) Achieve first unit equipped/initial operational capability with CHS equipment
- (U) Conduct initial operational test & evaluation (IOT&E) on MCS using CHS hardware
- (U) Competitively award a contract for software development/systems engineering with options covering next five years
- (U) Begin Subsystem engineering, integration and test for the Maneuver functional areas

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

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

(U) FY 1993 Planned Program:

- (U) Conduct Army Systems Acquisition Review Council (ASARC) III for production decision for procuring CHS for MCS
- (U) Continue evolutionary MCS software development
- (U) Continue development of common software architecture modules
- (U) Continue system engineering/integration for the MCS
- (U) Continue subsystem engineering, integration and test for the maneuver functional areas

D. (U) WORK PERFORMED BY: Project Manager, Operations Tactical Data Systems, Program Executive Office, Command and Control Systems, Fort Monmouth, NJ. Loral C2 Systems, Colorado Springs, CO is the prime contractor for software development and Tactical Computer Processor production. TRW, Inc., Redondo Beach, CA is the prime contractor for system engineering and integration.

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: None
2. (U) SCHEDULE CHANGES: Version 11 delivery delayed from Nov 91 to Jan 92 as a result of FY91 Congressional funding reductions. Delayed further from Jan 92 to May 92 due to technical difficulties.
3. (U) COST CHANGES:

F. (U) PROGRAM DOCUMENTATION:

Required Operational Capability (ROC)	7/82
Decision Coordinating Paper (DCP)	5/83
Updated ROC	6/88
Test and Evaluation Master Plan (TEMP) Service approved	7/88
Temp Revised	5/90
Temp DA Approved	8/91
Temp OSD Approved (Anticipated)	6/92

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

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

	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate
OTHER PROCUREMENT, ARMY			
Maneuver Control System BA9320	6000	8042	42253

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

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

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

J. (U) TEST AND EVALUATION DATA:

	Test and Evaluation Activity		
Event	Planned Date	Actual Date	Remarks
Field Validation (FV)		5/90	For material release Demo with British,
Quadrilateral Interoperability Demonstration		5/90	French and German Systems
Version 11 System Software Acceptance Test	5/92		First step in accepting Version 11 software

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

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

Project Number / Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D106 Aircraft Component Improvement Program	7055	6316	6676	Cont	Cont

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Engine Component Improvement Program (CIP) corrects fielded engine 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. Under the Turbine Engine Component Improvement Program (CIP), these projects correct fielded engine problems; enhance flight safety; improve reliability and durability; reduce operating and support cost; update engine technology to reduce obsolescence; retain engine performance for compliance with aircraft mission requirements; increase severe weather and extreme climate capability; and preserve aviation assets for longer periods. CIP is included in the RDTE vice procurement appropriations in accordance with Congressional direction.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND 1993:

(U) Project D106 - Aircraft Component Improvement Program:

(U) FY 1991 Accomplishments:

- (U) T700 Engine
  - Developed improved performance compressor blisk
  - Qualified improved life blower bearing
  - Qualified number 1 and 2 bearing/housing
  - Spin pit evaluation of turbine wheels
  - Conducted engine/component life analysis and testing
  - Developed battle damage repairing techniques
- (U) T55 Engine
  - Qualified the improved number 3 main bearing
  - Qualified fuel control changes to improve starting
  - Qualified components re-alloyed to eliminate magnesium-thorium
- (U) T53 Engine
  - Completed redesign of improved gearbox seals
  - Completed qualification of hot section parts designed in new material
  - Redesigned number 3 seal to eliminate failures
- (U) GTCP36 Auxiliary Power Unit (APU)
  - Completed development of improved life power take-off (PTO) clutch
  - Qualified planetary gear redesign

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

(U) FY 1992 Planned Program:

- (U) T700 Engine CIP
  - Engine component life management & verification-safety/reliability
  - Engine evaluation, test, assembly, disassembly, & support-safety/readiness
  - Investigate field safety problems as/when they occur-safety/reliability/durability
  - Qualify improved performance compressor blisk-readiness
  - Develop battle damage repair techniques-readiness
  - Develop compressor erosion resistant coatings-cost savings/durability
- (U) T755 Engine CIP
  - Qualify stainless steel compressor case-readiness/durability/cost
  - Develop machined combustor liner-readiness/durability/cost
  - Complete qualification of the improved #3 main bearing-readiness/safety/cost
  - Redesign power turbine disc lock cup & crush washer installation-reliability/safety
  - Electromagnetic interference/electromagnetic pulse protection assessment and redesign reliability/ readiness
- (U) T53 Engine CIP
  - Redesign power shaft bearing to eliminate roller end wear-readiness/cost
  - Starter drive spline improvement-readiness/reliability/cost
  - Turbine TIP clearance improvement-readiness/cost
- (U) GTC36 Auxiliary Power Unit CIP
  - Investigate service revealed deficiencies-readiness/cost
  - Development of repair techniques for high dollar hardware-cost/readiness
  - Analytical condition inspection of high time engines-safety/readiness/cost
  - Qualify improved power take off clutch-safety/readiness

(U) FY 1993 Planned Program:

- (U) T700 Engine CIP
  - Develop repair engineering techniques-cost savings/readiness
  - Qualify compressor erosion resistant coatings-cost savings readiness
  - Engine evaluation, test assembly and support-safety/readiness
  - Investigate flight safety problems as/when they occur-safety
- (U) T55 Engine CIP
  - T2 sensor relocation evaluation and redesign-reliability/readiness
  - Machined combustor liner rig test & qualify-readiness/durability-cost
  - Component lab test and qualification of improved electro magnetic interference/electro magnetic pulse-reliability/readiness
  - Qualification of improved power turbine disc lock cup & crush washer installation-reliability/safety
  - Redesign & qualify improved lube system-reliability/durability/readiness
- (U) T53 Engine CIP
  - Complete power shaft bearing improvement-readiness/reliability/cost
  - Turbine TIP clearance improvement-readiness/cost
  - Alternate vendor qualification-readiness/cost savings

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

- (U) GTCP36 Auxiliary Power Unit CIP
  - Investigate service revealed difficulties-readiness/cost
  - Develop repair techniques for high dollar hardware-readiness/cost

(U) Work Performed By:

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

DEVELOPING ORGANIZATION: US Army Aviation Systems Command, St. Louis, Missouri

(U) Related Activities: The Aircraft Engine Component Improvement Program (CIP) is authorized for all three military services by 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. Funding levels are negotiated at an annual tri-service coordination meeting and are based on the size of each service's inventory.

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

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0203755A** Project Number: **#D109**
PE Title: **Field Artillery Ammunition Support Vehicle (FAASV)** Budget Activity: **#4**

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

Project Number / Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D109 Field Artillery Ammunition Support Vehicle					
	- 0 -	810	- 0 -	- 0 -	810

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Field Artillery Ammunition Support Vehicle (FAASV) is a fully tracked, self-propelled armored vehicle constructed on an M109 derivative chassis that provides 65% commonality with the M109 series of howitzers. The FAASV is designed to replace the M548 Ammunition Carrier, providing cargo area ballistic protection and improved ammunition handling. During the M109 HIP Initial Operational Test and Evaluation, the FAASV was found to be deficient in several areas. Redesign of the FAASV crew compartment, stacker, conveyor and electrical/hydraulic systems is required to maintain interoperability with the M109A6 PALADIN.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN 1993:

(U) Project D109 - FAASV

(U) FY 1991 Accomplishments: Project not funded.

(U) FY 1992 Planned Program:
- (U) Initiate design improvements, hardware fabrication and testing
- (U) Complete and release engineering change proposal and technical data package

(U) FY 1993 Planned Program: Project completed in FY 1992.

(U) Work Performed By: FAASV Program Management Office is assigned responsibility for the enhancement/redesign activities required to maintain interoperability with the M109A6. The major supporting commands/laboratories are Tank Automotive Command, Armamont Research, Developmentand Engineering Center, and Human Engineering Laboratory.

(U) Related Activities: There are no other related program elements. There is no unnecessary duplication of effort within the Army or DoD.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0203755A** Project Number: **#D109**
PE Title: **Field Artillery Ammunition Support Vehicle (FAASV)** Budget Activity: **#4**

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

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
WEAPONS AND TRACKED COMBAT VEHICLES:			
FAASV PIP to Fleet (SSN GA8010)	- 0 -	- 0 -	25847

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D036	PATRIOT Product Improvement Program				
	45859	37864	38390	Cont	Cont
D038	AVENGER Product Improvement Program				
	- 0 -	2482	4755	Cont	Cont
D303	STINGER RMP Product Improvement Program				
	- 0 -	3020	5175	Cont	Cont
D690	HAWK Product Improvement Program				
	8133	14574	7995	Cont	Cont
PE TOTAL	53992	57940	56315		

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 BOTH FY 1992 AND 1993:

(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/Primary Power Unit (ECU/PPU); interface the AVENGER fire control system with the Forward Area Air Defense Command Control and Intelligence (FAAD C2I) system; integrate non-cooperative target recognition (NCTR) sensors, which provide positive hostile aircraft identification and Enhance Position Locating and Reporting System (EPLRS); and accomplish new mission to keep current with evolving threat.

(U) FY 1991 Accomplishments: Project not funded

(U) FY 1992 Planned Program:
- (U) Define, develop, and integrate ECU/PPU

(U) FY 1993 Planned Program:
- (U) Define and initiate development for NCTR integration
- (U) Define command, control and intelligence (C2I) interfaces and develop C2I manual
- (U) Initiate development of Integrated Weapons Control System (IWCS)

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

- (U) Develop initialization, acquisition, engagement, and management software algorithms
- (U) Develop sensor suite encompassing NCTR
- (U) Conduct test programs and assess system performance through combined technical/operational test

(U) Project D303: STINGER RMP PIP is a product evolution that allows the missile to receive upgraded countermeasures capability via externally loaded software. The software is downloaded from a reprogrammable module contained in the launcher (gripstock). This concept allows for timely upgrades to correct system deficiencies, rapid reaction to new threats or threat countermeasures, and development of specialty software programs where full capability may not be desired and accommodate new missions. This project includes fulfilling the urgent need to develop a solution to the "hidden target" problem; fulfilling the urgent need to solve recognized system performance deficiencies. Further, related to resolution of the "hidden target" and other system deficiencies is effort in the area of target characterization. This project will also establish a government post deployment software support posture.

(U) FY 1992 Planned Program:
- (U) Initiate Infrared Counter Counter-Measure (IRCCM)
- (U) Pursue "hidden target" solution, establish post deployment software support posture, and work toward threat missile trajectory guidance optimization

(U) FY 1993 Planned Program:
- (U) Assess system performance against threat
- (U) Develop prototype RMP module for threat assessment
- (U) Flight test module
- (U) Conduct system performance assessment

(U) Work Performed By:
AVENGER: In-house technical efforts performed by Program Executive Officer for Air Defense, 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.

STINGER: The primary contractor is General Dynamics at Valley Systems Division, Ranch Cucamonga, CA. In-house technical efforts will be performed by Program Executive Officer, Air Defense, Project Manager, Air to Air Missile and the U. S. Army Missile Command both located at Redstone Arsenal, AL, and the U.S. Army Air Defense School, Fort 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. In addition, the Air to Air Missile Project Manager is the Executive Agent for the procurement of all STINGER missiles within DOD.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

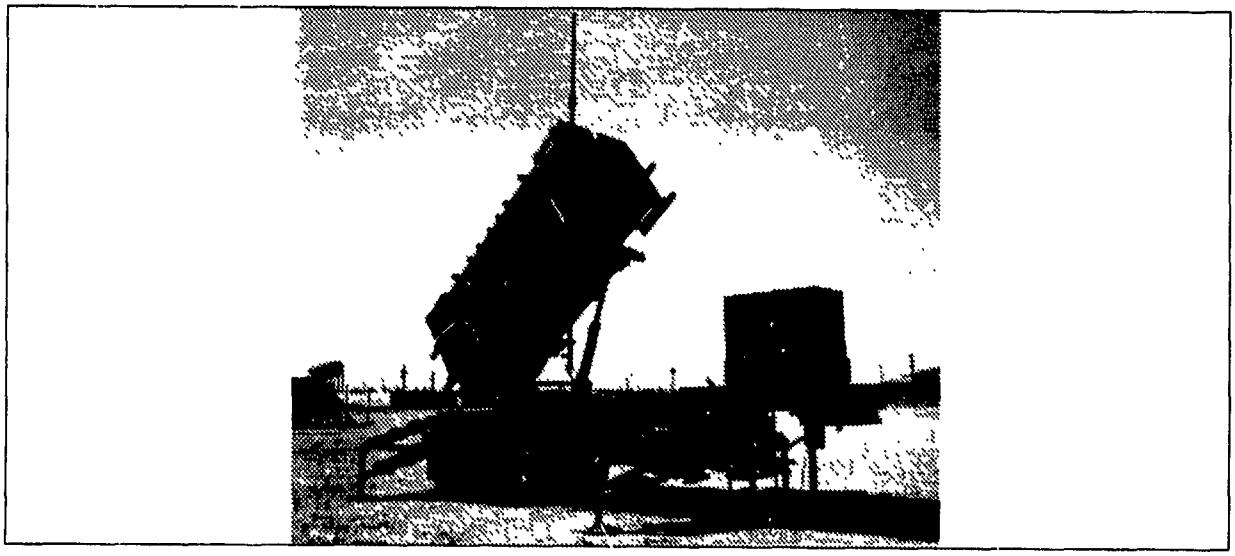
(U) Other Appropriation Funds: ($ in Thousands)

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
MISSILE PROCUREMENT, ARMY			
AVENGER MOD (CE 8710)	-0 -	4272	4191

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0203801A** Project Number: **#D036**
PE Title: **Missile/Air Defense Product Improvement Program** Budget Activity: **#4**



POPULAR NAME: **PATRIOT**

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

SCHEDULE	FY 1991	FY 1992	FY 1993	To Complete
Program Milestone				
Engineering Milestones	PDB 3 fielded; Radar Enh Phase II end, Comm Upgrades start, PosID Phase 1 end, Emp Enh End	WCC upgrade end, Tng Dev Upgrades end; PosID Phase II start, Comm Upgrade cont	Continue Comm Upgrades and Pos ID Phase II	Out of Sector Launch and Advanced Radr r PosID Phases II and III completed
T&E Milestones	ENG & PROD Tests	ENG & PROD Tests	ENG & PROD Tests	ENG & PROD Tests
Contract Milestones				
BUDGET ($000)	**FY 1991**	**FY 1992**	**FY 1993**	**Program Total (To Complete)**
Major Contract	39154	29914	30185	Cont
Support Contract	2092	1150	4000	Cont
In-House Support	3289	3421	2213	Cont
GFE/Other	1324	3379	1992	Cont
Total	45859	37864	38390	Cont

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0203801A** Project Number: **#D036**
PE Title: **Missile/Air Defense Product Improvement Program** 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 1991 Accomplishments:
- (U) Fielded Interim Post Deployment Build 3 (PDB 3) software modifications; modifications include the pulse doppler waveform search/track capability, and missile guidance enhancements
- (U) Continued development of training device upgrade
- (U) Completed development of radar enhancements phase II
- (U) Initiated development of communications upgrades
- (U) Completed analysis of positive target identification phase I
- (U) Continue development of Expanded Weapons Control Computer (EWCC)
- (U) Completed development of Emplacement Enhancements Upgrade

(U) FY 1992 Planned Program:
- (U) Continue development of communications upgrades
- (U) Complete development and integration of EWCC upgrade
- (U) Initiate development of positive identification (ID) phase II
- (U) Finalize development of training device upgrade
- (U) Field final version of Post Deployment Built (PDB) 3

(U) FY 1993 Planned Program:
- (U) Continue with concept design review for positive ID phase II
- (U) Continue design of communications upgrade

(U) Program Plan to Completion:
- (U) Continue PATRIOT product improvements and software post deployment builds
- (U) Continue analysis of threat as it responds to PATRIOT product improvements
- (U) Initiate Out of Sector Launch
- (U) Complete concept design for POS ID Phase II
- (U) Continue design for communication Upgrade
- (U) Initiate Positive ID Phase III

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0203801A** Project Number: **#D036**
PE Title: **Missile/Air Defense Product Improvement Program** Budget Activity: **#4**

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 Officer (PEO), Air Defense, PATRIOT Project Office and U.S. Army Missile Command, Redstone Arsenal, Al, and U.S. Army Air Defense School, Ft. Bliss, TX.

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

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 PE #0603302A (Joint Tactical Missile Defense Program) and 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)

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
MISSILE PROCUREMENT ARMY			
Budget Activity 2 - PATRIOT (C49100)	1002753	156052	25160
Budget Activity 3 - PATRIOT Modifications (C50700)	142856	35505	10044

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.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0203801A** Project Number: **#D690**
PE Title: **Missile/Air Defense Project Improvement** Budget Activity: **#4**

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

Popular Name	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
HAWK PIP	8133	14574	7995	Cont	Cont

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: HAWK is a surface-to-air guided missile system designed specifically to defend against low and medium altitude aircraft. Although the system has been in the U.S. Army since 1960, it has been upgraded by a series of product improvements to improve reliability, reduce operating costs, and improve performance against the advancing tactical aircraft threat. Product improvements include field maintenance equipment (FME) upgrades and system mobility enhancements. The FME upgrade will reduce the number of FME shops, personnel, and provide compatibility with the Army's standard field test equipment for electronic components - Integrated Family of Test Equipment (IFTE). The completion of the planned FME development is necessary for maintenance support compatibility with the HAWK Phase III program, which is currently in production and fielding. The mobility enhancement program will result in a reduction of vehicles in HAWK firing platoons, improve system emplacement time, and improve the tactical mobility of the firing unit.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- **(U)** Continued field maintenance equipment development
- **(U)** Continued mobility enhancement development
- **(U)** Performed system assessment analyses
- **(U)** Evaluated emerging technology for inclusion into HAWK

(U) FY 1992 Planned Program:
- **(U)** Complete FME upgrade development
- **(U)** Complete mobility enhancement development

(U) FY 1993 Planned Program:
- **(U)** Complete Mobility Enhancement Development
- **(U)** Continue development efforts

D. (U) WORK PERFORMED BY: The prime contractor is Raytheon Co., West Andover, MA. The first increment of test program sets (pre-phase III) was developed and produced by Harris Corporation. Phase III test program sets are being developed by Summa Technologies. In-house technical efforts will be performed at U.S. Army Missile Command by U.S. Army Research, Development and Engineering Center, Program Executive Officer (PEO) Air Defense, Redstone Arsenal, AL, and U.S. Army Air Defense School, Ft Bliss, TX.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0203801A** Project Number: **#D690**
PE Title: **Missile/Air Defense Project Improvement** Budget Activity: **#4**

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: None

2. (U) SCHEDULE CHANGES: None

3. (U) COST CHANGES: None

F. (U) PROGRAM DOCUMENTATION: Not applicable.

G. (U) RELATED ACTIVITIES: The U.S. Marine Corps participates in HAWK improvement programs. There is no duplication of effort within the Army or DoD.

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

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
MISSILE PROCUREMENT ARMY:			
Budget Activity 2. Other Missile Support (CA0275)	4850	596	1368
Budget Activity 2. HAWK (MIM-23-B)(C 25400)	- 0 -	1647	1694
Budget Activity 5. HAWK Modifications (C35200)	54215	10019	1514

I. (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.

J. (U) MILESTONE SCHEDULE:

Milestones	Milestones Dates
FME/TPS technical test (1st INCR)	12/88
FME/TPS MS III IPR	08/89

FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D045 HELLFIRE Product Improvement Program	34439	20730	5002	3237	137183
D050 MLRS Product Improvement Program	- 0 -	8213	11427	Cont	Cont
D051 Alternate TOW2 Warhead	- 0 -	4994	- 0 -	- 0 -	4994
D336 TOW Product Improvement Program	18163	28496	- 0 -	- 0 -	100643
PE TOTAL	52602	62433	16429		

B. (U) BRIEF DESCRIPTION OF ELEMENT: Expanding Regional Power Threats require an evolutionary improvement program to maintain the effectiveness of the Multiple Launch Rocket System (MLRS), HELLFIRE, and TOW 2/TOW 2B systems. The MLRS Materiel change (MC) will consist of an upgrade to the fire control system (FCS). The existing FCS has certain limitations in its ability to take full advantage of the M-270 family of munitions (MFOM) capabilities. In addition, the current FCS is experiencing difficulty in production and maintenance of current design. This is anticipated to become more severe. This program initiates an upgrade of the electronics to the latest technology to ensure system viability into the 21st Century and improves the data processing capability in support of the new MLRS family of munitions. The HELLFIRE PIP, consisting of the HELLFIRE Optimized Missile System (HOMS) and the insensitive munition (IM) 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 materiel changes (MC) provides advances in the warhead, rocket motor and sight improvements as well as completion of development of the alternate TOW 2B. The MC continues enhancements that maintain the Army and USMC capability to defeat evolving threat armor, countermeasures and includes other future improvements to TOW 2B design such as reprogrammable sensor and improved lethality.

FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND 1993:

(U) **Project Number and Title:** #D051, Alternate TOW 2 Warhead - Provides for the continued improvement 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 to include TOW improvement for basic research on an alternate TOW 2 Warhead which incorporates a Tungsten liner.

(U) **FY 1991 Accomplishments:** Project not funded

(U) **FY 1992 Planned Program:**
- (U) Initiate Tungsten Warhead development effort at congressional direction

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

(U) **Worked Performed By:** Contractor to be determined. Army management of all TOW programs is performed by Project Manager, TOW Program Executive Officer,Fire Support, Redstone Arsenal, AL.

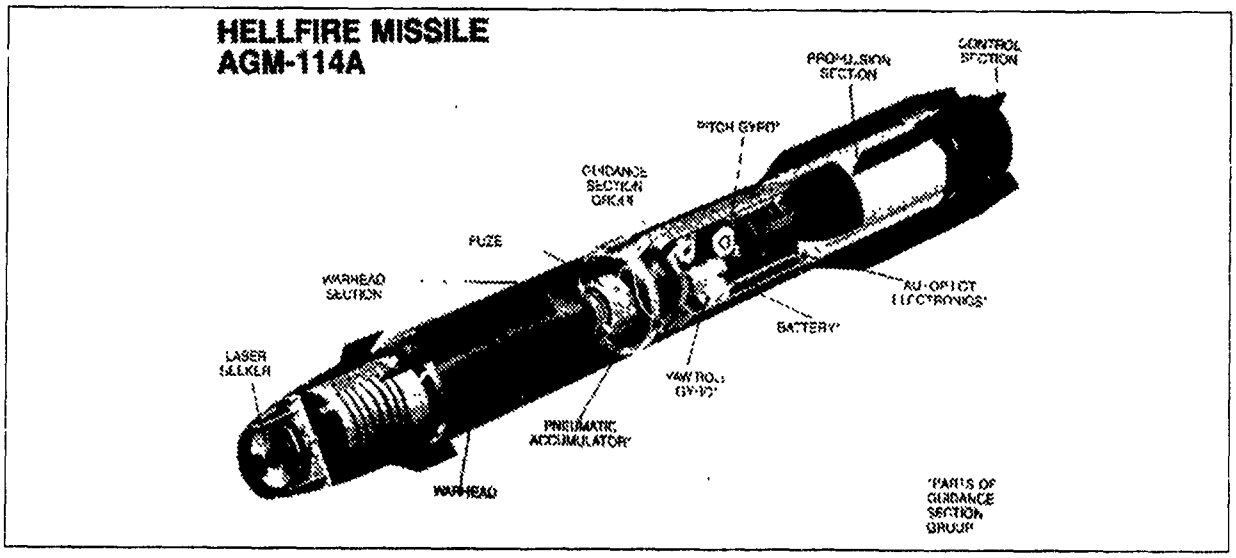
(U) **Related Activities:**
PE#0602120A, Electronic Survivability and Fuzing Technology
PE#0602303A, Missile Technology
PE#0602618A, Ballistics Technology
PE#0602624A, Weapons and Munitions Technology
PE#0603612A, Advanced Anti-Tank Weapon System
PE#0603810A, Advanced Missile System -Heavy
There is no unnecessary duplication of effort within the Army or the Department of Defense.

(U) **Other Appropriation Funds:** Not Applicable

(U) **International Cooperative Agreements:** Not Applicable

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0203802A**
PE Title: **Other Missile Product Improvement Programs**
Project Number: **#D045**
Budget Activity: **#4**
Project Title: **HELLFIRE Product Improvement Program**



POPULAR NAME: **HELLFIRE PIP**

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

SCHEDULE	FY 1991	FY 1992	FY 1993	To Complete
Program Milestones				
Engineering Milestones	Continue HOMS Development	Complete HOMS Dev, 4Q92	Initiate Insensitive Warheads 1Q93	Complete Insensitive Warhead Qual 1Q94
T&E Milestones				
Contract Milestones	Fund 2nd Incr HOMS Dev	Fund last Increment HOMS Dev	Fund First Incr Insensitive Warhead	Fund Last Incr Insensitive Warhead
BUDGET ($000)	**FY 1991**	**FY 1992**	**FY 1993**	**Program Total (To Complete)**
Major Contract	29296	13330	3672	108379 (1672)
Support Contract	1134	910	115	5820 (100)
In-House Support	3101	3710	665	15025 (615)
GFE/ Other	908	2780	550	7959 (850)
Total	34439	20730	5002	137183 (3237)

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0203802A**
PE Title: **Other Missile Product Improvement Programs** Project Number: **#D045**
Budget Activity: **#4**
Project Title: **HELLFIRE Product Improvement Program**

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The HELLFIRE Optimized Missile System (HOMS) development began in FY89 and consists of a combined digital autopilot/electro-optical countermeasure (EOCM) hardened laser seeker, and a more robust warhead. In addition, the optimized program will provide a missile bus that is compatible with the LONGBOW missile system requirements. The HOMS program provides a seeker that is hardened against countermeasure threats and a robust warhead which will defeat the developing Soviet threat through the 1990s. Recent threat assessments indicate that both an enhanced robust warhead and an improved EOCM seeker will be required to maintain HELLFIRE as an effective system through the 1990s. The insensitive munitions program contemplates development of a motor and warhead that are highly resistant to external stimuli that could cause unsafe detonation. Tri-service requirements call for weapons that exhibit reactions no more violent than burning when excited by external stimuli. Funding will provide for development and qualification of a warhead at the component level.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- **(U)** Continued HOMS development program

(U) FY 1992 Planned Program:
- **(U)** Complete HOMS system qualification

(U) FY 1993 Planned Program:
- **(U)** Initiate insensitive munitions program
- **(U)** Initiate warhead qualification testing

(U) Program Plan to Completion:
- **(U)** Complete insensitive warhead qualification tests

D. (U) WORK PERFORMED BY: The major contractor for the optimized missile is Martin Marietta Corporation, Orlando, FL. The Iowa Army Ammunition Plant and Conventional Munitions Systems, Tampa, Florida, are potential vendors for the Warhead. In-house effort for the optimized missile and insensitive munitions will be conducted by the Research, Development, and Engineering Center, U.S. Army Missile Command, Redstone Arsenal, AL.

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** None.
2. **(U) SCHEDULE CHANGES:** None.
3. **(U) COST CHANGES:** None.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0203802A**
PE Title: **Other Missile Product Improvement Programs**
Project Number: **#D045**
Budget Activity: **#4**
Project Title: **HELLFIRE Product Improvement Program**

F. (U) PROGRAM DOCUMENTATION:

Justification and Approval (J&A) Approved (Digital Auto Pilot (DAP) and electro-optical countermeasure (EOCM)	06/85
Justification and Approval (J&A) Approved (Improved Warhead, Interim)	02/88
Justification and Approval (J&A) Planned (HELLFIRE Optimized Missile System)	09/89

G. (U) RELATED ACTIVITIES:

PE #0604816 (Longbow)
PE #0603810A (Advanced Missile System-Heavy (AMS-H))
PE #0603757A (Forward Area Air Defense System)
PE #0602303A (Missile Technology)
PE #0602120A (Electronic Survivability and Fuzing Technology)
PE #0602624A (Weapons and Munitions Technology)
PE #0602618A (Ballistics Technology)
PE #0602709A (Night Vision Technology)
PE #0603710A (Night Vision Advanced Technology)
There is no unnecessary duplication of effort within the Army or other services/agencies within the Department of Defense. This is assured by continuous coordination with other services and agencies and oversight of the program by the OSD-level Conventional Systems Committee.

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

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
MISSILE PROCUREMENT ARMY:			
Budget Activity 2 - Laser HELLFIRE System (C70000)	192649	19697	103358

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

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

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0203802A**
PE Title: **Other Missile Product Improvement Programs**
Project Title: **MLRS Product Improvement Program**

Project Number: **#D050**
Budget Activity: **#4**

NO PICTURE AVAILABLE

POPULAR NAME: **MLRS PIP**

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

SCHEDULE	FY 1991	FY 1992	FY 1993	To Complete
Program Milestones				
Engineering Milestones	Tradeoff Analysis/ Best Tech Approach	Define Rqmts start hardware/ software Design		
T&E Milestones				
Contract Milestones		Award EMD Contract 8/92		
BUDGET ($000)	**FY 1991**	**FY 1992**	**FY 1993**	**Program Total (To Complete)**
Major Contract		3326	5224	Cont
Support Contract		3310	5200	Cont
In-House Support		1577	1003	Cont
GFE/Other				
Total	- 0 -	8213	11427	Cont

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0203802A** Project Number: **#D050**
PE Title: **Other Missile Product Improvement Programs** Budget Activity: **#4**
Project Title: **MLRS Product Improvement Program**

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The 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. Development of the Improved Fire Support Control (IFCS) is essential to correct present and future supportability problems resulting from electronic component obsolescence in the existing design. Because of throughput limitations the existing FCS requires the smart weapons and M-270 launcher to spend excessive time on the firing point to load mission critical data. The IFCS will provide the capability for increased and faster data flow needed by the suite of M-270 Family of Munitions (MFOM) weapons. This shortens the time to upload mission critical data, reduces the timelines, which requires less time on the firing point, and improved system battlefield survivability. The effectiveness of certain MFOM weapons will be improved by allowing more mission critical data to be loaded into the system.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments: Project not funded.

(U) FY 1992 Planned Program:
- **(U)** Initiate Engineering and Manufacturing Development (EMD)

(U) FY 1993 Planned Program:
- **(U)** Conduct System Design Review
- **(U)** Initiate Preliminary Design Review

(U) Program Plan to Completion:
- **(U)** Complete Engineering and Manufacturing Development phase

D. (U) WORK PERFORMED BY: In House and contract effort accomplished by Program Executive Officer for Fire Support, Program Manager MLRS, and US Army Missile Command to reduce microelectronics obsolescence.

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. **(U)** TECHNICAL CHANGES: None.
2. **(U)** SCHEDULE CHANGES: None.
3. **(U)** COST CHANGES: None.

F. (U) PROGRAM DOCUMENTATION: Acquisition Plan approved December 1991, Justification and Approval to be submitted to Department of Army January 1992. Contract statement of work to be complete and request for proposal to be issued February 1992. Engineering and Manufacturing Development (EMD) contract award expected by 1 August 1992 for a 60-month development program.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0203802A** Project Number: **#D050**
PE Title: **Other Missile Product Improvement Programs** Budget Activity: **#4**
Project Title: **MLRS Product Improvement Program**

G. (U) RELATED ACTIVITIES:

PE #0602120A (Electronic Survivability & Fusing Technology)
PE #0602303A (Missile Technology)
PE #0602618A (Ballistics Technology)
PE #0602624A (Weapons & Munitions Technology)
PE #0603612A (Advanced Anti-Tank Weapon System)
PE #0603810A (Advanced Missile System-Heavy)
PE #0603776A/0604816A (LONGBOW)
There is no unnecessary duplication of effort within the Army or DoD.

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

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
Budget Activity 2:			
MLRS Rocket (SSN 65400)	424670	617000	2169
MLRS Adv Proc (SSN 65400)	13656		
MLRS Launcher (SSN 65900)	129640	133600	197270
MLRS Adv Proc (C65900)	45944	3000	
Budget Activity 3:			
MLRS MODs (SSN C67500)	17468	36934	12215

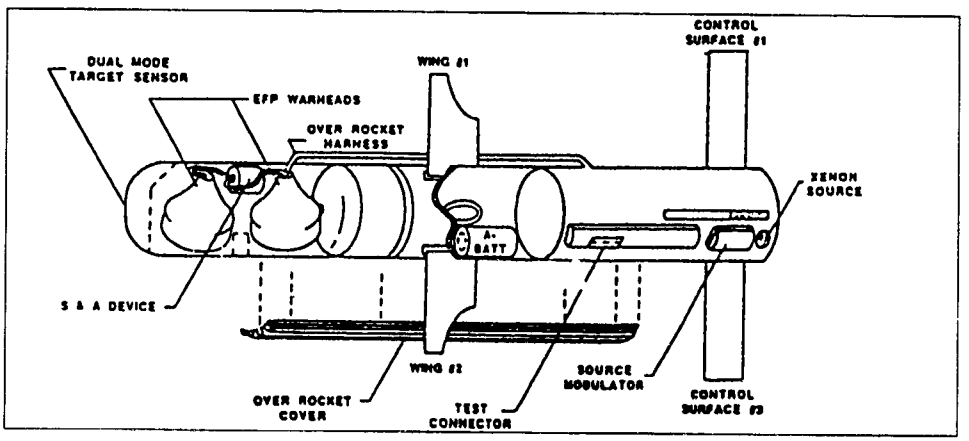
I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

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

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0203802A**
PE Title: **Other Missile Product Improvement Programs**
Project Title: **TOW Product Improvement Program**

Project Number: **#D336**
Budget Activity: **#4**



POPULAR NAME: **TOW 2**

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

SCHEDULE	FY 1991	FY 1992	FY 1993	To Complete
Program Milestones	IPR 11/90 Initial TOW2B BLK 92 ASARC V ALT TOW2B CANCELLED (Phase B)	TOW2B MRRB, ITAS IPR 1/92, ITAS MSII 7/92, TOW2B BLK92 IMP CDR, TSIP CANCELLED 10/91		TOW2B IMP MRRB, ITAS IIIA 10/96, ITAS III 10/97, ITAS FUE 9/97
Engineering Milestones				
T&E Milestones	TOW 2B DTOT 10/90	TOW2B PCVT COMPLETE 4/92	TOW2B IMP ECP INCORPORATED TO PROD K	
Contract Milestones	TOW2B ECP incorporated into Prod Contract Award 12/90			
BUDGET ($000)	**FY 1991**	**FY 1992**	**FY 1993**	**Program Total (To Complete)**
Major Contract	6006	16237	- 0 -	70177 (-0-)
Support Contract				
In-House Support	8818	2781	- 0 -	14745 (-0-)
GFE/ Other	3339	9478	- 0 -	15721 (-0-)
Total	18163	28496	- 0 -	100643 (-0-)

FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0203802A
PE Title: **Other Missile Product Improvement Programs**
Project Title: **TOW Product Improvement Program**

Project Number: **#D336**
Budget Activity: **#4**

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Provides for the continued development of improvements to the TOW missile system. Improvements are required to maintain the Infantry's capability to defeat a continually expanding regional power threats and countermeasure environments. Included in this project are warhead improvements to include Tungsten Warhead and Sensor Second Source (Leader-Follower), other future improvements to TOW 2B design such as reprogrammable sensor and increased lethality, improved aerodynamics, alternate TOW 2B, and TOW flight motor improvement. improvement, Improved Target Acquisition System, and warhead qualification testing to maintain state of the art.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- (U) Conducted In-Process Review (IPR) for production cut in of TOW 2B
- (U) Conducted TSIP Army Systems Acquisition Review Council (ASARC) V
- (U) Completed development test/operational test (DTOT) for TOW 2B
- (U) Cut in TOW 2B through engineering change proposal (ECP)
- (U) Continued development for TOW 2B
- (U) Alternate TOW 2B effort (Phase B cancelled)
- (U) Began TOW 2B Configuration Verification Tests (PCVT)
- (U) Initiated TOW 2B Improvements Program (Block 92)
- (U) Initiated Sensor Second Source (Leader-Follower)
- (U) Initiated Lethality Improvements

(U) FY 1992 Planned Program:
- (U) TSIP cancelled
- (U) Complete TOW 2B Production Configuration Verification Tests
- (U) Initiate development of Improved Target Acquisition System (ITAS)
- (U) Continue warhead threat development validation and qualification test
- (U) Continue development of TOW 2B Block 92 Improvements
- (U) Conduct ITAS AAE IPR
- (U) Continue Sensor Second Source (Leader-Follower)
- (U) Continue Lethality Improvement

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

D. (U) WORK PERFORMED BY: Development contractor is Hughes Aircraft Company, Tucson AZ. Army management of all TOW programs is performed by Project Manager TOW, Program Executive Office Fire Support, Redstone Arsenal, AL.

FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0203802A** Project Number: **#D336**
PE Title: **Other Missile Product Improvement Programs** Budget Activity: **#4**
Project Title: **TOW Product Improvement Program**

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** None.
2. **(U) SCHEDULE CHANGES:** None.
3. **(U) COST CHANGES:** None.

F. (U) PROGRAM DOCUMENTATION:

TOW 2B user requirements message	6/85
(PIP 1-86-03-3026) TOW 2B	12/85
Product improvement management info rpt	12/86
(PIP 1-88-03-3027) TOW 2 to TOW2A retrofit	5/88
TOW 2 retrofit user requirements and message	7/88
TOW Sight Improvement Program (DA IPR)	7/89
TSIP Cancelled	10/91

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)

	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate
MISSILE PROCUREMENT ARMY:			
Budget Activity 2, TOW 2 (C59300)	267036	210378	183061
Budget Activity 3, TOW MODS (C61700)	31258	8263	4998

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

J. (U) TEST AND EVALUATION DATA: The TOW 2B test program is on-going through the development phase with testing of subcomponents and of the full TOW 2B missile.

1. Sensor Development - Three sensors were developed with telemetry missile flights in Dec 88-Jan 89. The flights were completed in Jan 89. HAC chose Thorn EMI of Great Britain as the sensor source. Phase II of engineering flights took place through 6/90 at Redstone Arsenal, Alabama. A U.S. Second Source, LORAL of Archbald, PA, is under contract through a leader follower contract with Thorne, EMI.

2. Warhead Development - Twelve static tests and twenty-four dynamic warhead tests were completed.

Program Element: #0203802A
PE Title: **Other Missile Product Improvement Programs**
Project Title: **TOW Product Improvement Program**

Project Number: **#D336**
Budget Activity: **#4**

3. Missile Flights - Phase II engineering tests included twenty-six missile flights and were concluded 27 June 1990. TOW 2B developmental testing/operational testing began 21 July 1990 and will include total of forty-five missile flights at Redstone Arsenal, Alabama and Yuma Proving Ground, Arizona.

4. TOW Production Configuration Verification Test is ongoing.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

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

Project Number Title	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D107 Echelons Above Corps Communications (EAC COMM)	6940	4966	7592	Cont	Cont

B. (U) BRIEF DESCRIPTION OF ELEMENT: This project provides for development of Integrated Systems Control (ISYSCON) and modification to fielded Echelons Above Corps (EAC) equipment; monitoring of other service developed EAC COMM equipment and testing; and development of Army unique components associated with other service developments to allow interoperability with emerging EAC items, other items in the Army, other services and agencies, as well as equipment developed by NATO allies. The major portion of the project includes: development of software for the ISYSCON facility, completion of the development of the AN/TTC-39A circuit switch software, evolutionary development of the software for the AN/TTC-39D flood search circuit switch, AN/TYC-39 message switch upgrade development, continuing evolutionary development of the Communications System Control Element (CSCE) family software. Resources will be applied as necessary to development and modifications necessitated by changing technology in any EAC COMM related system.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND 1993:

(U) Project D107 Echelons Above Corps Communications (EAC COMM)

(U) FY 1991 Accomplishments:
- (U) Continued CSCE evolutionary software development to accommodate changes made to the AN/TTC-39D and AN/TYC-39A
- (U) Continued development and improvement of AN/TTC-39 circuit switch interface to Mobile Subscriber Equipment (MSE) at Corps and below

(U) FY 1992 Planned Program:
- (U) Initiate software development for ISYSCON
- (U) Continue CSCE/Integrated Network Management System (INMS) software integration and evolutionary upgrades (e.g., TTC-39D and Packet Switch Control)
- (U) Initiate software modifications to the AN/TYC-39 and AN/TTC-39 for Corps/NATO interface

(U) FY 1993 Planned Program:
- (U) Continue software development for ISYSCON.

(U) Work Performed By: Acquisition (development and production) of EAC-COMM equipment and software modifications are performed by the tasked service or agency as assigned by the Secretary of Defense. Current Army contractors are GTE, Needham Heights, MA (AN/TTC-39 family of switches); GTE, Raleigh, NC (CSCE). In-house developing organization for EAC COMM tasks assigned to the Army is the

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

Program Executive Office, Communications Systems, Fort Monmouth, NJ and Project Manager, Multi-Service Communications Systems (MSCS).

(U) Related Activities:
PE #0208010F (Joint Tactical Communications Program (TRI-TAC Air Force Program))
PE #0208010M (Joint Tactical Communications Program (TRI-TAC Marine Corps))
PE #0303401A (Communications Security Equipment).
There is no unnecessary duplication of effort within the Army or DOD.

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

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
OTHER PROCUREMENT, ARMY			
BA1010	31843	40774	6459
BB1600	41444	16209	37525

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

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

Project Number Title	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D491 COMSEC	10323	6615	6470	Cont	Cont

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program develops Communications Security (COMSEC) equipment and techniques required to combat threat signal intelligence capabilities and to ensure our data network integrity. The Army's RDTE COMSEC program objective is to implement National Security Agency (NSA) developed security technology in Army information systems. The thrust of the program is to insure 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 an Army priority, (paperless battlefield). NSA develops the basic technology such as standard modules, chips, and algorithms which the Army embeds into Army information equipment and systems. The Army COMSEC RDTE program provides the Army funding required to apply the NSA technology to Army command, control, communications and intelligence (C3I) systems in a cost effective expeditious manner. This Project was restructured from Program Element #0303401A.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND 1993:

(U) FY 1991 Accomplishments:

- (U) Completed proof of principle development, successfully completing early user test and initiated final phase of development of the Automated COMSEC Management and Engineering System (ACMES) in support of Mobile Subscriber Equipment (MSE), Single Channel Ground & Airborne Radio System (SINCGARS), Enhanced Position Location Reporting System (EPLRS), and several secured satellite systems
- (U) Prepared procurement package for Army Secure Tactical Initiative - Tactical End-to-End Encryption Device, the future tactical network COMSEC for use within the Army Command and Control System (ACCS) and strategic information systems. Conducted several studies related to network security architecture, protocol requirements for Army systems and development of network security emulator.
- (U) Continued Development/Production Prove-out contract of Communications Deception System leading to Initial Operational Test and Evaluation (IOT&E) in FY 92
- (U) Procured modified CANEWARE network COMSEC equipment from the National Security Agency for evaluation within Army test beds.
- (U) Prepared acquisition documentation and funded test organization for IOT&E leading to Milestone III and type classification of MINTERM which is the COMSEC for High Frequency and satellite systems
- (U) Continued evaluation of COMSEC non-developmental item (NDI) such as XEROX secure Local Area Network device, Magnavox's low probability of detection (LPD) development radio
- (U) Devoted installation kit support funding to quick reaction projects for Desert Storm in form of cables between PSC - 3 satellite radios and VINSON COMSEC, security for air traffic controller system and

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

KG-84 installation kits.

(U) FY 1992 Planned Program:

- (U) Continue final development of Automated COMSEC Management and Engineering Systems (ACMES), concentrating on software development for Data Transfer Device hardware developed by NSA for all Services and incorporating battlefield electronics signal operating Instructions and Electronic Counter-Countermeasures (ECCM) frequency hop sets
- (U) Complete studies of network security architectures and protocols for use in Army secure Tactical Initiative (ASTI). Incorporate delivered internet security environment emulator into network test beds.
- (U) Continue program management support in the completion of AR 70-1 documentation for the Army Key Management System (AKMS) level II program. Continue processing procurement of COMSEC front end device, one element of ASTI program
- (U) Develop generic methodology for accreditation for local area network (LAN) and perform on newly installed LAN within the local command
- (U) Continue evaluation of COMSEC NDI such as Wang secure LAN unit and TEPACHE COMSEC for secure E-Mail services
- (U) Redesign STU-III conference bridge and interfaces to other type COMSEC for improved producibility to lower manufacturer cost for DOD customers
- (U) Complete prototype development of low cost, limited capability, miniaturized VINSON (KY57), embedded within a radio cable for use by infantry company and below.

(U) FY 1993 Planned Program:

- (U) Achieve Milestone III Production and field phase one of ACMES and continue software development for phase two objective program under evolutionary fielding concept.
- (U) Award conceptual development contract for Army Secure Tactical Initiative (ASTI) Network COMSEC front end.
- (U) Prepare procurement packages for FY94 awards of ASTI user authentication system and trusted network base elements.
- (U) Continue evaluation of COMSEC NDI equipment such as STU-III video terminal, Small Key Management Module (SKMM), KIV-7, COMSEC unit, and CYPRESS programmable COMSEC module
- (U) Evaluate in-house various NDI biometric user authentication devices for use under the ASTI development program
- (U) Continue program management support in the completion of AR 70-1 documentation for the AKMS level II program

(U) Work Performed By: The primary contractors performing work in this program are: Group Technology Inc., Tampa, FL; Motorola, Scottsdale, AZ; General 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 Inc., San Diego, CA; TELOS, Tinton Falls, NJ; and Harris Corp, Rochester, NY. The primary in-house developing organizations are the US Army Communications-Electronics Command, Fort Monmouth, NJ; Program Executive Office (PEO) Communications and Program Manager (PM) Multiservice Communications Systems (MSCS), Fort Monmouth, NJ; US Army Test and Evaluation Command, Aberdeen Proving Ground, MD; US Army Signal Center and Fort Gordon, GA; and the National Security Agency, Fort Meade, MD.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

(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 #34805 P11 (Integrated System Control Engineering)
PE #BX3000 (Integrated System Control Production)
PE #643746 (Single Channel Ground & Airborne Radio System)

All the above related activities use key management, embedded COMSEC hardware, software, and Computer Security tools. In the area of key management, several Joint Service/NSA working groups exist to avoid duplication and to assure interoperability between all Services' systems, to include standards and testing for the emerging mulit-level network security area, the Defense Information Systems Agency (DISA). Multi-Level Security (MLS) working group coordinated the Services technology efforts. The National Security Agency reviews each Services's RDT&E program to avoid duplication. There is no unnecessary duplication of effort within the Army or DoD.

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

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
PROCUREMENT			
Other Procurement Army			
TA0500	5099	4199	6824
T90600	5459	6619	6913
BZ8950	2687	2290	1865
T54000	10112	11091	8513
BL5264	7004	7269	6055
TA2000	- 0 -	- 0 -	34
T03200	- 0 -	- 0 -	- 0 -
BQ0200	- 0 -	1000	987
BA1201	- 0 -	7560	7377

(U) International Cooperative Agreements: Not applicable.

AMENDED FY1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

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

Project Number Title	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D253 Defense Satellite Communications System | Defense Communications System (DSCS-DCS) (PHASE III)	6329	25572	33605	Cont	Cont
D455 MILSTAR Terminals	14689	74933	93913	272274	580375
D456 Tactical Satellite Communications (TACSATCOM) System	5832	12906	9509	Cont	Cont
PE TOTAL	26850	113411	137027		

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 Polity (MOP) 178. 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 178 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 equipments required to achieve end-to-end connectivity to satisfy JCS command, control, communications, and intelligence (C3 I) 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 BOTH FY 1992 AND 1993:
Not applicable

AMENDED FY 1992/1993 BIENNIAL RDTE 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 System (DSCS-DCS)**

Popular Name	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
DSCS/DCS	6329	25572	33605	Cont	Cont

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 Joint Chiefs of Staff (JCS) validated unique and vital Command, Control, Communications and Intelligence (C3I) for the worldwide super high frequency (SHF) Defense Satellite Communications System (DSCS) program.

C. (U) **PROGRAM ACCOMPLISHMENTS AND PLANS:**

(U) **FY 1991 Planned Program:**
- (U) Awarded Engineering and Manufacturing Development (EMD) contract on Universal Modem
- (U) Restructured and consolidated DSCS Satellite Principles Trainer (SPT) and DSCS Family of Training Devices programs into DSCS Training Devices
- (U) Continued Integrated Research Facility (IRF) upgrades and SETA support

(U) **FY 1992 Planned Program:**
- (U) Continue Engineering and Manufacturing Development (EMD) on the Universal Modem
- (U) Competitive solicitation on Engineering and Manufacturing Development (EMD) for DSCS Training Devices restructured program
- (U) Continue support and upgrades of the IRF and SETA efforts

(U) **FY 1993 Planned Program:**
- (U) Continue Engineering and Manufacturing Development (EMD) on the Universal Modem
- (U) Contract award on Engineering and Manufacturing Development (EMD) for DSCS Training Devices program
- (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; John Hopkins University/Applied Physics Laboratory, Laurel, MD; PM Training Devices, Orlando, FL.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:
1. (U) TECHNICAL CHANGES: Restructure of DSCS Training Devices Program.
2. (U) SCHEDULE CHANGES: None
3. (U) COST CHANGES: Increased funding in FY93 reflects revised estimate for DSCS minimum sustainment program.

F. (U) PROGRAM DOCUMENTATION: Defense Communications Agency (DCA) DSCS program plan approved annually by The Military Departments, validated by JCS and concurred in by OSD.

G. (U) RELATED ACTIVITIES: Not applicable.

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

	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate
1. PROCUREMENT			
Other Procurement, Army	43201	47874	139283

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Memorandum of Understanding (MOU) between US & UK Dec 1989 for Universal Modem. MOU between the US, UK, and France to be signed April 1992. Other selected allies have expressed interest.

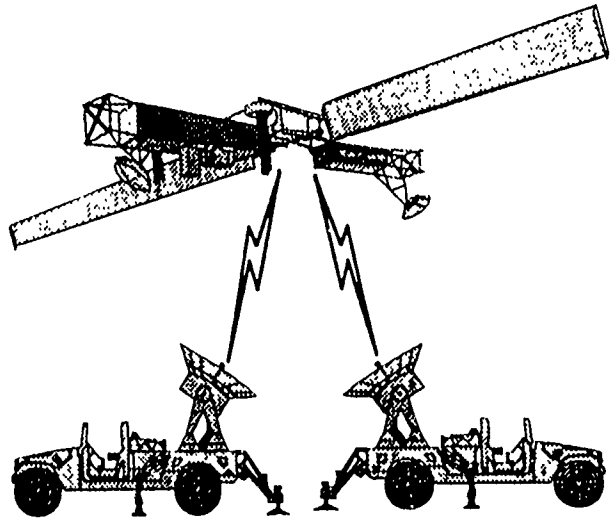
J. (U) MILESTONE SCHEDULE:

Milestones	Milestones Dates
1. DSCS TRAINING DEVICES:	
Program Restructure and Consolidation	FY91
Competitive Solicitation	FY92
Contract Award and Implementation in EMD Phase	FY93
Development/Design Review and Testing	FY94
Integration and Testing	FY95
Install and Test Engineering Design Models	FY96
Full Scale Production Phase	FY97/98
Initial Operational Capability	FY99
2. UNIVERSAL MODEM:	
Engineering and Manufacturing Development	FY91
Technical Test/Operational Test	FY94
Low Rate Initial Production (LRIP)	FY[illegible]
First Article Test	FY96
First Delivery	FY97
Full Scale Production Phase	FY97

AMENDED FY1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

Project Number: **#D455**
Budget Activity: **#5**



SMART-T

POPULAR NAME: **Army EHF Programs**

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

SCHEDULE	FY 1991	FY 1992	FY 1993	To Complete
Program Milestones	Est MOU w/ AF on GNDCP	MS II: SMART-T & SCAMP MS III: SCOTT Del 15 EMD SCOTT Terminals	Accept 2 GNDCP Terminals from AF	ASARC MSD III SMART-T & SCAMP
Engineering Milestones		Dev SMART-T & SCAMP Blk I	Cont SMART-T & SCAMP Blk I, DAMA Study	Field SMART-T & SCAMP Blk I Terms
T&E Milestones	Comp SCOTT Tech Testing	SCOTT IOT&E	Joint Interop Test	Milstar Sys Test SCOTT FOT&E on SMART-T
Contract Milestones		Awd Contracts for SMART-T & SCAMP Block I		Awd SMART-T LRIP Kt Awd Prod Kt for SMART-T & SCAMP Blk I
BUDGET ($000)	**FY 1991**	**FY 1992**	**FY 1993**	**Program Total (To Complete)**
Major Contract	1080	52882	72014	(213163)
Support Contract	2439	4583	5206	(13455)
In-House Support	11170	16825	16501	(45656)
GFE/ Other	0	643	192	
Total	14689	74933	93913	580375 (272274)

AMENDED FY1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0303142A** Project Number: **#D455**
PE Title: **Satellite Communications Ground Environment** Budget Activity: **#5**

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This program provides funds for the four Army MILSTAR programs: (1) The Secure Mobile Anti-Jam Tactical Terminal (SMART-T) will provide a range extension capability to the Army's Mobile Subscriber Equipment (MSE) to support the Airland Operations, specifically to provide a satellite interface to permit uninterrupted communications as our advancing forces move beyond the line-of-sight capability of MSE. (2) The Single Channel Anti-Jam Manportable (SCAMP) terminal will provide a manportable, secure, anti-jam satellite communications capability to Army and Air Force units which cannot be served by larger less mobile terminals. (3) The Single Channel Objective Tactical Terminal (SCOTT) will be fielded to satisfy the critical operational need for extremely reliable, extended range, highly mobile and flexible single channel tactical communications with high anti-jam and nuclear survivability capability. (4) The MILSTAR 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. The Army will design and field a transportable configuration.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments (each program individually addressed below):

SMART-T:
- (U) Developed system specification
- (U) Briefed industry
- (U) Established Electronic Bulletin Board (EBB) to gather industry comments on specifications and draft statement of work.

SCAMP:
- (U) Briefed industry
- (U) Developed system specification
- (U) Established Electronic Bulletin Board (EBB) to gather industry comments on draft specifications and draft statement of work.

SCOTT:
- (U) Completed Technical Testing
- (U) Continued reliability growth development testing.
- (U) Continued training simulator development
- (U) Continued Medium Power Transmitter development
- (U) Established Milstar Test Facility

GNDCP:
- (U) Established Memorandum of Understanding with Air Force

(U) FY 1992 Planned Program:

SMART-T:
- (U) Obtain Milestone Decision II approval from Army Systems Acquisition Review Council (ASARC)
- (U) Award Engineering and Development contract

SCAMP:
- (U) Milestone decision Review
- (U) Award EMD for Bock I contract
- (U) Receive delivery of 5 Lincoln Laboratory models

AMENDED FY1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0303142A
PE Title: **Satellite Communications Ground Environment**
Project Number: #D455
Budget Activity: #5

SCOTT:
- (U) Completed Reliability Growth Development Testing (Nov 91)
- (U) Conduct Acceptance Testing
- (U) Accept Delivery of 15 EMD Terminals
- (U) Complete Operational Evaluation.
- (U) Participate in MILSTAR MST-6000 end-to-end test with development flight satellite
- (U) Continue medium power transmitter development
- (U) Continue training simulator development (Critical Design Review conducted Dec 91)
- (U) Continue software upgrades/enhancements (over-the-air rekey, red key overwrite, in-band control).
- (U) Release Production solicitation

GNDCP:
- (U) Transportable Configuration Designed
- (U) Acquire Government Furnished Equipment

(U) FY 1993 Planned Program:

SMART-T:
- (U) Continue development
- (U) Conduct systems engineering design reviews
- (U) Obtain results from contractor's Demand Assignment Multiple Access (DAMA) study of possible material enhancement to the SMART-T

SCAMP:
- (U) Continue development of Block I terminal
- (U) Initiate Laboratory study of Block II terminal

SCOTT:
- (U) Continue software upgrades/enhancements
- (U) participate in MILSTAR Joint Interoperability Testing
- (U) Complete medium power transmitter development
- (U) Support EMD terminals
- (U) Complete training simulator development
- (U) Initiate Post Deployment Software Support Depot (PDSS)
- (U) Initiate First Article testing on Production Tooled Terminals
- (U) Conduct Milestone III Decision Review ASARC
- (U) Award Production Contract

GNDCP:
- (U) Procure initial EHF and UHF spares.
- (U) Army accepts 2 terminals from USAF of fixed configuration

(U) Program Plan To Completion:

SMART-T:
- (U) Release solicitation for Low Rate Initial Production (LRIP) contract
- (U) Receive delivery of 12 Engineering Development Model terminals
- (U) Obtain approval to proceed into LRIP
- (U) Obtain Milestone Decision III approval from ASARC
- (U) Award Request for Proposal (RFP) options

AMENDED FY1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0303142A** Project Number: **#D455**
PE Title: **Satellite Communications Ground Environment** Budget Activity: **#5**

SCAMP:
- (U) Continue development of Block I terminal
- (U) Conduct Reliability Development Growth Tests (RDGT)
- (U) Conduct Operational Testing
- (U) Deliver RDGT and Operational Assessment Units
- (U) Milestone III Review
- (U) Award Production Contract for Block I
- (U) Perform First Article Test
- (U) Field 150 Block I terminals

SCOTT:
- (U) Complete software upgrades/enhancements
- (U) Transition management to Communications and Electronics Command (CECOM)

GNDCP:
- (U) Accept and field terminals
- (U) Procure EHF and UHF spares
- (U) Transition management of GNDCP to CECOM

D. (U) WORK PERFORMED BY:

SMART-T AND SCAMP: 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 U.S> Army Communications-Electronics Command (CECOM), Fort Monmouth, NJ. Major Contractors to be determined in 3QFY92.

SCOTT: In-house: PM MILSTAR (Army) Fort Monmouth, NJ under the management of Program Executive Officer Communications Systems (PEO-COMM) with support provided by U.S. Army Communications-Electronics Command (CECOM) Fort Monmouth, NJ. Major Contractors; Magnavox, Ashburn, VA and Rockwell, Tx; Raytheon Corp., Marlborough, MA; Lincoln Laboratories, Bedford, MA. Training Simulator program is managed by PM TRADE with Statistica, Inc., Rockville, MD.

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

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

SMART-T

1. (U)**TECHNICAL CHANGES:** In the former RDTE descriptive summary, the SMART-T was called the Extremely High Frequency Medium Data Rate (EHF MDR) terminal. Additionally, requirements were refined to dissolve the need for a single low data rate terminal (previously identified as the EHF LDR) terminal) and create a single LDR/MDR terminal (i.e., the SMART-T). Also, the recent requirement to assess the potential material enhancement of the SMART-T to include a Demand Access (DAMA) capability has been identified.
2. (U) **SCHEDULE CHANGES:** None
3. (U) **COST CHANGES:** None

SCAMP

1. (U) **TECHNICAL CHANGES:**
   a. Identified the need for a Block II - 12 lb Objective SCAMP.

AMENDED FY1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0303142A** Project Number: **#D455**
PE Title: **Satellite Communications Ground Environment** Budget Activity: **#5**

b. An interim paging capability for SCAMP - Block I has been identified with paging-on-the-move as the objective SCAMP - Block II capability.

2. (U) **SCHEDULE CHANGES:** None
3. (U) **COST CHANGES:** None

SCOTT

1. (U) **TECHNICAL CHANGES:** Program restructured
2. (U) **SCHEDULE CHANGES:** Multi-services schedules coordinated.
3. (U) **COST CHANGES:** Significant changes and rescoping of program quantities downward. The Joint Staff has scrubbed the requirements for this terminal to the minimum essential to provide a tactical nuclear survivable capability to the Dept of Defense.

GNDCP

1. (U) **TECHNICAL CHANGES:** None
2. (U) **SCHEDULE CHANGES:** None
3. (U) **COST CHANGES:** None

F. (U) PROGRAM DOCUMENTATION:

SMART-T:

— Test and Evaluation Master Plan Draft 12/91
— Test and Evaluation Master Plan Draft 12/91
— Operational Requirements Document signed by MG Clark, Fort Monroe, 9 Jan 92 and forwarded to HQDA for approval
— Joint Integrated Logistics Support Plan (JILSP) 01/92

SCAMP:

— Operational Requirements Document signed by MG Clark, Fort Monroe, 9 Jan 92, and forwarded to HQDA for approval
— Acquisition Plan Approval
— Test and Evaluation Master Plan Draft Dec 91
— Joint Integrated Logistics Support Plan Jan 92

SCOTT:

— Organization & Operation (O&O) Plan
Approved - Oct 82
Updated - Jul 92
— Cost and Operational Effectiveness Analysis
Approved - Aug 85
— Acquisition Plan
Revision 2 - Approved - Oct 87
Revision 3 - Jul 89
— Test and Evaluation Master Plan Revision 8 - Sep 91

GNDCP:

— Test and Evaluation Master Plan Approved - Feb 89
— USAF responsibility
— Joint Program Documents - JILSP - Draft
— Army Baseline Cost Estimate (BCE) validated - Jan 92

AMENDED FY1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0303142A** Project Number: **#D455**
PE Title: **Satellite Communications Ground Environment** Budget Activity: **#5**

G. (U) RELATED ACTIVITIES:

SMART-T:

— Joint Milstar Program. There is no unnecessary duplication of effort within the Army or DoD.

SCAMP:

— 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.

SCOTT:

— 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 DoD.

GNDCP:

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 DoD.

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

SMART-T:

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	FY 1994 Estimate
PROCUREMENT (OPA)	- 0 -	- 0 -	- 0 -	- 0 -

SCAMP:

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	FY 1994 Estimate
PROCUREMENT (OPA)	- 0 -	- 0 -	- 0 -	- 0 -

SCOTT:

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	FY 1994 Estimate
PROCUREMENT (OPA)	- 0 -	- 0 -	45000	180100

GNDCP:

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	FY 1994 Estimate
PROCUREMENT (OPA)	- 0 -	16000	13800	5700

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable for all four programs.

AMENDED FY1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0303142A** Project Number: **#D455**
PE Title: **Satellite Communications Ground Environment** Budget Activity: **#5**

J. (U) TEST AND EVALUATION DATA:

SMART-T:

— Conduct technical testing	FY 1994-1995
— Perform First Article Test (FAT)	FY 1996-1997
— Perform interoperability testing with the Single Channel Objective Tactical Terminal.	FY 1996
— Conduct Low Data Rate Operational Test	FY 1997
— Conduct Follow-on Test and Evaluation	FY 1999-2000

SCAMP:

— Conduct SCAMP-Block I technical tests	FY 1994
— Conduct Block I Reliability Growth tests	FY 1995
— Conduct Operational Assessments - Block I	FY 1995
— Conduct First Article Test	FY 1997

SCOTT:

— Completed environment and transportability test	FY 1990
— Completed software preliminary qualification and final qualification test.	FY 1990
— Completed EMI testing	FY 1990
— Completed technical testing	FY 1992
— Complete reliability growth development tests.	FY 1992
— Conduct EMP/INR testing	FY 1992
— Participate in Milstar joint service interoperability test	FY 1991-1994
— Conduct FAT on two SCOTT EMD Production Tooled terminals	FY 1992-1993
— Complete Operational Evaluation	FY 1992
— Conduct Milstar System Test	FY 1992

GNDCP:

— Responsibility of the USAF

AMENDED FY 1992/1993 RDTE DESCRIPTIVE SUMMARY

Program Element: **#0303142A**
PE Title: **Satellite Communications Ground Environment**
Project Number: **D456**
Budget Number: **#5**

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

Project Title: Tactical Satellite Communications (TACSATCOM)Systems

Popular Name	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
TACSATCOM	5832	12906	9509	Cont	Cont

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The Ground Mobile Forces Satellite Communications (GMFSC) or TACSATCOM System program provides funds for the development of tactical satellite communications terminals and control systems for the Defense Department. Developments under this program provide rapid, reliable, effective communications to support tactical command, control, communications, and intelligence (C3I) requirements for tactical commanders and Commander in Chiefs (CINCs).

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- (U) Continued Phase II TSQ-173 Conceptual Testing
- (U) Phase III TSQ-173 Final Design Approval

(U) FY 1992 Planned Program:
- (U) Complete technical specifications for Enhanced Manpack UHF Terminals (EMUT) PSC-3 and PSC-3/VSC-7
- (U) Complete Phase III TSC-173 Functional/Operational Tests
- (U) Deliver 4 ea Phase III TSQ-173 prototypes
- (U) Deliver 1 ea Stand-Alone TSQ-173
- (U) Commence TSQ-173 conceptual testing at Ft. Detrick.

(U) FY 1993 Planned Program:
- (U) Award development contract for PSC-3/VSX-7 EMUT
- (U) Evaluate bid samples for ND-I PSC-5 EMUT

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

AMENDED FY 1992/1993 RDTE DESCRIPTIVE SUMMARY

Program Element: **#0303142A**
PE Title: **Satellite Communications Ground Environment**
Project Number: **D456**
Budget Number: **#5**

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. **(U)TECHNICAL CHANGES:** None
2. **(U)SCHEDULE CHANGES:** EMUT: full scale engineering award 2nd Qtr FY 93 (PSC-3/VSC-7). PSC-5 EMUT changed to non-developmental item (NDI) approach, production award scheduled 1st Qtr FY 94
3. **(U)COST CHANGES:** None.

F. (U) PROGRAM DOCUMENTATION:

AN/TSQ-173:	Required Operational Capability (ROC) Approval	09/89
EMUT:	ROC Approval	08/88

G. (U) RELATED ACTIVITIES: There is no unnecessary duplication of effort within the DoD.

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

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
1. PROCUREMENT	11593	10536	22300

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

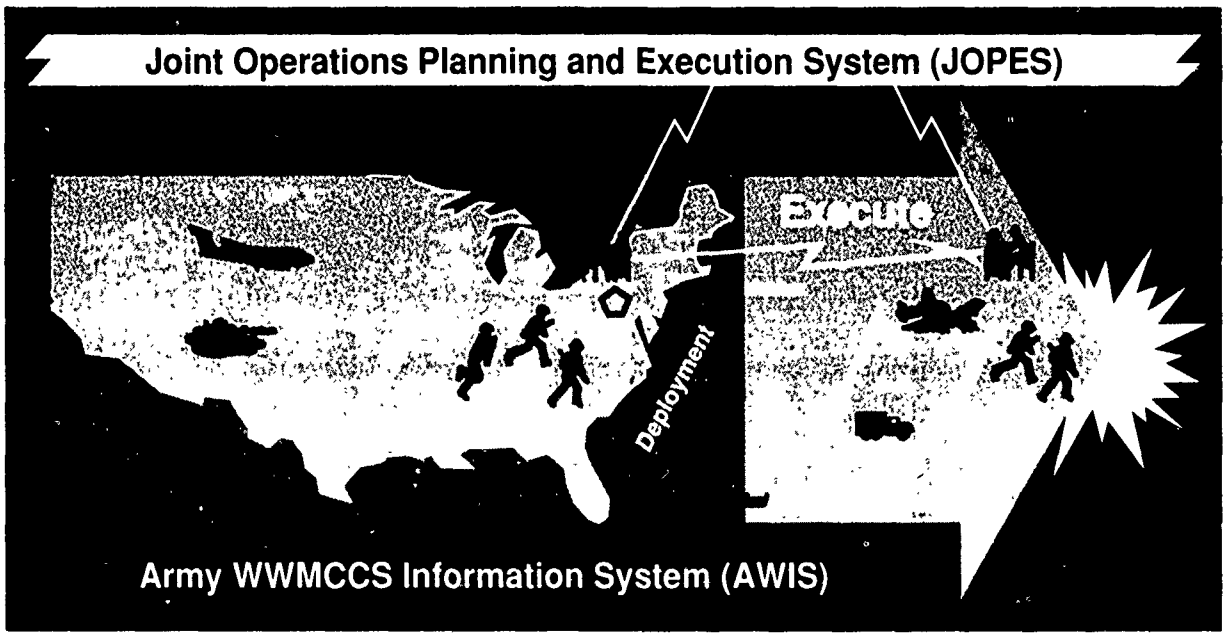
J. (U) MILESTONE SCHEDULE:

Milestones	Milestones Dates
AN/TSQ-173	
Initial Operational Capability (IOC) Phase I	2QFY90
IOC Phase II	3QFY90
IOC Phase III	3QFY92
EMUT	
Complete technical specifications available	2QFY92
Contract award for PSC-3 development	2QFY93

AMENDED FY 1992/1993 BIENNIAL RDTE 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 1991	FY 1992	FY 1993	To Complete
Program Milestones				
Engineering Milestones	ASD Contract Development of Segment 2		ASD Contract Critical Design All Functionality Apr 93	
T&E Milestones	ASD Contract OT Dec 90		ASD Contract OT Sep 92	
Contract Milestones	Site Support Recompete Apr 91	Fld 2nd release Seg 1 software Initiate design Sel Seg 2 Software mod	Propagate Log, Pers, Unit Status software to secondary sites	Fld 2nd release Seg 2 software modules Init Prel Des Seg 3 soft mod
BUDGET ($000)	FY 1991	FY 1992	FY 1993	Program Total (To Complete)
Major Contract				
Support Contract				
In House Support				
GFE Other				
Total				

AMENDED FY1992/1993 BIENNIAL RDTE 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: AWIS is the Army component system that directly supports Army implementations of the World-Wide Military Command and Control Systems (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 WWMCCS ADP Modernization (WAM) Program. AWIS provides both Army-unique strategic-level command and control (C2) software and the hardware infrastructure necessary for operation and support of the WAM-developed 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 1991 Accomplishments:
- (U) Computer Software Configuration Item detailed design, coding, and initial fieldings of unit status, logistics, and personnel strategic C2 software to lead sites
- (U) Continued fielding of Forces Command (FORSCOM) Mobilization/Operations Deployment Employment Execution (MOB/ODEE) product line
- (U) Began replacement of hard to maintain, site-unique software at FORSCOM
- (U) Performed IV&V on the software development efforts
- (U) Army Software Development (ASD) Contract Development of Segment 2 and Operational Test (OT)

(U) FY 1992 Planned Program:
- (U) Field the second release of the segment one software (logistics, personnel, and unit status) to the lead sites and export modules to other primary AWIS sites
- (U) Initiate the maintenance phase of the segment one software
- (U) Initiate detailed design for selected segment two software modules

(U) FY 1993 Planned Program:
- (U) Propagate the logistics, personnel, and unit status software to secondary sites
- (U) Field selected segment two software modules
- (U) Field the first release of segment two software modules

(U) Program Plan to Completion:
- (U) Field the second release of segment two software modules
- (U) Initiate preliminary and detailed design for segment three software modules

AMENDED FY1992/1993 BIENNIAL RDTE 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**

- (U) This is a continuing program

D. (U) WORK PERFORMED BY: AWIS Software Development Contract: TRW, Fairfax, VA. Program Management and Site Support Contract: TAI, Alexandria, VA. IV&V Contract: EER Systems, McLean, VA.

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: Delays in Joint Operational Planning and Execution System (JOPES) releases require additional software to be fielded in smaller increments.

2. (U) SCHEDULE CHANGES: The FY92 level of effort on the AWIS software development will be reduced, resulting in delayed fielding of some items and deferred development of others:

a. The Initial Operating Capability (IOC) for MOB/ODEE for FORSCOM and WWMCCS Entry System users throughout CONUS, earlier scheduled for 1st quarter FY92, is now delayed until 3rd quarter FY92. The mobilization planning software will be fielded in a delayed release rather than with the MOB/ODEE IOC release. Reserve Component Automation Systems interfaces would also be delayed.

b. Logistic software replacement/upgrade for the current Logistics Network system, currently scheduled for September 92, will be delayed until September 93.

c. The Personnel and Unit Status product line releases, currently scheduled for January 92 will be released in August 92.

d. The Start-up of the Force Planning and Transportation Product lines, scheduled for FY92, will begin in FY93 and then developed at a slower pace.

e. The Logistics Munitions and End Items release, currently scheduled for March 93, would be delayed until September 93. The Mobilization, Personnel, Unit Status System subsequent releases, currently scheduled for March 93, would be delayed until September 93.

f. The FY94-96 time frame, all product lines under development would be slipped approximately 4-6 months. There would be a concurrent reduction of support of software maintenance and enhancement activities. Database enhancement and activities would also be deferred.

3. (U) COST CHANGES: The schedule delays will result 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
Material System Requirements Specifications	05/85
WIS Decision Coordinating Paper	07/85
WIS Test & Evaluation Master Plan (TEMP)	07/87
AWIS TEMP	09/87
AWIS Program Master Plan (PMP)	12/87
JOPES Required Operational Capability (ROC)	04/88
Life Cycle Documents Architecture Design Contract	05/88

AMENDED FY1992/1993 BIENNIAL RDTE 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**

G. (U) RELATED ACTIVITIES:

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

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

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
OPA2 (BE4102)	13282	10045	7887

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

J. (U) TEST AND EVALUATION DATA:

Event	Date
AWIS Major Program Operational Test	3Q FY93
Technical Testing and Site Testing	3Q FY93
Major Design Review III	1Q FY93

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
A91A	In-House Laboratory Independent Research - Army Materiel Command				
	5397	5474	5671	Cont	Cont
A91C	In-House Laboratory Independent Research - Medical Research and Development Command				
	2578	2538	0 *	Cont	Cont
A91D	In-House Laboratory Independent Research - Corps of Engineers				
	859	846	877	Cont	Cont
A91E	In-House Laboratory Independent Research - Army Research Institute of Behavioral and Social Sciences				
	0	88	149	Cont	Cont
PE TOTAL	8834	8946	6697		

* These medical resources transferred to OSD, Health Affairs, effective FY 1993

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 selected members of the Army Science Board whose 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 Technology Base Master Plan, Science and Technology Objectives (STOs) milestones for the Army's key emerging technologies therein, and Army force modernization plans.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project A91A - In-House Laboratory Independent Research (ILIR) - Army Materiel Command: Represents the initial FY 1990 ILIR allocation for the laboratories and Research, Development and Engineering Centers in the Army Materiel Command (AMC).

(U) Project A91C - In-House Laboratory Independent Research (ILIR) - Medical Research and Development Command: Represents the initial FY 1990 ILIR allocation for the laboratories in the Medical Research and Development Command. These medical resources transferred to OSD, Health Affairs, effective FY 1993.

(U) Project A91D - In-House Laboratory Independent Research (ILIR) - Corps of Engineers: Represents the initial FY 1990 ILIR allocation for the laboratories in the 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 1991 Accomplishments:**

- (U) The results of the research performed in FY 1990 were evaluated by the Army Science Board, and the ILIR allocation for FY 1992 for each laboratory was determined by the results of this evaluation. The laboratory Directors will select the projects to be funded in FY 1992. This procedure is designed to reward those laboratory Directors who best utilize their ILIR investment.

(U) **FY 1992 Planned Program:**

- (U) The laboratory Directors select in-house 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) **FY 1993 Planned Program:**

- (U) The results of the research performed in FY 1992 will be evaluated by the Army Science Board, and the ILIR allocation for FY 1994 for each laboratory will be based on the results of the 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) **Work Performed By:** The work will be performed in-house by the Army Laboratories and Research, Development and Engineering Centers.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

(U) Related Activities: The Navy and Air Force 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.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
A31B	Night Vision and Electro-Optics Research				
	6886	5226	6432	Cont	Cont
A71A	Research in Chemical Warfare/Biological Warfare Defense				
	4650	4741*	7342	Cont	Cont
AF22	Research in Vehicular Mobility				
	921	948	1193	Cont	Cont
AH40	Signals Warfare Laboratory				
	918	862	1085	Cont	Cont
AH42	Materials and Mechanics				
	2693	2993	3602	Cont	Cont
AH43	Research in Ballistics				
	5150	5331	7842	Cont	Cont
AH44	Sensor Systems Research				
	2299	2564	3400	Cont	Cont
AH45	Air Mobility				
	6996	7204	8925	Cont	Cont
AH47	Electronic Device Research				
	4162	4426	5871	Cont	Cont
AH48	Communications Research				
	2164	2227	2804	Cont	Cont
AH49	Research in Missiles and High-Energy Lasers				
	5254	5313	6589	Cont	Cont
AH51	Combat Support				
	1081	1133	1424	Cont	Cont
AH52	Equipment for the Soldier				
	2863	2959*	5309	Cont	Cont
AH60	Research in Armaments				
	3531	2170	2706	Cont	Cont
AH61	Research in Close Combat Weaponry				
	1690	1606	2007	Cont	Cont
AH68	Processes in Pollution Abatement Technology				
	423	514	4354	Cont	Cont
AT22	Soil and Rock Mechanics				
	2011	2088	3653	Cont	Cont
AT23	Basic Research/Military Construction				
	1118	934	1022	Cont	Cont

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
AT24	Snow, Ice and Frozen Soil				
	1484	1322	2427	Cont	Cont
B52C	Mapping and Remote Sensing				
	2768	2738*	2886	Cont	Cont
B53A	Atmospheric Sciences				
	5047	5451*	7291	Cont	Cont
B74A	Human Engineering				
	2234	2449	3212	Cont	Cont
B74F	Personnel Performance and Training				
	3285	3413	4354	Cont	Cont
BH27	Research in Munitions Science				
	2663	2533	4484	Cont	Cont
BH57	Scientific Problems with Military Applications				
	55431	59778	65519	Cont	Cont
BS04	Military Pollutants and Health Hazards				
	570	840	912	Cont	Cont
BS11	Science Base/Medical Chemical Defense				
	6262	7616	0 **	Cont	Cont
BS12	Science Base/Medical Biological Defense				
	16854	16515	0 **	Cont	Cont
BS13	Science Base/Medical Research Infectious Disease				
	8180	9321	0 **	Cont	Cont
BS14	Science Base/Combat Casualty Care Research				
	3491	3137	0 **	Cont	Cont
BS15	Science Base/System Health Hazards Research				
	7668	8365	0 **	Cont	Cont
BS16	Science Base/Combat Dentistry Research				
	1023	1150	0 **	Cont	Cont
BS17	Molecular Biology/Military HIV Research				
	0	1000	0 **	Cont	Cont
PE TOTAL	171770	178867	166645		

* Supplemental appropriation funds for Operation Desert Storm (ODS) in the amount of $191k are included
** These medical resources transferred to OSD, Health Affairs, effective FY 1993

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

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 Technology Base Master Plan, Science and Technology Objectives (STO's) milestones for the Army's key emerging technologies, and Army force modernization plans.

C. (U) JUSTIFICATION FOR PROJECTS:

(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 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, hign yield focal plane array (FPAs) supporting next generation thermal imaging systems. Other critical elements include new tunable laser materials for Army countermeasure applications, 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 1991 Accomplishments:
- (U) Target acquisition model based on neural net algorithms developed and brought in-house for testing
- (U) Demonstrated 10X improvement in sensitivity of detection of impurities in detector materials by direct coupled Zeeman atomic absorption spectroscopy
- (U) Developed improved absorption coating for uncooled detectors
- (U) Demonstrated first high efficiency diode pumped erbium laser for eyesafe operation at 1.54 microns
- (U) Improved by almost two orders of magnitude the switching threshold and dynamic range of IR power limiter for sensor protection

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

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

(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) Project A71A - Research in Chemical Warfare/Biological Warfare Defense: The purpose of this project is to obtain, through basic research in chemistry, physics and life sciences, fundamental information in support of: new and improved defensive systems for biological agents and toxins; new and improved defensive systems for chemical threat agents; 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 environmental fate and impact of military unique processes.

(U) FY 1991 Accomplishments:

- **(U)** Demonstrated use of bioprocess technology for study of chemical agent decontamination and detection
- **(U)** Initiated assessment of the chemistry and toxicology of bioactive compounds, developed new riot control compounds, and developed methodology for inhalation toxicology
- **(U)** Continued aerosol science studies of full polarization nephelometry, inversion techniques, and particle manipulation (chemistry of single particles). Especially important was the focus of bio-aerosols related to threats identified in Operation Desert Storm (ODS)
- **(U)** Continued studies of the fluid dynamics of stability phenomena associated with partial solid/partial liquid payloads on projectiles
- **(U)** Initiated development of laser technologies for desorption/ionization of compounds and laser vaporization of biological aerosols in mass spectrometer
- **(U)** Continued studies on mechanisms of chemical agent decontamination and air purification technologies

(U) FY 1992 Planned Program:

- **(U)** Continue use of bioprocess technology for study of chemical agent decontamination and detection; transition biotechnology products to exploratory development
- **(U)** Continue assessment of the chemistry and toxicology of bioactive compounds, transition new riot control compounds and methodology for inhalation toxicology to exploratory development
- **(U)** Continue aerosol science studies of full polarization nephelometry, inversion techniques, and particle manipulation
- **(U)** Continue studies of the fluid dynamics of stability phenomena associated with partial solid/partial liquid payloads on projectiles; modify Epicyclic Theory
- **(U)** Continue development of laser technologies for desorption/ionization and electrospray mass spectrometry of compounds of biological aerosols. Initiate study of hybrid techniques (such as high pressure liquid chromatography (HPLC)/electrospray mass spectrometry) to increase sensitivity, improve signal-to-noise, and shorten analysis turn-around time.
- **(U)** Continue studies on mechanisms of chemical agent decontamination and air purification technologies, both as solid/liquid, solid/air and liquid/air interfaces

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

(U) FY 1993 Planned Program:

- (U) Continue use of bioprocess technology for study of chemical agent decontamination and etection; expand use of bioprocess technology for pathogen and toxin detection; develop predictive Index of Threat for pathogens for a variety of different environmental scenario's; initiate evaluation of novel strategies (i.e., biomagnetic) for separation of priority pollutants; initiate studies to immobilize receptors to microsensors to document pollutants at concentrations below health effect levels; initiate studies to engineer biomaterials (such as catalytic antibodies) with ability to detoxify/degrade military unique compounds at ambient conditions; identify structure of recognition sites on receptor molecules and design synthetic analogs using molecular modeling; purify catalytic enzymes and surfactants with ability to degrade and detoxify chemical agents under ambient conditions; transition bioprocess technology products to exploratory development
- (U) Continue assessment of the chemistry and toxicology of bioactive compounds
- (U) Continue aerosol science studies of full polarization nephelometry, inversion techniques, and particle manipulation. Initiate mechanisms of reactive chemistry on surface of single particles
- (U) Continue studies of the fluid dynamics of stability phenomena associated with partial solid/partial liquid payloads on projectile; modify Epicyclic Theory
- (U) Continue development of laser technologies for desorption/ionization of compounds and electrospray mass spectrometry of compounds of biological aerosols, with increasing focus on high molecular weight species (>50,000 Daltons). Initiate study of hybrid techniques (such as HPLC/electrospray mass spectrometry) to increase sensitivity, improve signal-to-noise, and decrease analysis turn-around time. Improve the methodology of mass spectrometry techniques for rapid identification of suspect "unknown" toxic proteins.
- (U) Continue studies on mechanisms of chemical agent decontamination and air purification technologies on military unique compounds; initiate the use of designer aerosols in pollution prevention. Increase focus on mechanisms of decontamination of biological and toxin "agent" species. Initiate studies on the use and mechanism of catalytic materials focused on ecological remediation
- (U) Develop validated methods for use of modern analytical tools (such as ion trap mass spectrometry) to assess threat potential of potentially toxic chemical and biomolecules in an environmental matrix
- (U) Initiate the development of microcosm methodologies which assess the impact of noxious chemicals, especially military unique, on soil, marine and freshwater flora and fauna communities
- (U) Initiate comprehensive studies on the environmental fate and mechanism of miliary unique species. Initiate study to determine rational biogenetic pathways and develop analytical m methodology to follow, in real time, biodegradation processes of military unique compounds in natural matrices
- (U) Initiate comprehensive studies to determine how fielded military systems (e.g., the Nuclear Biological Chemical (NBC) Reconnaissance Program) may be configured for real-time monitoring and assessment of priority pollutants. Demonstrate and transition such technologies to depots and other military installations for purpose of environmental compliance and pollution prevention

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

(U) Project AF22 - Research in Vehicular Mobility: This effort provides the scientific foundation for increasing the mobility of tracked and wheeled vehicles in all weather and soil conditions. Principal thrusts include vehicle dynamics, propulsion, survivability and robotics. The goal is greater mobility with smaller crew, and more effective crew requirements including improved survivability and logistics.

(U) FY 1991 Accomplishments:
- (U) Developed kinematic symbolic factorization solutions
- (U) Determined stress in chemically vapor deposited (CVD) Si coatings
- (U) Determined global linearization algorithm for nonlinear control
- (U) Conducted thermal imaging of engine flame propagation
- (U) Obtained instantaneous measurement of engine friction

(U) FY 1992 Planned Program:
- (U) Simulate multiple rigid-body mechanical systems with arbitrary topological structure
- (U) Develop target acquisition criteria which utilize clutter, shape, color, and motion
- (U) Develop high resolution photoacoustic imagery of ceramic engine coatings
- (U) Complete platinum silicide focal plane array camera for short integration time thermal imaging

(U) FY 1993 Planned Program:
- (U) Thermoacoustic signature analysis
- (U) Establish a quantitative comparison of color and relative contrast for visual detectability
- (U) Support control design and stability analysis using system reduction and matrix inversion techniques
- (U) Examine the effects of thermal diffusivity upon ceramic coatings in high temperature engines

(U) Project AH40 - Signals Warfare Research: 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, first, Artificial Intelligence (AI) based research for sorting and fusing data from sensors, and second, signal processing techniques that promote both sorting and fusing at the sensor itself.

(U) **FY 1991 Accomplishments:**
- (U) Developed algorithms to assist in the reliable and robust recognition of on-going enemy plans in tactical situations for diverse application
- (U) Developed algorithms for advanced array processing to provide increased accuracy in direction-finding, copy, and time-difference-of-arrival geolocation
- (U) Tested tactical Threat Assessment system
- (U) Developed mathematical theory for Artificial Intelligence battlefield strategy
- (U) Investigated computational geometry and artificial intelligence to produce building blocks for intelligence production reasoning
- (U) Extended algorithms for direction-finding, copy, and time-difference-of-arrival geolocation

- (U) Developed techniques for exploitation of signal internals
- (U) Completed the extension of the design of the antenna array and direction finding (DF) algorithms for wider search assumptions
- (U) Advanced the detection and classification for frequency agile emitters

(U) **FY 1992 Planned Program:**

- (U) Develop theory to advance the deterministic solutions provided by computation geometry research for tactical decision making
- (U) Continue the design of the spatial database management system to support efficient, high level implicit templating
- (U) Develop algorithms for advanced array processing to provide increased accuracy in direction-finding, copy, and time-difference-of-arrival geolocation
- (U) Develop algorithms to assist in the reliable and robust recognition of on-going enemy plans in tactical situations for diverse application
- (U) Extend algorithms for direction-finding, copy, and time-difference-of-arrival geolocation which will transition to Ground Based Common Sensor
- (U) Design optimal antenna array for extended bandwidth application

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

- (U) Develop techniques for testing and evaluation of a robust, domain independent and extensible threat recognition and assessment
- (U) Initiate study of performance degradation on varying numbers of receiver channels and antenna sensors for efficient algorithm development
- (U) Develop theory to advance the deterministic solutions provided by computation geometry research for tactical decision making
- (U) Design the spatial database management system to support efficient, high level implicit templating
- (U) Develop algorithms for advanced array processing to provide increased accuracy in direction-finding, copy, and time-difference-of-arrival geolocation
- (U) Develop algorithms to assist in the reliable and robust recognition of on-going enemy plans in tactical situations for diverse application

(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, superconducting materials and chemical protection.

(U) **FY 1991 Accomplishments:**

- (U) Evaluated corrosion of ion-implanted materials
- (U) Evaluated novel synthesis techniques for improved adhesives
- (U) Developed enhanced radiographic imaging for ceramic armor
- (U) Continued evaluations of compressive failure of ceramics at high strain
- (U) Continued synthesis methods to impart laser resistance to polymers

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

- (U) Continued evaluations of high critical temperature (Tc) superconductors for Army applications
- (U) Investigated applications of artificial intelligence to ordered polymer synthesis
- (U) Continued predictive methodology for absorption/desorption of chemical agents in organic materials

(U) **FY 1992 Planned Program:**
- (U) Continue predictive methodology for absorption/desorption of chemical agents in organic materials
- (U) Determine effect of fatigue cycling on hydrogen embrittlement of high strength steels
- (U) Continue development of structural polymeric materials with inherent laser resistant properties
- (U) Develop test methodology to investigate energy absorption mechanisms of fiber reinforced composite materials
- (U) Calculate effects of sulphur, carbon and hydrogen in grain boundaries of high strength steels
- (U) Continue investigation/evaluation of corrosion of ion-implanted materials
- (U) Continue evaluation/investigation of novel synthesis techniques for improved adhesives

(U) **FY 1993 Planned Program:**
- (U) Select and optimize Rapid Solidification Process (RSP) for ballistically tolerant components
- (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) Project AH43 - Research in Ballistics: This project contains research on combustion chemistry, physics and fluid dynamics, physics of explosive materials, and interior ballistic reaction kinetics.

(U) **FY 1991 Accomplishments:**
- (U) Derived new computer capabilities for evaluating propellant combustion using reduced reaction set kinetics schemes
- (U) Applied Fluid Dynamics Modelling to wrap-around fins to support projectile performance of extended range artillery concepts
- (U) Derived test data on mechanism of penetrator and ceramic armors in order to develop new armor concepts
- (U) Quantified mass/space efficiency of special materials vs. kinetic energy (KE) penetrators at 1/4 scale
- (U) Derived safety, chemical compatibility, detonability, and performance data on candidate materials for an insensitive explosive

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

(U) FY 1992 Planned Program:

- (U) Using computer evaluation capabilities enhanced in 91, screen energetic liquid propellant (LP), electrothermal (ET), and low vulnerability ammunition (LOVA) materials
- (U) Measure in-bore and free-flight fin temperature to verify Navier-Stokes Fluid Dynamics Models of extended range and other rounds
- (U) Identify promising mechanisms for defeat of both KE and chemical energy (CE) threat to armor
- (U) Complete 10-20 tests of oriented polycrystaline tungsten penetrators
- (U) Identify preferred binary pair for an insensitive explosive

(U) FY 1993 Planned Program:

- (U) Determine optimal propulsion materiels for use in gun systems using energetic computer capabilities
- (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 polycrystaline tungsten penetrator candidates
- (U) Characterize decompostion/combustion products and environmental efficts of halogenated hydrocarbon (HALON) alternatives
- (U) Study solubility of energetic materials in modified supercritical fluids for future recycling techniques for polution 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) 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 1991 Accomplishments:

- (U) Initiated growth of novel optoelectronic devices by molecular beam epitaxy in gallium arsenide-type semiconductor materials
- (U) Modeled and measured non-linear optical properties of quantum well and superlattice semiconductor structures for device applications
- (U) Initiated techniques for measurement of femtosecond optical responses in semiconductor devices
- (U) Continued theory and measurements of strain effects in gallium arsenide type materials
- (U) Investigated image algebra and higher-order cumulants for target recognition

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

- (U) Continued experiments on radiation hard ferroelectric memories and silicon-on-insulator structures
- (U) Modeled and simulated diffraction terms in electromagnetic scattering simulations
- (U) Continued efforts on ultra wideband radar penetration of foliage

(U) **FY 1992 Planned Program:**
- (U) Grow gallium arsenide (GaAs)-type materials by molecular beam epitaxy. Study detailed mechanisms in which strain, light, or electric fields modulate the complex refractive index of layered semiconductor GaAs structures
- (U) Measure femtosecond response time of optoelectronic components to optical and electrical excitation
- (U) Explore non-linear optical materials for signal processing and optical network applications
- (U) Extend research on ferroelectric films and evaluate radiation response of complementary metal oxide semiconductor (CMOS) circuits with ferroelectric elements
- (U) Continue research on impulse and millimeter-wave radar backscatter modeling and imaging

(U) **FY 1993 Planned Program:**
- (U) Continue basic studies of novel molecular beam epitaxy growth of gallium arsenide-type semiconductor structures for device applications. Pursue low-temperature experiments to isolate various interactions that affect optoelectronic operations
- (U) Initiate growth of "self electro-optic effect devices" for applications to optoelectronic signal processing
- (U) Examine degradation and failure effects in ferroelectric memory films
- (U) Complete evaluations of impulse techniques for foilage penetration synthetic aperture radar, and millimeter-wave techniques for target sensing radar

(U) Project AH45 - Air Mobility: Basic and applied research in aerodynamics, structures, propulsion and avionics as applied to rotary wing aircraft. Analysis, code development, test and evaluation are conducted on rotor unique aerodynamics, dynamics, performance, stress, structures and aircraft performance and acoustics, as well as transmissions, turbines, and compressors applicable to small engines and powertrain systems. Efforts in avionics are focused in antenna modeling and advanced display concepts.

(U) **FY 1991 Accomplishments:**
- (U) Investigated artificial intelligence (AI) engine controls
- (U) Conducted crack growth tests on multi-hole large panels
- (U) Aft slotted High Maneurerability Agility Rotor Control System (HIMARCS) airfoil designed, fabricated and tested
- (U) Initiated electromagnetic analysis of non-perfectly conducting material helicopters
- (U) Continued to expand delamination characterizations for combined loading conditions and residual thermal stresses
- (U) Developed analysis for predicting crushing response of composite sine-wave beams
- (U) Conducted flap, lag, torsion dynamics, stall analysis

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

- (U) Initiated controlled combustion pattern factor experiments of streamwise vorticity stirring (SVS) techniques
- (U) Integrated variable overlap field of view (FOV) biocular head mounted optics (HMO) into differential maneuvering simulator
- (U) Completed models and analyzed selected cycles of wave rotor
- (U) Developed and applied neural network simulation program to classify lap joint bond integrity

(U) **FY 1992 Planned Program:**
- (U) Continue electromagnetic analysis of non-perfectly conducting materials for helicopters
- (U) Expand composite delamination fatigue life predictions to combined loads conditions
- (U) Initiate wave rotor testing and code validation
- (U) Conduct forward slotted HIMARCS airfoil tests
- (U) Initiate Phase 1 of wave rotor experiment
- (U) Conduct noise control tests on complex structures
- (U) Complete reconfigurable propulsion control design using expert systems approach
- (U) Develop structural analysis model and life prediction methodology for ceramic turbine materials
- (U) Develop advanced computer-aided geometrical modeling techniques for automatic input to electromagnetic (EM) analysis codes
- (U) Conduct crack growth tests on 8090 Al-Li (Aluminum-Lithium Alloy)
- (U) Test British experimental rotor program (BERP) model series

(U) **FY 1993 Planned Program:**
- (U) Develop analysis techniques and fabricate helicopter scale models for antenna patterns
- (U) Fabricate high coefficient of life slotted airfoil
- (U) Test new blade concepts for reduced detection
- (U) Establish feasibility of pictorial display augmentation by imaging sensor-based information
- (U) Complete verification of Sprag clutch engagement model and test
- (U) Conduct testing of new gear tooth forms to reduce noise and vibrations
- (U) Complete engine demonstration of high speed active stabilization of centrifugal compressor
- (U) Produce scaling effects of complex composite structures such as airframes and their subfloors
- (U) Complete validation of inverse design code for radial turbines
- (U) Complete evaluation of streamwise vorticity stirring (SVS) configurations
- (U) Investigate advanced crashworthy concepts such as coherent collapsible composite airframes
- (U) Model cruciforms and compare finite element code predictions with static crushing test data develop/demo improved low-velocity impact damage analysis

(U) Project AH47 - Electronic Device Research: Perform research on critical 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, missile seekers, and secure communications; tactical power sources for a wide variety of manportable electronic equipment.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

(U) FY 1991 Accomplishments:

- (U) Optimized material growth and processing parameters of pseudomorphic indium gallium-arsenide devices with 0.1 to 0.25 micron gates for ultrahigh speed applications
- (U) Designed, fabricated, and evaluated unique building blocks of lightwave system using multiple-quantum-well heterostructure optical waveguides and switches
- (U) Developed new design concepts and optimize permanent-magnet rotor assemblies for high efficiency motors and generators
- (U) Developed enhanced permanent-magnet magnetic resonance imaging structures for improved field homogeneity
- (U) Designed and evaluate permanent-magnet biasing structures for microwave tube, requested by tube manufacturers (Martin-Marietta and Hughes)
- (U) Examined feasibility of replacing superconducting magnets with permanent magnets in backward oscillator tubes
- (U) Extended high-quality film area to 2 inch diameter on oxide substrates for microwave and infrared devices
- (U) Fabricated, measured, and evaluated superconductor/semiconductor oxide-based epitaxial superlattices
- (U) Explored/invented high dielectric constant organic liquids for use as impregnants in high-energy pulse forming lines, and capacitors for kinetic energy weapons and countermeasures

(U) FY 1992 Planned Program:

- (U) Design and evaluate new optoelectronic devices including quantum infrared (IR) photoconductors, IR light modulators, logic elements, and monolithic integration with microwave devices
- (U) Initiate design and modeling of three-dimensional (3-D) integrated circuit structures
- (U) Optimize selective-wavelength microwave quantum well IR detectors in array format
- (U) Optimize processing and nanolithography of quantum millimeter wave devices into gallium arsenide high-speed signal processing circuits
- (U) Evaluate alternate processing technology for gallium arsenide optical switches and quantum devices
- (U) Model quantum-feature-size neural networks for front end signal processing/decision making electronics
- (U) Build a working prototype permanent-magnet magnetic resonance imaging apparatus and nuclear magnetic resonance scanners for antiterrorist activities
- (U) Optimize and integrate oscillators into microwave front ends including antennas, network, and mixers with superconducting matching networks, for improved selectivity
- (U) Develop novel polymeric films with high dielectric constant and high dielectric strength using solution-cast and extrusion methods

(U) FY 1993 Planned Program:

- (U) Provide ultradense, fast 3-d microelectronics using quantum devices and optoelectronic integration

- (U) Fabricate and test terahertz devices based on indium gallium arsenide strained-layer heterostructures
- (U) Fabricate second-generation lateral quantum-well arrays and evaluate performance at room temperature
- (U) Optimize processing and nanolithography for quantum feature size neural networks for front-end signal processing/decision-making electronics
- (U) Construct high-efficiency permanent-magnet rotor for a three-phase motor and perform experimental analysis
- (U) Explore new high-energy-product magnetic materials for incorporation into existing and new magnetic circuits for radars, free-electron lasers, and travelling wave tubes
- (U) Test new device concepts integrating superconducting superlattices on electro-optically active substrates for optical and microwave switching and modulating devices
- (U) Develop 8X higher energy density batteries for electric guns through efficient utilization of transition-metal-oxide-sulfide cathode materials

(U) Project AH48 - Communications Research: U.S. Army Communications-Electronics Command (CECOM) Center for command, control, and communications (C3) systems' mission is to perform basic research necessary to meet Army needs in the development and improvement of survivable tactical C3 equipment and systems. Specifically, this project addresses research issues in the areas of antennas, network management and control, electromagnetic (EM) propagation, survivable networks electronic counter countermeasures (ECCM) aspects, artificial intelligence/modeling for distributed command and control (C2), and fiber optics.

(U) FY 1991 Accomplishments:

- (U) Designed and assembled fully functional experimental model of modulated scattering technique near field antenna measurement system; established capabilities and limitation of method
- (U) Developed a new mathematical model for automated conversion for integrated services digital network (ISDN) like networks
- (U) Completed preliminary model for ISDN to incorporate fuzzy time into protocol timer variables
- (U) Completed experimental and theoretical investigation on microwave/millimeterwave (MMW) pulse broadening and depolarization effects in vegetation; determined effect on data transmission
- (U) Refined diffraction grating and growth techniques to grow optic transmitters and receivers as well as their associated electronic circuits, all on D-shaped optical fiber
- (U) Evaluated effectiveness of network-based attacks and corresponding countermeasures through simulation
- (U) Incorporated an object-oriented approach for stochastic processing services to support advanced decision aids for combat evaluation
- (U) Extended stochastic combat modeling to perform faster than real time wargaming to support Army Tactical Command and Control System (ATCCS) decision aids

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

(U) FY 1992 Planned Program:

- (U) Investigate accurate characterization of printed circuit antennas and arrays including their feed systems
- (U) Continue development of ISDN interconnection models and strategies; work on formal protocol proof techniques, and on smart protocols that learn from network environment
- (U) Continue research on test sequences generation metholodogies and use of fuzzy logic/time
- (U) Continue observation campaign of European high frequency (HF) measurement with expanded station network. Collect, process, interpret HF wideband data
- (U) Test & evaluate the D-shaped optical fiber transceiver to determine performance parameters
- (U) Develop network level approaches to improved survivability of distributed internetwork tactical communications
- (U) Investigate an integrated approach to extend Airland Battle Management (ALBM) related knowledgebase/databases and analytical models to include terrain reasoning
- (U) Investigate combat plans and model to illustrate services for AI-based C2 presentations

(U) FY 1993 Planned Program:

- (U) Continue investigation of printed curcuit antennas, start synthesis problem of planar arrays of these antennas with EM coupled feed systems embedded in substrate
- (U) Complete work in protocol proofing techniques; perform application proof tests of smart protocols that learn from the network environment
- (U) Assess predictability of HF oblique circuit performance from vertical realtime data
- (U) Explore capability and integration problems associated with cascading N-number of multiple quantum well devices onto a multi-purpose electro-optical circuit
- (U) Simulate performance on adaptive electronic counter-countermeasures (ECCM) network protocols on tactical HF/very high frequency (VHF) radios
- (U) Develop a framework for cooperative problem-solving in a distributed command post environment
- (U) Investigate combat tasks and develop mathematical models to illustrate services for AI-based C2 operations

(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 photonics, optical, computers, nonlinear optical materials, integrated optics, laser photo-chemistry, missile systems research and laser science.

(U) FY 1991 Accomplishments:

- (U) Demonstrated optical correlator guidance against model board noncooperative (tank) targets
- (U) Continued study of optical architectures for implementation of neural networks in automatic target recognition (ATR) and pattern recognition
- (U) Continued efforts to develop faster, cheaper, more sensitive image modulators
- (U) Conducted study of fast optical switching properties of metal microsphere colloidal suspensions
- (U) Continued study of a variety of spatial light modulators for optical processing applications

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

(U) **FY 1992 Planned Program:**
- (U) Continue study of optical computer applications for ATR, guidance, and target cueing
- (U) Continue study to enhance efficiency and stability of electro-optical guided wave systems for signal processing and computing applications
- (U) Continue effort to improve materials for high quality electro-optical devices such as indium phosphide detectors
- (U) Continue study of photosensitive polymers for optical memories and data storage

(U) **FY 1993 Planned Program:**
- (U) Continue study of optical computer applications for ATR, guidance, and target cueing
- (U) Continue theoretical studies in bistability and nonlinear optics for all optical digital computers
- (U) Apply neural network concepts to optical computers
- (U) Continue studies to tailor nonlinear optical properties of materials using laser chemistry

(U) Project AH51 - Combat Support: This research is focused on the three commodity areas countermine, counter-surveillance and mobility fuels, where technological opportunities and well identified Army needs promise the highest pay-off. The majority of programs are joint ventures with universities to capitalize on latest scientific advances while providing excellent training experience for our technical staff.

(U) **FY 1991 Accomplishments:**
- (U) Completed X-ray backscatter imaging research and transition effort to Exploratory Development Project AH20
- (U) Continued microwave mine detection research with universities, and Army Research Office (ARO). This program is also supported by the Joint Services Electronics Program (JSEP)
- (U) Intensified research on the formation and detonation of explosive clouds in support of mine neutralization. (Collaboration with Johns Hopkins University)
- (U) Focused Camouflage Research on smart materials to achieve controlled radar scattering behavior
- (U) Completed definition of hot fuel surface deposit mechanisms

(U) **FY 1992 Planned Program:**
- (U) Following a review by scientific expert panel, concentrate microwave mine detection research on experimental verification of promising concepts. Continue participation by leading universities such as University of PA, University of CA - Berkeley, Stanford and Georgia Tech
- (U) Continue research on shock and heat wave dynamics in dispersed explosives
- (U) Continue experimental effort on X-ray photon detector types and arrays to optimize photon presentation for visual interpretation
- (U) Continue electromagnetic data collection and analysis to quantify sensor parametric dependency for separated aperature technology
- (U) Complete description of mechanism of fuel deposit formation and transition research results to Projects AH20 and D150

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

(U) FY 1993 Planned Program:

- (U) Increase emphasis in mine detection research on signal processing using Neural Nets and other adaptive processing schemes
- (U) Transition initial results of explosives cloud research to ongoing developmental efforts in mine neutralization
- (U) Initiate experimental investigation of microstrip antenna configuration for microwave sensors
- (U) Validate radar screen prediction model
- (U) Investigate basic mechanisms of additive interactions in petroleum products, aimed toward the development of guidelines that minimize compatibility problems while allowing product innovations

(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.

(U) FY 1991 Accomplishments:

- (U) Successfully incorporated the capability to detoxify a mustard agent simulant into a film for use in a protective clothing system
- (U) Demonstrated that properties and functions of enzymes, with capability to destroy G-agents, are retained even when fixed on a fabric substrate
- (U) Combined NLO tetrabenzprophyrin in microlens array and successfully demonstrated energy limiting against eye damage from laser radiation
- (U) Demonstrated major role of negative expectations toward operational rations in decreasing consumption in the field by soldiers and thereby established basis for countering this situation
- (U) Experimental fiber, possessing relatively highly pleated structure, was identified in conjunction with DuPont as having superior ballistic protective potential. Fiber was transferred to Soldier Enhancement Program for reduced weight helmets
- (U) Established adequacy of correlation of marker concentration increase as a function of time and temperature with microbial lethality by thermal processing and initiated patent and commercialization process
- (U) Formed monolayer assemblies based on the incorporation of photoreceptors and conductive polymers for optical and electronic "chameleon-like" responses
- (U) Developed and verified utility of computational fluid dynamics in modeling opening phenomena of parachutes

(U) FY 1992 Planned Program:

- (U) Polymerize and metallize substituted tetrabenzporphyrins to enhance nonlinear optical properties for use in tunable laser eye protection

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

- (U) Determine yield and nutritional quality of foods derived from a conceptual environmental bioconversion process intended to serve as a basis for producing operational rations in the field
- (U) Conduct bifurcation analysis of parachute stability during opening
- (U) Model structural proteins for electromagnetic responses and architecture to assist in the design of genes for bioengineered materials and coatings for signature reduction properties and controlled pore size for membranes.
- (U) Establish critical factors affecting water intake in the field as a means of reducing dehydration casualties due to inadequate water consumption
- (U) Develop 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) Investigate novel pigments/colorants to reduce thermal emission and improve nuclear flash protection
- (U) Develop new polymeric materials specifically tailored for ballistic impact resistance; form into fibers that are able to maximize the energy absorption capabilities of textile structures
- (U) Develop improved body armor materials through process variations of liquid crystalline fibers
- (U) Identify, synthesize or isolate reactants against specific hazardous threats, including munitions and chemical agents
- (U) Clone the streptavidin gene into suitable host and incorporate suitable promoters and signal sequences

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

- (U) Transition enhanced prototype nonlinear optical materials to 6.2 program for incorporation into eye safety devices for protection against tunable lasers
- (U) Transition the technology of synthesizing and processing thermotropic liquid crystalline polymers to the 6.2 program for improved body armor
- (U) Commence validation of the decelerator model for parachute opening
- (U) Optimize biodegradable polymer structures to meet storage stability and field degradation needs and to meet environmental standards for Law-of-the-Sea and for ground exercises
- (U) Model visual factors affecting ration acceptance and consumption by soldiers for improved ration acceptability
- (U) Identify and assess factors affecting staling of bread and other starch based products to improve retention of quality during storage
- (U) Commence testing of biomembrane systems for their potential use in field water purification
- (U) Determine the combined lateral compressive- axial tensile- lateral shear stress-strain behavior and failure mechanisms of high strength fibers for ballistic protection
- (U) Determine viscoelastic behavior and dynamic mechanical properties of high performance fibers, yarns, and composites for soldier protection to optimize the impact resistance of fiber reinforced composites
- (U) Develop a spectral (wavelength) selective system of detection for distinctively identifying friend versus foe on the battlefield

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

- (U) Develop mathematical models based on the organic components used in bioceramics to predict how to tailor ceramic particle size, shape and orientation in order to develop enhanced ceramic properties for armor and electronics
- (U) Measure reactions of hazardous compounds, including specificity and sensitivity, with biosensors to detect environmental contaminants
- (U) Evaluate binding constance and selectivity of hazardous compounds with laboratory grown cultures for detection of specific bioengineered microbes used in pollution control

(U) Project AH60 - Research in Armaments: This project contains research in the following areas: smart projectiles/mines, autonomous launchers, fire control, and laser protection. This project was restructured in FY 1992 to fund PE #0601104, Project BH62. The FY 1991 accomplishments associated with this restructure are found there.

(U) **FY 1991 Accomplishments:**
- (U) Created new waveguide device for high-speed signal processor applications from Gallium Arsenide (GaAs) films
- (U) Modified physics of bacterio-Rhodopsin (BR) to optimize detection performance in future laser protection devices
- (U) Generated laser radar (LADAR) profile clutter data from captive flight tests for future terrain modelling
- (U) Investigated massive parallel computing architectures for future fire control systems

(U) **FY 1992 Planned Program:**
- (U) Design, fabricate, & test a two element light-induced grating antenna
- (U) Investigate BR substitute chromophores for improved spectral response laser protection devices
- (U) Extend LADAR signal processing to two dimensions for improved target sensing capability
- (U) Define learning efficiency and rapidity of new target recognition architectures

(U) **FY 1993 Planned Program:**
- (U) Fabricate high speed waveguide signal processor utilizing new waveguide device
- (U) Develop a modal control algorithm for real-time identification of gun tube frequencies and shapes for improved fire control accuracy
- (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) 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.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

Additional efforts involve the prediction of the dynamic effects in weapon and ammunition components, deposition of high strength refractory metals and alloys and the aerodynamic behavior of hypervelocity projectiles. This project supports Science & Technology Thrusts for Advanced Land Combat Vehicle.

(U) FY 1991 Accomplishments:
- (U) Established parameters for optimum mechanical properties of isothermally heat treated AF1410 steel for guns
- (U) Performed feasibility tests for large scale molten salt isothermal bainite heat treatment
- (U) Investigated the rate of attenuation of transient vibrations along the length of tapered gun tubes
- (U) Developed a three-dimensional linear heat conduction code
- (U) Evaluated reactively sputtered refractory (tantalum nitride, boride and disulfide) gun tube coatings
- (U) Developed one dimensional mathematical model of recalesence in cannon materials

(U) FY 1992 Planned Program:
- (U) Investigate the viability of mechanical alloying processes for armament materials
- (U) Perform experimental tests of martensite and bainite transformation theories
- (U) Develop methodology for measuring muzzle brake forces with strain gages and accelerometers
- (U) Optimize processes for plating tantalum and tantalum alloys inside cylinders from a molten salt bath
- (U) Extend recalesence model to two dimensions
- (U) Conduct theoretical studies on failure mechanisms of composite structures

(U) FY 1993 Planned Program:
- (U) Investigate implications of non-linearities in models of martensite transformations
- (U) Clarify role of charge density waves in the martensitic transformation of thermoplastic martensite
- (U) Investigate the resistance of refractory and ceramic coatings to plasma erosion
- (U) Establish methodology of failure mechanism evaluation in weapon systems
- (U) Measure flexural strength and fracture toughness for advanced composites

(U) Project AH68 - Processes in Pollution Abatement Technology: This project provides a fundamental understanding of the physical, chemical, and biological properties and mechanisms that control the degradation and treatment of military-unique hazardous wastes. 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. Wastes of concern include explosives, propellants, chemical agents and smokes. This project supports exploratory development efforts in Program Element 0602720A, Projects AF25 and D048.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

(U) FY 1991 Accomplishments:
- (U) Completed determination of basic mechanisms responsible for biodegradation of explosives by composting
- (U) Isolated, identified, and cultured microorganisms that actively degrade trinitrotoluene (TNT) and cyclonite (cyclotrimethylenetrinitramine, RDX)
- (U) Determined tolerable and optimum conditions for transfer of selected microorganisms to biodegradation systems for TNT and RDX contaminated soil

(U) FY 1992 Planned Program:
- (U) Conduct studies to determine the critical environmental consequences of in-place treatment of contaminated soil and groundwater using biodegradation
- (U) Determine effects of wastewater constituents on dinitrotoluene biodegradation
- (U) Evaluate/determine the occurrence of disappearance of Redwter intermediates from wet air oxidation

(U) FY 1993 Planned Program:
- (U) Determine the electrical properties of wastes and waste/soil mixtures
- (U) Establish operating parameters and wastewater constituent concentration requirements for optimal biotreatment of dinitrotoluene
- (U) Initiate studies to determine the fundamental biological and microbial processes in cold regions soils for use in cold regions bioremediation
- (U) Initiate studies to determine the cross-coupled flow and other electrical and electromagnetic phenomena for contaminant detection and identification in groundwater

(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 mechanisms associated with complex geologic/structural materials and develop mathematical models needed for first-principle analyses of explosive induced ground shock and high-velocity projectile impact; and determination and prediction of multispectral electromagnetic and mechanical wave signatures of terrain backgrounds. These technologies provide the basis for advanced research to provide: analytical capabilities for mobility assessments; mariod and battlefield positions, fixed facilities, and semi-fixed assets; multispectral camouflage, concealment, and deception for fixed facilities; and advanced vertical and horizontal construction materials in PE #6. 784A, Project AT40.

(U) FY 1991 Accomplishments:
- (U) Stress-strain strength relations defined from lab test data and incorporated into high-pressure mechanical property database
- (U) Developed computer code to predict/analyze the three-dimensional impact and penetration of rigid axisymmetric projectiles into horizontally layered soil, rock, and/or concrete
- (U) Developed constitutive equations for the automated description of loads and deformation responses of tire-soil interactions beneath multi-axle wheeled vehicles
- (U) Investigated silicate binders with specified engineering properties using readily-available local waste materials (slags, fly ash, etc) for use in pavement and structures construction

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

- (U) Developed computer concepts for 3-D thermal landscape signature model
- (U) Completed investigation of fast application decals for rapid multispectral signature alteration

(U) **FY 1992 Planned Program:**
- (U) Develop interactive personal computer (PC)-based computer code with users guide to search/retrieve digitized stress-strain-strength relations
- (U) Develop simple total stress models to simulate behavior of soil backfill materials and library of model fits for PC ground shock code
- (U) Conduct high-pressure laboratory tests defining stress-strain and strength characteristics of new high-strength concrete mixtures
- (U) Develop functional processor (computer program) that accounts for effects of climate and weather on soil type-moisture-strength relations
- (U) Develop material characterization methods for overlays and improvement of pavement analysis
- (U) Develop experimental quantities of active response camouflage, concealment and deception (CCD) materials (e.g., thin film polymers)

(U) **FY 1993 Planned Program:**
- (U) Develop PC-based computer code and user's guide for prediction/analysis of projectile penetration into layered geologic/structure targets with irregular/curved geometry
- (U) Conduct tests on effectiveness of high-strength Portland cement, fiber-reinforced Portland cement, and slag cement concretes against penetration by armor piercing (AP) projectiles
- (U) Upgrade room-to-room airblast propagation code based on non-planar non-normal shock-wave impingement tests
- (U) Develop and expand a new discontinuous deformation analysis numerical model (Block Theory) for the analysis of pavement structures
- (U) Determine soil properties (such as chemical bonds, mineralogy and physical make-up) that contribute to moisture movement under pavements and cause failure
- (U) Develop preliminary millimeter-wave bi-directional reflectance data to support terrain background radar modeling
- (U) Develop anomaly detection and analysis methods for buried objects
- (U) Develop radar cross-section adjustment procedures using Laminated Paper Glass for CCD

(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 in Program Element #0602784, AT41. The project includes basic research support to energy systems, energy conservation and environmental quality in Program Element #0602784, Project AT45 and Program Element #0602720, Project A896.

(U) **FY 1991 Accomplishments:**
- (U) Developed basic understanding of natural convection between building zones
- (U) Defined surface impedance characteristics of high critical temperature conducting materials
- (U) Developed indoor air quality indices related to occupant performance satisfaction and welfare

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

- (U) Completed dynamic cooling rate model and control algorithm

(U) FY 1992 Planned Program:
- (U) Develop full color qualitative morphology algorithm for automated interpretation of visual information
- (U) Define electromagnetic properties of high critical temperature superconductors
- (U) Determine feasibility of multi-input, multi-output for non-linear control systems

(U) FY 1993 Planned Program:
- (U) Define wind effects on solar pond gradient zone
- (U) Define interior sound control methods impact on occupant performance and productivity
- (U) Develop fundamental mathematical principals for modal analysis modeling of structures subjected to acoustic waves
- (U) Identify enzyme and microbial kinetic mechanisms in subsurface soil activity

(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 regions processes impacting military materiel, 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. Products are directly input to PE #0602784, Project AT42 as well as specific Navy and Air Force technology base efforts and forms the basis for much civilian applied research in these areas.

(U) FY 1991 accomplishments:
- (U) Developed model of induced seismic/acoustic signatures in complex winter conditions
- (U) Three-dimensional finite element model completed for evaluation of effect of spatial variability of snow cover on electromagnetic sensors
- (U) Developed cyclic tension-compression test for evaluation of ice properties; determined effect of porosity on ice strength

(U) FY 1992 Planned Program:
- (U) Develop model of freeze-thaw effects on soil/water equilibria of trace organics
- (U) Develop model of effect of convection in snow covers on surface thermal and electromagnetic signatures
- (U) Develop 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

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0601102A
PE Title: **Defense Research Sciences** Budget Activity: #5

- (U) Develop inverse model of electro-optic (E-O) propagation as affected by turbulence over snow covers

(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 #0602784, Project A855.

(U) **FY 1991 Accomplishments:**
- (U) Developed software for determining the military significance of landforms in support of battlefield commander's decision making
- (U) Developed and evaluated a new hypothesis for correlating conjugate stereo imagery for generating digital elevation data more rapidly and more accurately than current procedures
- (U) Prepared and published the Remote Sensing Field Guide, Desert in support of Operation Desert Storm (ODS). It contained patterns and descriptions that allow various characteristics of the terrain to be predicted. The U.S. Marine Corps subsequently printed 20,000 copies for immediate use.

(U) **FY 1992 Planned Program:**
- (U) Demonstrate application of artificial intelligence and other processing techniques to identify terrain features
- (U) Develop automated processing techniques for registration of terrain data from varied sensors
- (U) Develop dynamic terrain models within distributed heterogeneous systems

(U) **FY 1993 Planned Program:**
- (U) Develop fundamental issues in terrain knowledge representation and scene analysis to support realtime vision modules
- (U) Demonstrate the integration of feature extraction from digital data with hyperspectral imagery to enhance terrain reasoning and analysis
- (U) Demonstrate techniques for identifying mobility corridors for battlefield planning
- (U) Develop hyperspectral data base to support extraction of natural and manmade features from reconnaissance data, and to assist in terrain characterization in support of ground operations

(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, high energy lasers, smoke deployment, and target designators

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

(U) FY 1991 Accomplishments:
- (U) Evaluated concept of standoff bioagent detection Light Detection and Ranging (LIDAR) system
- (U) Demonstrated methods to mitigate obscuration effects on imagery and target acquisition
- (U) Quantified the combined synergistic effects of obscuration and camouflage, concealment and deception
- (U) Verified Model of Atmospheric Chemical Hazards (MACH) using field data
- (U) Evaluated theory of aggregate sphere scattering of electromagnetic waves through experimentation

(U) FY 1992 Planned Program:
- (U) Develop scene visualization algorithms for haze
- (U) Complete Wind In Non-uniform Domain (WIND) Project and review micrometeorology (MICROMET) model
- (U) Perform field evaluation of laser/millimeter wave obscurant propagation effects for optimized millimeter wave screener
- (U) Analyze and compare passive/covert wind sensing techniques for artillery meteorology
- (U) Develop microphysics model for fog

(U) FY 1993 Planned Program:
- (U) Complete field evaluation of techniques for mitigation of optical turbulence effects
- (U) Develop variable-scale transport and diffusion methods
- (U) Develop interim MICROMET model with variable land use
- (U) Develop physical wind sensing simulation for passive/covert methodology for vertical wind sensing
- (U) Develop variable-scale transport and diffusion methods applicable to pollution control as well as battlefield aerosols and obscurants
- (U) Develop mew 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) 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 1991 Accomplishments:
- (U) Continued efforts to develop a metric to assess acute combat-like stress in a variety of military operations and settings
- (U) Expanded research efforts in visual detection and recognition to further develop the visual application to aided target recognition systems
- (U) Developed a metric to be used in evaluating the effect of speech intelligibility on crew performance for application in combined arms operations

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

- (U) Conducted research on the quality and quantity of visual information required for soldiers to effectively employ teleoperated systems which rely on indirect, processed, or otherwise altered presentation of visual information for target acquisition, driving, or other mission critical functions

(U) FY 1992 Planned Program:

- (U) Continue soldier visual performance research to determine the allocation of visual attention in various displayed scenes and identify the effects of various visual target characteristics on aided target detection and acquisition
- (U) Continue to determine and exploit basic soldier-machine acoustic phenomena to apply to the design of communication equipment so that it is more effective in high noise level operational contexts. Expand research into the basic psychoacoustic and interpretive processes associated with the detection, identification and localization of complex sounds in time-varying backgrounds
- (U) Complete development of a metric to assess acute soldier combat-like stress in a variety of military operations and settings. Determine a measure, valid across different settings, to (a) predict soldier/system performance under stress; (b) measure stress; and (c) provide direct input into the development of design guidelines for crew-served weapons
- (U) Continue soldier performance research efforts to provide information and models critical to the development of information and video display systems for the navigation of teleoperated military vehicles by soldiers. Determine pixels and grey levels required for recognition of obstacles and perceptibility of landmark cues as a function of resolution

(U) FY 1993 Planned Program:

- (U) Extend previous soldier visual performance research on the allocation of visual attention in displayed scenes and develop a model of visual search and target acquisition performance in static scenes
- (U) Continue soldier acoustic research efforts extending current theories of signal detection to the detection of complex transient sound. Evaluate acoustic factors that affect the character of sound at the sensors location given various backgrounds, atmospheric conditions and ground surfaces. Initiate development of psychoacoustic and physical acoustic models to predict critical detection parameters
- (U) Continue soldier performance research efforts to provide information and models critical to the development of information and video display systems for the navigation of teleoperated military vehicles by soldiers. Conduct simulations to examine the ability of subjects to effectively navigate teleoperated vehicles as a function of the quality and quantity of displayed information and terrain conditions. Initiate studies of map-reading, orienting, wayfinding, path selecting and detour negotiating performance in order to develop an adaptive navigational aid applicable to remote operations
- (U) Conduct soldier performance experiments under conditions simulating noise fields for incoming artillery. Various signature scenarios will be presented to company size groups of soldiers and the changes in performance associated with conceptual weapons and equipment in a hostile environment will be qualified and assessed

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

(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 1991 Accomplishments:**
- (U) Explored relevant variables and individual-organizational relationships, that determine successful decision making and problem solving in hierarchical organizations, with particular attention to crisis situations
- (U) Determined learning and reasoning principles that are central to such high level activities as formation of complex concepts, automatic performance of high mental workload tasks, and long term skill retention
- (U) Determined separate and combined effects of personality, motivation, and time-of-day factors on the performance of cognitive tasks
- (U) Defined research methods and concepts related to the military sociology of the American soldier, focusing on the non-commissioned officer

(U) **FY 1992 Planned Program:**
- (U) Determine behavioral analysis of human communication processes and how they influence group problem solving and decision making in realistic environments
- (U) Identify key variables responsible for the motivation of group performance
- (U) Further define procedures for predicting human sensitivity to stress and develop hypotheses for maximizing resistance to it

(U) **FY 1993 Planned Program:**
- (U) Continue research on human communicative processes for spatially-separated but electronically-linked individuals and groups
- (U) Investigate role of time-of-day factors with respect to irregular work schedules, accidents and human performance error, and task-execution after rapid time-zone change
- (U) Develop theoretical understanding of personality factors that lead to enhanced job motivation, performance under stress, and performance in irregular work schedules
- (U) Explore cultural variables as factors in performance effectiveness of individuals and groups

(U) Project BH27 - Research in Munitions Science: Conduct basic research in the areas of explosives, propellants and warhead/penetrator materials in support of future munitions. This research will result in improved performance of chemical/kinetic energy warheads, bio-synthesis/biodegradation of energetics, increased manufacturing safety and improved battlefield survivability.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

(U) FY 1991 Accomplishments:
- (U) Developed 2D hydrodynamic/chemistry code (Vulcan) and kinetic code (Pandora) for liquid propellants (LPs)
- (U) Performed molecular dynamics studies of cyclotrimethylenetrinitramine (RDX) in gas phase
- (U) Initiated synthesis of nitro/amino substituted pyridine
- (U) Performed TEM analyses of soft recovered tantalum explosively formed penetrators (EFPs)
- (U) Initiated high pressure studies on di-iodo cubane
- (U) Continued fast reaction studies in explosives
- (U) Completed modeling stress/strain relationships for tantalum

(U) FY 1992 Planned Program:
- (U) Calculate ab-initio force constants for trinitroazedoquanidine (TNAZ)
- (U) Conduct parametric study of LP 1846 with LP Combustor
- (U) Synthesize new nitro/amino azine derivatives
- (U) Define controlling parameters for optimum properties in tantalum EFP preforms
- (U) Develop new parameters from molecular orbit calculations to predict sensitivity

(U) FY 1993 Planned Program:
- (U) Initiate enzymatic synthesis of nitramines (i.e., RDX, and cyclotetrmethyenetetranitramine [HMX]) for polution prevention
- (U) Investigate methods for waste stream treatment of nitrate esters for pollution prevention
- (U) Investigate the innovative use of surfactants to free bound explosive molecules for waste stream treatment
- (U) Explore the use of microbiological fertilizers for in-situ demil-degradation of energetics and chemical agents
- (U) Explore dynamics of dinitrogen tetroxide in solid state
- (U) Synthesize high energy ingredients- nitro-methanol for LP
- (U) Obtain coherent anti-Stokes Raman spectroscopy (CARS) spectra from RDX combustion; compare with kinetic code predictions
- (U) Characterize the collapse process mechanism in wrought and PM tantalum blanks to form the EFP
- (U) Continue studies to determine rate controlling chemistry in energetic materials

(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.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

(U) FY 1991 Accomplishments:

- (U) The concept of "smart" rotor blade actuation has been realized by embedding piezoelectric crystals in blades to create a vibration suppression feedback loop, reducing vibrations up to 30%
- (U) The capability to design, fabricate and test state-of-the-art indium-gallium-arsenide/indium-aluminum-arsenide modulation-doped field-effect transistors exhibiting record-breading high-frequency characteristics has been demonstrated
- (U) Record level control in the flatness of x-ray masks necessary for future ultrafast information processing systems has been achieved
- (U) An easily fabricated monolithic monopulse antenna system operating at 94 GHz has been demonstrated
- (U) A novel technique which allows quantitative measurements of temperature and chemical species concentration within 100 microns of a burning solid propellant strand surface has been developed
- (U) Advances in the use of phosphorylated silica as a chromatographic packing has proved valuable in the separation of aromatic amines
- (U) Increased understanding of combustion of energetic materials has resulted from the development of a molecular beam photofragmentation apparatus
- (U) Solutions of nonlinear elliptic partial differential equations have been used to model combustion and detonation
- (U) Scalable parallel algorithms have provided superlinear speedup over conventional algorithms running on parallel computers with potential application to large-scale combat simulations

(U) FY 1992 Planned Program:

- (U) Enzymes will be 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 will be tested on a bearingless smart rotor model
- (U) Metal-matrix composites will be improved by introducing macroscopic surface layers which more evenly distribute the maximum stresses thereby retarding crack initiation and corrosion
- (U) Novel variation reduction techniques will be applied to importance sampling in the simulation of rare events leading to a highly reliable and faster computer simulation methodology
- (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) FY 1993 Planned Program:

- (U) Multipath communication interference problems will be overcome thereby leading to the development of more robust mobile radio systems

- (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) New techniques to control the incorporation of dopants in optical glasses will improve fabrication of lasing structures for future targeting and optical communications systems

(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 1991 Accomplishments:**
- (U) Completed aquatic microcosm test development
- (U) Completed automated toxicity monitoring system development
- (U) Determined interlaboratory variability of a non-mammalian developmental toxicity test method

(U) **FY 1992 Planned Program:**
- (U) Evaluate candidate nonmammalian immunotoxicity test methods
- (U) Complete development of rapid, inexpensive aquatic toxicity screening tests for environmental samples
- (U) Initiate nonmammalian neurotoxicity model development research

(U) **FY 1993 Planned Program:**
- (U) Complete test protocols for nonmammalian carcinogenicity screening tests
- (U) Complete test protocols for nonmammalian developmental toxicity screening tests

(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. These studies are further 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 U.S.Army Medical Research and Development Command (USAMRDC) executes the medical defense portion of this executive agent role.

(U) **FY 1991 Accomplishments:**
- (U) More clearly demonstrated mechanisms of action for cell damage and cell death due to vesicant agents
- (U) Demonstrated proof of concept evaluation of catalytic antibody pretreatment protection against nerve agent toxicity

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

- (U) Demonstrated correlation between time-dependent changes for biochemical markers and discrete pulmonary injury caused by threat respiratory agents
- (U) Continued the investigation of nerve agent-induced seizures and brain injury; studied protective mechanisms of promising anticonvulsants

(U) FY 1992 Planned Program:
- (U) Continue to determine mechanisms of action and toxicity of vesicants and emerging chemical threats, and identify potential protective approaches
- (U) Develop required initial design and synthesis data for conceptualized new medical countermeasures to chemical agents, particularly vesicants and emerging threats
- (U) Continue multidisciplinary basic biomedical research for better protection of the soldier against chemical agents

(U) FY 1993 Planned Program:
- (U) Continue to explore the identified mechanisms of action and toxicity of vesicants and emerging chemical threats, and identify potential protective approaches
- (U) Continue to develop required initial design and synthesis data for conceptualized new medical countermeasures to chemical agents, particularly vesicants and emerging threats
- (U) Continue multidisciplinary basic biomedical research for better protection of the soldier against chemical 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 countermeasures against agents of biological origin, both natural and synthetic. The objectives are to identify mechanisms of action common to a variety of validated threat agents and to devise generic therapeutic and prophylactic measures against them.Emerging threats of low molecular weight toxins, toxic fractions of snake venoms (neurotoxins), and genetically altered microorganisms, isolated from various sources in nature and duplicated in the laboratory, with the potential for mass production, must be studied and fully characterized in order to develop effective prophylactic and therapeutic countermeasures. Army has been designated as the Department of Defense (DOD) Executive Agent for medical biological defense research and development and USAMRDC executes the medical defense portion of this executive agent role.

(U) FY 1991 Accomplishments:
- (U) Terminated basic studies on aerosol-transmissible, vector- and rodent-borne viral diseases which do not appear on the Armed Forces Medical Intelligence Center (AFMIC) validated threat list

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

- (U) Sequenced and analyzed the lethal factor (LF) gene from Bacillus anthracis (anthrax bacterium) and revealed a region of homology between LF and edema factor (EF), suggesting that this portion of the molecule may be involved in binding to protective antigen (PA). This finding also predicts that some monoclonal antibodies may react with both LF and EF. Exploration of this finding may eventually provide for improved protection of U.S. forces exposed to the disease anthrax disseminated by an adversary
- (U) Determined that biochemical modification will convert the anthrax toxin protective antigen to a non-functional form providing another approach for an improved anthrax vaccine
- (U) Created a more sensitive biochemical identification assay for B. anthracis isolates based on anthrax-specific deoxyribonucleic acid amplified directly from spores and bacterial cells using polymerase chain reaction (PCR) technology
- (U) Developed protocols for determining the minimum inhibitory concentration and minimum bactericidal concentrations of selected antibiotics for virulent strains of B. anthracis and generated antibiotic susceptibility profiles of 75 strains of B. anthracis for establishment of medical doctrine for post-exposure therapy
- (U) Synthesized, by chemical means, the gene for one-third of botulinum toxin type A. This material will be tested as a second generation botulinum toxin vaccine
- (U) Initiated efforts to develop human monoclonal antibodies to botulinum toxin using state-of-the-art technology for production of Escherichia coli. These antibodies will be useful as diagnostic reagents and human therapeutics
- (U) Identified vaccinia (smallpox) proteins expressed in prokaryotic and eukaryotic protein expression systems using monoclonal antibodies. Continued molecular identification of several vaccinia virus antigens, relevant to the use of poxvirus-vectored vaccines, which may provide for improved, multivalent, single-dose vaccines
- (U) Demonstrated that the "red tide" toxin (brevetoxin) can affect the central and peripheral nervous tissue in a similar fashion, suggesting dual sites of action, which may have profound implications for the development of effective medical management
- (U) Demonstrated in vitro that picomolar concentrations of palytoxin (potent marine neurotoxin derived from corals) can cause release of arachidonic acid, a precursor of eicosanoids (substances which induce tissue inflammation and damage). This finding identifies an intervention site for development of medical countermeasures against intoxication by this potent toxin
- (U) Determined the nucleotide sequence of the nucleocapsid gene of multiple strains of Crimean-Congo Hemorrhagic Fever virus and developed a sensitive diagnostic assay based on PCR technology
- (U) Successfully conducted molecular conversion of a protective and virus-neutralizing (hemorrhagic fever) mouse monoclonal antibody into a human monoclonal antibody that bears only a minor portion of the original mouse antibody, a finding which provides technology leading to improved immunotherapeutics

(U) **FY 1992 Planned Program:**

- (U) Continue basic studies to investigate virulence factors, replicative strategies and antibiotic sensitivities of classical (bacterial and rickettsial) threat agents in order to develop medical countermeasures

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

- (U) Continue to investigate structure, composition, pharmacology, mechanisms of action and pathogenesis of protein toxins leading to development of medical countermeasures
- (U) Continue basic studies to elucidate antigenic composition, replicative strategies and specific gene functions leading to development of medical countermeasures against viral agents disseminated by an adversary
- (U) Continue basic research to investigate structure, pharmacology and mechanisms of action of neuroactive compounds in order to develop medical countermeasures to protect service members
- (U) Continue basic research leading to the development of technology for the rapid diagnosis and identification of validated biological threat agents

(U) FY 1993 Planned Program:

- (U) Continue basic studies supporting the development of medical countermeasures against classical (bacterial and rickettsial) threat agents to protect U.S. forces
- (U) Continue to determine structure, composition, pharmacology, mechanisms of action and pathogenesis of protein toxins leading to development of medical countermeasures
- (U) Continue basic studies to determine antigenic composition, replicative strategies and specific gene functions leading to development of medical countermeasures against viral agents disseminated by an adversary
- (U) Continue basic studies to determine structure, pharmacology and mechanisms of action of neuroactive compounds in order to develop medical countermeasures to protect U.S. service members
- (U) Continue basic research leading to the development of technology for the rapid diagnosis and identification of validated biological threat agents

(U) Project BS13 - Science Base/Medical Research Infectious Disease: This project funds the basic research into 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. The US Army is the Congressional lead agency for infectious disease research and development.

(U) FY 1991 Accomplishments:

- (U) Characterized the immune response after shigella infection and demonstrated a lack of cross protection between S. flexneri and S. sonnei, the two most common species infecting soldiers
- (U) Developed methodology for culturing the liver stages of Plasmodium falciparum, P. vivax, P. berghei, and P. yoelii
- (U) Cloned and sequenced genes encoding for a unique P. falciparum sporozoite antigen and a P. falciparum liver stage antigen, both of which may prove critical components for a successful malarial vaccine

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

- (U) Demonstrated that the emergence of parasite resistance to antimony treatment is a potential risk of inadequate dose therapy
- (U) Designed and evaluated new methods for the identification of hepatitis C and hepatitis E viruses based on the polymerase chain reaction assays
- (U) Cloned the class 3 outer membrane protein gene of Group B meningococcus, the leading cause of major outbreaks of meningitis world-wide

(U) **FY 1992 Planned Program:**
- (U) Continue molecular studies to characterize blood and liver stage malarial antigens
- (U) Develop methods for the culture and identification of hepatitis C and E viruses
- (U) Characterize virulence factors for bacterial agents of diarrheal diseases
- (U) Evaluate newly emerging targets for antimalarial drugs
- (U) Evaluate new approaches for insect repellents to replace or supplement DEET.
- (U) Initiate studies to evaluate the causes of respiratory diseases.
- (U) Initiate studies to investigate viruses that may cause high levels of morbidity and mortality and are transmitted by mosquitoes or aerosol with the potential for high morbidity and mortality

(U) **FY 1993 Planned Program:**
- (U) Continue studies to evaluate the immune response to malarial antigens and molecular targets for chemoprophylaxis and therapy
- (U) Continue to accumulate a data base on non-A, non-B hepatitis virus infections in military populations and worldwide
- (U) Continue to investigate the use of molecular technology to simultaneously identify infectious disease agents and their insect vectors
- (U) Continue to evaluate viruses of military importance requiring high levels of biological containment

(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 treatment and surgical procedures to "buy time" and enhance survival and return to duty rates.

(U) **FY 1991 Accomplishments:**
- (U) Demonstrated restoration of vasomotor tone in late irreversible shock by blocking nitric oxide synthesis
- (U) Identified a neuroprotective pharmacology associated with a novel class of kappa opioid drugs
- (U) Developed microvascular models to study uncontrolled hemorrhage and resuscitation
- (U) Completed the equilibrium and kinetic characteristics of crosslinked hemoglobin binding to respiratory gases
- (U) Demonstrated prolonged survival in hemorrhagic shock with anti-endotoxin antibodies

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

(U) FY 1992 Planned Program:
- (U) Develop efficient scavengers for iron mediated free radical formation
- (U) Define causes of bacterial translocation in shock
- (U) Determine the balance between peripheral resistance and tissue oxygenation following hemorrhage and also following resuscitation
- (U) Explore the effectiveness of a synthetic surfactant in preventing inhalation injury-induced mismatching of air flow and blood flow

(U) FY 1993 Planned Program:
- (U) Define mechanisms and treatments for abnormal neutrophil activation and adhesion in shock
- (U) Explore primary cell culture models to study the ionic mechanisms and the role of second messenger systems in neuronal injury
- (U) Study the deleterious consequences of altered vascular reactivity of head injury using cranial window preparations
- (U) Explore applications of buffers and neutrophil antibodies as adjunct therapies following ischemia

(U) Project BS15 - Science Base/System Health Hazards Research: Project objectives 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 1991 Accomplishments:
- (U) Demonstrated feasability of a new non-mammalian teratogenicity assay using a frog embryo model, and verified rapid, sensitive non-mammalian testing methods for assessing the toxicity of Army relevant chemical hazards
- (U) Determined relationship between body size and muscle fiber composition in determining performance of high intensity exercise in support of efforts to reduce training injuries and improve fitness
- (U) Investigated potential pharmacological treatment procedures to reduce retinal scar formation following laser eye injury
- (U) Demonstrated that human growth hormone blocks stress-induced suppression of immune function in rats in support of efforts to reduce lost-duty time resulting from illness during training
- (U) Demonstrated the utility of an injury prediction model for rapid determination of non-auditory effects of blast overpressure for free-field weapons firing

(U) FY 1992 Planned Program:
- (U) Investigate pharmacological compounds for potential to reduce cognitive deficits induced by altitude exposure

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

- (U) Determine the extent of cardiopulmonary degradation following non-lethal blast overpressure injury
- (U) Demonstrate the applicability of new, rapid water quality test methodologies for measuring/monitoring water contaminated with chemical and biological warfare agents. This will be used in monitoring field water potability
- (U) Initiate a sleep deprivation model and describe the effects of nutritional factors on the neurochemical and behavioral responses to this stress

(U) **FY 1993 Planned Program:**
- (U) Demonstrate the utility of testing procedures for assessing the amount of human power produced during work
- (U) Characterize the metabolic processes that predict performance degradation during prolonged sleep deprivation
- (U) Investigate the relation of mixed intensity noise exposures to hearing loss
- (U) Describe the pathophysiology caused by exposure to oxides of nitrogen characteristic of weapons systems operations

(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 the return to duty rate. The Army has been designated by Congress as lead agency for Combat Dentistry research.

(U) **FY 1991 Accomplishments:**
- (U) Evaluated microencapsulated cefazolin in osteomyelitis model in laboratory models
- (U) Developed a laboratory model of mandibular osteomyelitis
- (U) Initiated an in vivo study of potassium channel blockers as potential dental anesthetics
- (U) Initiated an in vivo study of nonsteroidal anti-inflammatory drugs as indirect pulp capping agents

(U) **FY 1992 Planned Program:**
- (U) Study efficacy of potassium channel blockers as potential dental anesthetics
- (U) Study efficacy of nonsteroidal anti-inflammatory drugs as pulp capping agents
- (U) Identify diagnostics capable of rapidly quantifying and identifying periodontal pathogens
- (U) Evaluate microencapsulated antibiotics for efficacy in preventing/treating osteomyelitis of the jaw

(U) **FY 1993 Planned Program:**
- (U) Study electronic stimulated release of anesthetic producing chemical substances (e.g. 5-hydroxy-tryptamine enkephalins, endorphins)
- (U) Explore potential use of naturally occurring neurotoxin as local anesthetics
- (U) Study growth hormones in vitro and in vivo for potential of inducing angiogenesis in avulsive or crush wounds

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

(U) Project BS17 - Science Base/Military HIV Research: This project funds the basic research towards development of medical countermeasures directed against the spread of the HIV in military populations. The establishment of this Project, by Congressional direction, in FY 1992 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 1991 Accomplishments**
- (U) This project was previously described and funded under project DH29.

(U) **FY 1992 Planned Program**
- (U) Characterization of HIV-2 virus strains for potential impact on the vaccine development program
- (U) Evaluation of the immune response stimulated by synthetic peptides derived from the virus envelope glycoprotein for possible inclusion in future protective vaccines.
- (U) Characterization of self-antigens and their impact on the development of immunity to the HIV
- (U) Characterization of cellular mechanisms of cytotoxicity as is relates to suppression of HIV infections

(U) **FY 1993 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) **Work Performed By:** The research supported under this program is 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 laboratories/activities responsible for conducting the project of this program are as follows:

A31B - Center for Night Vision and Electro-Optics, Fort Belvoir, VA
A71A - Chem. Research, Development and Engineering Ctr, Aberdeen Proving Ground, MD
AF22 - Tank-Automotive Command, Warren, MI
AH40 - Center for Signals Warfare, Warrenton, VA
AH42 - Materials Technology Laboratory, Watertown, MA
AH43 - Ballistic Research Laboratory, Aberdeen Proving Ground, MD
AH44 - Harry Diamond Laboratories, Adelphi, MD
AH45 - Aviation Systems Command, St. Louis, MO
AH47 - Electronics Technology and Devices Laboratory, Fort Monmouth, NJ
AH48 - Communications and Electronics Command, Fort Monmouth, NJ
AH49 - Missile Command, Redstone Arsenal, AL
AH51 - Belvoir Research, Development and Engineering Center, Fort Belvoir, VA
AH52 - Natick Research, Development and Engineering Center, Natick, MA
AH60 - Fire Support Armaments Center, Dover, NJ
AH61 - Close Combat Armaments Center, Dover, NJ

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

AH68 - Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, MD
AT22 - US Army Engineer Waterways Experiment Station, Vicksburg, MS
AT23 - The Construction Engineering Research Laboratory, Champaign, IL
AT24 - Cold Regions Research and Engineering Laboratory, Hanover, NH
B52C - Engineer Topographic Laboratories, Fort Belvoir, VA
B53A - Atmospheric Sciences Laboratory, White Sands Missile Range, NM
B74A - Human Engineering Laboratory, Aberdeen Proving Ground, MD
B74F - US Army Research Institute for Behavioral and Social Sciences, Alexandria, VA
BH27 - Armament Engineering Directorate, Dover, NJ
BH57 - Army Research Office, Research Triangle Park, NC
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 Reed Army Institute of Research, Washington, D.C.; US Army Medical Research Institute of Chemical Defense, Aberdeen Proving Ground, MD; US Navy
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 Institute of Environmental Medicine, Natick, MA; US Army 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.

(U) **Related Activities:** Work in this program element is related to and fully coordinated with efforts in PE #0601104A, PE #0602120A, PE #0602623A, PE #0602624A, PE #0602720A, PE #0602784A, PE #0602786A, PE #0602787A 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.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

(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.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

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

Project Number / Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
BH62 FFRDC for Electromechanics and Hypervelocity Physics	- 0 -	2959	3888	Cont	Cont
PE TOTAL	- 0 -	2959	3888		

B. (U) BRIEF DESCRIPTION OF ELEMENT: The objective of this element is to: (1) Conduct long-term and applied research to improve the state of the art in 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. It is a restructure from Program Elements 0601102A and 0602624A. This project supports the Science and Technology Thrust for Advanced Land Combat Vehicles (ALCV).

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project BH62 - FFRDC for Electromechanics and Hypervelocity Physica: 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 devices to achieve major technical and operational breakthroughs for future generations of military systems. The FFRDC for Electromechanics and Hypervelocity Physics 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 system development with potential applications for anti-armor, artillery and air defense.

(U) **FY 1991 Accomplishments:**
- (U) Funded in PE #0601102A, Project AH60 and PE #0602624, Project AH18
- (U) Unique projectile geometries defined to provide a basis for numerical analysis
- (U) A fully coordinated joint electric gun program was be created to coordinate component development, system design and integration, and prototype demonstration
- (U) Participated as a Defense Advanced Research Projects Agency simulation consortium member to develop an integrated simulation capability for evaluation of concepts

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

(U) FY 1992 Planned Program:

- (U) Brief industry new concepts for rotating machines and integrated pulse forming networks
- (U) Develop a new 3-dimenstional, finite element code in combination with a boundary-element code to solve the electromagnetic design problem
- (U) Provide detailed design for an advanced contactless electromagnetic launcher (coilgun)
- (U) Develop and coordinate an integrated test plan for the 9 MJ EM Laboratory and Range Guns at the University of Texas and at Yuma Proving Grounds

(U) FY 1993 Planned Program:

- (U) Review electric gun system and subsystem concepts for modification
- (U) Complete characterization of electric gun system and subsystem concepts for modification
- (U) Address manufacturing and producibility factors for electric gun components
- (U) Report on mass/velocity tradeoff analysis and experiments to predict performance of penetrators against ceramic target

(U) Work Performed By: The University of Texas/Institute for Advanced Technology (UT/IAT). The manager of the FFRDC 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, PE #0602618A, PE #0602624A, PE #0603004A, PE #0602303A and PE #0603313A 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.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
AH84	Materials 13678	11723*	13983	Cont	Cont
PE TOTAL	13678	11723*	13983		

* Supplemental appropriation funds for Operation Desert Storm (ODS) in the amount of $186k are included

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. The work in this program element is consistent with the resource constrained Army Technology Base Master Plan and Science and Technology Objectives (STO's) therein.

C. (U) JUSTIFICATION FOR PROJECT:

(U) FY 1991 Accomplishments:

- (U) Fabricated/demonstrated and tested metal matrix composite (MMC) howitzer components
- (U) Improved strength and stiffness of oxynitride glass fibers for advanced material system
- (U) Completed Cooperative Research and Development Agreement (CRDA) with Pittsburgh Plating and Glass (PPG) industries to develop advanced processing techniques for manufacturing oxynitride glass fibers
- (U) Developed processing technology for high temperature metal matrix composites for application in the Integrated High Performance Turbine Engine Technology (IHPTET) program
- (U) Continued to improve chemical barrier materials for food, clothing, and ammunition
- (U) Evaluated novel approaches to cut and join heavy armor and processing techniques for laminated armor
- (U) Optimized slip casting of silicon nitride for engine components
- (U) Continued Center of Excellence efforts on corrosion prevention and control
- (U) Developed designs for lightweight system components
- (U) Continued studies on bonding/bondability of materials
- (U) Developed initial designs of metal matrix composite lightweight howitzer components
- (U) Developed processing techniques for ceramics and hybrids for low observable and low heat rejection propulsion applications

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

(U) FY 1992 Planned Program:

- (U) Initiate quarter scale testing on Block IV armor for frontal, sides and roof
- (U) Scale up silicon nitride slip casting process
- (U) Compare accelerated penetrator corrosion data with long term tear down inspection of projectiles
- (U) Produce and test lightweight component demonstrators
- (U) Develop improved analysis methods for design of adhesive joints

(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 Center of Excellence and 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) Work Performed By: In-house: Army Materials Technology Laboratory, Watertown, MA; Army Research Office, Research Triangle Park, NC and the Department of Energy, Los Alamos, NM. Limited support via other government agencies. The primary contractors are: Kratos Analytical Inc., Ramsey, NJ; Colt Industries, Mecklenberg, NC; Aluminum Corporation of America, Alcoa Center, PA., Allied Signal-Air Research Division, Los Angeles, CA., Northeastern University, Boston, MA and P.P.G. Industries, Pittsburgh, PA.

(U) Related Activities: Activities are coordinated with other Government services and agencies including OSD Tri-service program reviews in materials and structures, and the tri-service Joint Directors of Laboratories. 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.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
A140 High Power Microwave (HPM) Technology	11038	8217*	8018	Cont	Cont
AH16 Electronic Fuze Technology	6073	4742	4710	Cont	Cont
AH25 Nuclear Effects Survivability Technology	9609	7106*	6476	Cont	Cont
PE TOTAL	26720	20065	19204		

*Supplemental appropriation funds for Operation Desert Storm (ODS) in the amount of $326k are included.

B. (U) BRIEF DESCRIPTION OF ELEMENT: The objective of this program is to determine and reduce the susceptibility and vulnerability of Army equipment and systems to nuclear and Radio Frequency (RF)/High Power Microwave (HPM) environments as well as to provide the technology essential to fuzing and guidance-integrated fuzing (GIF) systems for future munitions. Four critical technologies are addressed to increase the survivability and combat effectiveness of tactical Army forces: Nuclear Effects Survivability Technology; High Power Microwave (HPM) technology; Electronic Fuze Technology; and Combat Identification (ID) Technologies. The work in this program element is consistent with the Army's Technology Base Master Plan, and the Science and Technology Objectives (STOs) therein. It supports the Precision Strike Science and Technology Thrust area.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project A140 - High Power Microwave (HPM) Technology: The objective of this project is to determine 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 protect/harden US equipment and systems against postulated threat weapons and to develop and evaluate technology required to conduct a RF/HPM weapon proof-of-principle demonstration. This is an emerging technology program and is supported by the Battlefield Development Plan.

(U) FY 1991 Accomplishments:
- (U) Conducted countermine field demonstration program
- (U) Continued to investigate semiconductor device damage mechanisms/thresholds and expend effort to include device upset
- (U) Conducted tests of several new designs of high power microwave sources to validate theoretical predictions
- (U) Initiated wide-band phenomenology program to determine critical waveform parameters

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

- (U) Continued susceptibility testing of critical Army systems
- (U) Completed hardening design handbook and distribute to the DoD community

(U) FY 1992 Planned Program:
- (U) Continue susceptibility/vulnerability assessments of critical systems
- (U) Design/fabricate a compact pulser suitable for utilization in tactical HPM systems
- (U) Extend microwave source evaluations to include phased arrays and repetitive pulse capabilities
- (U) Transition hardening technology to system developers and provide technical support to Program Executive Officers (PEOs)/Project Managers (PMs)
- (U) Continue evaluations of new technologies (e.g. micro/millimeter wave monolithic integrated circuits (MIMIC))
- (U) Continue efforts to identify critical wide-band RF waveform parameters

(U) FY 1993 Planned Program:
- (U) Continue evaluation of microwave weapon system components
- (U) Conduct vulnerability/lethality assessments to support Army requirements
- (U) Extend source development efforts to higher powers and higher pulse repetition rates
- (U) Provide technical support to PEO's/PM's and prime contractors in the areas of test facilities, vulnerability assessments and hardening design as part of the Army Electromagnetic Environmental Effects (E3) program

(U) Project AH16 - Electronic Fuze Technology: This project provides the technology for sensors, signal processors, electronic safety and arming systems, and other components essential to fuzing and guidance-integrated fuzing (GIF) systems for future munitions. Goals include optimizing burst point to enhance weapon effectiveness, improving performance in high countermeasure (CM) and clutter environments, sensing low-observable targets, and integrating the fuzing function into the seeker hardware and software for guided munitions. Current thrusts are smart anti-armor and anti-helicopter mine fuzes, GIF for air defense missiles and anti-armor smart munitions, and an artillery shell registration fuze. Systems benefiting include PATRIOT, corps surface-to-air missile (SAM), Air Defense and Anti-Tank System (ADATS), future smart munitions, Advanced Field Artillery System (AFAS), and smart mines. This project will also provide technological solutions to combat ID problems.

(U) FY 1991 Accomplishments:
- (U) Completed smart mine fuzing effort with research on target and clutter signatures, remote sensor control, and components, and with design and breadboarding of sensor concepts
- (U) Developed initial air-target GIF backscatter and end game model and use to analyze fuzing algorithms and seeker performance requirements for PATRIOT Multimode Seeker Demonstration Program flight tests
- (U) Completed design concept for clutter-resistant air-target radio frequency proximity fuze
- (U) Completed design, fabrication, and flight test proof-of-concept registration fuze rounds

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

(U) FY 1992 Planned Program:

- (U) Build initial mine fuze sensor and verify performance using the signature data base obtained in FY 1991
- (U) Make initial air target GIF feasibility determination, using PATRIOT flight test results and developed models; begin signature collection
- (U) Complete development of validated end-game fuzing and tracking simulation model for millimeter wave (MMW) anti-armor GIF sensors; perform breadboard test and finalize design of prototype antiarmor GIF
- (U) Complete development of proof-of-concept radiosonde system using global positioning system (GPS) information to determine wind velocity; conduct demonstration tests; complete final report; transition GPS-sonde to engineering and manufacturing development
- (U) Test amd evaluate concepts for identification of ground targets for positive identification; and applications of advanced multi-sensor processors technologies to provide real time, accurate knowledge of one's own location as well as locations and identification of friendly, enemy, neutrals, and noncombatants.

(U) FY 1993 Planned Program:

- (U) Field test initial smart mine system; design and build full featured, dual target smart mine
- (U) Continue target signature collection, modeling, and algorithm development for air target GIF; factor ground clutter, chaff, rain, electronic countermeasures (ECM), and low observable (LO) target treatment into models
- (U) Complete prototype MMW anti-armor GIF
- (U) Complete exploratory development of a GPS registration fuze for artillery and conduct field demonstration of complete system; complete final report; transition system to engineering and manufacturing development
- (U) Develop for rapid prototyping those technologies selected through the FY 1992 evaluation as near term solutions to the fratricide/combat identification problem.
- (U) Initiate the evaluation and development of concepts for the mid-term and far-term solutions to the combat ID problem, including infrared, electro optics, acoustics, and radar to provide evolutionary improvements to active cooperative ID to make the platforms less vulnerable, and to further the development of active and passive noncooperative ID solutions.

(U) Project AH25 - Nuclear Effects Survivability Technology: This project develops and provides nuclear weapon effects survivability technology for designing, producing and fielding tactical materiel and assuring the continued survivability throughout the useful life. The goal is to understand new weapons phenomena and the response of emerging and critical technologies to nuclear weapons effects, to develop new techniques for mitigating the response and protect systems against the effects, and to research methods for analyzing and validating the hardening technology and hardened systems. In the next decade the Army nuclear hardened force is faced with a continuing threat from the existing Soviet arsenal and nuclear proliferation creating a rapidly growing third world threat. Arms control activities, including the Intermediate Nuclear Forces (INF) Treaty, do not change the threat to or the strategic deterrence value of the Field Army. Three basic nuclear weapon effects areas have been defined for hardening studies: (1) A High Altitude Electromagnetic Pulse (HEMP) burst puts all electronics equipment at risk of catastrophic damage in an area covering thousands of square miles. Protection against Electromagnetic Pulse (EMP) damage is necessary to prevent the loss of the entire

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

inventory of electronic systems from a nuclear weapon burst that causes no other damage on the ground. (2) In a region around a low altitude nuclear weapon burst, air blast and thermal radiation often act synergistically to damage military equipment because the thermal radiation weakens the structural materials before the arrival of the blast shock. Thin skinned structures such as communication antennas and commercial vehicles such as the Commercial Utility Cargo Vehicle (CUCV) adapted for command, control, communications and intelligence (C3I) applications are particularly vulnerable to this effect. (3) The Tactical Source Region (TSR) is an annular area around the burst point of a low yield nuclear weapon beyond the range where personnel and equipment are disabled by the blast and thermal radiation, but where nuclear radiation is being deposited in the air creating a complex, time varying radiation, ionizing electron and electromagnetic pulse (EMP) environment. Greatest concern in this environment is placed on non-developmental computers which make use of emerging technologies such as very large scale integrated circuits (VLSIC) and electro-optics. The technology development approach to provide the tools for designing and maintaining nuclear survivable materiel includes three focus areas: (1) Analytic predictions and basic hardening methods are developed and maintained for use by materiel developers in designing and validating system survivability. (2) Nuclear weapons effects simulators are developed and maintained for designing survivable equipment and associated environmental issues are addressed as required. Major simulator development projects for all three nuclear weapon effects. (3) Effects phenomenology and energy coupling mechanisms into materials and electronic components are evaluated to provide a data base on material and component vulnerabilities. Radiation shielding technology is developed and demonstrated for protection of crews in armored vehicles and other heavy structures.

(U) FY 1991 Accomplishments:

- (U) Continued to develop and maintain the nuclear weapon effects (NWE) survivability technology base in all effect areas and in the related development of vulnerability analysis and hardening technologies and the needed effect simulation efforts
- (U) Continued the new hardening program for Army 21 and Joint Chiefs of Staff (JCS) identified threats that feeds into the fielded system nuclear vulnerability assessment program directed to achieving nuclear survivable Army systems
- (U) Prepared an Environmental Impact Statement (EIS) for several possible sites to aid in the selection of a site for the future HEMP simulation program to support JCS HEMP threat and other threats identified in Army 21
- (U) Completed development of EMP immune flight controls using fluidic and fiber optic technologies
- (U) Conducted joint blast simulation programs with French scientists to study the combined blast/thermal survivability of articulated vehicles
- (U) Participated in a Tactical Source Region (TSR) Underground Nuclear Test sponsored by the Defense Nuclear Agency (DNA) to validate TSR hardening techniques

(U) FY 1992 Planned Program:

- (U) Continue to develop and maintain the nuclear weapon effects (NWE) Survivability technology base in all effects areas to increase the survivability of Army materials
- (U) Continue new hardening program efforts for the JCS identified threats
- (U) Based on the results of Environmental studies, construct a HEMP simulation facility to support JCS HEMP threat and other treats identified in Army 21

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

- (U) Develop test management and diagnostic equipment for depot level nuclear survivability verification
- (U) Continue to coordinate and validate source region experiments with DNA using underground nuclear test planned for 1994
- (U) Continue in coordination with DNA to develop new blast and thermal simulation technologies for transition to the Large Blast/Thermal Simulator (LB/TS)

(U) FY 1993 Planned Program:

- (U) Continue to develop and maintain the NWE Survivability technology base in all effects areas to increase the survivability of Army materials
- (U) Continue new hardening program efforts for JCS identified threats
- (U) Continue transfer of HEMP simulation facility to support JCS HEMP threat to a site chosen with regard to environmental studies
- (U) Continue to coordinate and validate source region experiments with DNA using underground nuclear test planned for 1994
- (U) Continue in coordination with DNA to develop new blast and thermal simulation technologies for transition to the Large Blast/Thermal Simulator (LB/TS)

(U) Work Performed By: In-house work to be performed by Harry Diamond Laboratories, Adelphi, MD; Ballistic Research Laboratory, Aberdeen Proving Ground, MD; Electronic Technology and Devices Laboratory, Fort Monmouth, NJ. Contract work to be performed by Martin Marietta Corp., Orlando, FL; Mission Research Corp., San Diego, CA; Sol Telecommunications Services, Tucson, AZ; SRI International, Menlo Park, CA; Electronic Fuze Tech: In-house work to be performed by Harry Diamond Laboratories, Adelphi, MD. Contract work to be performed by 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.

(U) Related Activities: This program adheres to Tri-Service Reliance Agreements on Nuclear Weapons Effects with oversight provided by the Joint Directors of Laboratories. Work in this program element is related to and fully coordinated with effforts in PE #0603737D, PE #0603802A, PE #0601102A, and PE #0603604A, 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.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
A47A	Aeronautical & Aircraft Weapons Technology				
	29423	36462	36220	Cont	Cont
AH85	Aircraft Avionics Technology				
	8420	9082	10391	Cont	Cont
PE TOTAL	37843	45544	46611	Cont	Cont

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 Army 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 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 technology base functional organization with assistance from National Aeronautics and Space Administration (NASA) at three co-located activities and the Avionics Research and Development Activity 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 Army aircraft systems, and to improve the capabilities of future aircraft. This PE also provides funds for overall administration and management of Army Aviation research and development centers. The 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 resource constrained Army Technology Base Master Plan (ATBMP) and Army Aviation Modernization Plans; addresses Science and Technology Objectives in the ATBMP; and supports the DoD Science & Technology Thrust Number 2 for Precision Strike.

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 Army 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

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

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 material applications; internal/external loads; fatigue and fracture; advanced structural concepts; small airflow gas turbines, high temperature materials, mechanical drive systems; environmental control systems; 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 Army aircraft systems and all aviation system block improvement programs. The propulsion technology in this project supports the Integrated High Performance Turbine Engine Technology (IHPTET) initiative at the Office of the Deputy Under Secretary of Defense (Research and Advanced Technology) to support development of technology for aircraft and missile power plants. The goal of this program is to demonstrate technology which would double propulsion system capability for a wide range of potential future aircraft and missile applications.

(U) FY 1991 Accomplishments:

- (U) Applied automated opponent for air-to-air combat simulation
- (U) Conducted crash tests of composite fuselage sections
- (U) Completed detailed design of low inertia turbine
- (U) Completed threat radar signal processing analysis
- (U) Continued Nuclear Biological/Chemical/Environmental Control Unit (NBC/ECU) filter development
- (U) Completed Integrated Flight and Fire Control (IFFC) system feasibility analysis, system architecture and preliminary design
- (U) Completed initial engineering validation of Second Generation Comprehensive Helicopter Analysis System (2CHAS) and introduced 2CHAS to the user community
- (U) Completed Cockpit Delethalization Investigation
- (U) Initiated Combat Maintenance/Battle Damage Repair (CM/BDR) of optical components
- (U) Initiated testing of tailored control, optimized rotor, aeroelastic models to enhance helicopter stability, control and performance
- (U) Continued the advanced composite structure repair effort
- (U) Continued pre-design analysis and layout design of aviation notional systems
- (U) Continued engineering validation of 2CHAS technology modules and full up codes
- (U) Initiated the investigation of a digital terrain data base to enhance aircraft position/target acquisition and combat effectiveness
- (U) Completed fabrication and test of improved 30mm cannon ammunition
- (U) Fabricated smart skins and test
- (U) Initiated ceramic matrix combustor testing at exit temperatures up to 3000o F
- (U) Awarded contract for advanced rotor blade erosion protection device
- (U) Initiated enhanced NBC initiative program and awarded contract

(U) FY 1992 Planned Program:

- (U) Complete testing of low noise spiral bevel gears
- (U) Conduct ballistic tolerance testing and analysis of composite structures
- (U) Award contracts for IFFC full mission simulation

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

- (U) Initiate advanced crashworthy fuel cell program
- (U) Initiate CM/BDR assessment of directed energy threats
- (U) Initiate advanced external cargo sling investigations
- (U) Initiate program modification of Apache helicopter turbulence math model for real time operation
- (U) Complete investigation of color TV for target acquisition
- (U) Initiate components design for Phase II FY 1993-1995 (if conducted) Advanced Rotorcraft Vectored Thrust Combat Agility Demonstrator (ARVTCAD) pending successful results from Phase I ARVTCAD FY 1991/1992.

(U) FY 1993 Planned Program:

- (U) Complete wind tunnel test of extension twist coupled model rotor in support of nonconventional rotorcraft investigation efforts
- (U) Fabricate hardware and conduct performance test of advanced rotor erosion protection
- (U) Conduct tracking and gust sensitivity tests of advanced rotors
- (U) Complete Integrated Pump Actuator Program (IPAP) ground and flight testing
- (U) Determine ballistic tolerance of composite structures
- (U) Initiate IFFC simulation for system effectiveness and complete vehicle integration design
- (U) Complete investigations measuring workload impact of various pilot strategies
- (U) Initiate design of ceramic mixed-flow turbine rotor
- (U) Initiate evaluation of advanced cannon technology emerging from research
- (U) Complete concept development of Weapons Advanced Targeting Expert System (WATES)

(U) Project AH85 - Aircraft Avionics Technology: The objective of this project is the exploration of new concepts and techniques in aviation electronics for developing highly sophisticated avionics systems to perform battlefield functions more effectively. Emphasis is on reducing pilot workload through the use of voice interactive avionics, digital avionics and fault tolerant processors, advanced architecture integration concepts, advanced communication/covert capabilities and high speed data burst transmission.

(U) FY 1991 Accomplishments:

- (U) Developed airborne/ground flight following prototype
- (U) Completed tradeoff analysis on hardware/software fault tolerant management schemes, Real Time Artificial Intelligence System (RTAIS) brassboard design, and development of Tactical Integrated Electronics (TIE) dynamic path algorithm
- (U) Defined Expert Communications Link Manager (ECLM) requirements for a cognitive decision aid for management of communications system
- (U) Developed precision navigation system differential Global Positioning System (GPS) algorithms
- (U) Completed first version software for advanced voice recognition system

(U) FY 1992 Planned Program:

- (U) Fabricate brassboard Fault Tolerant Parallel Processing (FTPP) and RTAIS
- (U) Integrate and flight test precision navigation system
- (U) Flight test TIE dynamic path algorithm

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

- (U) Demonstrate C2 antenna multiplexer technology and feasibility of Broad Band (BB) Electronic Counter-Counter Measure (ECCM) High Frequency (HF) Antenna

(U) FY 1993 Planned Program:
- (U) Demonstrate FTPP and RTAIS concepts
- (U) Evaluate Adaptive Tactical Navigation (ATN) algorithm in simulation
- (U) Complete laboratory testing of Concurrent Architecture Recognizer (CAR) system
- (U) Prototype and test ECLM hardware and software and provide algorithms to Rotorcraft Pilot's Associate (RPA) ATTD II

(U) Work Performed By: In-House developer for avionics: US Army Avionics Research and Development Activity (AVRADA), Fort Monmouth, NJ. Major contractors: Vitronics, Eatontown, NJ; Anocapa Sciences, Santa Barbara, CA; ITT Corp, Nutley, NJ; AEL, Lansdale, PA. In-house developer for aeronautical & aircraft weapons: US Army Aviation Systems Command, St Louis, MO; Aerostructures Directorate, NASA Langley Research Center, Hampton, VA; Aeroflightdynamics Directorate, NASA Ames Research Center, Moffett Field, CA; Propulsion Directorate NASA Lewis Research Center, Cleveland, OH; and Aviation Applied Technology Directorate, Ft. Eustis, VA. Related Activities: by National Aeronautics and Space Administration. The principal contractors: Sikorsky Aircraft, Stratford, CT; Pratt and Whitney Aircraft, LTD, Montreal, Quebec, Canada; Bell Helicopter Textron, Fort Worth, TX; Computer Sciences Corporation, Mountain View, CA; Boeing Helicopter Company, Philadelphia, PA; McDonnell Douglas Helicopter, Mesa, AZ; Hughes Aircraft, Los Angeles, CA; General Electric Company, Lynn, MA; and Martin Marietta, Orlando, FL.

(U) Related Activities: This program adheres to Tri-Service Reliance Agreements on Aeropulsion and Air Vehicles (Rotary) 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. 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: #0603801A, Aviation Advanced Development and #0603003A, Aviation Advanced Technology. Active joint Service programs include the Army/Air Force Digital Map Generator Development and the Integrated Communications, Navigation, Command and Control System, and the Tri-Service Integrated High Performance Turbine Engine Technology program.

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

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
A442 Tactical Electronic Warfare Technology	11626	12459*	12611	Cont	Cont
A906 Tactical Electronic Warfare Techniques	9610	10619	9883	Cont	Cont
PE Total	21236	23078	22494		

* Supplemental appropriation funds for Operation Desert Storm (ODS) in the amount of $1.4K are included.

B. (U) BRIEF DESCRIPTION OF ELEMENT:

C (U) JUSTIFICATION FOR PROJECTS:

(U) Project A442 - Tactical Electronic Warfare Technology (transfer in FY 1991 from PE #0603270A Project A042):

(U) FY 1991 Accomplishments:

- (U) Completed improved infrared (IR) decoy and jointly test with Armament Research Development and Engineering Center (ARDEC)
- (U) Continued Semi-Automatic Command-To-Line-Of-Sight (SACLOS) countermeasures (CM) development, transitioned CM to missile CM device for Operation Desert Storm (ODS)
- (U) Initiated development of countermeasures techniques against missiles using imaging seekers
- (U) Performed Rosette Scan Seeker (RSS) Missile exploitation to determine most effective counter measures
- (U) Initiated high accuracy angle of arrival missile warning receiver techniques for directional IR jammers

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

- (U) Completed joint development with the US Army Tank-Automotive Command (TACOM) of tank Radar Warning Receiver (RWR) and integrate into Vehicle Integrated Defense System (VIDS) and assess candidate countermeasures
- (U) Completed Integrated Aircraft Survivability Equipment (IASE) HOTBENCH microwave environment generator; HOTBENCH used to support reprogramming of aircraft survivability equipment (ASE) during ODS
- (U) Initiated development of high direction finding (DF) accuracy direction finding for Advanced Technology Very High Speed Integrated Circuit (VH-SIC) RWR

- (U) Continued high accuracy laser warning techniques
- (U) Integrated Surface Acoustic Wave (SAW) channelizer with baseline Miniaturized Electronic Support Measures Direction Finding Location Intercept (MEDFLI) hardware and test
- (U) Continued low-cost phase shifter development
- (U) Initiated two-dimensional passive intercept techniques to provide target ranging information for air defense/multi-sensor fusion applications
- (U) Initiated joint (U.S. Army Communications-Electronics Command (CECOM)/Electronics Technology and Devices Laboratory (ETDL)) development of solid state, millimeter wave (MMW) transmitter/jammer

(U) FY 1992 Planned Program:

- (U) Develop advanced deception techniques against coherent radars
- (U) Initiate artificial intelligence (AI) techniques for Radar Warning Situational Awareness and Electronic Support Measure (ESM) for increased speed of emitter platform identification assessing both neural network and knowledge based approaches
- (U) Initiate high energy microwave (MW) location and receiver protection
- (U) Complete fabrication of multispectral environmental chamber to support technical insertion into PM ASE, PM Survivable Systems, The Technical Cooperation Program (TTCP) Subpanel-17, and Special Operations Aircraft (SOA) programs
- (U) Initiate MMW and laser simulator upgrades to the multi-spectral environmental generator

(U) FY 1993 Planned Program:

- (U) Conduct Surface to Air Missile (SAM) live fire MMW jamming test versus drone; under The Technical Cooperation Program (TTCP) Subgroup Test Panel-16, Monopulse Countermeasures
- (U) Complete and test tank MMW jammer

- (U) Continue IR countermeasures (CM) versus image seeker technology
- (U) Initiate advanced IR jamming techniques

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

- (U) Initiate multi-spectral IR jammer development
- (U) Initiate long wavelength IR decoy material development
- (U) Initiate directional infrared countermeasures (IRCW) for anti-tank guided missile (ATGM)
- (U) Continue joint (CECOM/ETDL) solid state, MMW radar transmitter/jammer development
- (U) Continue high energy MW location and protection for RWR

- (U) Continue situation awareness data fusion effort with U.S. Army Avionics Research and Development Activity (AVRADA)
- (U) Initiate RWR low band frequency extension for SOA and low observable (LO) aircraft
- (U) Complete monopulse Electronic Countermeasures (ECM) for advanced radio frequency countermeasures (RFCM) jammer
- (U) Complete WARLOCK-Radar Target Simulator (RTS) Non-Communication Deception System

- (U) Continue laser beamrider missile CM
- (U) Continue laser warning clutter rejection filter
- (U) Complete time difference of arrival (TDOA) electronic support measures (ESM) for ground based common sensor
- (U) Continue modern modulation intercept brassboard
- (U) Continue artificial intelligence/neural processing for ESM

(U) Project A906 - Tactical Electronic Warfare Techniques, transfer from PE 0603270A Proj A904:

(U) **FY 1991 Accomplishments:**

- (U) Acquired/developed high power wideband transistor for the family of Army jammers

- (U) Investigated techniques to provide efficient amplifier outputs

- (U) Completed initial phase of investigation of high temperature superconductive material for use as amplifiers and antennas with application to communications/electronics equipment

- (U) Developed concepts/techniques to operate communications jammers in a cooperative fashion

- (U) Integrated and tested algorithms in spatial problem solving, tactical planning and plan recognition, and computational tradeoffs

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

- (U) Analyzed threat EW, air defense and intelligence information distribution systems in the presence of US Army Intelligence Electronic Warfare (IEW) system capabilities prior to system integration
- (U) Completed minimum signal knowledge jamming effort
- (U) Developed hybrid spatial and object oriented database management systems for data fusion
- (U) Developed test methodology criteria to evaluate electronic intelligence (ELINT) correlation algorithms

(U) FY 1992 Planned Program:

- (U) Develop devices to reduce size, weight, and prime power requirements of common modules for ground, air and unmanned aerial vehicle application

- (U) Develop and demonstrate technology to automate manpower intensive correlation and integration of tactical sensor data from multiple and diverse sensors
- (U) Continue to provide computer based simulation of force-on-force combat with emphasis on the effects of communications IEW systems
- (U) Develop ECM receivers that are smaller, lighter and require less power than current systems
- (U) Continue research/development in novel approaches for reduced size HF antenna designs
- (U) Develop prototypes of efficient techniques for combining power amplifier outputs
- (U) Develop concepts/techniques to operating communications jammers which do not interfere with friendly communications
- (U) Develop techniques to allow directed jamming and digital ESM capability
- (U) Integrate and test tactical planning and plan recognition algorithm efforts utilizing the data fusion testbed

(U) FY 1993 Planned Program:

- (U) Continue development of devices for common module requirements
- (U) Transition advancements in high temperature superconductive material for amplifiers and antennas to advanced development for application purposes

- (U) Develop techniques to detect, sort and identify multiple communication signals in a dense signal environment

- (U) Provide automated data fusion processing to reduce required manpower and more effective utilization of sensor and fusion resources
- (U) Reduce requirement for large field exercises by providing computer based simulation of IEW technology advancements

(U) Work Performed By: In-house work: USA CECOM Electronic Warfare Reconnaissance, Surveillance Directorate, and Target Acquisition; Electronics Technology and Devices Laboratory,

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: # 502270A
PE Title: **Electronic Warfare Technology** Budget Activity: #1

Fort Monmouth, NJ; USA CECOM Signals Warfare Directorate, Vint Hill Farm Station, Warrenton, VA; and USA Harry Diamond Laboratories, Adelphi, MD. Supporting work: Air Force Avionics Laboratory, Wright Patterson AFB, OH; Rome Air Development Center, Grifriss AFB, NY; Naval Weapons Center, China Lake, CA; Letterman Research Institute, San Francisco, CA; Pacific Missile Test Center, Point Mugu, CA; National Security Agency, Ft Meade MD. Contract work: GE/RCA Corporation, Camden, NJ; Delfen Corporation, San Jose, CA; Hughes Aircraft Corporation, Fullerton, CA; Sanders Associates, 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; 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.

(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, PE #0603789F, PE #0603270A, PE #0604270A, PE #0603745A, PE #0602131M, and PE #03058856G 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: Current Memorandum of Understanding (MOU) on Electro-Optical Countermeasures (EOCM) with United Kingdom. Pending MOU with Canada on MEDFLI/SILENT FOX effort, a NATO Electronic Support Measure (ESM) payload. The Technical Cooperation Program (TTCP) Subgroup Q (EW), Defense Exchange Agreement (DEA) with France and Israel.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
A214 Missile Technology	32732	22869*	30277	Cont	Cont
DC04 Smart Munition Technology Management	2237	2716	2887	Cont	Cont
PE TOTAL	34969	25585	33164		

* Supplemental appropriation funds for Operation Desert Storm (ODS) in the amount of $25k are included.

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 and 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 Technology Base Master Plan and Science and Technology Objectives (STOs) therein and supports DoD Science and Technology Thrusts for Precision Strike and Air Defense.

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, allow 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 thrust areas:

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

(U) **FY 1991 Accomplishments:**

- (U) Completed the Advanced Kinetic Energy Missile (ADKEM) full scale, boost phase and coast phase wind tunnel at speeds up to Mach 5.5

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

- (U) Initiated optical adaptive processor
- (U) Applied autonomous acquisition algorithms to technology demonstration hardware
- (U) Demonstrated bench test of prototype orientation package for ADKEM at component level
- (U) Initiated procurement of focal plane array seeker and electronics
- (U) Awarded contracts for concept definition and breadboard prototypes of strap-down, millimeter wave seekers for ADKEM
- (U) Demonstrated missile track using millimeter wave radar
- (U) Initiated evaluation of high performance minimum signature propellants for Insensitive Munitions (IM)
- (U) Completed 1000 "g" acceleration while operational testing of inertial components to establish feasibility for ADKEM inertial measurement unit (IMU)
- (U) Initiated design for uncooled carbon dioxide receiver for laser beamrider guidance link
- (U) Began design for fiber optic gyro
- (U) Completed initial evaluation of dual mode inertial guidance system
- (U) Completed critical evaluation of seeker scan pattern analysis for dual mode inertial guidance system
- (U) Initiated seeker test and testbed for Combined Arms Multipurpose Missile System (CAMMS) and Republic of Korea, respectively
- (U) Initiated demonstration for Real Time Executive for Missile Systems (RTEMS) using product code
- (U) Initiated upgrade of multiprocessing testbed for digital signal processors
- (U) Completed prototype for vertical, soft-launch, strap-on control device for Advanced Kinetic Energy Missile (ADKEM)
- (U) Initiated guided round hardware fabrication/test of commercially available very large scale integrated (VLSI) circuits
- (U) Coded and integrated guided ADKEM software and test guided rounds of VLSI circuits
- (U) Initiated advanced man-machine interface for an advanced target acquisition aid for man-in-the-loop Fire Control System
- (U) Completed wind tunnel tests for baseline ADKEM
- (U) Fundamental 2-D plume flowfield and signature models completed
- (U) Development of enhanced models (bifurcated nozzles, helicopter signature, etc.) underway
- (U) Plume flowfield model validation using non-intrusive measurements and wind tunnel test completed
- (U) Designed and fabricated unitized, composite airframe
- (U) Designed and fabricated wing opening/flap deployment mechanism
- (U) Aerodynamic model of ADKEM developed
- (U) An automatic target acquisition processor was prototyped and integrated into the CAMMS
- (U) Hardware integration of initial CAMMS prototype completed and test interfaces and procedures tested at Eglin Air Force Base
- (U) A common infrared/millimeter wave (IR/MMW) detector was patented
- (U) Progress has been made toward a U.S./Japan program of a dual mode (IR/MMW) seeker
- (U) Exploratory development of an imaging IR seeker for air defense included studies and captive tests to evaluate various sensors and efficiency of several signal processing techniques
- (U) Multipath suppression techniques and accuracy production for the MMW guidance of ADKEM led to an experiment definition for FY 1992

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

- (U) A joint Army/Defense Advanced Research Projects Agency (DARPA) program to develop an optical range Doppler correlator for the Quiet Radar was initiated

(U) FY 1992 Planned Program:

- (U) Flight test ADKEM (gyro guidance only) during the boost phase of the flight trajectory
- (U) Conduct tower measurements of polarized infrared signatures
- (U) Transition millimeter wave direct fire guidance to system application
- (U) Evaluate passive sensor performance in clutter
- (U) Procure prototype infrared focal plane array seeker for evaluation
- (U) Initiate flight demonstration on uncooled carbon dioxide laser beamrider data link
- (U) Evaluate thermal protection materials for ADKEM
- (U) Apply new composites/materials technology to ADKEM
- (U) Demonstrate lightweight composite blast shield technology as integral airframe component
- (U) Complete design and fabrication of fiber optic coil winding system for fiber optic gyros
- (U) Complete helicopter transfer align study for CAMMS
- (U) Complete Ada digital signal processor technology applications
- (U) Complete development of high efficiency electromagnetic actuator and improved energy storage system
- (U) Complete evaluation of expert and neural network technology for image processor application
- (U) Hand off aerodynamic design of a hypervelocity missile to the ADKEM demonstration program
- (U) Complete the development of a plume simulation for laser attenuation through a missile plume
- (U) Initiate power-on wind tunnel testing of a missile design with an integrated turbojet design
- (U) Perform final checkout and integration of the all-purpose programmable Radio Frequency (RF) jammer into the hardware-in-the-loop (HWIL) RF simulator
- (U) Continue validation of millimeter wave (MMW) clutter models
- (U) Investigate applications of digital RF memories to signal generation for RF HWIL simulation
- (U) Develop concepts for dual spectrum, MMW and infrared (IR), HWIL simulators
- (U) Initiate Phase II of Advanced Simulation Processor Complex (ASPC) simulation processor conversion to Ada language
- (U) Complete Phase I of IR dynamic scene projector development
- (U) Demonstrate Insensitive Munition (IM) capability of strip laminate and composite case and elastomer modified cast double based (EMCDB) propellant in a selected motor
- (U) Develop electroexplosive device (EED) resistant material database
- (U) Evaluate aeroelastic/control interactions for ADKEM
- (U) Demonstrate bipropellant gel formulations in test hardware
- (U) Evaluate and design alternate propulsion cycle components
- (U) Demonstrate digital fuel control for turbojet
- (U) Initiate full scale, completely inertial guided ADKEM flights
- (U) Conduct flex petal stability feasibility study
- (U) Continue standardized plume flowfield experimental validation
- (U) Develop flow visualization techniques
- (U) Design and test intermediate range (40 km) fiber optic spool
- (U) Begin development of global positioning system (GPS) based navigation system, hardware and software

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

- (U) Captive flight tests and missile flight tests for CAMMS will be completed
- (U) Demonstration of common IR/MMW detector will continue
- (U) Investigation of IR polarization characteristics of targets of interest
- (U) Phase I of the U.S./Japan Dual Mode program will begin
- (U) Insertion of the Quiet Radar optical processor during 3d quarter
- (U) The Advanced Sensors Technology Program will investigate promising techniques for passive target detection and sensor fusion demonstrations

(U) FY 1993 Planned Program:

- (U) Initiate a series of ADKEM guided flights which demonstrate complete guidance package of inertial and command to line of sight guidance
- (U) Initiate development of flow visualization techniques for external separated flows
- (U) Exploit emerging technology in composite structures to improve performance, extend life, and reduce costs of missile systems
- (U) Determine capability of missile guidance for aimable warhead fuzing
- (U) Complete full scale, completely inertial guided ADKEM flights
- (U) Conduct captive flight test on polarized imaging sensor
- (U) Analyze ultrawideband radar critical components
- (U) Integrate passive sensors for fusion test
- (U) Test infrared focal plane array seeker and integrate algorithms
- (U) Complete full scale completely inertial guided ADKEM flight
- (U) Complete fire control graphics coprocessor demonstration
- (U) Improve fidelity of RF clutter models
- (U) Design next generation low noise, wide bandwidth digital quadrature modulators
- (U) Design dual spectrum MMW and IR HWIL simulator
- (U) Complete Phase II of ASPC simulation processor conversion to Ada
- (U) Initiate Phase II of IR dynamic scene projector design
- (U) Complete high speed wind tunnel test and analysis of alternate booster stabilization concepts for clustered booster configurations
- (U) Complete nonreacting standard plume flowfield validation and initiate multinozzle plume modeling
- (U) Complete finalized airframe design and develop aerodynamic model for turbojet airframe
- (U) Characterize a high performance minimum signature propellant for IM propulsion
- (U) Conduct lab scale motor tests of selected alternate propulsion cycles
- (U) Continue evaluation of new energetic materials for high performance minimum signature propellants
- (U) Develop high performance smokey composite propellants for IM Product Improvement Plan (PIP) programs
- (U) Complete baseline evaluation of IM minimum signature analog motor for Line of Sight Anti-Tank (LOSAT)
- (U) Evaluate small turbojet for shoulder fired application
- (U) Complete stress-free temperature shift verification study
- (U) Complete model extensions for ballistically driven cracks in solid propellants
- (U) Design and testing of flex petal structure

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

- (U) Define concepts and identify components of an advanced long range data link weapon to carry a warhead or surveillance package that can identify/track targets in day/night all weather, severe clutter, or camouflaged environments
- (U) Initiate the fabrication and evaluation of major components in a breadboard arrangement for an advanced long range data link weapon
- (U) Integrate and demonstrate MMW Guidance Radar performance in open-loop test
- (U) Demonstrate high range resolution waveform non-cooperative target recognition (NCTR) performance of multi-role survivable radar (MRSR)
- (U) The Advanced Sensors technology will demonstrate unconventional passive target detection, sensor fusion, and quantum well sensors
- (U) Ultra Wide Band Radar applications will be demonstrated
- (U) Transition the Dual Mode Seeker to PE #0603313/404

(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 is 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. Office provides unbiased broad perspective recommendations to Army decision makers from a system-of-systems point of view to sort out what requirements and materiel solutions will make the most significant contribution on the integrated battlefield. Only integration staff element within Department of the Army to assist decision makers concerned with smart weapon target engagement, target acquisition, and command/control requirements/solution. Provides single entry point to focus industry independent research and development (IR&D) initiatives.

(U) FY 1991 Accomplishments:

- (U) Implemented methodology to reduce signature production requirements as chair of requirements panel of Foreign Signatures Measurements Committee (FSMS)
- (U) Developed methodology to define impact of weather and countermeasures (CM) and prepare specifications for smart weapons (SW) systems in development and next generation/future systems
- (U) Assisted in deep battle neck-down analysis by integration of technical analyses performed by U.S. Army Missile Command (MICOM) Research, Development and Engineering Center (RDEC), Vulnerability Assessment Lab, Army Materiel Systems Analysis Activity (AMSAA), and U.S. Army Artillery Center
- (U) Transitioned Smart Weapon Data Acquisition (SWEDAS) concept to Project Manager-Instrumentation, Targets, and Threat Simulators (PM-ITTS) for development and utilization
- (U) Managed tactical weapons Guidance and Control (G&C) Information Analysis Center (GACIAC) for Joint Service Guidance and Control Committee (JSGCC) to benefit entire DoD community (government and industry)
- (U) Oversaw Low Cost Anti-Armor System (LOCAAS) program execution
- (U) Implemented CHICKEN LITTLE role as Army/Air Force signature production center of excellence

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

(U) FY 1992 Planned Program:

- (U) Perform technical and programmatic assessments at request of Department of the Army Balanced Technology Initiative (BTI) manager, OSD BTI director, and Office of the Under Secretary for Research and Engineering; Research and Advanced Technology (OUSDRE(RAT)) weapon science and technology specialist
- (U) Perform independent technology and program assessments
- (U) Prepare assessment of smart munitions/smart weapons (sm/sw) technology base initiatives and assess industry technologies and concepts on SM/SW
- (U) Conduct SM/SW system of systems analysis as AMC review of TRADOC field Long Range Army Materiel Requisition Plan (LRAMRP)

(U) FY 1993 Planned Program:

- (U) Integrate and exchange technology and concepts among mission areas, multiple service applications, and strategic defense to prevent duplication of effort and maximize return-on-investment
- (U) Monitor/inform other Services, Defense Advanced Research Projects Agency (DARPA), Industry, Allies on SW
- (U) Provide technical/programmatic analysis for Program Executive Office (PEO) Fire Support, PEO Armaments
- (U) Manage tactical weapon G&C Information Analysis Center (GACIAC) for Joint Service Guidance and Control Committee (JSGCC) to benefit entire DoD community
- (U) Manage Army participation in Joint Project Office (JPO) CHICKEN LITTLE. Focus CHICKEN LITTLE III on CM/CCM testing and analyses

(U) Work Performed By: The Research, Development, and Engineering Center (RD&EC), U.S. Army Missile Command, Redstone Arsenal, AL, has primary responsibility for execution of this program. The major contractors performing work for this program 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. Contractors with capabilities in Unmanned Aerial Vehicle airframes, propulsion, simulation, data links, and ground station design will be selected and funded for specific tasks. The AMC-SWMO obtains Government technical expertise from MICOM RDEC, Armament Research Development and Engineering Center, all Laboratory Command Laboratories 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 and PE #0602782A in accordance with the ongoing Reliance joint planning process and contains no unwarranted duplication of effort among the Military Departments.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

Budget Activity: **#1**

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

(U) International Cooperative Agreements: Joint USA/Canada defense development sharing agreement.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0602307A**
PE Title: **Advanced Weapons Technology** Budget Activity: **#1**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
A139	Directed Energy Technology				
	440	484	585	Cont	Cont
PE TOTAL	440	484	585	Cont	Cont

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.

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 1991 Accomplishments:
- (U) Evaluated overtone chemical laser concept for tactical applications
- (U) Monitored and assessed evolving technologies for tactical laser weapons applications
- (U) Accomplished Laser Light Defense System (LLADS) test in Debug mode resulting in minor hardware and software changes

(U) FY 1992 Planned Program:
- (U) Continue evaluation of short wavelength lasers for tactical applications
- (U) Monitor and assess evolving technologies for tactical laser weapons applications

(U) FY 1993 Planned Program:
- (U) Monitor and assess evolving technologies for tactical laser weapons applications

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0602307A**
PE Title: **Advanced Weapons Technology** Budget Activity: **#1**

- (U) Evaluate the use of multiwavelength dye laser technology and RF energy for tactical weapons applications

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

(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, PE #0602601F, PE #0603221C, 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.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
AC99	Modeling and Simulation Technology				
	0	8000	0	Cont	Cont
PE TOTAL	0	8000	0	Cont	Cont

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program provides exploratory development of state-of-the-art techniques and technology for distributed interactive simulation in support of weapon system upgrades. It supports modeling and prototyping in real time, soldier-in-the-loop, virtual reality battlefield simulation. This program element is a key Army initiative in support of defense modeling and simulation.

C. (U) JUSTIFICATION FOR PROJECT:

(U) Project AC99 - Modeling and Simulation Technology

(U) **FY 1991 Accomplishments:** Not Applicable

(U) **FY 1992 Planned Program:**

- (U) Develop detailed plans associated with the acquisition of CASE Facility by University of Texas to provide basic services and perform research in distributed interactive simulation on a potential lease basis to the Army
- (U) Conduct upgrades to existing computer and simulation equipment as required to provide an initial operational capability to perform research in distributed interactive simulation
- (U) Conduct lease vs purchase analysis of facility
- (U) Acquire networking equipment required to link facility with Army and other Service distributed interactive simulation
- (U) Conduct modeling and simulation activities, including exploratory development of simulation techniques, modeling for combat development of tactics and doctrine, and test and evaluation of command and control systems

(U) **FY 1993 Planned Program:** Not Applicable

(U) **Work Performed By:** Prime Contractor: University of Texas, Fort Worth, Texas. In-house: Project Manager-Training Devices (PM-TRADE), Orlando, FL, Army Research Institute

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0602308A**
PE Title: **Modeling and Simulation 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 #0602727A and PE #0604715A.

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

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
AH91	Tank & Automotive Technology				
	17808	20393*	37705	Cont	Cont
AH97	Advanced Components Test Bed				
	7505	8300	0	Cont	Cont
DC05	Heavy Armor				
	9197	9779*	9287	Cont	Cont
PE TOTAL	34510	38472	46992		

* Supplemental appropriation funds for Operation Desert Storm (ODS) in the amount of $1266K ($190K in Project DC05 and $1076K in Project AH91) are included.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program advances state of the art technologies leading to the development of ground combat systems and componentry that will improve the Army's ability to fight, survive against, and defeat the future battlefield threats. In response to the changing world situation, increased emphasis is placed on technologies for strategically mobile, lightweight, versatile and highly survivable systems. New technology thrusts designed to yield more strategically deployable future armored vehicles reflect the Army's decision to place greater emphasis on lightening the force while retaining the ability to survive in diverse, worldwide battlefield environments. This project pr(ides the critical new technology to improve survivability against advanced anti-armor weapons. The work in this program element complies with the resource constrained Army Technology Base Master Plan and the Science and Technology Objectives (STO's) therein and supports Advanced Land Combat Vehicles (ALCV), one of the Department of Defense Science and Technology Thrusts.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project AH91: Tank and Automotive Technology: This project provides new and improved concepts leading to product improvements to currently fielded equipment and to the development of future systems that will enable the Army to fight and survive against diverse threats. Conceptual designs, physical and analytical simulations, and analyses of ground vehicle systems identify high potential emerging technologies, as well as the benefits, burdens and trade-offs related to ground vehicle applications. The program is comprised of six tasks: (1) future vehicle concepts and technology integration; (2) mobility; (3) integrated survivability; (4) vehicle electronics; (5) composite materials; and (6) simulation/analysis. The integrated survivability efforts include signature reduction, countermeasures, and damage reduction which complement, but do not duplicate, the work

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

performed under the Heavy Armor program in enhancing the overall survivability of combat vehicles. New technology initiatives are being pursued to address future mobility, survivability and lethality requirements of lighter vehicle systems. A new thrust involves the use of composite materials for combat vehicle structures and armor. Following concept exploration in FY 1991 and FY 1992, a contract will be awarded for an ad ced technology transition demonstration (ATTD) for a Composite Armored Vehicle (CAV). The Department has increased Project AH91 in FY 1993 by $9500 to accelerate this program and permit contract award in FY 1993 versus FY 1994 as originally planned. CAV will transition to PE# 0603005A in FY 1994. Project AH91 was also increased in FY 1993 to accelerate exploratory development of integrated survivability technologies that can be especially effective against smart weapons without the weight burden of armor.

(U) FY 1991 Accomplishments:

- (U) Developed comprehensive technical and management plans for the CAV ATTD
- (U) Continued congressionally-directed evaluation of Hansen rotary valve system (one year no-cost contract extension granted due to contractor's supplier delays)
- (U) Conducted parametric analyses and design trade-off studies of future combat vehicle systems
- (U) Initiated bench and vehicle electrical integration in the Component Advanced Technology Test Bed (CATTB)
- (U) Developed active noise cancellation system and visible signature suppression system for future combat vehicles; modeled signature suppression for CATTB
- (U) Completed field evaluation of semi-active suspension at Waterways Experiment Station
- (U) Added nonlinear suspension system response capability to track loop simulation code
- (U) Completed assembly and integration of Crew Station/Turret Motion Base Simulator to assess full scale vehicle turrets and subsystems in simulated field tests
- (U) Developed tracked vehicle computer aided design/evaluation work station
- (U) Developed emergency battlefield damage vehicle repair kits for Operation Desert Storm (ODS)

(U) FY 1992 Planned Program:

- (U) Apply systems engineering approach to integrate Advanced Land Combat Vehicles (ALCV) technical goals into future combat systems and translate ALCV technical goals into future combat systems concepts
- (U) Conduct concept exploration in preparation for the CAV ATTD
- (U) Initiate design study for lightweight composite/advanced survivability approaches
- (U) Complete development of vehicle electronics systems architecture demonstrator
- (U) Demonstrate technologies to reduce detection of future combat vehicles
- (U) Perform user evaluation of integrated defensive system in a Bradley Fighting Vehicle
- (U) Initiate technical data package for new 3-line laser protected unity vision devices
- (U) Initiate integration of vetronics crew display demonstrator (VCDD) with Battlefield Distributed Simulation-Developmental (BDS-D) at Ft. Knox, Kentucky
- (U) Initiate high speed lightweight band track development
- (U) Initiate elastomers program to reduce track operating and support costs
- (U) Initiate active suspension/track control system development for lightweight combat vehicles
- (U) Man-rate the crew station/turret motion base simulator

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

(U) FY 1993 Planned Program:
- (U) Plan, coordinate, assess, and direct ALCV technology base activities
- (U) Perform concept formulation and analysis of lightweight composite vehicles
- (U) Award contract for CAV ATTD (originally planned for FY 1994)
- (U) Develop components for active suspension
- (U) Expand the tracked vehicle design workstation to include structural design capabilities
- (U) Evaluate new 3-line laser protected vision devices for combat vehicles
- (U) Fabricate a vehicle integrated defense system (VIDS) using standard Army vetronic architecture (SAVA) components; demonstrate VIDS on CATTB in the field
- (U) Demonstrate modular low observable technology
- (U) Initiate expert system for defeat of top attack, guided missile and tube fired chemical energy threats
- (U) Evaluate active suspension performance
- (U) Award electric drive contract and initiate component development
- (U) Evaluate high speed lightweight band track and continue elastomers program

(U) Project AH97 - Advanced Components Test Bed: This project was created in FY 1991 to allow funds to be provided directly to the performing agency (i.e., the Program Executive Officer (PEO) for Armored Systems Modernization (ASM)) to improve program execution). It provides for advanced technology development of vehicle electronics, integrated survivability (countermeasure) technology, combat vehicle simulation and analysis. This project ends in FY 1992 and all tank and automotive technology will be conducted under Project AH91, consistent with the Army decision to defer several ASM programs, but maintain options to resume development as required by threat assessments and technology maturation.

(U) FY 1991 Accomplishments:
- (U) Performed conceptual design and analysis in support of PEO, ASM
- (U) Provided technical and management support for ASM source selection evaluation boards
- (U) Developed low observable designs for incorporation into CATTB
- (U) Continued tracked vehicle work station development for non-simulation specialists
- (U) Extended tracked vehicle work station to include the North Atlantic Treaty Organization (NATO) Reference Mobility Model

(U) FY 1992 Planned Program:
- (U) Provide vehicle and subsystem concept designs and computer analysis for wargaming and acquisition milestone documentation, including ATAS and FARV-A simulation studies
- (U) Validate simulation models for mobility, ride dynamics, firing dynamics and conduct vehicle signature prediction through comparative testing on the CATTB
- (U) Conduct Soldier Machine Interface (SMI) (Human Factors) for the CATTB through the Vetronics Crew Display Demonstrator (VCDD) at the U.S. Army Tank-Automotive Command (TACOM)

(U) **FY 1993 Planned Program:** Work funded under Project AH91, this PE.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

(U) Project DC05 - Heavy Armor: This project lays the technical foundation to solve critical frontal armor deficiencies and improve the survivability of conventional ground combat forces against increasingly lethal antiarmor weapons. The term "heavy armor" refers to ballistic armors required for high protection levels of such vehicles as main battle tanks. Emphasis is on improving mass efficiency of armors, plus using innovative survivability techniques such as those described in project AH91, to develop lighter combat vehicles. Within the broader field of armor development, it addresses a problem that is unique to the Army: protection of our main battle tanks and other combat vehicles requiring high levels of armor protection against large caliber kinetic energy projectiles, explosively formed projectiles 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) 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. This project covers all types of armor, including passive, reactive, and electromagnetic.

(U) FY 1991 Accomplishments:
- (U) Completed development and full scale tests of hybrid armors with combined kinetic energy and shaped charge protection
- (U) Supported development of advanced frontal armor technologies at Los Alamos and Lawrence Livermore National Laboratories
- (U) Supported advanced material development for integral reactive and other armors
- (U) Continued transition of programs and products from Army/DARPA/USMC A3 Program
- (U) Continued development of armor models to reduce development and test time and cost
- (U) Completed initial tests of momentum transfer defeat mechanism using full scale design provided by Lawrence Livermore National Laboratory
- (U) Tested first filament-wound composite structure for use in confinement of ceramic armor

(U) FY 1992 Planned Program:
- (U) Demonstrate reactive concepts to defeat kinetic energy (KE) and shaped charge warheads
- (U) Continue development and improvement of armor systems for advanced threats
- (U) Develop performance model of armor against shaped charge jets
- (U) Fabricate and test full scale reactive armor in a multi-hit structure
- (U) Develop simulations of ceramic armor boundaries bounded by momentum traps or selected impedance mismatches
- (U) Evaluate momentum transfer defeat mechanism at full scale

(U) FY 1993 Planned Program:
- (U) Continue development of advanced passive, reactive and compact reactive armor technologies to defeat side and top attack threats
- (U) Optimize hybrid KE/electromagnetic armor design and test at subscale
- (U) Configure armor for KE and shaped charge defeat and test performance

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

- **(U)** Develop concepts to improve performance of ceramic armor components
- **(U)** Demonstrate proof-of-principle target for integral reactive armor

(U) Work Performed By: The US Army Tank-Automotive Command (TACOM) and Program Executive Officer, Armored Systems Modernization, Warren, MI. Major contractors include: General Dynamics Land Systems Division, Warren, MI; Williams International, Walled Lake, MI; Adiabatics Incorporated, Columbus, IN; Boeing Company, Seattle, WA; TRW, Redondo Beach, CA; Perkin-Elmer, Norwalk, CT; FMC, San Jose, CA; General Motors Military Vehicle Operation, Warren, MI; Texas Instruments, Dallas, TX; Honeywell Corp., Hopkins, MN; General Electric, Lynn, MA; Garrett Corp., Phoenix, AZ.

(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 contains no unwarranted duplication of effort among the Military Departments.

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

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
AH80	Ballistics Technology				
	28881	28030*	30402	Cont	Cont
AH81	Armor/Anti-Armor MOU				
	0	34950	28989	Cont	Cont
PE TOTAL	28881	62980	59391		

* Supplemental appropriation funds for Operation Desert Storm (ODS) in the amount of $3k are included.

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, executed by the Army's Ballistic Research Laboratory (BRL), is focused on anti-armor warhead mechanics; penetrator mechanics; munition-target interactions; terminal effects; propulsion dynamics; launch and flight dynamics and remote sensing. 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/Defense Advanced Research Projects Agency (DARPA)/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/Projects #0603004A/D223 and #0603005A/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 Technology Base Master Plan and the Science and Technology Objectives (STOs) therein, and supports Advanced Land Combat Vehicles (ALCV), 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 and defensive material in response to heavy, medium, and light threats in a global context. This project contains ballistic technology advances in vehicle survivability, direct fire armament capabilities, indirect fire support, and weapon effectiveness evaluation in order to be able to design the most lethal weapon capability and optimally protect against the most dangerous threat. It manages and exploits the Army's supercomputer network, as well as extensive experimental programs to advance the state of ballistics technologies.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

(U) FY 1991 Accomplishments:
- (U) Evaluated three-dimensional (3-D) failure assessment methodologies for sabot designs
- (U) Developed mechanical properties for composite materials for ballistic systems
- (U) Determined laser parameters necessary for direct propellant ignition for greater muzzle velocities and high lethality
- (U) Performed simulator tests for propellant laser ignition of unicharge
- (U) Validated and applied complete tank gun launch model to hypervelocity launch
- (U) Extended high velocity armor performance database at half scale to include reactive and other armor technologies
- (U) Completed lethality assessment of mass-velocity trade-off for high velocity penetrators against advanced targets.

(U) FY 1992 Planned Program:
- (U) Finalize 3-D failure assessment methodologies for sabot designs
- (U) Demonstrate prototype propellant laser ignition system
- (U) Measure hypervelocity launcher dynamics for tank cannon
- (U) Determine optimal defeat mechanism for armor systems to defeat kinetic energy (KE) and chemical energy (CE) threats
- (U) Evaluation of medium caliber ammunitions and design tradeoffs to defeat light and medium tracked/wheeled threat vehicles
- (U) Investigate feasibility of constructing Ballistic Research Laboratory - Computer Aided Design (BRL-CAD) 3-D vehicle descriptions from blue prints

(U) FY 1993 Planned Program:
- (U) Integrate 3-D failure assessment methodology into digitized analysis capability of sabot designs producing greater KE penetrator lethality
- (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) Incorporate into BRL-CAD the capability to construct 3-D vehicle descriptions from blue prints for survivability improvements during vehicle design phase
- (U) More accurately incorporate the phenomena of shock and blast in the Stochastic Quantitative Assessment of Systems Hierarchy environment
- (U) Convert Vulnerability/Lethality codes from aircraft analysis into computer framework

(U) Project AH81 - Joint Armor/Anti-Armor Program: 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 application 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

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

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.

(U) **FY 1991 Accomplishments:**
- (U) Efforts were funded in PE/Projects #0603004A/D223 and #0603005A/D221)
- (U) Provided lightweight, affordable ceramic armor protection applique for Light Armored Vehicles in field test
- (U) Provided armor protection upgrades for Line Of Sight Antitank (LOSAT)
- (U) Began development of advanced armor designs for vehicle protection upgrades
- (U) Successfully tested technology for Vehicle Survivability Program components, promising increased protection at reduced weight and cost
- (U) Develop small arms anti-armor capability using gel propellant and special bullet
- (U) Discovered dynamic jetting method for deep target penetration
- (U) Tested high efficiency rigid body penetration with composite rod
- (U) Developed new rod-in-tube projectile for increased penetration

(U) **FY 1992 Planned Program:**
- (U) Demonstrate optimized, light applique system technique in three different armor weights (ultralight, light, and medium)
- (U) Deliver development of armor modules for Government evaluation
- (U) Conduct advanced penetration research into unconventional hypervelocity projectiles
- (U) Investigate advanced chemical energy concepts such as superfast jets, megabar response materials, and computer assisted design of ultra-high precision warheads
- (U) Study threat for top attack munitions, active protection and armor technology
- (U) Locate and acquire foreign technology and systems for future exploitation
- (U) Test most promising high efficiency armor designs for light vehicles
- (U) Demonstrate ceramic armor applique on tactical vehicle
- (U) Further develop new armor materials including biomimetics, graded cermets, and low flammability/sensitivity energetic materials
- (U) Design light, deployable CE warheads with improved countermeasure resistance
- (U) Begin interceptor program for terminal defense of high value targets
- (U) Conduct full scale tests of advanced kinetic energy penetrators

(U) **FY 1993 Planned Program:**
- (U) Demonstrate high performance projectile propulsion
- (U) Prove full-scale penetration lethality of specially processed tungsten
- (U) Design and fabricate selected advanced threat surrogates
- (U) Transition high efficiency armors for potential application to Army systems
- (U) Transition advanced CE warhead designs to the U.S. Army Missile Command
- (U) Conduct system demonstration of interceptor technology
- (U) Transition high performance penetrators for potential application to Army systems

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

(U) Work Performed By:
AH80: In-house efforts accomplished by the US Army Ballistic Research Laboratory, Aberdeen Proving Ground, MD. Research efforts will be supplemented by contract support by New Mexico Institute of Mining and Technology, Socorro, NM; Dynamic Sciences, Inc., Phoenix, AZ; Honeywell, Minneapolis, MN; Aircraft Armaments Inc., Cockeysville, MD.

AH81: 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, Honeywell Defense 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, PE #0602624A, and PE #0603004A 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.

AMENDED FY 1992/1993 BIENNIAL RDTE 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 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
A551	Nuclear Biological Chemical Survivability				
	11850	9100	0	Cont	Cont
A552	Smoke/Novel Effects Munitions				
	5851	7964	8196	Cont	Cont
A553	Chemical/Biological (CB) Defense & General Investigations				
	25821	33098*	39531	Cont	Cont
A554	Chemical Munitions				
	3150	1217	0	Cont	Cont
PE TOTAL	46672	51379	47727		

*Supplemental appropriation funds for Operation Desert Storm (ODS) in the amount of $1,028k are included.

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 missions 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; defense technology and antiterrorism. In addition to improving our defenses, the U.S. must maintain a limited technology base capability in chemical weapons development in order to guard against technological surprise. As the DOD Executive Agent, the Army will continue to update technological capabilities and conduct exploratory development in chemical agents, chemical agent effects, and chemical munitions (Project A554). Project A554 consists of the Advanced Riot Control Agent Device which will be completed in FY 1992. Project A552 provides exploratory development of several essential capabilities to provide countermeasures to enemy weapons systems and to provide the overall

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

capability of degrading or defeating the mission of an enemy. Improved multispectral smokes/obscurants will be explored in order to save lives 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. In addition under project A552, development of non-lethal munitions will provide incendiary devices and anti-materiel devices for use during military operations in urban terrains (MOUT) and under similar circumstances to support counterterrorism. Project A551 addresses support to Program Executive Officer, Armored Systems Modernization to include Collective Protection, Smoke, Detection and Auxilliary Powered Environmental Control System. The work in this program element supports the Army's Technology Base Master Plan, and the Science and Technology Objectives (STO's) therein.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project A551 - Nuclear Biological Chemical Survivability: This project addresses support to Program Executive Officer, Armored Systems Modernization (PEO,ASM) to include Collective Protection, Smoke, Detection and Auxilliary Powered Environmental Control System (APECS). This project was created in FY 1991 and 1992 to allow the funds to be provided directly to the performing agency (PEO,ASM).

(U) FY 1991 Accomplishments:

- (U) Collective Protection / Detection / Smoke / Auxiliary Powered Environmental Control System
  - Delivered and demonstrated Pressure Swing Absorption (PSA)/ Environmental Control Unit (ECU) prototype hardware for Component Advanced Technology Test Bed (CATTB) 1
  - Continued preparations for full scale agent/simulant testing on PSA/Catalytic Oxidation (CatOx) preprototype systems
  - Continued development of PSA performance prediction model
  - Continued gathering of PSA and CatOx fundamental data
  - Completed fabrication of two full scale PSA test units for PSA math model validation
  - Initiated development of CatOx lab scale simulant based performance prediction
  - Completed evaluation which eliminated reactive bed plasma and membrane technology as near term applications for ASM
  - Completed initial drafts of warning and reporting performance and vehicle control and operating system (VCOS) specs and detection equipment interface control documents
  - Completed a market survey of standoff detection concepts
  - Continued investigation on Infrared (IR) and Millimeter Wave (MMW) smoke materials and dissemination techniques
  - Conducted field tests and breeze tunnel tests on new materials and dissemination equipment for conceptual IR and MMW materials
  - Initiated work on generic smoke performance and VCOS specs
  - Finalized APECS hardware designs and initiated fabrication for CATTB2 and APECS predictive math model validation
  - Continued development of APECS performance prediction model

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

(U) FY 1992 Planned Program:

- (U) Collective Protection / Detection / Smoke / APECS
  - Support CATTB1 and CATTB2 demos of PSA/ECU system
  - Finalize designs and fabricate two PSA units for APECS integration for CATTB2 and APECS predictive math model validation
  - Initiate full scale simulant and agent testing on two PSA math model validation systems
  - Complete work on preliminary PSA predictive math model
  - Continue PSA and CatOx data gathering
  - Complete work on CatOx lab scale simulant based performance prediction model
  - Finalize and deliver warning and reporting performance and VCOS specs and detection interface control documents
  - Complete Chemical Sample Transfer System breadboard and deliver to CATTB2
  - Continue investigation on IR and MMW smoke materials and dissemination techniques
  - Continue to conduct field tests and breeze tunnel tests on new material and dissemination equipment for conceptual IR and MMW materials
  - Complete generic smoke performance and VCOS specs
  - Complete fabrication of two APECS units for integration with two PSA units for CATTB2 and for APECS math model/validation testing

(U) FY 1993 Planned Program:

- (U) Funded in Project A553, this PE

(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 antimateriel and flame systems.

(U) FY 1991 Accomplishments:

- (U) Smoke
  - Evaluated theory, material and processes necessary to produce multicomponent multispectral screening agent
  - Defined system capabilities of XM56 millimeter wave module by calculation and test
  - Produced millimeter wave materials in belts for ease of packaging and dissemination
  - Produced environmentally degradable, high performance screening millimeter wave materials from hydrocarbon feedstock
  - Defined system capabilities of aerial delivered multispectral munition by calculation and test
- (U) Antimateriel/ Flame/Incendiary Technology
  - Successfully demonstrated enhanced reactive materials (ERM) payload in several munition systems against several difficult targets Aviation School initiated requirements document
  - Successfully demonstrated single payload mission kill alternative for defeat of armored vehicles by indirect fire

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

- Successfully demonstrated an emerging technology for defeat of armor/other vehicles by direct fire
- Demonstrated viability of using the on-board fuel to enhance the effectiveness of the U.S. Navy HARPOON Anti-ship Missile
- Demonstrated feasibility of using the Shaped Charge Follow Through Munition concept to increase the behind-armor effectiveness of shaped charge munitions
- Demonstrated Incendiary Projectile payload materials to produce enhanced combined effects (i.e. blast/overpressure plus thermal)
- Initiated efforts to identify flame and incendiary enhancement to fragment-producing and area coverage munitions systems
- Initiated efforts to quantify the effects and effectiveness of flame and incendiary materials
- Initiated in-house lab efforts to develop flame and incendiary technologies and materials
- Continued definition of the role of flame and incendiary materials on the battlefield

(U) FY 1992 Planned Program:

- (U) Smoke
  - Demonstrate Millimeter Wave Module (MMW)
  - Demonstrate Aerial Delivered Multispectral (MS) munition warhead. Investigate high performance materials for Aerial Delivered MS munition
  - Continue to investigate candidate materials for directed energy defense
  - Demonstrate prototype electro-optical marker
  - Demonstrate Light Vehicle Obscuration Screening System (LVOSS)
- (U) Antimateriel/ Flame/Incendiary Technology
  - Complete testing and modeling of mission kill system and determine feasibility of payload for an indirect fire system
  - Terminate active Enhanced Reactive Materials program and emerging technologies
  - Solicit requirement document from potential users
  - Initiate a front end analysis and Master Plan for Target Defeating Munitions to define the U.S. Army's operational requirements for flame and incendiary materials
  - Demonstrate enhanced after-penetration or behind-armor effects with a shaped charge follow through munition concept using energetic flame and incendiary follow through materials
  - Identify and pursue potential technical areas for an international cooperative effort
  - Investigate alternate thickeners to be used in Flame Field Expedients
  - Continue development of techniques to quantify the effects and effectiveness of flame and incendiary materials

(U) FY 1993 Planned Program:

- (U) Smoke
  - Complete documentation for successful transition of XM56 MMW module
  - Transition LVOSS to system-oriented Demonstration/Validation phase
  - Continue to investigate candidate materials for multispectral screening and for directed energy weapons defense

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

- Demonstrate candidate electro-optical marker and IR/MMW chaff

- (U) Antimateriel/ Flame/Incendiary Technology
  - Maintain tech watch level of effort of new antimateriel technologies
  - Continue to solicit requirement document from user
  - Complete front end analysis and Master Plan for target defeating munitions to define the U.S. Army's operational requirements for flame and incendiary materials
  - Further develop the shaped charge follow through munitions concept
  - Continue to identify and pursue potential technical areas for an international cooperative effort
  - Continue development of assessment techniques to quantify the effects and effectiveness of flame and incendiary materials
  - Continue to identify and assess potential flame and incendiary technologies and materials

(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 NBC survivability.

(U) FY 1991 Accomplishments:

- (U) Reconnaissance, Detection and Identification
  - Initiated toxin/pathogen test kit program for detection of biological threat materials
  - Completed live agent testing of BC Detector
  - Conducted technology survey and initiated contract to deliver light weight chemical detector
  - Fielded test kits and sampling equipment for biodetection in support of Operation Desert Storm (ODS)
  - Constructed a mass spectra database for algorithm/pattern recognition efforts for the CB Mass Spectrometer
  - Conducted US Marine Corps (USMC) technology demonstrator of lightweight standoff chemical agent detector (LSCAD) on a unmanned aerial vehicle (UAV)
  - Transitioned LSCAD to U.S. Marine Corps (USMC) non-system advanced development
  - Initiated Army technology demonstration for LSCAD
  - Evaluated US and French laser systems in joint aerosol field tests for standoff chemical detection
  - Demonstrated small compact frequency agile laser for standoff chemical detection
  - Initiated two standoff biological detection programs in support of ODS
  - Developed program plans for an enhanced biological agent detection program
- (U) Individual Protection
  - Successfully transitioned Aircrew Protective Mask to the Demonstration/Validation phase
  - Completed feasibility studies of advanced technologies in materials, seal design, lenses, filtration and communications for RESPO 21
  - Initiated fabrication of both multi-layer and lightweight RESPO 21 design concepts and

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

submitted patents
- Established a fully operational computer aided design prototyping lab
- Fielded Protective Mask Fit Validation System for ODS to size hard-to-fit soldiers
- Conducted special surveillance study of masks in ODS
- Provided info on protective capability of U.S. equipment against various combustion products of raw crude oil

- (U) Collective Protection
  - Evaluated Reactive Bed Plasma, Catalytic Oxidation and/or membranes for fixed sites
  - Conducted component optimization studies in reactive bed plasma
  - Completed process development studies on new reactive adsorbants
  - Selected final, new reactive adsorbant formulation and design the production process
  - Completed development of and implement chromium free carbon
  - Determined materials of construction for advanced canister
- (U) Decontamination
  - Completed selection of replacement organic solvent for deliberate decontamination
  - Transitioned Decontamination Agent, Multipurpose (DAM) for deliberate decontamination to the Demonstration/Validation phase
  - Completed agent decontamination effectiveness studies on selected formulations for self-stripping decontamination (hasty decontaminations)
  - Initiated hardware integration study and hardware prototype design for CD-260 formulation application for hasty decontamination
  - Developed three new coating formulation concepts for self stripping decontamination
  - Transitioned self-stripping coating to 6.3A and initiated technology demonstration
  - Discovered new substitution medium for mustard decontamination
  - Initiated study of reactive polymers for individual equipment decontamination
- (U) CB Antiterrorism
  - Continued development of special purpose defensive materiel in detection, individual and collective protection necessary to combat the CB terrorist threat
- (U) CB Defense Technology
  - Updated Tripartite threat agent assessment
  - Synthesized potential threat agents
  - Analyzed foreign suspect samples
  - Conducted toxicological evaluations
  - Completed expansion of Non-Uniform Simple Surface Evaporation 4 (NUSSE 4)
  - Conducted International Simulants Workshop
  - Conducted Nuclear, Biological and Chemical (NBC) survivability assessments
  - Evaluated properties/behavior of various encapsulated materials
  - Determined persistency of agents on Saudi sands and soils
  - Analyzed Saudi Arabia soil samples for composition and background signatures
  - Evaluated a unique threat agent disseminator
  - Evaluated performance of Individual Protection Equipment against dusty agents
  - Determined ability of chemical agent detectors to detect dusty agents
  - Standardized test method and procedures for electronic/transparency agent/simulant survivability measurements

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

- Measured physical properties of chemical agents at high temperatures
- Conducted analysis of munition system footprints
- Performed biological threat assessment for selected delivery systems

(U) FY 1992 Planned Program:

- (U) Reconnaissance, Detection, Identification
  - Continue toxin/pathogen test kit program for detection of biological threat materials
  - Initiate work on CB Detector pre-planning product improvement (P3I) for generic detection and improved biosensors
  - Continue effort for light weight chemical agent detector
  - Participate in ATTD of USMC Biological Analysis Module
  - Continue passive IR technology approaches for light weight standoff chemical agent detection
  - Evaluate performance of frequency agile laser and integrate into field evaluation breadboard
  - Upgrade laser induced flourescence for standoff bio detection and conduct field test
  - Evaluate a near IR biological cloud mapping system in laboratory
- (U) Individual Protection
  - Continue technology monitoring of RESPO 21
  - Continue computer aided design/computer aided manufacturing (CAD/CAM) design studies for RESPO 21 and light weight mask
  - Continue component design/fabrication efforts for RESPO 21 and light weight mask
  - Continue Light Weight Protective mask program using flexible filters and advanced materials
- (U) Collective Protection
  - Produce new reactive adsorbants production lot
  - Build/Test/Evaluate initial filters using new reactive adsorbants
  - Initiate Engineered Sorbent program
- (U) Decontamination
  - Begin market survey for interior decontamination method
  - Monitor progress on chlorofluorocarbon replacement for Non Aqueous Equipment Decontamination
  - Rank sorbent candidates and select candidates for further tests
  - Optimize selected sorbent candidates for individual equipment decon
  - Initiate computational chemistry study of agent docking
  - Continue catalytic application to deliberate, hasty, and individual equipment decon
- (U) CB Antiterrorism
  - Continue development of special purpose defensive material in detection, individual and collective protection necessary to combat the CB terrorist thrust
- (U) CB Defense Technology
  - Continue to identify threat agents from a variety of sources
  - Continue to synthesize threat agents
  - Continue to analyze foreign samples
  - Continue primary toxicological screen of threat agents

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

- Complete ODS lessons learned of CB Defensive Material
- Update biological-cloud travel model challenge assessment
- Initiate biological-simulant development/analysis
- Continue environmentally safe simulants search
- Conduct NBC Survivability assessments
- Initiate program to identify properties and threat of solid aerosols
- Initiate front end analysis (FEA) of Reconnaissance, Detection and Identification (RDI) Master Plans
- Initiate Biological Defense Program FEA
- Update ventilation kinetics technology

(U) FY 1993 Planned Program:

- (U) Reconnaissance, Detection and Warning
  - Continue toxin/pathogen test kit program for detection of biological threat materials
  - Continue CB Detector P3I program for generic detection and improved biosensors
  - Continue effort for light weight chemical agent detector
  - Initiate project to improve lasers for Ultraviolet/Laser induced fluorescence for bio standoff detection
  - Evaluate near IR biological cloud mapping system in field tests. Initiate upgrade
  - Continue Passive IR technology approaches
- (U) Individual Protection
  - Continue technology monitoring of Respo 21
  - Continue CAD/CAM design studies for RESPO 21 and light weight mask
  - Continue component design/fabrication efforts for RESPO 21 and light weight mask
- (U) Collective Protection
  - Continue evaluation of catalytic oxidation system for fixed sites
  - Initiate Engineered Sorbent program
- (U) Collective Protection/Detection/Smoke/APECS (ASM)
  - Complete and deliver APECS/PSA unit for CATTB2 demo and for APECS math model validation testing
  - Continue full scale simulant and agent testing on two PSA math model validation systems
  - Continue to refine PSA predictive math model
  - Continue PSA and CatOx data gathering
  - Continue to refine CatOx lab scale simulant based performance predictive model
  - Initiate standoff detection concepts
  - Continue investigation on IR and MMW smoke materials and dissemination techniques
  - Continue to conduct field tests and breeze tunnel tests on new materials and dissemination equipment for conceptual IR and MMW materials
  - Support CATTB2 demoonstration
- (U) Decontamination
  - Select concept for sensitive electronics/avionics decontamination
  - Study addition of reactivity to self stripping coating
  - Transition Sorbent decontamination for individual soldier equipment to NBC Soldier

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

Survivability Advanced Technology Demonstration (ATD)
- Continue catalytic application to deliberate, hasty and individual soldier equipment decon

- (U) CB Antiterrorism
  - Continue development of special purpose defensive material in detection, individual and collective protection necessary to combat the CB terrorist thrust
- (U) CB Defense Technology
  - Update Tripartite Threat Agent Assessments
  - Continue to synthesize mid-spectrum threat agents
  - Continue to analyze foreign samples
  - Continue toxicological screening of threat agents
  - Complete modernized battlefield biological cloud travel model
  - Conduct environmental impact/fate studies of CB simulants
  - Complete FEA of RDI Master Plan
  - Complete Biological Defense P FEA
  - Continue to conduct NBC Surv y assessments
  - Complete program to identify properties and threat of solid aerosols
  - Complete persistency of age database matrix
  - Complete Individual Protection Equipment aerosol modeling validation

(U) Project A554 - Chemical Munitions: This project supports exploratory development efforts in chemical agents, chemical agent effects, and chemical munitions to deter the threat of chemical warfare. It addresses the urgent need to replace the current stockpile with munitions which will be compatible with current and developmental weapon systems, provide a rear echelon attack capability, minimize the transportation logistic burden, and facilitate demilitarization and avoid technological surprise. Project is terminated with the completion of the Advanced Riot Control Agent Device in FY92.

(U) FY 1991 Accomplishments:

- (U) Advanced Riot Control Agent Device (ARCAD)
  - Held successful Joint Working Group meetings to define system with users
  - Actively pursued finalization/approval of Operational and Organizational (O&O) Plan and Operational Requirements Document (ORD)
  - Completed Trade-off Determination/Analysis and Best Technical Approach
  - Initiated detailed dissemination studies/testing and hardware prototype concepts/design
  - Continued modeling to support dissemination studies
  - Continued improved systhesis studies and scale up evaluations
  - Continued toxicological evaluations/studies

(U) FY 1992 Planned Program:

- (U) Advanced Riot Control Agent Device (ARCAD)
  - Complete efforts and transition to the Demonstration/Validation phase

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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

(U) FY 1993 Planned Program: Terminates in accordance with OSD direction regarding chemical weapons.

(U) Work Performed By: Smoke and Obscurant Munitions and Chemical Munitions: In-house work is performed by the US Army Chemical Research, Development and Engineering Center (CRDEC), Aberdeen Proving Ground, MD. Some other government agencies performing work for CRDEC are: US Army Ballistics 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; Atmospheric Sciences Laboratory, NM. The top contractors are 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 performed by the U. S. Army Chemical 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 Ballistics 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 The top contractors are Battelle Columbus Laboratories, Columbus, OH; Geocenter, MA; Teledyne, CA; Science and Technology Corp, VA; Environmental Technologies Group, MD; TSI, Minn; Wirtz Manufacturing Co, Mich.

(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 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.

(U) International Cooperative Agreements:

- Memorandum of Understanding (MOU) with France - Joint research and development of a Laser Stand-Off Chemical Detector
- Trinational MOU with United Kingdom/Canada/U.S. on cooperative development of Biological-Chemical Detector

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0602623A**
PE Title: **Joint Service Small Arms Program** Budget Activity: **#1**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
AH21 Joint Service Small Arms Program (JSSAP)	4213	4531	4786	Cont	Cont
PE TOTAL	4213	4531	4786		

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 weapons to meet future battlefield requirements for all Services. The JSSAP effort is configured to overcome the technological barriers associated with small arms and munitions for individual and crew served weapons, target acquisition under all environmental conditions, and materials to achieve substantial improvements in threat defeat (including personnel with body armor and next generation lightly armored vehicles) with a goal of lightening 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 (SAMP), the US 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. This effort maximizes return on investment as all Services are participants in this program. The main efforts include the following: (1) Helicopter door-gun beam sight-primary application: night use by Special Operations Forces for anti-personnel, anti-materiel, anti-armor to increase first burst hit probability from 0.15 to 0.9; (2) Crew Served Weapons to replace the M60 machine gun, the M2 machine gun, and the MK19 grenade launcher with a man-portable system having comparable capability and weight reductions approaching 60-75%; (3) Hyper velocity kinetic energy projectile - greater than 100% increase in light armor penetration; and (4) Bursting Munition - 40% increase in hit probability for first shot to a range of 500 meters; (5) Nonconventional Target Effects - Provide optional, variable level, lethal/non-lethal, point and area fire through nonconventional mechanisms. The work in this program element is consistent with the Army's resource constrained Army Technology Base Master Plan and Science and Technology Objectives (STO) therein.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project AH21 - Joint Service Small Arms Program:

(U) FY 1991 Accomplishments:

- (U) Conducted breadboard bursting munition component demonstrations of Ring Airfoil Grenade and Rocket-assisted Projectile in support of SAMP
- (U) Completed comprehensive, multi agency assessment of bursting munitions and defined future program direction
- (U) Transitioned hypervelocity kinetic energy efforts to USMC advanced development

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0602623A**
PE Title: **Joint Service Small Arms Program** Budget Activity: **#1**

- (U) Fabricated component hardware and began evaluation of critical componentry (lightweight gas powered, explosively-formed projectiles and diode laser ranging) for Advanced Crew Served Weapon breadboard
- (U) Transitioned helicopter door-gunner Advanced Beam Sighting System to non-system advanced development
- (U) Fabricated and began evaluation of laboratory devices for initial nonconventional target effect concepts and assessed performance potentials

(U) FY 1992 Planned Program:
- (U) Construct Bursting Munition breadboard hardware (fuze trade-offs, laser ranging, recoil mitigation and warhead design) and initiate demonstrations
- (U) Complete component technology demonstrations for Advanced Crew Served Weapon, assess overall crew-served technology area, and definitize future program direction
- (U) Complete demonstrations of lethal effect (anti-personnel, anti-materiel) nonconventional concepts
- (U) Begin fabrication of incremental effect (anti-personnel), nonconventional concepts
- (U) Begin preparation of a harmonized Joint Master Plan for Small Arms

(U) FY 1993 Planned Program:
- (U) Complete Bursting Munition breadboard component demonstrations and assessment of system potential and prepare for transition to non-system advanced development
- (U) Broaden component design activities (propulsion, warhead, fuzing and materials), fabricate components, and begin breadboard demonstrations
- (U) Complete fabrication and demonstration of incremental effect nonconventional concepts
- (U) Conduct overall technology assessment of lethal and incremental nonconventional area and focus program for initiation of breadboard system thrust
- (U) Complete preparation of a harmonized Joint Master Plan for Small Arms

(U) Work Performed By: This exploratory development program is under the direction of the Joint Service Small Arms Program Management Committee. The prime in-house organization responsible for the program is the US Army Armament Research, Development and Engineering Center, Picatinny Arsenal, NJ with other efforts at: The Naval Weapons Support Center, Crane, IN, and the Air Force Armament Laboratory, Eglin Air Force Base, FL. Primary contractors for JSSAP exploratory development activities are: University of Texas, Austin, TX; Battelle Columbus Labs, Columbus, OH; Baird, Bedford, MA; CAMDEC, Santa Ana, CA.

(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, PE #0602624A, PE #0603607A, PE #0603802A, PE #0604802A and PE #0604601A 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.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0602623A**
PE Title: **Joint Service Small Arms Program** Budget Activity: **#1**

(U) International Cooperative Agreements: Not Applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0602624A**
PE Title: **Weapons and Munitions Technology** Budget Activity: **#1**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
AH18	Artillery & Combat Support Technology				
	29782	22447	17670	Cont	Cont
AH19	Close Combat Weaponry				
	8267	8565	8807	Cont	Cont
AH28	Munitions Technology				
	9352	8451	10793	Cont	Cont
PE TOTAL	47401	39463	37270		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program develops technologies for the future artillery weapons and munitions and armaments for air and ground combat vehicles. 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 Insensitive Munitions technology for increased survivability of combat vehicles and safety in explosive manufacturing and storage facilities. It supports advances in warhead technology to defeat future threats; develops technology for high energy density explosives for increased battlefield lethality and for application to gun propellants for increased velocity; demonstrates advanced armament fire control systems; and supports technology advances in mine warfare and demolitions. The program explores weapon stabilization and control techniques for aircraft armament to increase effectiveness at extended ranges. It also develops technology for thermal management of high performance, high rate of fire, large caliber guns, and advanced air-to-air gun and ammunition demilitarization technology. The work in this program element is consistent with the resource constrained Army Technology Base Master Plan, Science and Technology Objectives (STOs) therein, and Science and Technology Thrusts for Precision Strike, Advanced Land Combat Vehicle, and Air Superiority/Defense.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project AH18 - Artillery and Combat Support Technology. 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, are being developed to lighten towed howitzers and other systems resulting in improved strategic and tactical mobility for contingency and light forces. The joint Army/Defense Advanced Research Projects Agency (DARPA) mine program will utilize Identification Friend or Foe (IFF) and warhead technologies to develop an Anti-Helicopter

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0602624A
PE Title: **Weapons and Munitions Technology** Budget Activity: #1

Mine to enhance air defense capabilities. Laser protection techniques are being pursued to counter the agile laser threat. The program is also developing broadbased technology in the areas of advanced electrical propulsion to achieve hypervelocity launch with improved hit and kill probability against future threats at extended ranges. This project was restructured to create PE #0601104A beginning in FY 1992.

(U) FY 1991 Accomplishments:
- (U) Completed installation of Phase I power supply for the Army's high energy Electric Armament Research Center
- (U) Completed detailed design definition and functional specifications for AFAS chief-of-section and platoon leader decision support system
- (U) Provided Unicharge data to support AFAS propulsion decision
- (U) Completed design of Extended Range Artillery (ERA) projectile
- (U) Completed Anti-Helicopter Mine brassboard testing at Sandia National Laboratory
- (U) Demonstrated guidance concepts for the joint Army/DARPA Enhanced Kinetic Energy Weapon (X-Rod)
- (U) Demonstrated Laser Radar (LADAR) technology potential

(U) FY 1992 Planned Program:
- (U) Conduct ballistic tests of Extended Range Artillery (ERA) projectile
- (U) Complete X-Rod Guide-to-Hit demonstration preparation
- (U) Conduct testing of Royal Ordinance (United Kingdom) lightweight 155mm towed howitzer
- (U) Continue component research tests of electromagnetic (EM) projectile in 9 MJ EM Laboratory Gun
- (U) Evaluate component technologies developed by Army and Department of Energy (DOE) laboratories to enhance explosively formed penetrators (EFP) warhead performance

(U) FY 1993 Planned Program:
- (U) Demonstrate ERA projectile prototype
- (U) Demonstrate vehicle-integrated multi-processor for AFAS chief-of-section decision support system
- (U) Conduct advanced railgun barrel testing at Electric Armament Research Center
- (U) Perform X-Rod Guide-to-Hit demonstration
- (U) Conduct captive flight tests of LADAR sensor system
- (U) Design/test/evaluate sub-scale, light weight component technologies for application to multi-purpose EFP warheads

(U) Project AH19 - Armament Technology for Close Combat Weaponry: The objective is to conceptualize and demonstrate improvements in cannons for ground and airborne combat vehicles. The scope of the program encompasses the system-oriented areas of combat vehicles, aircraft and air defense armaments, as well as developing 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. Specific investigations develop both hardware and analytic tools

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0602624A
PE Title: **Weapons and Munitions Technology** Budget Activity: #1

necessary to assess system performance, identify problem areas and address resolution of these problems.

(U) FY 1991 Accomplishments:
- (U) Demonstrated gun control via tested Precision Aircraft Armament Control Experiment (PAACE) sub-systems sufficient to engage airborne threats
- (U) Completed demonstration of the Combat Vehicle Armament Technology (COMVAT) and made system available for transition
- (U) Evaluated technologies to provide attack helicopters with a Simultaneous Engagement Armament System (SEAS) permitting concurrent use of both gun and missile systems
- (U) Evaluated various gun, projectile, propulsion and control technologies for a High Performance Armament System (HIPAS) for future attack helicopters
- (U) Evaluated optical technologies to provide a light weight man-portable munitions for low intensity conflict

(U) FY 1992 Planned Program:
- (U) Complete tests of low collateral damage munitions and complete design of a laser warhead munition
- (U) Complete design of thermal management system for howitzers
- (U) Initiate gun, ammunition, storage, feed and turret and fire control sub-system designs for HIPAS
- (U) Complete design studies for howitzer munition loader
- (U) Determine short and long term role of gun systems in theater air defense

(U) FY 1993 Planned Program:
- (U) Fabricate gun, ammunition, feed, storage, turret and fire control sub-systems for HIPAS
- (U) Fabricate fire control systems for SEAS
- (U) Evaluate advanced laser warhead and transition to advanced development
- (U) Fabricate, test and transition howitzer thermal management sub-system
- (U) Complete evaluation and transition howitzer munition loader

(U) Project AH28 - Munitions Technology: 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 being developed will provide higher energy and density to increase anti-armor lethality. Countermeasures being developed will protect low flying and relatively slow Army aircraft

(U) FY 1991 Accomplishments:
- (U) Identified treatments for Nuclear, Biological, Chemical (NBC) decontaminable wood as directed by Congress
- (U) Formulated IM candidates for LX-14 explosive replacement in warheads
- (U) Proved out pilot plant for trinitroazeditine (TNAZ) explosive production

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0602624A**
PE Title: **Weapons and Munitions Technology** Budget Activity: **#1**

- (U) Tested advanced non-axisymmetric EFP warhead
- (U) Fabricated 96% tungsten rods for full-scale 25mm tests

(U) FY 1992 Planned Program:
- (U) Continue Congressional directed research on wood packaging
- (U) Continue development of LX-14 explosive replacement
- (U) Develop procedure to produce high quality, large scale casts of TNAZ
- (U) Evaluate non-axisymmetric materials with new liner materials/processing
- (U) Design thermo-mechanical processing scheme to achieve a preferred orientation in tungsten alloys

(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) Transition non-axisymmetric warhead to advanced development
- (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) **Work Performed By:** In-house efforts accomplished by U.S. Army Armaments Research Development and Engineering Center, Picatinny Arsenal, NJ. Major contractors are: Alliant Tech Systems, Minneapolis, MN; Geo-Centers, Wharton, NJ; Drexel University, Philadelphia, PA; Textron, Lowell, MA; 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 #0601102A, PE #0601104A, PE #0602618A, PE 0602623A, PE #0603004A, PE #0603606A, PE #0603607A, and PE #0603005A 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 1993 ABBREVIATED BUDGET REVIEW

Program Element: **#0602705A**
PE Title: **Electronics & Electronic Devices** Budget Activity: **#1**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
AH94	Electronic and Electronic Devices				
	20340	19995*	18011	Cont	Cont
PE TOTAL	20340	19995	18011		

* Supplemental appropriation funds for Operation Desert Storm (ODS) in the amount of $1K are included.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program supports advanced electronic device and power source device technology, pervasive to both present and projected Army systems, enabling considerable lower operations and support cost, 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, and automatic target recognition (ATR). 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 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-for (IFF) and global positioning systems. The work in this program element is consistent with the resource constrained Army Technology Base Master Plan, and the Science and Technology Objectives (STOs) therein. It supports all of the Science and Technology Thrust areas that employ electronic technology.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project AH94 - Electronic and Electronic Devices.

(U) **FY 1991 Accomplishments:**

- (U) Demonstrated optical control of phase, amplitude, and frequency for microwave integrated circuit phased Arrays
- (U) Successfully demonstrated 200 Kilojoule per kilogram dipolar lithium salt battery for 100 cycles
- (U) Prototyped 1 KW traveling wave tube (TWT) to permit Apache escort jammer to protect multiple aircraft
- (U) Developed dual function planarized millimeter wave missile antenna for guidance ATR

FY 1993 ABBREVIATED BUDGET REVIEW

Program Element: #0602705A
PE Title: **Electronics & Electronic Devices** Budget Activity: #1

- (U) Developed programmable frequency exciser to excise strong interfering signals coming from smart jammers
- (U) Developed smart battery electronics to automatically protect against internal abnormalities
- (U) Developed universal battery for training and combat incorporating rechargeable lithium cells and associated community effort directed to the elimination of 90% of high energy battery procurements. Applications include Single Channel Ground/Airborne Radio Systems (SINCGARS), Battlefield Computer System (BCS), and Position Location and Reporting System (PLRS), Short range thermal sights, and thermal weapons sights
- (U) Applied full color electroluminescent display technology to high resolution displays in sizes suitable for map databases and targeting applications
- (U) Successfully modeled new voltage device and amplifier designs for advanced phased array radar
- (U) Develop advanced millimeter wave sensor circuit for triggering reactive armor

(U) **FY 1992 Planned Program:**

- (U) Demonstrate Megawatt photoconductive microwave transmitter arrays
- (U) Demonstrate 50,000 amp metal oxide semiconductor (MOS) controlled thyristor (MCT) solid state switching array and characterize performance of switches for high frequency drives
- (U) Establish experimental limits of 1.5 J/G and .77 J/G high energy density capacitor
- (U) Complete Ku-Band travelling wave tube (TWT) and deliver to Harry Diamond Laboratory (HDL)
- (U) Develop high coulomb gaseous switch for near term requirements
- (U) Field test preproduction prototype low cost magnesium training battery
- (U) Continue development of heterojunction bipolar transistor power amplifier with high gain and efficiency suitable for active array radar, beacon, and jammer applications
- (U) Demonstrate/technology transfer stable dielectric resonator oscillator/amplifier for special operation forces beacon transmitter with 2X weight reduction
- (U) Develop low maintenance, intelligent time-transfer system for single channel objective tactical terminal (SCOTT) to provide system autonomy
- (U) Produce 10X improvement in acceleration-insensitive resonators (to 0.05 ppB/g) via finite element modeling for Joint Surveillance and Target Attack Radar System (JSTARS)
- (U) Demonstrate prototype elint receiver capable of feature detection and identification of continuous wave (CW), binary phase shift keying (BPSK), radio frequency (RF) Pulse, and Chirp Low probability of Intercept (LPI) Signals
- (U) Demonstrate SAW pulse compression subsystem incorporating digital correction to improve elint receiver multiple frequency dynamic range by 100X
- (U) Prototype 94 GHz frequency modulation (FM)/CW missile sensor for advanced kinetic energy missile (ADKEM)/reactive armor and common aperture 94 GHz sensor for dual mode seeker
- (U) Develop 94 GHz multiplier for multiple target acquisition system (MTAS) transmitter driver and 60/94 GHz noise module to USMC for exdrone jammer
- (U) Deliver ten fully integrated, solid state, KA-Band transmit modules for electronically steered Apache escort jammer
- (U) Improve phosphors for shelter-legible thin film electroluminescent (TFEL) and plasma displays
- (U) Demonstrate full color, 640 by 480 pixel TFEL Display

FY 1993 ABBREVIATED BUDGET REVIEW

Program Element: **#0602705A**
PE Title: **Electronics & Electronic Devices** Budget Activity: **#1**

- (U) Demonstrate neural coprocessors on-a-board with cray-level performance for identifying electronic warfare (EW) emitters/missiles in noise rich environments
- (U) Fabricate and test prototype direct digital synthesizer for all digital radio
- (U) Complete Very High Speed Integrated Circuits (VHSIC) hardware description language (VHDL) modeling handbook, demonstrate VHDL model library for obsolete parts, and design PC-workstation for VHDL modeling for DOD system vendors
- (U) Develop automated microcircuit design synthesis tool for operation and support (O&S) cost reduction
- (U) Establish DOD-wide/industry smart buyer's guide for affordable electronics
- (U) Develop 10X improved lifetime optical switch
- (U) Develop planarized TFEL tank/cockpit display

(U) **FY 1993 Planned Program:**
- (U) Fabricate and evaluate full color, high resolution flat panel displays
- (U) Deliver prototype direct digital synthesizer for Army and Air Force all-digital radio
- (U) Demonstrate heterojunction bipolar transistor power amplifier 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 VHDL-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) **Work Performed By:** The Electronics Technology and Devices Laboratory (ETDL), Fort Monmouth, NJ. Principal contractors are 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. Work in this Program Element is related to and fully coordinated with efforts in PE #0602705A 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.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0602709A**
PE Title: **Night Vision Technology** Budget Activity: **#1**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
DH95 Night Vision and Electro-Optic Technology					
	21498	30616*	35706	Cont	Cont
PE TOTAL	21498	30616	35706		

* Supplemental appropriation funds for Operation Desert Storm (ODS) in the amount of $611K are included.

B. (U) BRIEF DESCRIPTION OF ELEMENT: The key objectives of this program are to provide electro-optical 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 a new generation of high performance infrared focal plane arrays 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. Additionally, development of uncooled focal plane arrays with inherently low cost and minimal logistical burdens is emphasized for smart munitions, driving aids and infantry applications. In signal processing exploitation of automatic target acquisition capabilities afforded by integrating second generation FLIR technology with advanced imaging 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 tunable laser and laser radar sources required to meet the Army's directed energy, and combat identification applications. Additionally, emphasis is placed upon the development of filter and power limiter technology and devices for the protection of existing and developmental electro-optic systems. 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, night vision and electro-optic target acquisition systems. Flexible manufacturing technologies are also being investigated. The work in this program element is consistent with the Army's resource constrained Technology Base Master Plan, and the Science and Technology Objectives (STOs) therein. This program supports the Precision Strike, Advanced Land Combat Vehicle, Air Superiority/Defense and Improved Acquisition Science and Technology Thrust areas.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project DH95 - Night Vision and Electro-Optic Technology.

(U) **FY 1991 Accomplishments:**

- (U) In-House microfactory operational for the growth and producibility processes of Mercury Cadmium Telluride via Molecular Beam Epitaxial methods

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0602709A**
PE Title: **Night Vision Technology** Budget Activity: **#1**

- (U) Demonstrated multi-sensor feature fusion at field evaluation of industry algorithm\processor suites
- (U) Demonstrated In-House one (1) joule, diode pumped laser source
- (U) Implemented program to develop one (1) kilowatt flashlamp pumped laser source
- (U) Conducted laboratory measurements of the Comanche Demonstration/Validation Forward Looking Infrared System (FLIRS) and Aided Target Recognition (ATR)
- (U) Designed, fabricated and deployed experimental helicopter dune avoidance kits for Operation Desert Storm (ODS)

(U) **FY 1992 Planned Program:**

- (U) Initiate program to establish multi-sensor fusion algorithms on the focal plane array for target acquisition applications
- (U) Continue development of the one kilowatt flashlamp pumped laser source
- (U) Initiate design of smart multi-color focal plane arrays
- (U) Initiate development of ATR model
- (U) Initiate development of advanced image intensification components (microchannel plates, fiber optics etc.) for high resolution, wide field of view Advanced Pilots Aid (APA)

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

- (U) Implement program to establish a family of modular high performance, Standard Electronics Module-Version E (SEM-E) components that are suitable for deployment on next generation/future systems
- (U) Initiate the binary optics microstructure work for smart sensors
- (U) Continue development of advanced image intensification componments in prepartion for transition to the APA in FY 1994
- (U) Continue development of multi-sensor algorithms for on focal plane array processing
- (U) Continue development of smart multi-color focal plane arrays
- (U) Continue development of the binary optics microstructures
- (U) Continue development of the ATR model

(U) **Work Performed By:** U.S. Army Communications-Electronics Command (CECOM) Night Vision and Electro-Optics Directorate, Fort Belvoir, VA. Major contractors are: Martin Marietta, Orlando, FL; Texas Instruments, Dallas, TX; Rockwell International, Anaheim, CA and Fibertek Inc., Herndon, VA.

(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 and contains no unwarranted duplication of effort among the Military Departments.

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

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0602709A**
PE Title: **Night Vision Technology** Budget Activity: **#1**

(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.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0602716A**
PE Title: **Human Factors Engineering Technology** Budget Activity: **#1**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
AH70	Human Factors Engineering Systems Development				
	11887	5852*	10568	Cont	Cont
PE TOTAL	11887	5852*	10568		

* Supplemental Appropriation funds for Operation Desert Storm (ODS) in the amount of $ 480K are included.

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. The work in this program is consistent with the resource constrained Army Technology Base Master Plan and the Science and Technology Objectives (STOs) therein.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project AH70 - Human Factors Engineering Systems Development:

(U) FY 1991 Accomplishments:
- (U) Conducted field evaluations of new command and control (C2) displays and automated tactical operation center concepts to improve the soldier-command-control-communication (C3) interface in a combined arms forward area air defense battlefield situations
- (U) Continued technology developments of expert systems to determine the feasibility of the knowledge-based logistics planning for tactical ammunition management
- (U) Completed an evaluation of field artillery battlefield decision making
- (U) Completed Human Factors Engineering Assessments for 55 systems under development

(U) FY 1992 Planned Program:
- (U) Transition to the user and materiel developer human factors engineering design guidelines for air defense command and control and weapon system components
- (U) Determine the performance requirements of a four man main battle tank and, with the aid of new automation technologies, redistribute those performance tasks to a two-man crew

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0602716A**
PE Title: **Human Factors Engineering Technology** Budget Activity: **#1**

(U) FY 1993 Planned Program:

- **(U)** Demonstrate a global positioning system (GPS) fuze concept for artillery registration rounds to improve the effectiveness of artillery fire support
- **(U)** Develop an operational prototype of a knowledge based decision support system for Corps level baseline and contingency supply distribution and inventory planning
- **(U)** Conduct human factors experimentation in aided target recognition (ATR) and develop a comprehensive human factors data base to ensure the soldier-ATR interface is effectively designed

(U) Work Performed By: In-house work is performed by the US Army Human Engineering Laboratory (HEL) Aberdeen Proving Ground, MD Primary support contractors are: 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.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0602720A**
PE Title: **Environmental Quality Technology** Budget Activity: **#1**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
A830	Biodegradable Packaging Technology				
	2962	450	0	0	3412
A835	Military Medical Environmental Criteria				
	3037	4547	4904	Cont	Cont
A896	Base Facility Environmental Quality				
	2978	5428	5156	Cont	Cont
AF25	Military Environmental Restoration Technology				
	2073	9910	4646	Cont	Cont
D048	Industrial Operations Pollution Control Technology				
	1674	4020	3741	Cont	Cont
PE TOTAL	12724	24355	18447		

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, propellants, smokes and chemical munitions. The current DOD estimate for the total Army cost of completing this cleanup program is $5 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 control, materials recycling and substitution, and technology to mitigate noise impacts and maneuver damage resulting from Army training activities. The work in this program element is consistent with the resource constrained Army Technology Base Master Plan and the Science and Technology Objectives (STOs) therein.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project A830 - Biodegradable Packaging Technology: This project is a joint DoD, Dept. 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

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0602720A
PE Title: **Environmental Quality Technology** Budget Activity: #1

field, meet environmental requirements, meet international treaty obligations, provide useful-materials from renewable starch-based resources instead of oil, and lighten-the-load for the individual soldier.

(U) FY 1991 Accomplishments:
- (U) Identified key processing technology for fabrication of films and blends from starch-based materials in collaboration with industry
- (U) Successfully produced blown film and injection molded utensils from starch blends for eventual use by Navy to eliminate plastic disposal at sea
- (U) Fabricated and evaluated films and shaped objects from starch-based materials in terms of environmental degradation in simulated marine systems, marine toxicity, storage stability, and processability as packaging materials
- (U) Studied specific chemical modifications of starch to enhance water processing stability and functional properties of resulting packaging films

(U) FY 1992 Planned Program:
- (U) Initiate studies required under the National Environmental Policy Act and other environmental laws and regulations to assess the environmental and operational feasibility and impact of landing unmanned space capsules at White Sands Missile Range

(U) FY 1993 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 in 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 level 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 1991 Accomplishments:
- (U) Completed development of improved risk/endangerment assessment methods for hazardous materials
- (U) Completed study to determine the up-take and metabolism of trinitrotoluene (TNT) by small feral animals
- (U) Completed development of an air deposition model for off-post migration of military smokes
- (U) Completed development of an alternative aquatic based human carcinogenicity model
- (U) Completed verification of an in-vitro ocular irritation test method
- (U) Completed determination of the efficacy of treating munitions contaminated soils by composting
- (U) Completed subchronic (90 day) mammalian toxicity studies on nitrobenzenes and tetryl

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0602720A**
PE Title: **Environmental Quality Technology** Budget Activity: **#1**

(U) FY 1992 Planned Program:
- (U) Complete acute toxicity screening methodologies for hazardous waste sites
- (U) Complete aquatic microcosm toxicity screening tests
- (U) Develop program to estimate toxicological hazard from chemical structures
- (U) Complete health advisories for nitrobenzene and tetryl
- (U) Initiate toxicity assessment of bioremediation byproducts
- (U) Initiate hazard assessment of TNT production wastewater
- (U) Evaluate toxicity of munitions ash byproducts

(U) FY 1993 Planned Program:
- (U) Complete development of immunotoxicological test systems
- (U) Complete studies to determine the effects of inventory smokes on small feral animals
- (U) Provide final environmental criteria and health advisories for inventory screening smokes, munitions and propellants
- (U) Complete toxicity assessment of bioremediation byproducts
- (U) Complete hazard assessment of TNT production wastewater
- (U) Complete toxicological assessment of structural decontamination

(U) Project A896 - Base Facility Environmental Quality: This project provides the technical capability to control and mitigate blast noise created by large caliber weapons firing and to provide technology to assess, mitigate and restore physical damage to training ranges created by overuse and intensive force-on-force training. In both the U.S. and Europe, the Army loosing operational capacity at airfields due to noise complaints and resulting lawsuits evolving from surrounding civilian communities. A similar problem is occurring at training ranges. Many installations in this country and Germany are losing the use of firing ranges or are unable to modify or improve existing ranges due to citizen complaints. Loss of training areas due to physical damage such as tree loss, soil erosion and large gullies result in a loss of training realism and creates safety problems including the potential for tanks overturning. This project also provides technology to help installations meet environmental discharge standards for air, water, and solid waste.

(U) FY 1991 Accomplishments:
- (U) Developed methods for extending the life of potable water infrastructure
- (U) Provided guidance on current state of solid waste disposal in Army and viable alternatives
- (U) Provided capability for biotechnological decontamination of oil-soaked soils
- (U) Developed federal or national standard for determining helicopter noise impacts
- (U) Developed design techniques for low frequency sound absorption barriers

(U) FY 1992 Planned Program:
- (U) Develop design criteria for sound-absorbing structures
- (U) Provide guidelines for cost effective pollution control facilities for Army aircraft maintenance
- (U) Develop guidelines for evaluating training land needs for maximizing training opportunities
- (U) Provide guidelines for facility compliance with Safe Drinking Water Act

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0602720A
PE Title: **Environmental Quality Technology** Budget Activity: #1

- (U) Evaluate application of Geographical Resources Analysis Support System (GRASS) for evaluating noise contours at training ranges

(U) FY 1993 Planned Program:
- (U) Develop criteria and procedures for training land design and remediation
- (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) Provide capabilities to remove volatile organic contaminants from air streams
- (U) Initiate waste conversion program for solid waste minimization

(U) Project AF25 - Military Environmental Restoration Technology: This project provides the technology to control off-post migration of hazardous and toxic waste and to safely restore or decontaminate soil, water and structures at less cost. The Army has over 3000 wastes sites at over 1300 installations which are involved in its restoration program. These sites were created prior to passage of environmental legislation that controlled the safe handling and disposal of hazardous and toxic materials and their waste products. The Army is under mandate through the Defense Environmental Restoration Program (which is the DOD equivalent of the Superfund Program) to cleanup all of these waste sites. The current DOD estimate for cleaning up all of the Army sites is $5 to $10 Billion. Current funding levels for the cleanup program are not sufficient without the introduction of the less costly technology that this project provides.

(U) FY 1991 Accomplishments:
- (U) Completed development of testing kits for on-site field analysis of TNT and nitramine-based explosives (RDX) (Cyclonite) contaminated soils
- (U) Completed field tests of laser-excited fluorescence with the fiber-optic cone penetrometer for detection and mapping of fuel contamination in soils
- (U) Completed initial evaluation of heavy metals treatment technologies
- (U) Completed initial assessment of in situ biotreatment implementation scenarios as an alternative to incineration

(U) FY 1992 Planned Program:
- (U) Complete development support required to implement biodegradation as an alternative to incineration for restoration of explosive contaminated soil
- (U) Initiate development of groundwater models to be required to assess effectiveness of cleanup operations
- (U) Develop concepts for design of fiber optic infrared (IR) instruments for the detection of organic contaminants in soil with the cone penetrometer
- (U) Develop specification and technical design documentation of completed cone penetrometer equipment and instruments built for hazardous waste site characterization
- (U) Develop prototype hot gas soil samplers for the in situ purging and collection of volatile organic contaminants for soils

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0602720A**
PE Title: **Environmental Quality Technology** Budget Activity: **#1**

- (U) Complete data interpretation methods for determining the types and amounts of fuel contamination present in soil from complex spectral records
- (U) Complete evaluation of biomat technology for removal of metal from ground water
- (U) Conduct bench scale assessment of biological treatment of gas streams
- (U) Conduct bench scale assessment of photolytic/chemical oxidation of explosives in contaminated groundwater
- (U) Complete evaluation of available groundwater models

(U) FY 1993 Planned Program:

- (U) Investigate feasibility of physical fractionation of heavy metal contaminated soils
- (U) Develop enhanced capabilities to provide above ground treatment for explosives contaminated groundwater
- (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 cone penetrometer
- (U) Develop prototype hot gas purging sampler for collecting and extracting water samples for contaminant analysis
- (U) Develop geophysical interpretive models for application to geophysical data obtained with the cone penetrometer
- (U) Develop concepts for improved designs for penetrometer soil and groundwater sampling equipment
- (U) Develop concepts for automated cone penetrometer for investigating hazardous waste sites
- (U) Develop improved interpretation methods for determining the type and quantity of explosives wastes in soil spectral data collected with the cone penetrometer optical sensors

(U) Project D048 - Industrial Operations Pollution Control Technology: This project provides process control technology required to reduce operating costs resulting from use of hazardous wastes and provides the capability to meet the required environmental discharge standards for current and future waste streams. The Army generates approximately 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. New technology is essential to reduce the generation of hazardous waste in order to meet the goal, set by the Army, of a 50% reduction in hazardous waste generation by 1992 and to avoid future hazardous waste problems.

(U) FY 1991 Accomplishments:

- (U) Conducted laboratory/bench testing to develop low cost treatment technology for TNT production wastes
- (U) Piloted test technologies for improved tactical vehicle waste treatment for implementation in conjunction with Army Depot industrial waste treatment facility modernization projects

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0602720A**
PE Title: **Environmental Quality Technology** Budget Activity: **#1**

(U) FY 1992 Planned Program:

- (U) Initiate a large scale demonstration project to identify the most cost effective technology to solve systemic pollution prevention problems
- (U) Complete bench testing to select best processes to optimize conditions for treatment of TNT production wastes
- (U) Initiate identification and evaluation of non-cyanide replacement electroplating baths
- (U) Initiate pilot tests to evaluate the feasibility of metal recovery in electroplating process and rinse waters
- (U) Initiate testing and evaluation of non-hazardous parts cleaning and degreasing technologies
- (U) Initiate pilot-scale testing of the use of orthonitrotoluene as feedstock for the production of TNT
- (U) Complete exploratory development evaluation of alternative technologies for improved control of nitrogen oxide air emissions from munitions production facilities
- (U) Complete procurement/design criteria for use of waste explosives as heating fuel
- (U) Complete evaluation of alternative technologies to eliminate open burning/open detonation

(U) FY 1993 Planned Program:

- (U) Complete pilot testing of improved technology for treatment of nitrocellulose production wastes
- (U) Conduct laboratory/bench development studies of cost effective pink water treatment technologies
- (U) Complete pilot testing and generation of full scale process design for recovery of single/double base waste propellants
- (U) Provide explosives production waste recycle reuse technology

(U) Work Performed By:

A830: The 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; MIT, Cambridge, MA; University of Rhode Island, Kingston, RI; Clemson University, Clemson, SC; University of Detroit, Detroit, MI; Lowell University, Lowell, MA; Washington University, St. Louis, MO; and University of Connecticut, Storrs, CT.

A835: Contractors include the following Department of Energy Laboratories: Pacific Northwest Laboratories, Richland, WA; Oak Ridge Laboratories, Oak Ridge, TN; Argonne Laboratories, Argonne, IL. Other contractors include 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 in-house developing agency is the Biomedical Research and Development Laboratory, Ft. Detrick, MD.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0602720A**
PE Title: **Environmental Quality Technology** Budget Activity: **#1**

A896: The prime contractor is the University of Illinois, Champaign, IL. The in-house developing agency is the U.S. Army Construction Engineering Research Laboratory, Champaign, IL.

AF25: The prime contractor is Roy F. Weston Co., Westchester, PA. The in-house developing agency is the U.S. Army Waterways Experiment Station, Vicksburg, MS.

D048: The prime contractor is PEI, Inc., Cincinnati, OH. The in-house developing agency is the U.S. Army Construction Engineering Research Laboratory, Champaign, IL.

(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 (ASBREM). Work in this program element is related to and fully coordinated with efforts in PE #0601102A, PE #0602787A, and PE #0603002A in accordance with the ongoing Reliance joint planning process and contains no unwarranted duplication of effort among military departments. Duplication of effort is avoided through annual DOD-sponsored technical reviews of all environmental quality RDT&E programs and quarterly meetings of the DOD-sponsored Installation Restoration Technical Coordinating Committee.

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

(U) **International Cooperative Agreements:** Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0602727A**
PE Title: **Non-System Training Device Technology** Budget Activity: **#1**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
A230	Non-System Training Devices				
	6231	3500	8483	Cont	Cont
PE TOTAL	6231	3500	8483		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program provides exploratory development of state-of-the-art generic training methods and equipment to increase overall combat effectiveness while reducing Army training costs. This program also provides enabling technologies for advancing Distributed Interactive Simulation (DIS) networking capabilities and simulated representations of battlefield environments needed for training active and reserve component forces in an era of reduced Operating Tempo (OPTEMPO) and range availability. Arrival of sophisticated, high technology equipments and their complex relations to each other, coupled with increased constraints on personnel, money, and time in the field training environment, makes this effort critical to the overall success of the Army. As an example, support from this program previously resulted in a Multiple Integrated Laser Engagement Simulation System (MILES). The work in this program element is consistent with the resource constrained Army Technology Base Master Plan and the Science and Technology Objectives (STOs) therein and supports the DOD Science and Technology (S&T) Thrust Area Number 6 for Training and Readiness.

C. (U) JUSTIFICATION FOR PROJECT:

(U) Project A230 - Non-System Training Devices

(U) FY 1991 Accomplishments:

- (U) Completed National Training Center (NTC) concept exploratory studies to expand from battalion size to brigade size training capability
- (U) Demonstrated feasibility of improved multiple integrated laser engagement simulation (MILES) laser system to shoot through smokes and obscurants to allow training with operational thermal sights
- (U) Published initial protocol data unit standards of visual weapons systems for DIS and initiated standard development for next level of systems
- (U) Initiated investigation of applicability of existing and proposed Government Open System Interactive Profile (GOSIP) communications protocols to DIS requirements
- (U) Demonstrated Artificial Intelligence (AI) application for role player assist for computer battle simulations
- (U) Initiated exploration of architectures, standards and modeling to support the Battlefield Distributed Simulation-Developmental (BDS-D) program which will provide an accredited, warfighter in the loop, real time, distributed simulation of virtual combined arms battlefield
- (U) Demonstrated feasibility of semi-automated dismounted infantry for DIS

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0602727A**
PE Title: **Non-System Training Device Technology** Budget Activity: **#1**

- (U) Continued investigation of visual system dynamic data bases and display technologies
- (U) Investigated linkage of PATRIOT Operator Trainer with DI
- (U) Demonstrated capability of Digital Video Interactive (DVI) multimedia technology to support interactive thermal image combat vehicle identification training
- (U) Completed thermal target projector efforts with the publication of a final report detailing user and technical evaluations
- (U) Demonstrated embedded intelligent training system in air land battle management model

(U) FY 1992 Planned Program:

- (U) Expand capability and demonstrate artificial intelligence techniques to augment use of computer simulations supporting training at Combat Training Centers
- (U) Develop standards for wide area networking of dissimilar simulators
- (U) Demonstrate visual system dynamic data bases and display technologies
- (U) Continue development of communication and architecture standards for DIS
- (U) Examine methodologies for DIS standards conformance
- (U) Initiate studies to integrate Semi-Automated Forces (SAFOR) in DIS
- (U) Continue transition of BDS-D technology to guard/reserve and combat training devices, and materiel developers simulators
- (U) Demonstrate linkage of dissimilar simulation with the linkage of Patriot Operational Trainer and BDS-D simulators at Ft Rucker, AL
- (U) Demonstrate visual system dynamic data bases and display technologies
- (U) Demonstrate visual database conversion tools
- (U) Initiate implementation/evaluation of modular design principles for simulators

(U) FY 1993 Planned Program:

- (U) Enhance simulations of intelligent opposing and adjacent friendly forces to accurately reflect current battlefield doctrine
- (U) Develop practical, effective approaches for linking different simulation environments together to provide a seamless joining of live field exercises and simulated battles
- (U) Continue establishment and evaluation of DIS networking standards
- (U) Increase dynamic battlefield representation thru architecture definition for SAFOR
- (U) Initiate assessment of DIS to supplement operational field testing and evaluation
- (U) Demonstrate standard modular architecture for rotorcraft simulators
- (U) Develop application of DIS to support National Guard future training requirements
- (U) Develop multi-sensory realtime battlefield simulation technology which immerses soldiers in three dimensional space
- (U) Continue intelligent SAFOR technology at an accelerated rate of development in support of BDS-D
- (U) Support conformance testing of DIS standards utilizing North Carolina Consortium
- (U) Continue investigation of visual system architectures required for dynamic terrain data bases

(U) Work Performed By: Prime contractors: 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

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0602727A**
PE Title: **Non-System Training Device Technology** Budget Activity: **#1**

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. In-house: PM-TRADE, 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 S&T Evaluation Management Committee (TAPSTEM). Work in this Program Element is related to and fully coordinated with efforts in PE #0602308A 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

AMENDED FY 1992/1993 BIENNIAL RDTE 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 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
AH92 Communications Technology	16015	13168*	11495	Cont	Cont
AH93 Combat Surveillance and Target Acquisition Technology	8304	6121	10349	Cont	Cont
D780 Lightweight Tactical Area Comsat System	0	0	2457	Cont	
PE TOTAL	24319	19289	24301		

*Supplemental appropriation funds for Operation Desert Storm (ODS) in the amount of $638k are included.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program contains two related projects: exploratory development of advanced communications technology and technology base for vehicle/personnel detection radar. The work in this program element is consistent with the Army's resource constrained Technology Base Master Plan, and the Science and Technology Objectives (STOs) therein. 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 Defense Advanced Research Projects Agency (DARPA) 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.

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, 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. This project will meet the threats of Electronic Countermeasures (ECM), the need for survivability on the automated battlefield and the need to avoid unauthorized access. Efforts in this project transition to PE #0603805/246 in FY 1993.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0602782A**
PE Title: **Command, Control and Communications (C3) Technology** Budget Activity: **#1**

(U) FY 1991 Accomplishments:
- (U) Developed requirements for joint Army/Air Force proposal to develop Digital Radio
- (U) Completed non-deliverable Frequency Hopping Multiplexer (FHMUX) prototype
- (U) Started Integrated System Control (ISYSCON) Phase I of Expert System for Frequency Network Engineering
- (U) Completed system design of wireless EHF wireless local area network
- (U) Completed Integration of Tactical Secure Fiber Optics into Tactical Local Area Network (TACLAN)
- (U) Started tactical Multinet Gateway Protocol Design and multinet simulation
- (U) Initiated narrowband packet protocol characterization and enhancement

(U) FY 1992 Planned Program:
- (U) Develop digital synthesizer and digital signal processing chip
- (U) Deliver and test 2 frequency hopping power amplifiers
- (U) Verify interoperability of short term antijam (STAJ) capability with Improved high frequency (HF) Radio (IHFR)
- (U) Demonstrate Phase I expert system network frequency planning
- (U) Complete FHMUX tests
- (U) Start assessment to identify tactical vehicles for use with conformal antennas
- (U) Demonstrate baseline tactical multinet gateway protocol design and multinet work simulation
- (U) Initiate demonstration of concept feasibility and interoperability of wireless local area network (LAN) with Common Hardware Software (CHS) hardware
- (U) Fabricate and test preliminary exploratory development models (PEDM) Mini Fiber Optic Transmitter/Receiver (FO T/R) for LAN
- (U) Integrate PEDM hardware into TACLAN Testbed
- (U) Verify narrowband packet simulation with actual network characterization results
- (U) Start development of optical transceiver as D-shaped optical fiber for applications in signal processing and LANs

(U) FY 1993 Planned Program:
- (U) Build breadboard digital radio and explore interchange module development
- (U) Demonstrate Phase II expert system for integrated network and frequency planning
- (U) Complete technical assessment and identify specific conformal antennas targeted for candidate vehicles
- (U) Complete tactical multinet gateway Ada implementation and perform Demonstration Tests
- (U) Evaluate Tactical Secure FO performance and show compatibility with Army Tactical Command and Control System (ATCCS) and Mobile Subscriber Equipment (MSE)
- (U) Complete fabrication and test of Final Exploratory Mini FO T/R LAN integrated into TACLAN testbed and demonstrate in field tests

(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 radar data to target information which is at a low enough bandwidth to be compatible with Army communication systems. Radar technology thrust areas include: (1) Airborne Moving Target Indicator (MTI) radars capable of detecting and identifying moving targets; (2) Wide-band Synthetic Aperture Radars (SAR) capable of detecting and identifying targets masked by foliage, and (3) Multistatic techniques to enhance the survivability of both SAR and MTI radars. 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. Effort would encompass the investigation of stationary target indication (STI) techniques and algorithms (to include detection, classification and identification of military ground vehicles) applicable to Real Aperture Radars (RAR). The tasks would be primarily focussed on millimeter wave sensor applications.

(U) **FY 1991 Accomplishments:**

- (U) Completed system design to incorporate a range profiling mode in airborne MTI radar and provide capability to recognize military targets
- (U) Initiated design of a high resolution receiver for airborne MTI radar
- (U) Conducted breadboard tests of Ultra Wide Bandwidth (UWB) radar to validate simulated performance
- (U) Used UWB radar to collect signatures of targets concealed by foliage to support algorithm development
- (U) Demonstrated one dimensional optical processor
- (U) Designed Automatic Target Recognition (ATR) Optical Processor test bed for template matching sensor systems
- (U) Incorporated hybrid optical/digital processing techniques in neutral network and model based Synthetic Aperture Radar (SAR) ATR algorithms

(U) **FY 1992 Planned Program:**

- (U) Conduct engineering tests of range profiling mode of airborne MTI radar
- (U) Use mix of actual and computer simulated signatures to develop range profiling ATR algorithms
- (U) Refine UWB radar algorithms based on collected signatures
- (U) Continue development of ATR optical processor test bed for template matching sensor systems
- (U) Investigate hybrid bulk/integrated optical structures for use in multidimensional processing applications
- (U) Design test bed range doppler two dimensional optical processor for "quiet" radars

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

- (U) Collect signatures with range profiling radar to verify algorithm performance
- (U) Demonstrate performance of range profiling radar
- (U) Integrate brassboard airborne ultra wide bandwith SAR
- (U) Demonstrate range doppler two dimensional optical processor in U.S. Army Missile Command (MICOM) "quiet" radar
- (U) Develop wideband optical processor for mini-range profiling radar

- (U) Review of existing millimeter wave data for applicability
- (U) Collect well-rounded, geographically diverse clutter data base to supplement existing data (to include both seasonal and clutter class variations)
- (U) Collect realistic target/clutter data (i.e; vehicles hidden against tree lines, etc)
- (U) Evaluation of existing stationary target indication algorithms to determine current state of the art performance levels
- (U) Develop and evaluate candidate algorithms to improve upon currently achievable performance levels

(U) Project D780 - Lightweight Tactical Army Comsat System (LTACS): The name of this project will be changed to Advanced Satellite Technology and Extremely High Frequency (EHF) Communications (ASTEC). To joint DoD project develops the enabling technologies to support future global communications. Successful demonstration of these technologies will reduce the risk and permit the introduction of new, and potentially more affordable, technical alternatives into future communication architectures. Technologies for reliable, high efficiency, EHF components, lightweight frequency generators, nulling antennas, associated high speed signal processing, and frequency-hopping synthesizers will be developed and integrated to produce a demonstration EFH payload. This payload, with its "bolt-on" interface, will be hosted on an Advanced Standard Satellite Bus (ASSB) for demonstration of launch and operations as part of the DARPA-led joint Service ASTEC demonstration. This project is the Army contribution to the Joint DoD Advanced Technology Demonstrations for Global Surveillance and Communications. The specific projects have been coordinated and fully integrated with Army, Navy, Air Force and DARPA plans to insure non-duplication and compatibility with the integrated demonstrations. (This program has been referred to by the Army as Light Tactical Army Satellite Communications System (LTASS)). This is a new start for FY 1993.

(U) **FY 1991 Accomplishments:** Not applicable

(U) **FY 1992 Planned Program:** Not applicable

(U) **FY 1993 Planned Program:**
- (U) Initiate technology effort in support of the Extremely High Frequency Communications demonstration payload (leveraging DARPA technology)
- (U) Start planning for the demonstration

(U) **Work Performed By:** For Project AH92 the principal contractors are: 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 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 Defense Advanced Research Projects Agency. For Project AH93 in-house work is to be performed by Harry Diamond Laboratories, 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. The work on Project D780 is performed by the U.S. Army CECOM Center for Space Systems, Ft. Monmouth, NJ.

(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 cooordinated with efforts in PE #0603006A, PE #0208019A, PE #0602705A, PE #0603737D, PE #0602303A, PE #0603772A and PE #0303142A 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.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0602783A**
PE Title: **Computer and Software Technology** Budget Activity: **#1**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
A094 Tactical Software Technology	2144	2525*	3094	Cont	Cont
DY10 Computer and Information Science Technology	2314	3178	0	Cont	Cont
PE TOTAL	4458	5703	3094		

* Supplemental appropriation funds for Operation Desert Storm (ODS) in the amount of $1k are included.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Program Element (PE) develops and applies software technology to improve the performance and reduce the cost of computer software for both Army information systems and tactical embedded realtime systems. In Project DY10, efforts exploit advances in computer and communication technologies, and develop and modernize standard information management systems in support of the Information Systems Command. Program addresses technical issues in the development of the Army's Information Architecture which will interconnect regional, local, and end user computing services resulting in a fully connected Army information management system with minimum data storage and maximum data access. This program supports the Information Mission Areas of Automation, Communication, Audio Visual, Records Management, and Printing Publication Systems. In Project A094, efforts provide guidance for the development of tactical embedded real-time systems, solve technical problems being encountered in the application of Ada to Army software critical systems and improve the development process by reducing rework, eliminating unnecessary steps and making the process more efficient through such mechanisms as software reuse, application generators, and improved life cycle processes, methods and tools. Software Management practices are improved through the development of software process metrics, capability assessments and modifications to policies, regulations and standards to reflect technology directions. The work in this program element is consistent with the Army's resource constrained Technology Base Master Plan, and the Science and Technology Objectives (STOs) therein. For FY 1992, these funds provide the sole source of direct software related RDTE funding for U.S. Army Materiel Command and the U.S. Army Information Systems Command, respectively, and are critically needed for recurring basic contract costs. This program is critical for improving software producibility and supportability.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project A094 - Tactical Software Technology: This project concentrates on the technology needed to improve the productivity of the software development process. The project addresses executive management of software (for providing management insight into the software development

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0602783A**
PE Title: **Computer and Software Technology** Budget Activity: **#1**

process), software reuse (to determine how to realistically reuse software), real-time Ada programming and associated runtime environments (to solve problems being encountered with the application of Ada to real-time systems), Ada interface binding (to bind Ada to other software standards such as Standard Query Language (SQL)), software life cycle processes (to create predictable and affordable software developments), requirements engineering (to develop an engineering process that captures system requirements in a dynamic and changing environment), software documentation improvement to (reduce the costs associated with documentation and to make documents more useful), software re-engineering (to make existing software systems more supportable), and software methods and tools (for assessing and cataloging existing methods and tools).

(U) FY 1991 Accomplishments:
- (U) Investigated failure semantics for distributed Ada
- (U) Analyzed impact of Portable Operating System Interface for Computer Applications (POSIX)/Ada interface on real time application
- (U) Continued advocating testing software process metrics and develop software usage database
- (U) Explored hypertext, Semantic Database and Artificial Intelligence (AI) for information capture
- (U) Continued experiments in software reuse approaches
- (U) Applied documentation practice to pilot project
- (U) Explored rapid prototyping techniques
- (U) Applied requirements of capture acquisition model to pilot project
- (U) Enhanced showcase of software engineering tools

(U) FY 1992 Planned Program:
- (U) Investigate fault tolerance techniques for real time Ada application
- (U) Investigate dynamic scheduling techniques for real time Ada application
- (U) Perform Proof of Concept for POSIX/Ada compatibility for real time
- (U) Explore software metrics analysis tools and continue populating the software metrics database
- (U) Complete prototype Automated Reusable Component System
- (U) Develop guidelines for use of Process Model
- (U) Investigate Requirements Traceability
- (U) Establish Requirements Validation Handbook
- (U) Continue investigating documentation technology

(U) FY 1993 Planned Program:
- (U) Provide Proof-of-Concept experiments in Ada for real-time and distributed application
- (U) Develop guidelines for performing risk analysis
- (U) Investigate program generation technology
- (U) Perform domain analysis for Software Reuse
- (U) Expedite the use of Software Process Metrics
- (U) Investigate re-engineering technology
- (U) Enhance Showcase of Software Engineering Tools
- (U) Continue investigating documentation/maintenance technology

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0602783A**
PE Title: **Computer and Software Technology** Budget Activity. **#1**

(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 and information systems. 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 employed at Army installations throughout the world. The potential payoffs of this project are: measurable improvements in productivity and quality; reductions in utilization of life cycle resources with savings in development and maintenance costs; increased communication systems capacity, responsiveness, reliability, interoperability, availability, and maintainability.

(U) **FY 1991 Accomplishments:**

- (U) Developed a prototype that captures and allows manipulation of visual information as a user interface to a simulation or an operational planner
- (U) Developed an artificial intelligence based simulation for real time planning problems under conditions of uncertainty
- (U) Applied neural networks in Executive Information Systems to enhance database retrieval and data presentation
- (U) Defined and developed the user interface for a prototype simulation modeling environment for distributed systems
- (U) Developed prototype system that allows schemas from heterogeneous databases to be integrated and then queried as a single database
- (U) Completed a pilot project to re-engineer a COBOL system into Ada resulting in a $3M plus projected cost savings over a 10-year period

(U) **FY 1992 Planned Program:**

- (U) Transition a standard Army system to an open system environment
- (U) Demonstrate an integrated Integrated Services Digital Network (ISDN) workstation over a nationwide network
- (U) Develop a SAMeDL module to allow Ada application programs to access databases using SQL
- (U) Develop a working knowledge-based prototype filing system which controls records management by automatically assigning MARKS filing system codes to documents based upon subject and content
- (U) Develop a methodology to aid in legacy system modernization: to include re-engineering, restructuring, and reverse engineering

(U) **FY 1993 Planned Program:** Function and resources transfered to the Defense Information Systems Agency

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0602783A**
PE Title: **Computer and Software Technology** Budget Activity: **#1**

(U) Work Performed By: DY10 - In-house developing agency was the US Army Institute for Research in Management Information, Communications and Computer Sciences (AIRMICS) located at Univ. of Georgia Tech, GA. Major contractors are Georgia Institute of Technology; Purdue University; Clark Atlanta University; University of Arizona; Information and Systems Networks Company; Honeywell and Honeywell Federal Systems; and Software Engineering Research Center. A094-In-House: Center for Software Engineering, US Army Communications-Electronics Command, Ft. Monmouth, NJ. Contractors are: ISSI, Austin, TX; COMCOMS, Shrewsbury, NJ.

(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, PE #0603006A, PE #0603756D, PE #0303152A, and PE #0602234N 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

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0602784A**
PE Title: **Military Engineering Technology** Budget Activity: **#1**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
A855	Topography, Image Intelligence and Space Technology				
	10721	9676*	13649	Cont	Cont
AH71	Atmospheric Investigations				
	5711	5466*	6076	Cont	Cont
AT40	Mobility & Weapons Effects Technology				
	14678	13878*	10716	Cont	Cont
AT41	Military Facilities Engineering Technology				
	6315	6104	6536	Cont	Cont
AT42	Cold Regions Engineering Technology				
	5624	5299	5736	Cont	Cont
AT45	Energy Technology Applied to Military Facilities				
	3236	3020	3166	Cont	Cont
PE TOTAL	46285	43443*	45879		

*Supplemental appropriation funds for Operation Desert Storm (ODS) in the amount of $950K are included.

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 materiel 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 Technology Base 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,

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0602784A
PE Title: **Military Engineering Technology** Budget Activity: #1

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 1991 Accomplishments:

- (U) Demonstrated an improved Simulation Network (SIMNET) data base generation concept, integrating terrain and weather effects and simplifying construction of terrain data bases
- (U) Developed terrain visualization capabilities for use on low end workstations in tactical environments
- (U) Completed analysis of field verification of Digital Terrain Elevation Data using the Global Positioning System (GPS)
- (U) Demonstrated prototype expert system tools for computer assisted feature extraction on the Terrain Information Extraction System (TIES)
- (U) Developed Probabilistic Intervisibility Model for greater clarity in Tactical Decision Aids (TDAs) using line of sight models
- (U) Conducted demonstration of Tactical Exploitation of National Capabilities
- (U) Conducted successful troop demonstration of Digital Compass with Tilt Compensation leading to procurement of pre-production models for troop use
- (U) Completed evaluation of multispectral exploitation capabilities for applications by Army intelligence and topographic units
- (U) Fielded prototype hardware systems currently under development for ODS. Specifically three Digital Topographic Support System-Prototypes (DTSS-P) were deployed to help automate the job of the terrain analyst. The Quick Response Multicolor Printer-Prototype (QRMP-P) was deployed to provide color copies of large-format mapping, charting and geodesy products
- (U) Provided seven precise GPS receivers and GPS training to deploying troop units. During ODS, these GPS receivers were used to establish hundreds of high accuracy control points, including several inside Iraq and Kuwait prior to the start of the ground war

(U) FY 1992 Planned Program:

- (U) Transition advanced visualization technology to the Airland Battlefield Environment (ALBE) technology demonstration program
- (U) Demonstrate non-real time terrain visualization on tactical systems including the Army Command and Control System (ACCS) Common Hardware and Software (CHS)
- (U) Support networked simulation systems developments, i.e. Battlefield Distributed Simulation-Development (BDS-D) and Close Combat Tactical Trainer (CCTT)
- (U) Develop initial capability to interactively process spectral signature data from hyperspectral imagery. This represents the next generation capability for remote detection and identification of military targets and backgrounds beyond current multispectral imaging systems

(U) FY 1993 Planned Program:

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0602784A**
PE Title: **Military Engineering Technology** Budget Activity: **#1**

- (U) Integrate Synthetic Aperture Radar/Infrared/Electro Optical (SAR/IR/E-O)/multispectral demonstration
- (U) Transfer TIES technology to Digital Topographic Support System (DTSS) Preplanned product improvement (P3I)
- (U) Complete evaluation of Tactical Terrain Data (TTD) second prototype
- (U) Complete prototype portable terrain analysis capability for brigade and lower echelons
- (U) Integrate advanced visualization capabilities into ALBE test bed
- (U) Expand hyperspectral imagery processing capability to include spectral signature data from gasses in addition to solid materials
- (U) By leveraging the Image Exploitation System project being developed under the OSD Balanced Technology Initiative, develop a capability to rapidly screen reconnaissance imagery to provide near real time target queuing in support of the DoD Precision Strike Science and Technology thrust area
- (U) Demonstrate in laboratory the Full Color Recorder. This development is designed to process and print all types of images from a wide variety of sources including hard copy and digital

(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 1991 Accomplishments:
- (U) Performed field evaluation of system specific acoustic models
- (U) Developed four dimensional (4-D) data fusion capability for meteorological parameters at battlefield scales
- (U) Determined altitude limitations and accuracies of satellite soundings
- (U) Performed trade-off comparison of Radio Acoustic Sounding System versus radiometer/radiosonde
- (U) Developed target area meteorological analysis techniques
- (U) Developed nowcasting mesoscale meteorological model for target area
- (U) Developed terrain-influenced chemical dispersion decision aid
- (U) Integrated decision aids into downsized weather system
- (U) Conducted interoperability field experiments between proof of concept Integrated Meteorological System (IMETS) and battlefield functional area command and control systems
- (U) Integrated low power wind sensor into surface met sensor and conducted evaluation of expendable met surface sensors

(U) FY 1992 Planned Program:
- (U) Investigate and verify Acoustic Turbulence Similarity Model with Non-Imaging System (NIS) Phase I test
- (U) Distribute Electro-Optical Systems Atmospheric Effects Library (EOSAEL) 92 with new and improved models of battlefield atmospherics
- (U) Incorporate complex terrain influenced wind model into 4-D fusion module

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0602784A**
PE Title: **Military Engineering Technology** Budget Activity: **#1**

- (U) Develop precipitation area and rate estimation using data from meteorological satellites
- (U) Integrate direct reception of the Defense Meteorological Satellite Program downlink into the weather base station
- (U) Conduct sensitivity studies of battle outcomes to environmental conditions
- (U) Perform 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 the TDAs
- (U) Update EOSAEL 92 modules based on a user survey
- (U) Develop a set of enhanced meteorological satellite imagery products from various wavelength bands
- (U) Tailor and modify an Artificial Intelligence point precipitation forecasting model for Army applications
- (U) Prepare a TDA for chemical operations in urban areas
- (U) Incorporate battlefield atmosphere multi-media data into Military Analysts' work station
- (U) Integrate imagery and gridded weather data products into distributed architecture

(U) Project AT40 - Mobility and Weapons Effects Technology: This project will provide technologies for: rapid establishment and repair of lines of communications by both light and heavy engineers; optimal obstacle siting based on accurate predictions of enemy movement and terrain/environmental effects on weapons; techniques for rapid barrier creation; mine systems designed to mitigate environmental effects; accurate assessments of environmental and terrain influences on mobility for maneuver commanders; location of subsurface water in arid regions of the world during contingency operations; methodologies to predict, and techniques to mitigate, coastal effects on Logistics-Over-The-Shore operations; camouflage, concealment, and deception measures for fixed facilities to deny accurate acquisition and engagement by threat weapon systems; and designs, materials, and construction methods for either fixed or forward base survivability against advanced conventional weapons and terrorist weapons.

(U) FY 1991 Accomplishments:

- (U) Successfully demonstrated the Remote Minefield Detection System (REMIDS) during the Standoff Minefield Detection System (STAMIDS) Advanced Technology Transition Demonstration (ATTD). The STAMIDS ATTD was the Army's first successfully completed ATTD.
- (U) Developed design criteria for rock-rubble/concrete overlays to defeat large high-velocity (700 m/s) Semi-Armor Piercing and Armor Piercing projectiles.
- (U) In support of Operation Desert Storm (ODS), conducted computer simulations and subscale projectile penetration experiments to assess the penetrability of two complex layered targets by I-2000 and GBU-28 bombs.
- (U) Completed phase I of live-fire test of several US and foreign shoulder launched weapon systems to evaluate fuze functioning and standoff distances required for protection of masonry walls.
- (U) Condensed Army Mobility Model System (CAMMS) version 2.1 installed on the U.S. Army Forces Command (FORSCOM) Automated Intelligence Support System for field use during

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

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PE Title: **Military Engineering Technology** Budget Activity: **#1**

ODS.

- (U) Completed laboratory screening evaluation of dust control materials and applied selected materials to desert soils in traffic and non-traffic areas.
- (U) Improved Non-Destructive Test procedures for pavement evaluation to include spectral analysis of surface waves and statistical reliability of deflection basins measurement.
- (U) Defined field expedient Explosively Forged Penetrator (EFP) effectiveness against actual concrete and masonry bridge piers, abutments, and deck spans through computer analyses and field experiments.

(U) FY 1992 Planned Program:

- (U) Develop PC-based computer code and user's guide for prediction/analysis of free-field ground shock environments produced by buried conventional bombs.
- (U) Develop hardening concepts and unprotected versus protected vulnerability charts for Class III (Petroleum Products) storage facilities and criteria for expedient protection from shoulder launched smart fuzed bunker assault weapons and EFPs.
- (U) Complete upgrades to computer code for predicting the vulnerability of protective structures to indirect fire weapons.
- (U) Develop economical barrier concepts to protect masonry walls from a wide spectrum of terrorist assault weapons.
- (U) Determine the maximum angle of obliquity for EFP effectiveness against reinforced concrete, and investigate the usefulness of EFP array firings for demolition operations.
- (U) Develop capability for accurate battlefield mobility and trafficability assessments through integration of the TerraCAMMS geographical information system into the Army's Command Control System and the Department of the Army Movement Management System-Revised (DAMMS-R).
- (U) Characterize criteria and performance requirements for improved dispursed explosives (IDX) and other dispersed and distributed mine neutralization explosive systems.
- (U) Develop formulation of candidate construction binder material from industrial waste products (slags, etc.).
- (U) Provide criteria for dust control products for use on desert soils and evaluate materials for use on other types of soils.

(U) FY 1993 Planned Program:

- (U) Develop PC-based structural analysis computer code and user's guide for predicting in-structure shock for buried multi-story/multi-bay structures subjected to ground shock from conventional weapon detonations.
- (U) Provide procedures and concepts for hardening windows to terrorist bomb threats
- (U) Develop automated camouflage, concealment, and deception design and evaluation capability for protection of fixed facilities and semi-fixed assets from visual and thermal target acquisition threats.
- (U) Determine effects of tandem EFP firings and long standoff EFP accuracy and effectiveness; investigate high-precision factory-packed EFP compared to expedient EFP for combat engineer use.
- (U) Develop criteria for materials and methods that will effectively control dust while reducing equipment, manpower and logistic requirements by 30 percent.

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Program Element: **#0602784A**
PE Title: **Military Engineering Technology** Budget Activity: **#1**

- (U) Provide optimum design for rapidly-emplaced breakwaters to mitigate coastal effects at Logistics-Over-The-Shore sites.
- (U) Develop simplified automated geophysical data interpretation capability for location of subsurface water supplies.
- (U) Develop algorithms describing obstacle effectiveness integrated into Obstacle Planning Software.
- (U) Develop structural design of building components for seismic loading and cost estimating capability for concept designs in 3-dimensional structural modeling computer program.

(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 1991 Accomplishments:**
- (U) Developed an equipment maintenance management system to aid in repair versus replace decisions
- (U) Completed integration of master planning and space utilization models to improve Directorate of Engineering and Housing (DEH) planning activities with emphasis on advanced graphics
- (U) Completed laboratory evaluation of thermal paint removal
- (U) Developed the Railroad Maintenance Management System to uniformly rate track condition
- (U) Provided affordable physical security improvements to existing facilities
- (U) Developed prototype robotic inspection device for assessment of corrosion
- (U) Developed prototype expert system for alternative construction methods

(U) **FY 1992 Planned Program:**
- (U) Provide cost effective techniques (methods and equipment) that can be used for rehabilitation of pipelines
- (U) Develop Electromagnetic Pulse (EMP) shielding criteria for ferromagnetic materials
- (U) Provide enhanced microcomputer capabilities for installation real property management
- (U) Provide decision tool to optimize the applications of innovative building technologies
- (U) Develop installation level engineered management system master 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 automatic generation of construction schedules
- (U) Complete automated railroad track inspection system
- (U) Complete criteria for design of base isolation system for buildings
- (U) Provide Engineered Management System component for uniform building inspection and assessment

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Program Element: #0602784A
PE Title: Military Engineering Technology Budget Activity: #1

- (U) Develop knowledge based pilot system for generation of detailed construction schedules

(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 1991 Accomplishments:**
- (U) Developed concept for effective use of lower cost pavement base course materials in frost susceptible areas
- (U) Defined criteria to optimize performance of metal buildings in very cold climates
- (U) Quantified dominant process affecting mobility on thawing soil
- (U) Developed snow control methods for light forces using organic equipment
- (U) Defined degradation of perimeter security system performance in cold climates

(U) **FY 1992 Planned Program:**
- (U) Develop concrete masonry coatings for repair of water vapor damaged facilities in cold climates
- (U) Complete field validation of snow shock-wave attenuation relationships relevant to mine neutralization
- (U) Measure dynamic millimeter-wave dielectric properties in soils and snow for smart weapons and mine warfare

(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) Provide criteria for selection of low cost, long-life pavement materials for cold regions
- (U) Define criteria for environmental/perimeter security sensor integration for smart site operations
- (U) Develop mesoscale ice accumulation forecast methods

(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.

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Program Element: **#0602784A**
PE Title: **Military Engineering Technology** Budget Activity: **#1**

(U) FY 199? Accomplishments:
- (U) Developed criteria for selecting packaged Photovoltaic (PV) powered lighting systems
- (U) Developed guidelines for peak shaving with generators
- (U) Provided guidelines to optimize control systems in central heating plants
- (U) Provided guidance on biotechnology applications and estimates of potential benefits
- (U) Developed knowledge based diagnostic system for standard controls

(U) FY 1992 Planned Program:
- (U) Recommend Army heat recovery applications
- (U) Provide retrofit technology for electrical energy conservation
- (U) Develop implementation criteria for energy storage systems
- (U) Provide detailed heating, ventilating and air conditioning (HVAC) acceptance testing procedures that ensure energy efficient operation
- (U) Provide Diurnal Ice Storage Design System Guides and Acceptance Criteria
- (U) Develop methodology for selection of heat recovery application

(U) FY 1993 Planned Program:
- (U) Evaluate commercially available Distributed Digital Control (DDC) systems for Army applications
- (U) Provide technologies for heat energy distribution systems
- (U) Provide modernization technologies for central heating plants
- (U) Improve steam supply management technologies
- (U) Provide design and evaluation methods for cost effective desiccant cooling and dehumidification systems
- (U) Provide electric motor retrofits for variable speed drive

(U) Work Performed By:

A855 - Topography, Image Intelligence and Space Technology: Approximately 65 percent of the work is performed in-house by the Topographic Engineering Center, Fort Belvoir, VA. Primary civilian contractors: DBA Systems, Melbourne, FL, and Earth Satellite Corp., Chevy Chase, MD.

AH71 - Atmospheric Investigation: Approximately 77 percent of the work is performed in-house by the Atmospheric Sciences Laboratory, White Sands, NM. Primary civilian contractors: New Mexico State University, Las Cruces, NM; Sand T Corp., Hampton, VA; University of Texas, El Paso, TX.

AT40 - Eighty-two percent of the Waterways Experiment Stations work is performed in-house. Eighteen percent is performed out-of-house. Contractors: Hilton Systems, Inc., Battelle-Frankfurt.

AT41 - Military Facilities Engineering Technology: Approximately 65 percent is performed in-house by the U.S. Army Construction Engineering Research Laboratory, Champaign, IL. Primary contractor: 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 by

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Program Element: **#0602784A**
PE Title: **Military Engineering Technology** Budget Activity: **#1**

the Cold Regions Research and Engineering Laboratory, Hanover, NH. Primary contractor: Dartmouth College, Hanover, NH.

AT45 - Energy Technology Applied to Military Facilities: Approximately 65 percent is performed in-house by the U.S. Army Construction Engineering Research Laboratory, Champaign, IL. Primary contractors are: 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,
Defense 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 and

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National Academy of Sciences.

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

(U) **International Cooperative Agreements:** Not applicable.

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Program Element: **#0602785A**
PE Title: **Manpower, Personnel and Training Technology** Budget Activity: **#1**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
A790 Human Performance Effectiveness & Simulation	8642	6454	6157	Cont	Cont
A791 Manpower, Personnel & Training	9470	9416	9809	Cont	Cont
PE TOTAL	18112	15870	15966		

B. (U) BRIEF DESCRIPTION OF ELEMENT: The objective of this program is to provide a scientifically sound basis for maximizing soldier and unit performance by empirically determining: (1) how the soldier's workload can be "shifted from the head to the hardware" in the design of new weapon systems, (2) what information must be available to system designers to ensure compatible man-machine systems, (3) what simulator and training device design features are necessary to ensure effective training at minimal cost, (4) how individuals and units acquire and retain complex skills, (5) how to substitute automated, cognitive science-based tutoring technologies for rapidly diminishing individual training resources and (6) how behavioral science methods can be used to improve the recruiting, selection, and retention of quality soldiers. The work in this program element is consistent with the resource-constrained Army Technology Base Master Plan, and the Science and Technology Objective (STO) therein.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project A790 - Human Performance Effectiveness and Simulation: Work under this project experimentally determines. (1) the most effective means for integrating human decision makers and automated information technology in new Army systems, (2) the relative contributions of manpower, personnel, and training variables to weapon system performance and unit effectiveness, (3) the minimum design features for simulators/training devices that will achieve effective training at the lowest cost and (4) cognitive science-based technologies for delivering more effective training and job aiding.

(U) FY 1991 Accomplishments:

- **(U)** Completed development of joint U.S./Canadian flight training simulator testbed
- **(U)** Developed concepts for training feedback in networked simulators
- **(U)** Experimentally determined how crew selection procedures can reduce Army aviation accidents caused by human error
- **(U)** Empirically determined staff skill requirements for the Army Tactical Command and Control System

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0602785A
PE Title: **Manpower, Personnel and Training Technology** Budget Activity: #1

- (U) Tested and refined prototype language training technology employing cognitive learning strategies
- (U) Developed prototype methods for predicting weapon system and unit performance degradation due to soldier stress, sleep loss and fatigue, crew turnover, and levels of personnel experience

(U) FY 1992 Planned Program:
- (U) Construct a government-owned, contractor-operated facility to house a research simulator testbed to be used to experimentally determine the needed complexity of aviation simulators and training devices
- (U) Develop experimentally-based rules for determining visual scene contents in low cost training simulators
- (U) Test preliminary methodology for selecting tasks for training using "virtual reality" simulated environments
- (U) Experimentally evaluate alternative cognitive (intellectual) learning strategies for language training
- (U) Develop a behavioral taxonomy to evaluate military intelligence (MI) performance and to characterize the complex MI decision-making process
- (U) Develop a prototype aviator performance tracking system

(U) FY 1993 Planned Program:
- (U) Determine cognitive job-aiding tools required to improve command and control situation assessment skills
- (U) Using simulator testbed, experimentally determine minimum visual fidelity requirements for different pilot tasks for effective flight simulator training
- (U) Develop preliminary individual and unit performance assessment methods for use in simulated "virtual reality" environments

(U) Project A791 - Manpower, Personnel & Training: The objectives of this project are to provide the scientific basis for: (1) improved methods for force structure planning, selection testing, and leader development; (2) improved methods for estimating manpower levels and soldier skills required by new Army weapon systems; (3) improved efficiency for training material development; and (4) improved individual and unit skill learning, retention and performance on the job.

(U) FY 1991 Accomplishments:
- (U) Developed and tested models for predicting the acquisition and retention rates of complex individual soldier skills
- (U) Developed methods for estimating required frequency of refresher training in units, by type of task, to assure skill retention
- (U) Tested and refined automated test development and training development tools
- (U) Developed methodology to generate job performance prediction equations
- (U) Validated preliminary model for estimating costs of alternative enlisted force structures for different contingency missions

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Program Element: **#0602785A**
PE Title: **Manpower, Personnel and Training Technology** Budget Activity: **#1**

- **(U)** Developed techniques for assessing effectiveness of high-level staff decision making

(U) FY 1992 Planned Program:
- **(U)** Develop a prototype crew-level training program for improving safety within operational aviation units
- **(U)** Validate collective skill retention model with different types of tasks and crews/teams
- **(U)** Refine skill learning and retention models for complex cognitive skills
- **(U)** Design and develop an automated tool for deriving training requirements for collective tasks
- **(U)** Experimentally determine how to enhance unaided day and night visual performance on the battlefield
- **(U)** Identify variables for predicting performance of low aptitude soldiers and identification of jobs that they can perform most effectively

(U) FY 1993 Planned Program:
- **(U)** Develop training strategies for sustaining command and control skills
- **(U)** Refine collective skill acquisition and retention models for prediction of needed refresher training for crews, teams and units
- **(U)** Design knowledge base for an expert system that will aid training developers in selecting training strategies
- **(U)** Develop a preliminary model of the multiple factors that affect officer career progression in order to enhance officer career management
- **(U)** Develop models that will lead to the most cost-effective utilization of soldiers of various aptitude levels

(U) Work Performed By: Primary contractors are: American Institutes for Research, Washington, DC; Fu Associates, Ltd., Arlington, VA; PAR Technology Corporation, New Hartford, NY; Perceptronics, Inc., Woodland Hills, CA; Systems Research and Applications Corporation, Arlington, VA The in-house developing organization is the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI), Alexandria, VA.

(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.

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Program Element: **#0602786A**
PE Title: **Logistics Technology** Budget Activity: **#1**

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

Project Number / Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
A427	Tactical Shelters-Exploratory Development				
	5168	4766	4752	Cont	Cont
AH20	Mobility Equipment Technology				
	12826	12502	12866	Cont	Cont
AH98	Clothing & Equipment Technology				
	22901	8402*	9640	Cont	Cont
AH99	Joint Services Food/System Technology				
	4345	4274	4714	Cont	Cont
D283	Airdrop Advanced Technology				
	1507	2177	2294	Cont	Cont
DJ10	Combat Rations Quality Enhancement				
	0	2800	1975	Cont	Cont
PE TOTAL	46747	34921	36241		

*Supplemental appropriation funds for Operation Desert Storm (ODS) in the amount of $569k are included.

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 technological 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, as well as 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

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emphasis on landmine detection and neutralization, improved mobility through more rapidly deployable, lighter tactical bridging, 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 Technology Base Master Plan, Science and Technology Objectives (STOs) milestones for the Army's key emerging technologies therein and Army force modernization plans.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project A427 - Field Shelters-Exploratory Development: This project addresses requirements for transportable maintenance tentage and Soldier Quality of Life Next Generation 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. 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 1991 Accomplishments:

- (U) Identified three-dimensional weaving and multilayer interlocking braiding in conjunction with high strength yarns as potential technologies, for advanced high pressure air beams for rapidly erectable tentage
- (U) Completed development of two-dimensional laminar/turbulent computer code for air circulation/containment transport in tents for improved Soldier Quality of Life habitability designs and chemical/biological (CB) protection and verified code with experimental data
- (U) Completed experimental verification of low frequency electromagnetic interference model for analyzing shelter internal electromagnetic fields

(U) FY 1992 Planned Program:

- (U) Fabricate naturally curved seamless fabrics using three-dimensional weaving and multilayer interlocking braiding techniques and experimentally evaluate potential for use in advanced air beams
- (U) Experimentally determine fabric stress/strain relations and incorporate in model of axisymmetric stress concentrations in pressurized air beam; verify model by experiment
- (U) Develop three-dimensional laminar/turbulent code for circulation/contaminant transport in tents

(U) FY 1993 Planned Program:

- (U) Fabricate and evaluate experimental pressurized air beam specimen using advanced fabrication techniques
- (U) Investigate stress concentrations in pressurized air beams with nonaxisymmetric discontinuities
- (U) Verify, through experiments, air circulation/contamination transport model to improve habitability and chemical survivability

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Program Element: **#0602786A**
PE Title: **Logistics Technology** Budget Activity: **#1**

(U) Project AH20 - Mobility Equipment Technology: This exploratory development program addresses the critical need for advanced Combat Support and Combat Service Support equipment and materiel. The project is directed toward providing the technology to help solve deficiencies in the Army mission areas of Engineer-Mine Warfare, Combat Service Support, and Command and Control. It includes the task efforts in the following fields: countersurveillance, deception, survivability, countermine, bridging, logistic supply and support, materials, fuels and lubricants, mobile electric power, environmental control, corrosion, and radiation (health physics).

(U) FY 1991 Accomplishments:

- (U) Developed thermoplastic composite decks to reduce the weight and increase the stiffness of mobile military bridges
- (U) Investigated deception technology to simulate activity for Moving Target Indicator (MTI) radar
- (U) Completed design of thermal suppression kit (tarps, ducts and camouflage screen) for fielding with PATRIOT systems
- (U) Complete evaluation of materials structures on suppression of thermal signatures generated by solar loading for ultra-lightweight camouflage systems
- (U) Developed a low cost, low maintenance prototype fatigue monitor device based on the principle of crack growth, which measures the remaining life of military bridge structures
- (U) Developed empirical and finite element analysis design guidelines for three generic composite joint arrangements typically found on military bridging
- (U) Developed a prototype fatigue monitor device which measures the remaining life of military bridge structures
- (U) Completed demonstration of competing countermine technologies for improved vehicle mounted detector and hand held detector
- (U) Demonstrated the feasibility of three directed energy countermine approaches in a field environment
- (U) Demonstrated feasibility of defeating ground sensors used with wide area mines
- (U) Refined ability to image buried mines using microwaves
- (U) Fielded an improved desert tan vehicle paint (Tan 686A) which reduced solar heating without diminishing visual color or CARC properties for DSO
- (U) Initiated development of application parameters for the use of electrodeposited coatings on ammunition and projectiles
- (U) Initiated testing of commercial products against the requirements of DOD-P-15328 with none fulfilling all performance requirements
- (U) Received kerosene micro-engines for Man Portable Generator demonstrations
- (U) Developed and initiated demonstration of the Vehicle In-Line Generator on a 2-1/2 ton truck
- (U) Determined applications and initiated demonstrations of Power Electronics Technology
- (U) Completed compound formulations for Advanced Materials for Air Cushion Vehicle Fingers
- (U) Completed evaluations of the On-Board Water Recovery Unit
- (U) Completed physical/chemical property matrix of aviation system greases

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Program Element: **#0602786A**
PE Title: **Logistics Technology** Budget Activity: **#1**

(U) FY 1992 Planned Program:

- (U) Prepare detailed technical development plans for implementation based on testing of new improved handheld mine detectors and transition program to 6.3a
- (U) Continue transmission line modeling for three dimensional analyses of separated aperature antenna for handheld detector
- (U) Experimentally investigate acoustic/seismic sensor implementation and arraying overcome mobility issues identified in previous research
- (U) Initiate development of a multiple cathode breadboard source for X-ray photon detector
- (U) Initiate in investigation of new energetic materials for explosive neutralization
- (U) Investigate technologies to significantly improve ability of passive radar reflectors to indicate target movement to MTI radars; experiment with very lightweight materials in simplified structural embers in components/decoys
- (U) Develop tubular laboratory shear joint adhesive bonding design guidelines for use on lightweight bridge structures
- (U) Initiate study of explosive stress relief technology as a means of increasing the post weld strength of large scale aluminum structures
- (U) Develop adhesive patch field repair kit for aluminum bridges
- (U) Study air-inflated technology and its application to low mass and bulk expedient bridging concepts
- (U) Investigate the use of standard and novel radar scattering materials in ultra-lightweight camouflage to provide 6dB broadband attenuation
- (U) Investigate design improvements for decoy self powered heat source
- (U) Initiate support efforts for Tank-Automotive Command electric drive technology demonstrator
- (U) Demonstrate kerosene micro-engines for Man-Portable Generators
- (U) Complete demonstration of the Vehicle In-Line Generator on a 2-1/2 ton truck
- (U) Conduct analysis of Soldier Individual Power technologies
- (U) Continue demonstrations of Power Electronics Technology for Army infusion
- (U) Complete and demonstrate Advanced Materials for Air Cushion Vehicle Fingers
- (U) Identify technologies for Water Individual Purification Systems
- (U) Conduct research into Reverse Osmosis Water Purification Unit (ROWPU) enhancements
- (U) Complete selection of fuel blends/requirements for evaluation in advanced low heat rejection engines
- (U) Complete performance requirements of multi-functional aviation grease and selected component testing for a single hydraulic fluid for all ground materiel
- (U) Complete engine, transmission, hydraulic system evaluations on candidate OEA OW-30 combat/tactical engine oils
- (U) Complete laboratory testing of single hydraulic fluid candidates
- (U) Complete laboratory evaluations and finalize field manual on antifreeze recycling procedures
- (U) Re-evaluate potential threats; investigate the alteration of the near IR reflectivity of black and brown camouflage colors to better match the chlorophyll curve for aircraft

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Program Element: **#0602786A**
PE Title: **Logistics Technology** Budget Activity: **#1**

(U) FY 1993 Planned Program:

- **(U)** Initiate wide area mine terminal sensor countermeasure test bed
- **(U)** Prepare equipment, sites and test procedures for engineering tests of Multi Cathode Breadboard and Photon Backscatter Testbed Systems to be delivered in FY 1994
- **(U)** Explore vehicle magnetic silencing for countermine applications
- **(U)** Continue investigation of new energetic materials for explosive neutralization
- **(U)** Continue field experimental investigation of acoustic/seismic sensor with emphasis on evaluation of sensor performance as implemented in mobile platform configurations
- **(U)** Complete development of multiple cathode breadboard source for X-ray photon backscatter detector
- **(U)** Refine design of MTI radar reflectors and evaluate an array in a simulated tactical scenario and select most promising techniques/technologies for transition to 6.3a based on results of prototype tests
- **(U)** Develop design manual for composite joints
- **(U)** Evaluate durability of adhesive bonded bridge structures
- **(U)** Develop design for an air-inflated fascine structure for expediently breaching tank ditches
- **(U)** Determine metallurgical and mechanical property changes and/or benefits from explosive stress relief
- **(U)** Test and transition self powered heat source to multispectral close combat decoys and log base critical node systems
- **(U)** Demonstrate ultra-lightweight camouflage screen with capabilities equal to or better than the current standard lightweight camouflage screen system
- **(U)** Continue electric drive propulsion efforts
- **(U)** Continue testing of man portable generators
- **(U)** Continue analysis of technologies supporting Soldier Individual Power
- **(U)** Demonstrate and initiate testing power electronics technologies
- **(U)** Initiate research into Lightweight Tactical Fuel Handling Equipment
- **(U)** Select technologies for Water Individual Purification Systems
- **(U)** Continue research into Reverse Osmosis Water Purification Unit (ROWPU) enhancements
- **(U)** Complete defining of fuel system temperature limits on modified engines
- **(U)** Complete laboratory/engine testing on low emissions engine oils and transition to 6.3a
- **(U)** Complete performance testing on single hydraulic fluid and transition to 6.3a
- **(U)** Complete development of a fluid recycling capability for reuse of hydraulic fluids
- **(U)** Develop temporary paints for aircraft applications with multispectral capability, particularly in the near IR, resistant to fuels and lubes but not necessarily to chemical agents

(U) Project AH98 - Clothing and Equipment Technology: Exploratory development designed to improve soldier performance and survivability on the modern day battlefield through significantly improved materials and new design applications for combat clothing, personal equipment, field support equipment, and tentage. Areas of emphasis include: material development to improve chemical/biological (C/B), ballistic, flame and nuclear thermal protection; enhanced

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0602786A
PE Title: Logistics Technology
Budget Activity: #1

countersurveillance/camouflage for the individual soldier; directed energy protection for soldier survivability, including eye protection against tuneable lasers; materials/concepts for protection in arctic/desert environments; and improvements to lighten the soldier's load. FY 1992 program is the level of effort permitted with the funds available.

(U) FY 1991 Accomplishments:

- (U) Transitioned reduced weight Spectra and improved Kevlar fabric-based helmet technology to 6.4 development
- (U) Fabricated prototype eye protective concepts using microlens array for protection against tunable lasers and determined the nonlinear optical properties of selected polymers for use in combination with such arrays
- (U) Transitioned new three-color desert camouflage pattern to end-item development during Operation Desert Storm (ODS)
- (U) Incorporated new lightweight laminate materials into chemical protective clothing for field demonstration
- (U) Characterized multilayer barrier films for chemical protective clothing packaging and other applications; transitioned technical data
- (U) Identified and improved elastomeric material formulation for development of a lightweight, multipurpose, chemical protective, and rain/snow overboot.
- (U) By applying motion analysis and anthropometric techniques, identified movement constraints imposed by standard clothing and individual equipment
- (U) Evaluated novel semi-flexible advanced materials for flechette protection to determine optimum composite structure
- (U) Enhanced ballistic casualty reduction models to graphically display simulations of injuries to individual body areas from threat fragments and flechettes

(U) FY 1992 Planned Program:

- (U) Incorporate new carbon-loaded semipermeable membrane/fabric laminates into a lightweight chemical protective uniform to provide enhanced liquid, vapor, and aerosol protection without increased heat stress or bulk, and conduct field evaluations
- (U) Optimize tunable laser/ballistic eye protection using the combination of microlens arrays and nonlinear optical polymers
- (U) Develop an integrated soldier performance model to support front-end analyses of soldier system items
- (U) Identify improved activated carbon foam laminate configurations for pilot and production scale manufacture of lightweight chemical protective material
- (U) Transition promising advanced composite material systems providing both fragment and flechette protection to end-item development
- (U) Incorporate carbon microfibers into an electrostatically flocked fabric for potential use in chemical protective undergarments
- (U) Determine biomechanics of footwear concepts in walking/running

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Program Element: **#0602786A**
PE Title: **Logistics Technology** Budget Activity: **#1**

(U) FY 1993 Planned Program:

- (U) Transition to development new ballistic protective materials and processing techniques to fabricate a protective helmet providing up to 30% weight reduction with equal protection
- (U) Expand the integrated soldier performance model to include updated hazard priorities and perform a proof-of-concept analysis for the Soldier Integrated Protective Ensemble (SIPE)
- (U) Construct a breadboard device based on nonlinear optics for eye protection against tunable lasers
- (U) Determine behavioral relationships between combat soldier quality of life and mission performance leading to a model for optimized use of field service equipment in combat scenarios
- (U) Characterize bioengineered polymers for feasibility in such areas as elastomers, electro-optics, chemical, and ballistic protection
- (U) Prototype handwear and footwear constructed from metallized/blended fabrics, using the concept of electrical resistance heating
- (U) Develop a stretchable meltblown web incorporating superactivated carbons to demonstrate a concept for thin, tightly fitting chemical protective undergarments
- (U) Incorporate soldier identification technology into clothing and individual equipment.

(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 which enhance the survivability, sustainability, and supportability of the Armed Forces on the battlefield ensuring optimal nutritional intake to maximize cognitive and physical performance on the battlefield.

(U) FY 1991 Accomplishments:

- (U) Conducted initial exploitation of innovative high-temperature short-time processes, such as ohmic heating, split-phase aseptic processing, and microwave sterilization, for producing shelf stable, A-ration quality, operational rations
- (U) Completed systems analysis of alternatives to reduce plastic packaging by 50%, and transferred concept for 90:1 reduction of plastic waste to industry for development, assisting the Navy to comply with the international prohibition of plastics disposal at sea; transitioned to 6.3A
- (U) Maximize nutrient bioavailability in high carbohydrate ration items to enhance soldier performance
- (U) Completed successful Air Force, Marine Corps test of a new reconstituted milk using stable, low saturated fat significantly reducing potential of cardiovascular disease, and transitioned to 6.3A
- (U) Completed successful small scale Navy user test of carbonated beverage tablets reducing weight and cube of conventional beverage systems by 89% and 60%, respectively, thereby reducing resupply and logistics requirements; transitioned to 6.3A
- (U) Developed concepts for self-heating, self-contained group meal offering benefits of low size, weight, and cost than current group rations while reducing the need for equipment, fuel and water

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0602786A**
PE Title: **Logistics Technology** Budget Activity: **#1**

- (U) Completed feasibility study for novel field kitchen concept featuring a single remote multifuel burner and heat transfer medium pumped to modular appliances, promising improvements in efficiency, reliability and maintainability, and safety
- (U) Presented new Air Force missile site feeding concept to HQ Strategic Air Command and received approval for implementation

(U) FY 1992 Planned Program:

- (U) Apply novel sources of exo- and endothermic energy to the application of flameless, on-the-move heating/cooling of operational rations by the dismounted soldier
- (U) Apply and refine cost-efficient food preservation technologies in the development and production of nutrient dense, shelf-stable operational rations
- (U) Evaluate potential performance enhancing, stress reducing nutrients and incorporate most promising into ration design
- (U) In coordination with the U.S. Department of Agriculture (USDA) and Office of The Surgeon General, conduct economic analysis and select candidate food items for irradiation sterilization/pasteurization to expand variety and increase shelf life of combat ration components
- (U) Explore concepts of edible barrier coatings to improve ration acceptability and to reduce packaging waste
- (U) Investigate feasibility/application of self purifying/hydrating packaging membranes to allow individual soldiers' access to any water source to reconstitute rations
- (U) Using ODS troop feedback as a basis, develop a series of highly acceptable Tray Pack ration foods which avoid the casserole syndrome to enhance Army/Marine Corps group field feeding systems

(U) FY 1993 Planned Program:

- (U) Using industry/university sources, perform limited irradiation/sterilization/pasteurization of candidate items for user evaluation. Assist USDA/industry in obtaining Food and Drug Administration (FDA) approvals in adopting irradiated sterilization for applicable ration item
- (U) Conduct feasibility study for integrating thermoelectric and thermophotovoltaic converters in multifuel burners to permit push button start and self powered operation in the field
- (U) Identify new processing, biochemical, or packaging methods to retard the degradation of nutrients in ration components
- (U) Evaluate and identify best candidate biodegradable ration packaging materials for different ration processing technologies and initiate regulatory clearance
- (U) Define alternative foodservice system concepts for 21st century warships
- (U) Establish quantitative methods for measuring and addressing instability of foods stored in environmental extremes to maintain quality and reduce loss

(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;

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Program Element: #0602786A
PE Title: Logistics Technology
Budget Activity: #1

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 1991 Accomplishments:
- (U) Determined canopy material effects on scaling laws and added these to existing scaling parameters utilized in model experiments
- (U) Completed computational fluid dynamic algorithms used to optimize parachute drag and to predict details of flow field about annular canopies; transitioned work to engineering development
- (U) Conducted deployment, opening, and glide experiments with an enhanced flex wing concept that provides leading edge drag, and transferred data to ongoing 6.3A joint program with National Aeronautics and Space Administration (NASA)
- (U) Conducted concept analysis of 200 knot and 250 knot single canopy and cluster-of-two concepts to evaluate opening, stability and descent performance for use in High Sped Low Altitude Retrorocket Next Generation Cargo Airdrop System
- (U) Conduct 200 KT and 250 KT single canopy and cluster-of-two concept studies to evaluate opening, stability, and descent performance

(U) FY 1992 Planned Program:
- (U) Determine consequence of electrostatic charges on parachute materials as a factor during the opening phase and as a potential cause of inconsistent performance in high speed applications
- (U) Investigate parachutist's response (i.e., psychological and physiological) to opening forces and transition data to designs for 6.3A technology demonstration
- (U) Evaluate the radial reefing concept for low-altitude parachute deployment and transition viable results to ongoing full scale development programs

(U) FY 1993 Planned Program:
- (U) Define potential low-altitude performance of parachutes using validated computational fluid dynamics and trajectory analysis
- (U) Explore advanced concepts for efficient clustering of parachutes by minimizing inter-canopy interference to improve opening

(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 1991 Accomplishments:** Not applicable.

(U) **FY 1992 Planned Program:**

- (U) Identify/investigate key limiting parameters affecting food quality during processing storage
- (U) Develop analytical techniques to measure quality quantification factors so corrective action can be taken.
- (U) Explore the efficacy of electric/magnetic processing technology in destroying spoilage and pathogenic microorganisms relevant to chilled foods.
- (U) Assess the practical use of findings in the studies noted above in processing fresh foods for packaging in containers appropriate for distribution

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

- (U) Investigate raw material/process interactions on food quality
- (U) Conduct sensory and psychophysical analysis to profile quality parameters in selected ration components.
- (U) Define effect of food preservation processes on quality
- (U) Develop baseline quality data for new food preservation technologies to document quality enhancement.

(U) **Work Performed By:** In-house efforts accomplished by Natick Research, Development and Engineering Center, Natick, MA; and Belvoir Research, Development, and Engineering Center, Ft Belvoir, VA. The primary contractors performing these programs are: Grumman Corp., Bethpage, NY; Engineering, Inc., Hampton, VA; Allied Signal, Inc., Morristown, NJ; Albany International, Mansfield, MA; IITRI, Chicago, IL; Chicago Aerial, Barrington, IL; 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, 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; North Carolina State, Raleigh, NC; Auburn Univ., AL; Worcester Polytechnical Institute, Worcester, MA; Univ. of Lowell, Lowell, MA; Oak Ridge National Labs, Oak Ridge, TN; Sandia National Lab, Albuquerque, NM.

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Program Element: **#0602786A**
PE Title: **Logistics Technology** Budget Activity: **#1**

(U) Related Activities:

PE #0601102A (Defense Research Sciences)
PE #0603001A (Logistics Advanced Technology)
PE #0603102A (Materiels and Structures Advanced Technology).
PE #0603606A (Landmine Warfare and Barrier Advanced Technology).
PE #0602784A (Military Engineering Technology)
PE #0603747A (Soldier Support and Survivability)
PE #0603804A (Logistics & Engineering Equipment Advanced Development)
PE #0603619A (Landmine Warfare & Barrier - Advanced Development)
PE #0604270A (Electronic Warfare Development)
PE #0604804A (Logistics & Engineering Equipment Engineering Development)
PE #0604713A (Combat Feeding, Clothing and Equipment)
PE #0604808A (Landmine Warfare/Barrier - Engineering Development)

There is no unnecessary duplication of effort within DOD.

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

(U) International Cooperative Agreements: Not applicable.

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Program Element: **#0602787A**
PE Title: **Medical Technology** Budget Activity: **#1**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
A825 Combat Maxillofacial Injury	2521	2342	0	Cont	Cont
A870 DOD Medical Defense Against Infectious Diseases	28873	31614*	0	Cont	Cont
A871 Medical Biological Defense - Exploratory Development	26637	15875	0	Cont	Cont
A872 Neurofibromatosis Research	0	8000	0	0	8000
A873 HIV Exploratory Research	0	2000	0	0	2000
A874 Combat Casualty Care Technology	12460	11148	0	Cont	Cont
A875 Medical Chemical Defense - Exploratory Development	18494	18062	0	Cont	Cont
A878 Health Hazards of Military Materiel	11626	9909	0	Cont	Cont
A879 Medical Factors Enhancing Soldier Effectiveness	10793	9870	0	Cont	Cont
PE TOTAL	111404	108820	0 **		

*Supplemental appropriation funds for Operation Desert Storm (ODS) in the amount of $1,328k are included
** These medical resources transferred to OSD, Health Affairs, effective FY 1993

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 improve the 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 chemical threat protection 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 equipment and materials required to provide essential dental treatment on the battlefield; combat casualty care

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ED addressing the investigations of trauma and burns due to weapons, 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. Requirements are identified in the Joint Chemical-Biological Effects Data Requirements (JCEDAR) of the Joint Chemical Warfare/Chemical/Biological Defense Research, Development Acquisition (CW/CBD RDA) Plan, Mission Area Analysis (MAA), Long Range Army Materiel Requirements Plan (LRAMRP), Operational and Organizational (O&O) Plans, Letters of Agreement (LOA), and Letter Requirements (LR). This PE also provides funds for overall administration and management of RDTE,A laboratories. The costs include salary, travel, equipment, and general support of civilian management personnel and their administrative support staffs. The work in this program element is consistent with the resource constrained Army Technology Base Master Plan, 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 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 1991 Accomplishments:

- (U) Evaluated osteogenic and growth factors on bone cell growth in vivo and in vitro
- (U) Determined the critical size defect in the mandible of the non-human primate
- (U) Developed multiphase system for repairing bone discontinuities in the skull

(U) FY 1992 Planned Program:

- (U) Support antibiotics microencapsulation experiment in space and return the package to earth
- (U) Continue longitudinal histologic study of intraosseous critical size defects in laboratory models
- (U) Develop a biodegradable hemostatic agent for osseous wounds
- (U) Construct hardware and design follow-up experiment for U.S. Space Shuttle Experiment (microencapsulation experiment, USAIDR 801)
- (U) Evaluate macrobeads of encapsulated tobramycin and cephamandole for efficacy in preventing soft tissue infections

(U) FY 1993 Planned Program:

- (U) These medical resources transferred to OSD, Health Affairs, effective FY 1993.

(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.

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Program Element: #0602787A
PE Title: **Medical Technology** Budget Activity: **#1**

(U) FY 1991 Accomplishments:

- (U) Established laboratories in the Theater of Operations for Operation Desert Storm (ODS), which documented the cause of early outbreaks of diarrheal disease and influenced the selection of appropriate chemotherapy improving troop readiness.
- (U) Invented and patented a powerful new method of expressing genes without cloning, which will permit rapid and reliable analysis of variant malaria parasite genes.
- (U) Constructed recombinant prokaryotic and eukaryotic protein expression systems for the production of malarial circumsporozoite and merozoite antigens, providing new methods to produce subunit vaccines against virulent malaria parasites.
- (U) Discovered that multiple drug resistant isolates of falciparum malaria are very susceptible to the 8-aminoquinoline class of drugs, providing a new strategy for the protection and treatment of U.S. forces against falciparum malaria.
- (U) Demonstrated the sensitivity and specificity of a diagnostic system, based upon the polymerase chain reaction method, for the dengue viruses, the most important mosquitoborne viral disease in terms of human morbidity and mortality in the tropics.
- (U) Designed and evaluated live recombinant vectors of the major protective surface antigen of Rickettsia prowazekii for use as inexpensive and possibly effective vaccines.
- (U) Demonstrated the safety of six dengue virus candidate vaccines in preclinical studies in preparation for future advanced development testing.

(U) FY 1992 Planned Program:

- (U) Continue to evaluate potential immunogens for enhancing protection of US forces against militarily significant infectious diseases.
- (U) Continue studies to evaluate technologies aimed at reversing drug resistance to parasitic diseases.
- (U) Continue evaluation of new antiparasitic drugs for countering drug resistent parasitic agents.
- (U) Develop infection models for hepatitis C and E viruses for the development and evaluation of medical countermeasures against these causes of debilitating hepatitis.
- (U) Determine the ability of purified dengue virus proteins expressed in baculovirus systems to protect against lethal challenge.
- (U) Initiate studies leading to the development of medical countermeasures against viruses that may cause high morbidity and mortality and are transmitted by mosquitoes or aerosols.

(U) FY 1993 Planned Program:

- (U) These medical resources transferred to OSD, Health Affairs, effective FY 1993.

(U) Project A871 - Medical Biological Defense - Exploratory Development: This project funds exploratory research on the development of vaccines and drugs to provide an effective medical defense against validated biological threat agents including bacteria, toxins, 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 agents.

(U) FY 1991 Accomplishments:

- (U) Terminated the Antiviral Drug Development Program and redirected resources to higher priority efforts

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Program Element: **#0602787A**
PE Title: **Medical Technology** Budget Activity: **#1**

- (U) Terminated exploratory studies on aerosol-transmissible, vector- and rodent-borne viral diseases which do not appear on the Armed Forces Medical Intelligence Center (AFMIC) validated threat list.
- (U) Identified monoclonal antibodies to be used in rapid diagnostic kits for identification of anthrax lethal toxin in support of ODS.
- (U) Evaluated immune response of U.S. forces to selected immunizations received during ODS Collected data contributed significantly to formulation of medical doctrine for ODS
- (U) Discovered a cell-surface protein which appears to be a receptor for the anthrax toxin. Confirmation of this finding and eventual isolation of the protein will open up entirely new ways to protect, diagnose and treat troops exposed to anthrax
- (U) Determined that antibiotic treatment of unvaccinated laboratory models within 24 hours after aerosol exposure to anthrax is protective, and that post-exposure treatment of inhalation anthrax with antibiotics plus vaccination will protect against a second exposure. These findings will be useful in formulating medical doctrine for therapy following an aerosol exposure disseminated by an adversary.
- (U) Determined, in experimental models, that chemically-modified and genetically engineered anthrax vaccine candidates and new adjuvant systems were less reactogenic and more efficacious than the current human vaccine.
- (U) Produced monoclonal antibody to the F1 capsular antigen of Yersinia pestis (plague) for use in assays to identify F1 antigen in sera.
- (U) Completed the first phase of a study designed to evaluate immunological protection by a microsphere encapsulated toxoid against respiratory challenge with staphylococcal enterotoxin B.
- (U) Demonstrated, in a model system, the efficacy of human and equine botulinum antitoxins in preventing and reversing the effects of lethal doses of inhaled botulinum toxin, serotype A.
- (U) Demonstrated that oxygen therapy following exposure to saxitoxin (marine dinoflagellate biotoxin) must be administered very rapidly following the onset of toxic symptoms.
- (U) Demonstrated, using a laboratory model, complete protection against ricin (potent toxin from castor bean seeds) aerosol exposure by vaccination with sublethal doses of toxin plus adjuvant.
- (U) Demonstrated, in laboratory models, that cross-protection to lethal Junin (Argentine Hemorrhagic fever) virus exposure via aerosol could be conferred by an attenuated, related arenavirus as well as by the Junin vaccine (Candid 1), and confirmed the critical role of cell-mediated immunity in protection from arenavirus infection.
- (U) Identified four major chemical classes of compounds with broad spectrum antiviral activity. Developed a ribonucleic acid polymerase assay based on a particulate fraction of infected cells, thus enhancing the search for molecular antiviral inhibitors.

(U) **FY 1992 Planned Program:**

- (U) Continue exploratory research on classical (bacterial and rickettsial) biological agents leading to the development of vaccines and drugs for an effective medical defense.
- (U) Continue to provide exploratory research for the development of vaccines and drugs for an effective medical defense against protein toxins.
- (U) Continue to provide exploratory research for the development of medical countermeasures against validated viral agents disseminated by an adversary.

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Program Element: #0602787A
PE Title: Medical Technology
Budget Activity: #1

- (U) Continue to provide exploratory research for the development of vaccines and drugs for an effective medical defense against neuroactive compounds.
- (U) Continue to conduct exploratory research leading to the development of technology for the rapid diagnosis and identification of validated threat agents in military and clinical settings.

(U) FY 1993 Planned Program:
- (U) These medical resources transferred to OSD, Health Affairs, effective FY 1993.

(U) Project A872 - Neurofibromatosis Research: This project is a Congressionally directed grant for neurofibromatosis research.

(U) FY 1991 Accomplishments:
- (U) This project did not exist in FY 1991.

(U) FY 1992 Planned Program:
- (U) Provide for the enhancement of the prevention, detection, diagnosis, treatment and rehabilitation of neurofibromatosis, a genetic disorder.

(U) FY 1993 Planned Program:
- (U) These medical resources transferred to OSD, Health Affairs, effective FY93. requiring high biological containment.

(U) Project A873 - 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 questions affecting manning, mobilization and deployment.

(U) FY 1991 Accomplishments:
- (U) This project did not exist in FY 1991.

(U) FY 1992 Planned Program:
- (U) Conduct exploratory evaluation of promising prophylactic and immunotherapeutic vaccines.

(U) FY 1993 Planned Program:
- (U) These medical resources transferred to OSD, Health Affairs, effective FY 1993.

(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 the investigation of weapons-induced trauma and burns. and shock due to blood loss. It also funds technologies for blood substitutes and blood preservation.

(U) FY 1991 Accomplishments:
- (U) Evaluated cultivated keratinocytes as epithelial autografts for the closure of burn wounds

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Program Element: #0602787A
PE Title: Medical Technology Budget Activity: #1

- (U) Performed a complete serological and immunological profile study on 45 patients to correlate endotoxin with organ failure
- (U) Reformulated the post thaw red blood cell storage solution
- (U) Developed an animal model to evaluate response to combined injury

(U) FY 1992 Planned Program:
- (U) Initiate studies of the changes in the permeability of the brain during injury
- (U) Initiate studies that involve innovative therapies such as lazeroids
- (U) Develop improved methods of preventing and treating hypertrophic scar formation in thermally injured patients

(U) FY 1993 Planned Program:
- (U) These medical resources transferred to OSD, Health Affairs, effective FY 1993.

(U) Project A875 - Medical Chemical Defense - Exploratory Development: This exploratory development 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 1991 Accomplishments:
- (U) Synthesized and examined several promising compounds that may be effective for treating cell injury due to vesicant agents
- (U) Designed and synthesized compounds with potential use as pretreatment scavengers against sulfur mustard
- (U) Demonstrated the role of inflammatory mediators in injury produced by threat respiratory agents
- (U) Developed improved methods for the detection and quantification of chemical warfare agents in nerve tissue and skin samples
- (U) Expanded studies for new nerve agent treatment compounds having both antidotal and anticonvulsant properties
- (U) Through advanced biotechnology produced monoclonal antibodies as candidates to protect against nerve agent poisoning

(U) FY 1992 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 effort to incorporate a reactive decontaminant component to an effective topical skin protectant
- (U) Continue to provide information to support doctrine for the medical management of chemical casualties thus enhancing survival and maximizing return to duty

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0602787A**
PE Title: **Medical Technology** Budget Activity: **#1**

(U) FY 1993 Planned Program:
- (U) These medical resources transferred to OSD, Health Affairs, effective FY 1993.

(U) Project D878 - Health Hazards of Military Materiel: The objective of this project is to sustain 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, vibration and impacts associated with the operation of combat vehicles, helicopters and other systems; blast over pressure and impulse noise generated by weapons systems; toxic hazards from combustion products and exposure to chemical compounds; directed energy sources (laser and microwave); and environmental stress imposed by operating in protective clothing and/or equipment.

(U) FY 1991 Accomplishments:
- (U) Established a toxicological data base to support health hazard assessment of liquid gun propellant
- (U) Demonstrated reduced eye injury from laser radiation by pretreatment induction of heat shock proteins
- (U) Published an occupational exposure standard for non-auditory injury from blast overpressure
- (U) Established new impulse noise exposure criteria for crews of towed artillery systems that enhance weapons systems performance with minimal risk to operators
- (U) Developed a real-time hydrogen chloride monitor for monitoring personnel exposure to rocket propellant combustion products

(U) FY 1992 Planned Program:
- (U) Determine new auditory exposure limits for mortars fired under free-field conditions
- (U) Determine sub-nanosecond laser injury thresholds to support development of laser safety design criteria
- (U) Improve heat strain tolerance curves to support development of improved doctrine for warfighting in hot environments
- (U) Describe chest wall motion resulting from exposure to free-field blast overpressure in order to support development of improved design criteria for artillery systems
- (U) Initiate toxicological studies to evaluate the health hazards of new unicharge solid propellants

(U) FY 1993 Planned Program:
- (U) These medical resources transferred to OSD, Health Affairs, effective FY 1993.

(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; environmental stresses, 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.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0602787A
PE Title: Medical Technolog, Budget Activity: #1

(U) FY 1991 Accomplishments:

- (U) Distributed a pocket guide for work/rest cycles and drinking water requirements during ODS entitled "Sustaining Health and Performance in the Desert" that contributed significantly to the unprecedented low incidence of heat illness and dehydration
- (U) Assisted in the evaluation of morale and stress factors affecting soldier performance during ODS
- (U) Critically evaluated the use of contact lenses in Army pilots during ODS combat operations
- (U) Evaluated the impact of shower frequency on the maintenance of troop health under field conditions
- (U) Identified the relationship of sleep and nutritional factors to physiological and cognitive indices of combat
- (U) Evaluated visual acuity with night vision goggles for various targets and night sky conditions
- (U) Determined that as a countermeasure against acute mountain sickness, carbohydrate supplementation at high altitude is best accomplished via a beverage component

(U) FY 1992 Planned Program:

- (U) Develop methodology and criteria for assessing pilot performance using the new integrated helmet and electro-optics display designs for the Apache and Comanche helicopters
- (U) Provide techniques for reducing degradation of decision-making and performance resulting from sleep loss
- (U) Evaluate the nutritional, immunological, and physiological status of a Ranger School training class in order to identify the causes of illness and injury during training
- (U) Document the incidence and risk factors for training-related injuries so that the number of such injuries can be reduced
- (U) Determine the effectiveness of nutritional health and performance promotion materials at the USMC Officer Candidate School in improving eating habits
- (U) Expand the scope of nutritional neuroscience research to apply the results of pre-clinical studies to human trials

(U) FY 1993 Planned Program:

- (U) These medical resources transferred to OSD, Health Affairs, effective FY 1993.

(U) Work Performed By:

A825 - Institute of Dental Research, 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; Sloan Kettering Institute, New York, NY; University of Miami, Miami, FL; Gorgas Memorial Institute of Tropical Medicine and Preventive Medicine, Inc., Rockville, MD; and Franklin Research Center, Philadelphia, PA.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0602787A**
PE Title: **Medical Technology** Budget Activity: **#1**

A871 - The U.S. Army Medical Research Institute of Infectious Diseases, the Walter Reed Army Institute of Research, the U.S. Army Medical Research Institute for Chemical Defense, and the U.S. Army Aeromedical Research Laboratory perform research in-house. The remainder is performed by extramural non-profit organizations, of universities, and industries. The major contractors are the University of Miami, Miami, FL; State University of New York, Albany, NY; Southern Research Institute, Birmingham, AL; Scripps Clinic and Research Foundation, La Jolla, CA; and the University of South Carolina, Columbia, SC.

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 Biomedical Research and Development Laboratory, 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; U.S. Army Biomedical Research and Development Laboratory, Ft. Detrick, MD; U.S. Army Aeromedical Research Laboratory, Ft. Rucker AL; Letterman Army Institute of Research, San Francisco, CA; and the Walter Reed Army Institute of Research, Washington, DC. The top five contractors are: EG&G Mason Research Institute, Worcester, MA; ERCI 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, Ft. 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 Research 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)

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

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0602787A**
PE Title: **Medical Technology** Budget Activity: **#1**

Development Command. This effort is coordinated annually, or more frequently as required, with Department of Defense, Director for Research and Engineering (Research and Advanced Technology); 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 as appropriate.

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0602789A**
PE Title: **Army Artificial Intelligence Technology** Budget Activity: **#1**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
A880 Army Artificial Intelligence Technology	0	2874	3301	Cont	Cont
PE TOTAL	0	2874	3301		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This effort was funded by the Operation and Maintenance, Army (OMA) Appropriation in FY 1990 and FY 1991. It transferred to the RDTE, Army appropriation in FY 1992. The Artificial Intelligence (AI) Exploratory Research program is an Army-wide effort, which uses AI technology to achieve the strategic advantage needed to maintain the Army's world-wide mission. The three fold purpose of the program is to: (1) develop/apply AI technology to solve large scale, highly complex management problems, (2) investigate AI technology for use Army-wide (policy, personnel training and management, and applications development), and (3) transfer technology to the Army through exploratory and advanced development research efforts. In addition, the program seeks to identify high potential, but embryonic AI methodologies and mature them for high payoff applications through targeted technology demonstration projects and the development of working prototypes. This program has established a number of sophisticated AI cells (Knowledge Engineering Groups (KEGs)) focusing on the integration and application of AI technologies to problems in functional communities such as command and control, management, force integration, logistics, modeling, intelligence, resource management, test and evaluation, training, and medical. Focus for this technology base 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. Although not originally a RDTE,A (P6) program, the AI exploratory Research program has established a solid foundation that will enable the Army to centrally manage and prevent duplication of effort in the Artificial Intelligence research and development arena. The work in this program element is consistent with the resource constrained Army Technology Base Master Plan, and the Science and Technology Objectives (STOs) therein.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project A880 - Army Artificial Intelligence Technology

(U) **FY 1991 Accomplishments:** Project funded in the Operation and Maintenance, Army appropriation at $1.709M. Transfers to the Research, Development, Test and Evaluation, Army appropriation in FY 1992.

(U) **FY 1992 Planned Program:**

- (U) Investigate Expert System support of installation management functions

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0602789A**
PE Title: **Army Artificial Intelligence Technology** Budget Activity: **#1**

- (U) Continue support to U.S. Army Combined Arms Center (CAC) and U.S. Army Communication-Electronics Command (CECOM) on the Army AirLand Battle Management Advanced Technology Transition Demonstration program
- (U) Demonstrate intelligent force generation and control
- (U) Investigate use of Neural Networks in analysis and classification of large volumes of textual data
- (U) Maintain momentum in autonomous platform control systems via simulation network (SIMNET) and other systems that are candidates for "embedded" AI applications
- (U) Support development of American National Standards Institute (ANSI)/Institute of Electronic and Electrical Engineers (IEEE)/Military Standard (MIL STD) standards for Expert Systems and other AI technologies

(U) FY 1993 Planned Program:

- (U) Continue investigation of Expert System support to installation management functions
- (U) Continue support to CAC and CECOM on the Army AirLand Battle Management Advanced Technology Transition Demonstration program
- (U) Continue development of intelligent force generation and control
- (U) Demonstrate use of Neural Networks in analysis and classification of large volumes of textual data

(U) Work Performed By: In house efforts 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. Research efforts will be supplemented by contract support by 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 Aggreements on Training Systems and Medical with oversight and coordination provided by the Joint Directors of Laboratories. Work in this Program Element contains no unwarranted duplication of effort among the Military Departments.

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

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603001A**
PE Title: **Logistics Advanced Technology** Budget Activity: **#2**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D150	Fuels & Lubricants				
	2511	2807*	2799	Cont	Cont
D242	Airdrop Equipment				
	1540	1585	1729	Cont	Cont
D543	Ammunition Logistics				
	3632	3433	3962	Cont	Cont
D594	Metrology and Calibration				
	972	657	653	Cont	Cont
DC07	Joint Service Food Technology Demonstrations				
	- 0 -	502	494	Cont	Cont
DC44	Tactical Logistics				
	- 0 -	502	494	Cont	Cont
DJ28	Test Measurement Technology Development				
	- 0 -	1003	911	Cont	Cont
DXXA	Soldier Survivability				
	- 0 -	- 0 -	247	Cont	Cont
PE TOTAL	8655	10489	11289		

* Supplemental appropriation funds for Operation Desert Storm (ODS) in the amount of $34K are included.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program supports development of technology and materiel essential to support and sustain wartime operations and peacetime readiness both strategically and tactically. This program funds projects outside of weapon system developments. 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 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 program supports the DOD in development of all petroleum, oil, and lubricants (POL) for ground vehicles and equipment and Army helicopters. 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. 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). The Test Measurement Technology (Diagnostics/Prognostics) program will reduce operation and support (O&S) costs of weapon systems by increasing the capability to rapidly diagnose and predict failures and by making automatic testing programming faster and more efficient through the use of expert system methodology. Ammunition Logistics

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603001A**
PE Title: **Logistics Advanced Technology** Budget Activity: **#2**

supports weapon system rearm, ammunition management and accountability, and explosive ordnance disposal. This Program Element (PE) also contains three new projects which are the result of program restructurings in other non-system advanced development and exploratory development PEs as follows: DXXA, Soldier Survivability, is funded in FY1990-1992 in PE #0603002A, Project D995. The project will continue to demonstrate integrated protective equipment for the individual soldier as the result of advanced technology applications. Project DC07, Joint Service Food Technology Demonstrations, was previously funded in PE #0602786A, Project AH99. This project will continue to demonstrate food service systems and food products, processing, preservation, and serving equipment resulting from technology programs approved by the Services and the Defense Logistics Agency. Project DC44, Tactical Logistics, was previously funded in PE #0603102A, Project DJ01. This project will continue to demonstrate applications of technology for Logistics-Over-the-Shore (LOTS), tactical electric power, and materials handling equipment. The work in this program element is consistent with the resource constrained Army Technology Base Master Plan and the Science and Technology Objectives (STOs).

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.

(U) FY 1991 Accomplishments:

- (U) Completed assessment on analytical methods for consideration in Lubricant Quality Analysis System (LQAS)
- (U) Completed correlation of near infrared measurements with combustion apparatus for predicting cetane quality
- (U) Developed method for assessing lubrication qualities of low viscosity fuels when used in diesel engines
- (U) Completed JP-8 demonstration program and quantified power loss in power limiting engine systems

(U) FY 1992 Planned Program:

- (U) Complete data collection on fuel consumption, parts replacements, and engine wear reduction showing acceptability of JP-8 as a cost effective ground fuel
- (U) Complete full scale engine testing of high-temperature engine lubricants in low-heat rejection engines
- (U) Complete full-scale rig testing of a non-flammable hydraulic fluid
- (U) Complete fabrication of a demonstrator Fuel Cetane Quality Monitor (FCQM)

(U) FY 1993 Planned Program:

- (U) Complete field evaluation using demonstrator FCQM
- (U) Complete data base of lubricant composition versus performance for use with oil quality monitor
- (U) Complete operational testing of non-flammable hydraulic fluid in armored vehicle simulator

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0603001A
PE Title: **Logistics Advanced Technology** Budget Activity: #2

- (U) Complete remaining engine/transmission testing of high-temperature engine oils for low-heat rejection engines

(U) Project D242 - Airdrop Equipment: The Airdrop Equipment program focuses on development of airdrop techniques and equipment which will exploit the enhanced cargo and personnel delivery capabilities (300 feet at 250 knots) of the new and developmental cargo aircraft. These efforts will demonstrate capabilities for airdropping 2200 pound supply containers, heavy equipment weighing up to 60,000 pounds, and assault forces from lower altitudes and at higher speeds, significantly improving the survivability of aircraft, crew, and airborne personnel, as well as increasing the probability that the equipment being delivered will land in a usable condition. Future requirements will necessitate the development of advanced parachute designs coupled with innovative aircraft exit techniques enabling deployment of large numbers of troops in a very short time.

(U) FY 1991 Accomplishments:
- (U) Fabricated components and successfully conducted feasibility tests of Advanced Personnel Recovery System candidates
- (U) Initiated join. venture with National Aeronautics and Space Administration (NASA) to leverage the shuttle Booster Rocket Advanced System program for precision guided, soft landing of large payloads
- (U) Completed concept formulation and began trade-off studies on the Next Generation 1-ton Supply Container Delivery System

(U) FY 1992 Planned Program:
- (U) Initiate concept designs for the 250 knot, 300-500 foot High Speed Mass Assault Personnel Airdrop System to exploit enhanced capabilities of new and developmental aircraft
- (U) Complete technical demonstration of the Advanced Personnel Recovery System and transition to engineering and manufacturing development
- (U) Fabricate components for the Next Generation 1-ton Supply Container Delivery System
- (U) Conduct technical demonstration of full-scale parafoil as part of the joint venture with NASA on the Advanced Recovery System program

(U) FY 1993 Planned Program:
- (U) Conduct technical demonstration of the Next Generation 1-ton Supply Container Delivery System and transition program to engineering and manufacturing development
- (U) Perform preliminary conceptual design of High Speed Mass Assault Airdrop System and begin prototype fabrication of components
- (U) Transition Advanced Recovery System technology to engineering and manufacturing development

(U) Project D543 - Ammunition Logistics: Ammunition Logistics satisfies a critical need for an improved system to sustain and support operations and peacetime readiness for both strategic and tactical scenarios. It will improve weapon system rearm for Artillery, Armor, Air Defense, Aviation, and Infantry, as well as enhance Explosive Safety, Combat Service Support/Sustainability, Command,

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603001A**
PE Title: **Logistics Advanced Technology** Budget Activity: **#2**

Control, Communications, and Computers (C4) for Ammunition Management. It also exploits emerging technologies and productivity enhancers aimed at quantum improvements in the global logistics system.

(U) FY 1991 Accomplishments:

- (U) Completed safety certification testing and user demonstration of Artillery Rearm Module (ARM) and transitioned to the Future Armored Resupply Vehicle-Ammunition (FARV-A) program
- (U) Developed Modular Aviation Rearm/Resupply System (MARRS) concept
- (U) Awarded contract for Standard Army Ammunition System--Ammunition Transfer Point (SAAS-ATP) management information system and initiated development of system architecture and software
- (U) Completed fabrication of FARS module components
- (U) Fabricated Explosive Ordnance Disposal (EOD) laser tool prototype and conducted an engineering evaluation
- (U) Completed fabrication of selected Combat Vehicle Armament Technology (COMBAT) Telescoped Ammunition Supply System (CTASS) components
- (U) Completed fabrication and engineering testing of prototype Generic Design Missile Container (GDMCs) for Stinger and Air Defense Anti-Tank System (ADATS) missiles

(U) FY 1992 Planned Program:

- (U) Select concept for an improved Artillery Rearm Module (ARM II) and initiate design and fabrication of prototype
- (U) Complete development of MARRS concept
- (U) Complete system architecture development and integration for the SAAS-ATP management information system prototype
- (U) Complete Future Armor Rearm System (FARS) testing and system technical demonstration with an advanced tank cannon
- (U) Initiate development of a teleoperated system for the Small Emplacement Excavator (SEE) to provide a remote operation capability for EOD personnel
- (U) Fabricate improved GDMC and conduct user test and evaluation at Fort Bliss, Texas

(U) FY 1993 Planned Program:

- (U) Complete fabrication and engineering of ARM II
- (U) Initiate rearm concept design for the Apache and Comanche advanced turret weapons
- (U) Demonstrate MARRS material handling equipment prototypes
- (U) Complete software development and field ammunition environment user test/technical demonstration of the SAAP-ATP prototype
- (U) Evaluate FARS technology demonstration results and publish final report
- (U) Complete prototype development of EOD teleoperated system and conduct user test
- (U) Finalize GDMC technical data package and transition to the Program Manager for Line of Sight Forward Heavy helicopters

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Program Element: **#0603001A**
PE Title: **Logistics Advanced Technology** Budget Activity: **#2**

(U) Project D594 - Metrology and Calibration: The purpose of this project is to develop essential calibration systems for Army test, measurement, and diagnostic equipment (TMDE). Calibration hardware is required to adjust, maintain, and repair TMDE. New, high technology weapon systems and future systems apply technologies which cannot be supported without metrology and calibration improvements. This project supports field Army, area calibration and repair centers, Army test ranges, proving grounds, research and development centers, and the Army Primary Standards Laboratory (APSL). At the direction of the Joint Logistics Commanders, this work is closely coordinated with the other services. Areas of special concern, where calibration support is inadequate or nonexistent include millimeter/microwave, electronics, photonics, and physical technologies which are heavily applied to weapon systems. Systems benefiting include Single Channel Objective Tactical Terminal (SCOTT), Sense and Destroy Armor (SADARM), Multiple Launch Rocket System-Terminally Guided Warhead (MLRS-TGW), Fiber Optic Guided-Missile (FOG-M), Intermediate Forward Test Equipment (IFTE), and others.

(U) FY 1991 Accomplishments:
- (U) Demonstrated a revolutionary dynamic pressure measurement system at the National Institute of Standards and Technology (NIST) for use in measuring gun tube blast pressures
- (U) Extended capability of 1-2 micron photonics detector standard for scene generation for infrared devices
- (U) Completed Automatic Test Equipment (ATE) calibration support study

(U) FY 1992 Planned Program:
- (U) Complete in-house development of an anechoic chamber to calibrate millimeter and microwave devices
- (U) Validate performance of NIST dynamic pressure measurement system
- (U) Demonstrate prototype quantitative standards for chemical/biological (CB) protective mask leak testing

(U) FY 1993 Planned Program:
- (U) Develop standards/methodology for microwave/millimeterwave field intensity antennas/sensors using the anechoic chamber
- (U) Demonstrate dynamic pressure measurement in a benchmark system
- (U) Validate CB protective mask leak test standards on Army equipment

(U) Project DC07 - Joint Service Food Technology Demonstration: 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 work and the associated funds were transferred from PE #0602786A, Project AH99 to more appropriately align the work with the nature of work being performed. This project is not a new start. 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.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603001A**
PE Title: **Logistics Advanced Technology** Budget Activity: **#2**

(U) FY 1991 Accomplishments: Not applicable.

(U) FY 1992 Planned Program:
- (U) Demonstrate food service plastic waste management systems on Navy ships meeting the Public Law and International Agreement deadline of 1992 for the elimination of plastic waste disposal at sea
- (U) Demonstrate an individual ration with integrated self-heating capability and familiar, tray type construction, providing enhanced soldier acceptance and consumption, insuring that all troops receive hot meals
- (U) Complete refinement/demonstration of a low saturated fat component of reconstituted milk product to improve dietary intake

(U) FY 1993 Planned Program:
- (U) Demonstrate methods to quickly monitor chemical or microbial changes in foods to enable Army inspection personnel to determine ration wholesomeness/serviceability in the field
- (U) Conduct demonstration of a simultaneously processed thermostabilized meal tray providing a familiar high quality individual shelf stable meal reducing processing/logistics cost and battlefield waste
- (U) Prepare for large scale production of Self-Heating Individual Meal Module, and Modular Assault Rations for scaled-up technical demonstration and conduct initial demonstration of Self Heating Group Module

(U) Project DC44 - Tactical Logistics: The Tactical Logistics program was previously funded in PE #0603102, Project DJ01. This project is not a new start. It 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 1991 Planned Program: Not Applicable.

(U) FY 1992 Planned Program:
- (U) Initiate testing of the advanced High Sea State Container Transfer System (HISEACOTS) technology demonstrator

(U) FY 1993 Planned Program:
- (U) Continue testing of the advanced HISEACOTS technology demonstrator

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603001A**
PE Title: **Logistics Advanced Technology** Budget Activity: **#2**

(U) Project DJ28 - Test Measurements Technology Development: Efforts are to demonstrate technology for increases to Army weapons systems' reliability and mission availability by improving the speed, accuracy and reliability of the weapon failure diagnosis as well as failure prediction. This project exploits technologies such as expert systems, micromachining, board Built-In Test (BIT), and Millimeter Microwave Integrated Circuit (MMIC). Demonstration of new test techniques, where required, utilize Army-wide technology expertise.

(U) FY 1991 Planned Program: Not applicable.

(U) FY 1992 Planned Program:

- (U) Initiate development of an Infrared Complementary Metal Oxide Semiconductor (IR CMOS) scene generator for low-cost, built-in calibration of infrared devices
- (U) Demonstrate concurrent engineering tool set on weapon systems for a built-in diagnostic capability with known confidence levels
- (U) Initiate development of MMIC built-in test methodology for self diagnostics

(U) FY 1993 Planned Program:

- (U) Demonstrate a 32 bit by 32 bit array scene generator CMOS device to attain adequate resolution for imagery of infrared devices' performance characteristics
- (U) Integrate diagnostic software into the Support Soldier System to reduce manpower requirements and to facilitate equipment repair
- (U) Demonstrate MMIC brassboard with BIT

(U) Project DXXA - Soldier Survivability: The Soldier Survivability project, an FY 1990-1992 Advanced Technology Transition Demonstration (ATTD) in PE #0603002A, Project D995, was restructured in this project in FY 1993. It addresses the critical Army need to enhance the performance, protection, and sustainment of the combat vehicle crewman. The program exploits emerging technologies to provide soldiers with high technology operational capabilities and protective systems. 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 1991 Accomplishments: Not applicable.

(U) FY 1992 Planned Program: Not applicable.

(U) FY 1993 Planned Program:

- (U) Define design/performance criteria for the modular head-to-toe individual fighting system components required for the crew Soldier Integrated Protective Emsemble (SIPE) Advanced Technology Transition Demonstration (ATTD)

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603001A**
PE Title: **Logistics Advanced Technology** Budget Activity: **#2**

(U) **Work Performed By:** In-house efforts will be accomplished by Belvoir Research Development and Engineering Center, Ft. Belvoir, VA; Project Manager Ammunition Logistics, Picatinny Arsenal, NJ; Communications Electronics Command, Fort Monmouth, NJ; Tank Automotive Command, Warren, MI; Electronic Technology and Devices Lab, Ft. Monmouth, NJ; Test Measurement Diagnostic Equipment Support Group, Huntsville, AL; Armament Research Development and Engineering Center, Picatinny Arsenal, NJ; Project Manager Test Measurement Diagnostic Equipment, Ft. Monmouth, NJ; Materials Technology Lab, Watertown, MA; Human Engineering Lab. Aberdeen, MD; Ballistics Research Lab, 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. Major contractors are 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, PA; 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 & Lubes with oversight and coordination provided by the Joint Directors of Laboratories. Work in this Program Element . related to and fully coordinated with efforts in PE #0602786A 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.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603002A**
PE Title: **Medical Advanced Technology** Budget Activity: **#2**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D804	Prostate Cancer Research				
	0	2000	0	0	2000
D805	Laser Burn Treatment				
	0	1000	0	0	1000
D806	Breast Cancer Research				
	0	25000	0	0	25000
D807	Industrial Base/Medical Biological Defense Vaccines and Drugs				
	16157	11086*	0	Cont	Cont
D810	Industrial Base/Infectious Disease Vaccines and Drugs				
	8911	2398	0	Cont	Cont
D819	Field Medical Protection and Human Performance Enhancement - Non-Systems Advanced Development				
	2001	3262	0	Cont	Cont
D840	Combat Injury Management				
	2050	2686	0	Cont	Cont
D995	Medical Chemical Defense Life Support Materiel - Non-Systems Specific Advanced Development				
	18164	8030	0	Cont	Cont
PE TOTAL	47283	55462	0 **		

* Supplemental appropriation funds for Operation Desert Storm (ODS) in the amount of $817k are included.
** These funds transferred to OSD, Health Affairs, effective FY 1993

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 Technology Base Master Plan, Science and Technology Objectives (STOs) milestones for the Army's key emerging technologies and Army force modernization plans.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603002A**
PE 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 Walter Reed Army Institute of Research.

(U) FY 1991 Accomplishments:
- (U) This project did not exist in FY 1991.

(U) FY 1992 Planned Program:
- (U) Establish a prostate disease center at Walter Reed Army Institute of Research.

(U) FY 1993 Planned Program
- (U) These medical resources transferred to OSD, Health Affairs, effective FY 1993.

(U) Project D805 - Laser Burn Research: By Congressional direction, the purpose of this project is to support advanced laser burn treatment diagnostics and therapeutic research.

(U) FY 1991 Accomplishments:
- (U) This project did not exist in FY 1991.

(U) FY 1992 Planned Program:
- (U) Conduct studies on advanced laser burn treatment diagnostics and therapeutic research.

(U) FY 1993 Planned Program
- (U) These medical resources transferred to OSD, Health Affairs, effective FY 1993.

(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 1991 Accomplishments:
- (U) This project did not exist in FY 1991.

(U) FY 1992 Planned Program:
- (U) Conduct research on the detection, diagnosis and treatment (to include rehabilitation) of breast cancer with special emphasis on military health care beneficiaries.

(U) FY 1993 Planned Program
- (U) These medical resources transferred to OSD, Health Affairs, effective FY 1993.

(U) Project D807 - Industrial Base/Medical Biological Defense Vaccines and Drugs: - Industrial Base/Medical Biological Defense Vaccines and Drugs: Research conducted in this project focuses on preclinical development of safe and effective prophylactic and/or post-exposure therapy for soldiers exposed to biological agents or their products (toxins) as a direct result of adversarial attack and/or naturally occurring infectious diseases Protection against biological agents during Operation Desert

Storm (ODS) was of utmost concern. The ability to rapidly identify and/or to diagnose exposure to biological agents in clinical samples is critical. To complete the defensive effort, a broad range of technologies involved in the targeting and delivery of prophylactic and therapeutic medical countermeasures are evaluated.

(U) FY 1991 Accomplishments:

- (U) Terminated the Antiviral Drug Development Program and preclinical studies on aerosol-transmissible, vector-and rodent-borne viral diseases that do not appear on the Armed Forces Medical Intelligence Center (AFMIC) validated threat list. Redirected resources to higher priority tasks within this project.
- (U) Developed and standardized investigational immunoassay procedures (antigen capture, Immunoglobulin M and G assays) for bacterial and viral agents of BW or geographic importance for use in field laboratories during ODS.
- (U) Successfully hyperimmunized equines against botulinum toxin, serotypes A,B,E, and F in nine weeks and collected plasma for the production of Equine F(ab')$_2$ botulinum antitoxin for use as passive protection/treatment of U.S. forces during ODS
- (U) Designed a polymerase chain reaction (PCR) to identify tularemia bacterial agent in blood.
- (U) Used PCR to detect as few as two bacterial spores of Bacillus anthracis, demonstrating the high sensitivity of the test.
- (U) Demonstrated a novel method to measure humoral immune response to anthrax vaccine.
- (U) Purified a major surface protein (PI) of an infectious Coxiella burnetii (Q fever) strain. The P1 protein was more effective than the phase I lipopolysaccharide in reducing rickettsial burden in laboratory models challenged by injection or aerosol.
- (U) Initiated an investigation to develop improved immunoassay procedures for the identification of staphylococcal enterotoxin B in clinical specimens.
- (U) Determined that antibodies induced by live or killed Venezuelan Equine Encephalitis (VEE) vaccines are of the same isotypes found after natural infection, suggesting equivalent functions in protection from infection.
- (U) Identified 103 compounds with antiviral activity using a new high volume screening approach.
- (U) Demonstrated that the infectious clone-derived VEE vaccine was efficacious in horses and had low reactogenicity.
- (U) Synthesized a six amino acid peptide intermediate of microcystin (biotoxin from freshwater algae), which will ultimately lead to compounds with prophylactic or therapeutic value.
- (U) Developed two new competitive inhibition enzyme immunoassays for identification and diagnosis of palytoxin.
- (U) Determined doses of serotonin antagonists required to block the disrupting effects of specific serotonin receptor subtype agonists on cognitive performance, laying the groundwork for the future development of antidotes for serotonin-related physiologically active compound (PAC) threats.

(U) FY 1992 Planned Program:

- (U) Continue to conduct studies leading to the preclinical development of vaccines to protect U.S Forces against classical biological agents.
- (U) Continue to conduct non-systems advanced development of safe and effective broad spectrum prophylactic regimes and post exposure therapy for soldiers exposed to protein toxins.

- (U) Continue to conduct studies leading to preclinical development of vaccines effective against validated viral threat agents.
- (U) Continue to conduct non-systems advanced development of safe and effective broad spectrum prophylactic regimes and post exposure therapy for soldiers exposed to neuroactive compounds.
- (U) Continue to produce and evaluate prototypes of identification/diagnosis products which are effective in identifying a broad spectrum of biological threat agents in the field environment.

(U) FY 1993 Planned Program:

- (U) These medical resources transferred to OSD, Health Affairs, effective FY 1993.

(U) Project D810 - Industrial Base/Infectious Disease Vaccines and Drugs: This project funds pre-clinical 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: malaria, diarrheal diseases, meningitis, infectious hepatitis, dengue fever, typhus fevers, and leishmaniasis.

(U) FY 1991 Planned Program:

- (U) Achieved long term (9 months) protection by oral immunization of rabbits with avirulent Campylobacter strains
- (U) Demonstrated that a kit using monoclonal antibody is sensitive and specific for identifying malaria sporozoites in mosquitoes.
- (U) Determined the essential pharmacokinetic and metabolic profile of anti-malarial drug WR 238,605
- (U) Determined the need for longer duration of anti-malarial halofantrine treatment to combat clinical failures due to a short mean residence time in the blood compartments.
- (U) Prepared over 12 dengue virus vaccine candidates in primary kidney cells and fetal lung cells for evaluation.
- (U) Demonstrated that hepatitis A (HAV)-infected humans and a non-human primate, but not recipients of formalin-inactivated HAV vaccines, developed antibody to nonstructural virus proteins suggesting a method to evaluate the immune response of vaccine recipients during clinical field trials.
- (U) Developed new methods for oral immunization with pilus protein antigens from enterotoxigenic Escherichia coli (ETEC) through incorporation into biodegradable, biocompatible microspheres.

(U) FY 1992 Planned Program

- (U) Continue preclinical evaluation of experimental immunogens as potential vaccines for malaria, rickettsia, viruses and bacterial organisms.
- (U) Continue preclinical evaluation for safety and efficacy of antiparasitic drugs.
- (U) Continue evaluation of novel means of non-specifically enhancing the immune response to candidate vaccines.

(U) FY 1993 Planned Program

- (U) These medical resources transferred to OSD, Health Affairs, effective FY 1993.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0603002A
PE Title: **Medical Advanced Technology** Budget Activity: #2

(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 1991 Accomplishments:

- (U) Initiated evaluation of a prototype performance nutrition intervention project at the USMC Officer Candidates School
- (U) Completed testing of the Army Field Feed System at high altitude to evaluate ration supplement requirements; and completed field testing of the Long Life Ration Packet (LLRP) under extreme cold weather conditions
- (U) Conducted trial studies on the efficacy and behavioral effects of two hypnotics as sleep inducing drugs to support soldiers during periods of sustained operations
- (U) Identified a liquid crystal material and other technologies as candidates to provide laser eye protection

(U) FY 1992 Planned Program:

- (U) Summarize recent laboratory and field data on sustaining health and performance of soldiers in cold weather operations for inclusion in an update of the pertinent Army Regulation
- (U) Compare the effects on memory of two sleep inducing drugs as candidate soldier performance enhancers during long range deployments
- (U) Complete nutritional and biomedical evaluation of the prototype Next Generation Survival Ration in a temperate environment
- (U) Continue development and field validation of stable isotope and clinical nutrition technologies to measure energy expenditure and nutrition status
- (U) Begin evaluation of the effectiveness of modified menus and recipes in an enlisted dining facility to promote health

(U) FY 1993 Planned Program:

- (U) These medical resources transferred to OSD, Health Affairs, effective FY 1993.

(U) Project D840 - Combat Injury Management: This project funds advanced development prototypes of non-system specific medical material items for management of shock, trauma, and 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.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603002A**
PE Title: **Medical Advanced Technology** Budget Activity: **#2**

(U) FY 1991 Accomplishments:
- (U) Designed and fabricated a battery powered wound lavage which was sent to a field medical facility for technology demonstration
- (U) Demonstrated differential haptoglobin binding with different model hemoglobin and commercial hemoglobin products
- (U) Identified limitations of high frequency oscillatory ventilation in an experimental model of inhalation injury
- (U) Designed and fabricated a liner for military blood shipment box that is resistant to chemicals

(U) FY 1992 Planned Program:
- (U) Develop an optimum mode of mechanical ventilation to prevent the adverse sequelae of inhalation injury
- (U) Initiate the evaluation and modification of the field operating room table for transition to development
- (U) Study the renal toxicity of hemoglobin compounds in experimental models
- (U) Study the free-radical mediated injury associated with model hemoglobin compounds in rats

(U) FY 1993 Planned Program:
- (U) These medical resources transferred to OSD, Health Affairs, effective FY 1993.

(U) Project D995 - Medical Chemical Defense Life Support Materiel - Non-Systems Specific Advanced Development: This non-system specific advance 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 1991 Accomplishments:
- (U) Transitioned to development two candidate topical skin protectants designed to augment current physical protection capabilities against a broad range of chemical warfare agents
- (U) Evaluated the effectiveness of wound and skin decontamination solutions against nerve and vesicant threat agents
- (U) Demonstrated the feasibility of producing a monoclonal antibody to vesicant threat agents
- (U) Expanded application of performance assessment methodology in modeling and prediction of militarily significant performance decrements caused by pretreatments, antidotes, or other medical countermeasures

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603002A**
PE Title: **Medical Advanced Technology** Budget Activity: **#2**

- (U) Conducted preclinical pharmacological and toxicological studies on new medical countermeasures to chemical warfare agents (e.g. cyanide pretreatment) in compliance with Food and Drug Administration (FDA) regulations for drug development
- (U) Synthesized scaled-up quantities of candidate chemical agent drugs as medical countermeasures for use in test and evaluation
- (U) Fabricated initial breadboards of system components for Soldier Integrated Protective Ensemble (SIPE) Advanced Technology Transition Demonstration (ATTD), completed evaluations of breadboards, and initiated design modifications for next phase
- (U) Completed the SIPE Technology Development Plan

(U) FY 1992 Planned Program:

- (U) Conduct pre-clinical pharmacological and toxicological studies on new medical countermeasures to chemical warfare agents to comply with FDA regulations
- (U) Continue to synthesize scaled-up quantities of candidate chemical agent drugs as medical countermeasures for use in test and evaluation
- (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) Complete SIPE design, Evaluation Plan, fabrication of brassboard hardware, system assembly, evaluation of technical and human factors

(U) FY 1993 Planned Program:

- (U) These medical resources transferred to OSD, Health Affairs, effective FY 1993.

(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 Biomedical Research and Development Laboratory, Fort Detrick, MD

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, Ft. Rucker, AL

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603002A**
PE Title: **Medical Advanced Technology** Budget Activity: **#2**

D807 - U.S. Army Medical Research Institute of Infectious Diseases, Ft. Detrick, MD (33%); U.S. Army Medical Research Institute of Chemical Defense, Aberdeen Proving Grounds, MD, (7%); Walter Reed Army Institute of Research, Washington, D.C., (2%); Naval Medical Research Institute, Bethesda, MD (2%); the remainder is performed by extramural contractors (nonprofit organizations, universities, and industries, 56%). The top three contractors are Southern Research Institute, Birmingham, AL; Utah State University, Logan, UT; and Biological Research Faculty and Facility, Ijamsville, MD.

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, Ft. 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 Research Sciences)
PE #0602720A (Environmental Quality Technology) (DA Proj 835 only)
PE #0602787A (Medical Technology)
PE #0603105A (Military Human Immunodeficiency Virus Research)
PE #0603807A (Medical Systems Advanced Development)
PE #0604807A (Medical Materiel/Medical 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.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603003A**
PE Title: **Aviation Advanced Technology** Budget Activity: **#2**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D313	Research Aircraft Systems				
	5955	1050	4279	Cont	Cont
D435	Aircraft Weapons				
	5956	749	525	Cont	Cont
D436	Rotary Wing Controls & Rotors				
	11819	10591	15249	Cont	Cont
D447	Aircraft Demonstration Engines				
	5278	9248	8069	Cont	Cont
DB34	Rotorcraft System Integration Simulator				
	709	- 0 -	- 0 -	- 0 -	51518
DB38	Tractor Cone				
	- 0 -	4601	3939	Cont	Cont
DB39	Flight Simulators Components				
	1062	2888	2561	Cont	Cont
DB72	Aircraft Propulsion Components				
	3100	- 0 -	- 0 -	- 0 -	28804
DB97	Aircraft Avionics Equipment				
	4043	4128	3910	Cont	Cont
PE TOTAL	37922	33255	38532		

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 infared 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 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, th' program element standardizes synthetic flight simulator component interfaces

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603003A**
PE Title: **Aviation Advanced Technology** Budget Activity: **#2**

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 Army aircraft of the mid-to-late 1990s and beyond, block improvements to existing aircraft. The work in this PE is consistent with the resourced constrained Army Technology Base Master Plan (ATBMP) and the Army Aviation Modernization Plan; addresses Science and Technology Objectives (STO's) milestones in the ATBMP; and supports the DoD Science & Technology Thrust for Precision Strike.

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.

(U) FY 1991 Accomplishments:
- (U) Initiated design of wind tunnel hardware for Phase I (FY 1991/1992) Advanced Rotorcraft Vectored Thrust Combat Agility Demonstrator (ARVTCAD)
- (U) Supported handling qualities research flight test
- (U) Initiated preliminary design of ARVTCAD based on modified AH-64 Apache

(U) FY 1992 Planned Program:
- (U) Perform ARVTCAD "Vectored Thrust Ducted Propeller" (VTDP) wind tunnel testing

(U) FY 1993 Planned Program:
- (U) Conduct Vertical Motion Simulator (VMS) piloted simulation of VTDP
- (U) Initiate Advanced Platform Technologies (APT) program preliminary design for Structures/Airframes for Rotorcraft in Battlefield Effectiveness Technology I (STARBET) & Advanced Rotorcraft Transmission II (ART)
- (U) Complete Phase I ARVTCAD wind tunnel testing, simulation and report.

(U) Project D435 - Aircraft Weapons: This project provides for the demonstration of aircraft weaponization technologies utilizing an integrated system approach to address the voids and deficiencies identified in the Army Aviation Mission Area Analysis and the US Army Training and Doctrine Command (TRADOC) Battlefield Development Plan (BDP).

(U) FY 1991 Accomplishments:
- (U) Completed the Integrated Air-to-Air Weapon (INTAAW) system integration and flight test on AH-64 Apache
- (U) Completed the Air-to-Air Mission Equipment Package/Weapons Development (AAMWD) technology demonstration analysis and initiate detail design
- (U) Complete the INTAAW system integration

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603003A**
PE Title: **Aviation Advanced Technology** Budget Activity: **#2**

(U) FY 1992 Planned Program:
- (U) Publish INTAAW final report and input INTAAW data into the Air-to-Air Mission Equipment Package/Weapons Development (AAMWD) technology demonstration trade-off analysis
- (U) Finalize AAMWD design
- (U) Initiate AAMWD system fabrication

(U) FY 1993 Planned Program:
- (U) Complete AAMWD software and hardware fabrication
- (U) Input/support target acquisition/weapons portion of Rotorcraft Pilot's Associate (RPA) Advanced Technology Transition Demonstration (ATTD) full mission systems simulation
- (U) Conduct AAMWD subsystem integration testing in test aircraft and transition to RPA ATTD

(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. Funding increases in FY 1992 and FY 1993 are consistent with the Army priority to complete the Day/Night Adverse Weather Pilotage System (D/NAPS) task and initiate full mission crew simulation as critical elements of the RPA ATTD.

(U) FY 1991 Accomplishments:
- (U) Completed integration effort of NASA's Vertical Motion Simulator (VMS) with the Rotorcraft System Integration Simulator (RSIS)
- (U) Initiated the detailed design and technical planning for RPA ATTD, full mission simulation
- (U) Continued Battlefield Distributed Simulation-Developmental (BDS-D) integration planning for RPA ATTD
- (U) Continued D/NAPS Phase I execution

(U) FY 1992 Planned Program:
- (U) Complete quantification of RPA ATTD goals and objectives
- (U) Prepare procurement package for FY 93 RPA ATTD contract award
- (U) Complete D/NAPS contract

(U) FY 1993 Planned Program:
- (U) Closout D/NAPS contract
- (U) Award RPA ATTD contract
- (U) Initiate preliminary system design of RPA ATTD
- (U) Conduct Cognitive Decision Aiding (CDA) and integration software design and development
- (U) Complete development of BDS-D/Crew Station Research and Development Facility (CSRDF) networked link for RPA ATTD

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603003A**
PE Title: **Aviation Advanced Technology** Budget Activity: **#2**

(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.

(U) FY 1991 Accomplishments:
- (U) Completed initial gas generator design for Joint Turbine Advanced Gas Generator (JTAGG) Phase I and conduct tri-service review
- (U) Continued initial JTAGG Phase I component tests
- (U) Initiated revisions of JTAGG Phase I component designs
- (U) Began assembly of JTAGG Phase I gas generator and initiate testing
- (U) Initiated JTAGG Phase I final configuration

(U) FY 1992 Planned Program:
- (U) Demonstrate Integrated High Performance Turbine Engine Technology (IHPTET) Phase I goals

(U) FY 1993 Planned Program:
- (U) Award JTAGG Phase II tri-service contracts and initiate detailed design
- (U) Demonstrate IHPTET Phase I goals

(U) Project DB34 - Rotorcraft System Integration Simulator (RSIS): This project provides for in-house support of RSIS. This joint Army/NASA effort minimizes facility development and integration costs. The effort supports the development of an advanced rotorcraft simulator facility by expanding the NASA Vertical Motion Simulator (VMS). Once developed, it will support an integrated approach to design and demonstrate of Army aircraft and rotorcraft technology in handling qualities and man-machine integration.

(U) FY 1991 Accomplishments:
- (U) Provided in-house support to complete technical efforts and close-out project

(U) FY 1992 Planned Program: Project completed in FY 1991

(U) FY 1993 Planned Program: Not applicable

(U) Project DB38 - Tractor Cone: This is a classified program.

(U) Project DB39 Flight Simulator Components: This project provides for the development and demonstration of advanced flight simulation techniques and components for the incorporation into the design of future simulators and for improving training capabilities of current training simulators. These future simulators and capabilities will aid in the evaluation of force effectiveness and new weapon systems concepts in the context of free play, simulated combined arms battlefield environment. In addition, this simulation capability will be used for demonstrating and assessing

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0603003A
PE Title: **Aviation Advanced Technology** Budget Activity: #2

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.

(U) FY 1991 Accomplishments:
- (U) Demonstrated of Ada computer language for real time, man-in-the-loop flight simulators

(U) FY 1992 Planned Program:
- (U) Complete exemplar photographic database for mission planning and rehearsal
- (U) Develop cost/labor reduction capabilities to optimize database development
- (U) Increase battlefield representation capability
- (U) Define the architecture and implementation methods for Semi-Automated Forces (SAFOR) capability in follow-on simulated battlefields
- (U) Initiate Battlefield Distributed Simulation-Developmental (BDS-D) ATTD

(U) FY 1993 Planned Program:
- (U) Demonstrate standard modular architecture for rotorcraft simulators to enhance reuse of standard components and reduce recurring development costs
- (U) Continue establishment/evaluation of networking standards
- (U) Demonstrate first phase expanded battlefield simulation and site-to-site linkage between Crew Station Research and Development Facility (CSRDF, and BDS-D, Ft Rucker site
- (U) Assess the ability of the Battlefield Distributed Simulation-Developmental environment to supplement operational field testing

(U) Project DB72 - Aircraft Propulsion Components: This project provides for improved propulsion components technology in drive systems, thrust devices, transmissions and test rigs to increase self deployability, increase range, improve payloads, and increase air-to-air agility of Army aircraft.

(U) FY 1991 Accomplishments:
- (U) Completed fabrication and conducted testing of transmission components for the Advance Rotorcraft Transmission (ART) program

(U) FY 1992 Planned Program: Project completed in FY 1991

(U) Project DB97 - Aircraft Avionics Equipment: This project supports a phased series of 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, as well as the RPA ATTD.

(U) FY 1991 Accomplishments:
- (U) Revised and updated planning and execution of Coordinated Concept Evaluation Program (CEP) 3 for FY 1992
- (U) Restructured Tactical Aviation Center (TAC)/Tactical Operations Center (TOC) program in accordance with Ft Rucker Airborne Tactical Operations center (ATOC) concept
- (U) Implemented secure facility within laboratory environment

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Program Element: **#0603003A**
PE Title: **Aviation Advanced Technology** Budget Activity: **#2**

(U) FY 1992 Planned Program:
- (U) Conduct CEP 3
- (U) Implement basic Tactical Receiver Equipment correlator algorithm on PC under UNIX
- (U) Initiate design of INTEL correlator

(U) FY 1993 Planned Program:
- (U) Develop documentation for technology transfer to advanced development programs
- (U) Implement Artificial Intelligence appliques for Electronic Intelligence (ELINT) correlation and tactical message handling
- (U) Demonstrate secure information handling and situation display capability

(U) Work Performed By: Contractual efforts are performed by 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, and Grumman. In-house developers of the technology under this program element include Project Manager Training Devices (PM TRADE), Orlando, Fla; Aviation Systems Command, St Louis, MO; Avionics Research and Development Activity, Ft Monmouth, NJ; Aerostructures Directorate, NASA Langley Research Center, Hampton, Va; Aeroflightdynamics Directorate, NASA Ames Research Center, Moffett Field, Ca; Propulsion Directorate 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 concept exploration is conducted under PE #0602211A, PE #0604801A and PE #0604270A. 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; and the Executive Steering Committee for the RPA ATTD 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.

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Program Element: **#0603003A**
PE Title: **Aviation Advanced Technology** Budget Activity: **#2**

(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.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603004A**
PE Title: **Weapons and Munitions Advanced Technology** Budget Activity: **#2**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D155	Liquid Propellant Guns/Ammunition Systems				
	13280	0	0	0	84905
D223	Combat Vehicle Anti-Armor				
	5594	0	0	0	115144
D232	Advanced Warhead Demonstration				
	0	3499	4425	Cont	Cont
D426	Advanced Tank Cannon (ATAC) Component Technology				
	395	0	0	0	395
D43A	Advanced Weaponry Technology Demonstrations				
	0	4500	4431	Cont	Cont
D439	Advanced Armaments Demonstrations				
	6665	0	2954	Cont	Cont
DL04	Electro-Magnetic/Electrothermal-Chemical (EM/ETC) Components Technology				
	6469	0	0	0	6469
DL05	Bunker Defeat Munition				
	0	6000	0	0	6000
DL09	Advanced Field Artillery System (AFAS) Demonstration				
	22024	0	0	0	0
DL94	Electric Gun Systems Demonstration				
	0	47866	37264	Cont	Cont
PE TOTAL	54427	61865	49074		

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 subdivided into (1) gun propulsion, (2) combat vehicle anti-armor munitions, and (3) field artillery technologies. The key objectives of gun propulsion efforts are to greatly enhance lethality by providing a significant increase in muzzle velocity and range. Technologies being pursued include Electromagnetic (EM) and ElectroThermal-Chemical (ETC) for tank and other direct fire applications. The key objectives of combat vehicle anti armor effects address Insensitive Munition (IM) warheads to increase combat vehicle/crew survivability 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 resource constraints of the Army Technology Base Master Plans Science and Technology Objective (STO) milestones for the Army's key Emerging Technologies and Advanced Technology Transition Demonstrations (ATTDs), the Army force modernization plans and Science and Technology Thrusts for Precision Strike, Advanced Land Combat Vehicle, and Air Superiority/Defense Note. All Armored Systems Modernization (ASM) key related tasks

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Program Element: #0603044A
PE Title: **Weapons and Munitions Advanced Technology** Budget Activity: **#2**

transfer to PE #0603645A as of FY 1992.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project D155- Liquid Propellant (LP) Guns/Ammunition Systems: The objective of the Liquid Propellant (LP) effort was to demonstrate the capability of liquid propellant systems to provide enhanced weapon performance at extended ranges and increased survivability while reducing logistics burdens associated with conventional solid propellant systems. This program provided technology development and demonstration of a brassboard 155mm Regenerative Liquid Propellant Gun (RLPG) and/ammunition system. In a preliminary life cycle evaluation of Liquid Propellants conducted by Army agencies, several system benefits were identified: (1) in production, critical raw materials are not required; (2) environmentally undesirable by-products are not generated; (3) since the proposed production process is easily automated using commercially available equipment, the costs of both facility and propellant are significantly less than comparable solid propellants; (4) liquid propellants require less volume in storage and transport; (5) current liquid propellant candidates are not easily ignited by accident or by munition impact and do not release energy rapidly under such conditions; (6) autoloader design will be simplified; (7) rate of fire increases since only the projectile will be handled mechanically; (8) potential ballistic improvements exist; (9) soft launch for acceleration of sensitive projectiles appears feasible. A propulsion downselect between LP and unicharge for Advanced Field Artillery System (AFAS) occurred in the 4th quarter of FY 1991. LP was selected.

(U) FY 1991 Accomplishments:
- (U) Characterized LP and classified as an Insensitive Propellant
- (U) Conducted technology demonstrations of 155mm RLPG versus 155mm Unicharge
- (U) Demonstrated rate-of-fire attainment with 155mm 2nd Generation RLPG
- (U) Completed concept design of AFAS prototype LP gun (3rd generation RLPG)
- (U) Completed LP fielding effects study
- (U) Provided final LP data to AFAS Propulsion Evaluation Board for LP versus Unicharge downselect

(U) FY 1992 Planned Program: N/A

(U) FY 1993 Planned Program: N/A

(U) Project D223 - Combat Vehicle Anti-Armor: This project exploited anti-armor concepts and technologies and demonstrated enhanced lethality, anti-armor chemical, and kinetic energy munitions capable of defeating projected armored threats. Project D223 was established in recognition of the need to demonstrate advanced warhead and kinetic energy penetrator technologies in full scale from FY 1986 through FY 1991. This project along with project D221 in PE #0603005A were dedicated to the support of joint Army/Defense Advanced Research Projects Agency (DARPA)/U.S. Marine Corps armor anti-armor (A3) program, which has been acclaimed for its success. Army funding for the joint program has been consolidated in PE #0602618A starting in FY 1992.

(U) FY 1991 Accomplishments:

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Program Element: **#0603004A**
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- (U) Provided funding to DARPA in accordance with Joint A3 MOU (See PE #0602618A)

(U) FY 1992 Planned Program: Not Applicable

(U) FY 1993 Planned Program: Not Applicable

(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 Precision Strike Science and Technology Thrust.

(U) FY 1991 Accomplishments: Not Applicable

(U) FY 1992 Planned Program:
- (U) Initiate design and test of multiple finned rod Explosively Formed Penetrator (EFP), telescoping EFP, combined effects, selectable and tandem EFP warheads
- (U) Incorporate component technologies into advanced warhead concepts
- (U) Evaluate integration effects on EFP warhead performance

(U) FY 1993 Planned Program:
- (U) Continue design/test of multiple finned rod EFP, telescoping EFP, combined effects, selectable and tandem EFP warheads
- (U) Test warheads incorporating advanced component technologies
- (U) Demonstrate multiple finned rod warhead and telescoping EFP warhead

(U) Project D426 - Advanced Tank Cannon Components Technology: Prior to FY 1991, all advanced technology development on the Advanced Tank Cannon System (ATACS) was performed under project D439. Project D426 was created in FY 1991 to allow funds to be provided directly to the performing agency (i.e., the Program Executive Officer for Armaments) to improve program execution. In FY 1991, the ATACS program transitioned to advanced system development (PE #0603645A).

(U) FY 1991 Accomplishments:
- (U) Integrated ATACS components into the Component Advanced Technology Test Bed (CATTB)
- (U) Supported ATACS testing

(U) FY 1992 Planned Program: N/A (Work funded under PE #0603645A)

(U) FY 1993 Planned Program: N/A (Work funded under PE #0603645A)

(U) Project D43A - Advanced Weaponry Technology: 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

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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 such as the Tube-Launched, Optically-Tracked, Wire Command-Link Guided (TOW) missile, HELLFIRE, Sense and Destroy Armor (SADARM) and Advanced Antitank Weapon System-Medium (AAWS-M). Prior to FY 1991, this work was performed under project D439.

(U) FY 1991 Accomplishments: Not Applicable

(U) FY 1992 Planned Program:
- **(U)** Complete HELLFIRE IM and performance testing
- **(U)** Initiate IM program for tank munitions
- **(U)** Initiate IM program for SADARM/Wide Area Mine (WAM)

(U) FY 1993 Planned Program:
- **(U)** Complete IM technology for heavily confined anti-armor warhead systems
- **(U)** Complete IM technology programs for mines and tank munitions
- **(U)** Initiate IM technology program for 155mm artillery projectiles

(U) Project D439 - Advanced Armaments Demonstration: This project provides for the demonstration of advanced armament components and subsystems for small to large caliber weapons. Specifically, it funds advanced development of the Advanced Tank Cannon System (ATACS), which transitions to advanced system development (PE #0603645A) in FY 1992. In FY 1991, this PE also included work on the Multi-Option Fuze Artillery (MOFA) and insensitive munitions (IM). After FY 1991, the MOFA program transitioned to PE #0603645A and the IM program was restructured under project D43A of this PE. Advanced technology demonstration efforts that were to have begun under this project in FY 1992 for a medium caliber cannon for a future infantry vehicle or potential Bradley Fighting Vehicle upgrade applications has been transferred by OSD to PE #0603645A. Transitioning technology for Cased Telescoped Ammunition with medium caliber cannon applications to advanced technology development.

(U) FY 1991 Accomplishments:
- **(U)** Completed data analysis of FY 1990 ATACS test firing
- **(U)** Completed Milestone I/II In-Process Review (IPR) for transition to Advanced Development
- **(U)** Completed Extended Range Gunnery Fire Control (ERGFC) system concept analysis and design
- **(U)** Designed MOFA demonstration hardware
- **(U)** Ordered long lead items and establish test criteria for FY 1992 MOFA demonstration

(U) FY 1992 Planned Program: N/A

(U) FY 1993 Planned Program:
- **(U)** Design and fabricate next interaction of Cased Telescoped Ammunition
- **(U)** Fabricate firing fixture
- **(U)** Initiate cartridge tests

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Program Element: **#0603004A**
PE Title: **Weapons and Munitions Advanced Technology** Budget Activity: **#2**

(U) Project DL04 - Electromagnetic (EM)/Electrothermal-Chemical (ETC) Component Technology: Prior to FY 1991, work on EM/ETC gun technologies was performed under project DL09. Due to the importance of EM/ETC technologies and the visibility they have received, a decision was made to restructure the EM/ETC program into a separate project. An interim solution was the creation of project DL04 for FY 1991 only. For FY 1992 and beyond, all advanced technology development work will be performed under project DL94. Project DL04 utilized electrical energy concepts and technologies to demonstrate the propulsion of hypervelocity projectiles. EM guns use an intense magnetic field to accelerate projectiles to velocities not achievable otherwise. ETC guns use electrical energy to initiate and control the chemical reaction of energetic propellant formulations. The primary benefits of electric guns are greatly increased muzzle velocities providing enhanced weapons system performance and improved survivability resulting from the absence of conventional explosive propellant. This is a multi-agency project with participation by the Navy, the Defense Advanced Research Projects Agency (DARPA), the Defense Nuclear Agency (DNA) and the Strategic Defense Initiative Office (SDIO) to ensure exploitation of supporting technologies and to avoid duplication. It is coordinated by the Joint Electric Armaments Committee.

(U) **FY 1991 Accomplishments:**
- (U) Continued advanced construction of 9 MJ EM Range Gun, Army/Balanced Technology Initiatives (BTI) ETC Pulse Power Module
- (U) Demonstrated advanced EM-launched tactical anti-armor rounds (Sabot Launched Electromagnetic Gun-Kinetic Energy (SLEKE))

(U) **FY 1992 Planned Program:** N/A (Work funded under project DL94)

(U) **FY 1993 Planned Program:** N/A (Work funded under project DL94)

(U) **Project DL05 - Bunker Defeat Munition:** This program was created in response to congressional interest in developing 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 1991 Accomplishments:** Not Applicable

(U) **FY 1992 Planned Program:**
- (U) Conduct market survey
- (U) Develop acquisition strategy
- (U) Acquire and test candidate Bunker Defeat Munitions

(U) **FY 1993 Planned Program:** Not Applicable

(U) Project DL09 - Advanced Field Artillery Systems (AFAS) Demonstration: This project developed and demonstrated AFAS subsystems and demonstrated the Unicharge propulsion system as a potential candidate for the AFAS. Electric Gun technologies were matured in this project through FY 1990, but transferred to project DL04 in 1991, and then to project DL94 in 1992. The AFAS

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demonstration transitioned to PE #0603645A in FY 1992. The Unicharge portion of the project was completed.

(U) FY 1991 Accomplishments:
- (U) Performed firing tests and studies to evaluate Regenerative Liquid Propellant (LP) and Unicharge (solid propellant) technologies and select the gun propulsion technology for the AFAS demonstration
- (U) Completed concept evaluation for self propelled howitzer, initiated major component design and detailed design for technical tactical fire control, automatic loader and cannon
- (U) Initiated full scale mockup of selected concept designs
- (U) Established AFAS/Future Artillery Resupply Vehicle-Advanced (FARV-A) and AFAS Common Chassis Interface
- (U) Provided Unicharge data for LP vs. Unicharge downselect process

(U) FY 1992 Planned Program: Not Applicable

(U) FY 1993 Planned Program: Not Applicable

(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 otherwise possible. ETC guns use electrical energy to initiate and control the chemical reaction in energetic propellant formulations. The primary benefits of electric guns are the potential for substantially increased muzzle energy, enhanced system performance, the absence of conventional explosive propellant, and the capability of defeating advanced threat armored vehicles. There is a coordinated inter-agency program to exploit this technology for tactical weapon applications including this project, a Navy project involving a potential close-in weapon system upgrade, and technology development efforts by DARPA and the Defense Nuclear Agency (DNA). Coordination with related Strategic Defense Initiative Office (SDIO) projects ensures exploitation of common supporting technology development. This project is a realignment of common supporting technology development conducted in Project DL09 through FY 1990 and transferred to Project DL04 for (1-year) FY 1991.

(U) FY 1991 Accomplishments: Efforts funded under Project DL04

(U) FY 1992 Planned Program:
- (U) Complete the construction and installation of 9 MJ EM Range Gun
- (U) Complete the construction and installation and initiate test firings with Army/BTI ETC Pulse Power Module
- (U) Complete fabrication and test SLEKE anti-armor projectiles at full energy against modern armor targets
- (U) Initiate component maturation for demonstration of electric armament system
- (U) Install Phase II of Electric Armament Research Center power supply for full 52 MJ capability
- (U) Initiate 20-40mm Cannon Caliber EM armament

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Program Element: **#0603004A**
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(U) FY 1993 Planned Program:

- **(U)** Conduct advanced projectile testing at Yuma Proving Ground with 9 MJ EM Range Gun
- **(U)** Conduct complete test firing program of 9 MJ EM Range Gun
- **(U)** Small caliber ETC Technology development completed - 15% performance improvement over conventional (ETC Program Decision Point 1)

(U) Work Performed By: Management of this PE will be accomplished by ARDEC, PM-AFAS, and the Electric Armaments Program Office. In-house efforts will be accomplished by Armaments Research, Development and Engineering Center (ARDEC), Picatinny Arsenal, NJ, Harry Diamond Laboratory, Adelphi, MD and the US Army Ballistic Research Laboratory (BRL), Aberdeen Proving Ground, MD. Major contractors include General Electric, Pittsfield, MA,; Bell Aerospace Textron, Niagara Falls, NY; Thiokol Corp., Elkton, MD; Alliant Tech Systems, Minneapolis, MN; FMC, San Jose, CA; Olin, Charlton, TN; ARMTEC, Palm Springs, CA; General Dynamics Land Systems Division, Warren, MI; and The Center for Electric 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, PE #0602618A, PE #0602624A, PE #0603005A, PE #0604802A, PE #0603802A, PE #0603645A and PE #0604645A in accordance with the on-going Reliance joint planning process and contains no unwarranted duplication of effort among the Military Departments.

Joint Agreements: DARPA/Army Electromagnetic Gun Memorandum of Understanding (MOU); DARPA/Army/Marine Corps Armor/Anti-Armor (MOU). Joint 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 for 155mm Joint Ballistic Working Group on Solid Propellant (UK, France, FRG, Italy). LP Technologies are being pursued by other nations including UK, France, Israel, and Japan. Discussions regarding possible co-development of MOFA with Germany are being pursued.

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Program Element: **#0603005A**
PE Title: **Combat Vehicle and Automotive Advanced Technology** Budget Activity: **#2**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D221	Combat Vehicle Survivability				
	7796	4543*	20520	Cont	Cont
D440	Advanced Combat Vehicle Technology				
	115538	14170	7051	Cont	Cont
D441	Combat Vehicle Propulsion Technology				
	4287	2007	1978	Cont	Cont
D444	Combat Vehicle Track, Wheel and Suspension				
	5736	1505	1484	Cont	Cont
D497	Combat Vehicle Electronics				
	10606	4384	13792	Cont	Cont
PE TOTAL	143963	26609	44825		

* Supplemental appropriation funds for Operation Desert Storm (ODS) in the amount of $572K are included.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program demonstrates feasibility and operational potential of technologies to enable upgrades to fielded ground combat systems, such as the Abrams tank and the Bradley Fighting Vehicle System, as well as future systems, such as the Advanced Field Artillery System (AFAS), Future Artillery Resupply Vehicle (FARV), a command and control vehicle, a future main battle tank and a future scout vehicle. The technology areas supported by this program element include: survivability, mobility, vehicle electronics and integration. The program was changed in December 1991, when the Secretary of the Army announced the indefinite delay of a new tank, infantry fighting vehicle and engineer vehicle under a restructured Armored System Modernization (ASM) program. A key element of the restructuring decision was a commitment for a robust technology base program to provide options to resume systems development in the future, based on recurring threat assessments and the pace of technological maturation. The new strategy, supported by this PE, provides multiple opportunities to transition technologies to systems. 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 1997-1998), development of a lighter, more survivable and deployable future main battle tank, most likely with a conventional gun, could be initiated. Through the Composite Armored Vehicle (CAV) demonstration the program is supporting technology for future light projectable armored vehicle The CAV program will demonstrate light structure and armor with embedded signature control which will rely on non-traditional techniques for survivability. In the FY 2001-2002 time frame, development of a revolutionary anti-armor system, possibly with electric armament, could be started. 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. These and other factors caused the DoD to focus its Science and Technology program into military capabilities that could be important in a decade or so hence. New initiatives conducted under this PE that support the Science and Technology thrust for "Advanced Land Combat Vehicles" include. the advancement of composite materials (with embedded signature reduction) to reduce weight of ground vehicle structures and armor, integrated survivability (e g., armor, threat sensors and countermeasures such as jammers,

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obscurants and decoys); crew size reduction through automation of crew functions and better crew/vehicle integration; and advanced mobility technologies to improve agility, reduce propulsion system size and weight, and decrease operations and support costs. Increases in FY 1993 over the FY 1992 submission reflect added emphasis given to integrated survivability (Project D221) and crew reduction technologies (Project D497). The key to these efforts is integration and demonstration of these and other advanced technologies, such as electric armaments, advanced sensors and target identification, for combat vehicle applications through the use of technology demonstrators, computer simulation, modeling and full scale mockups. The superb performance of fielded ground combat systems in Operation Desert Storm was made possible, in large part, by technology base investments over the past two decades. Continued investment is necessary, if we are to be successful in the future.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project D221 - Combat Vehicle Survivability: Armors and other survivability techniques are of no use unless they can be integrated into vehicles, and performance can only be measured in realistic vehicle configurations. This project includes all essential elements of survivability, such as signature reduction to avoid detection, warning devices to alert crews to threat systems, jammers and decoys to avoid being targeted, ballistic armor to defeat direct fire weapons, and means to minimize damage (e.g., spall protection and fire suppression), if a vehicle is hit and penetrated. The project provides increased protection for fielded and new vehicles through integration of Identification Friend or Foe (IFF) technologies to reduce fratricide, and threat warning receivers to counter advanced target acquisition and smart munition guidance systems. It also aims to maximize survivability while minimizing system weight. Survivability technologies that are integrated and demonstrated under this project include those transitioned from a variety of exploratory development programs, such as the Joint Army/Defense Advanced Research Projects Agency (DARPA)/US Marine Corps (USMC) Armor Anti-Armor (A3) Program (Project AH81, PE# 0602618A); ballistics research including lethality-vulnerability modeling and terminal effects (Project AH80, PE# 0602618A); detection, acquisition and hit avoidance, and damage reduction (Project AH91, PE# 0602601A); and heavy armor (Project DC05, PE# 0602601A). Funding for the Joint Army/DARPA/USMC A3 Program was transferred from Project D221 to Project AH81 starting in FY 1992.

(U) **FY 1991 Accomplishments:**

- (U) 68 per cent of project funds committed to support DARPA/Army/USMC A3 Program
- (U) Conducted design, testing and demonstration of ammunition and fuel compartmentation technology for future combat vehicles
- (U) Developed and acquired surrogate threat munitions needed to validate new armor technology
- (U) Documented analysis methodology for modular attachment of heavy armor systems
- (U) Acquired and began evaluation of test munitions to serve as surrogates for future threats
- (U) Supported development of countermeasure device for use in Operation Desert Storm

(U) **FY 1992 Planned Program:**

- (U) Continue surrogate ammunition acquisition and necessary upgrades
- (U) Initiate transition of advanced armors to the AFAS and FARV
- (U) Complete development of ammunition compartment design model

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Program Element: **#0603005A**
PE Title: **Combat Vehicle and Automotive Advanced Technology** Budget Activity: **#2**

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

- (U) Perform armor testing for future combat vehicles
- (U) Completion of ammunition compartmentation program
- (U) Continue surrogate threat ammunition activity
- (U) Continue transition of armor developments to AFAS and FARV
- (U) Transition directed energy hardening technology
- (U) Initiate fabrication of integrated survivability demonstrator vehicle showing payoff of nontraditional survivability technology

(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 for product improvements of current fleets of vehicles. The objective is to demonstrate innovative future combat vehicle configurations, technologies and integration techniques through hardware technology demonstrations, computer simulation and full-scale mockups, thereby accomplishing more rapid transition of advanced technologies to systems applications. The main effort included in this project that is critical to the modernization of ground combat systems is the Component Advanced Technology Test Bed (CATTB). In FY 1992, the Common Chassis Advanced Technology Transition Demonstration (CCATTD) and Combat Mobility Vehicle (CMV) ATTD were transferred to PE# 0603645A. All demonstrations include user and developer participation in a field environment. The objective of the CATTB is to verify the integration and interaction of advanced combat vehicle technologies. Competitively selected components will be demonstrated on a modified Abrams chassis. Key technologies include: advanced propulsion, track, external suspension, power and data distribution, and vehicle controls and displays. Future efforts will examine technologies applicable to future, more lethal and survivable systems that offer significantly improved deployability over current systems. The Composite Armored Vehicle (CAV) ATTD, 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 embedded signature reduction. 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 program will demonstrate the degree to which lighter projectable vehicles can be made survivable through non-traditional methods.

(U) **FY 1991 Accomplishments:**

- (U) Continued design, fabrication and integration of advanced components into CATTB
- (U) Transitioned technology information to industry under CATTB program
- (U) Conducted reviews for systems design and requirements for Armored System Modernization (ASM) variants
- (U) Purchased long lead time items for use in CCATTD System Integration Laboratory
- (U) Awarded the CMV ATTD contract and began hardware development
- (U) Initiated Survivability testing of CMV ATTD components

(U) **FY 1992 Planned Program:**

- (U) Conduct CATTB Chassis system integration laboratory demonstration
- (U) Conduct CATTB automotive and signature reduction demonstrations

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Program Element: **#0603005A**
PE Title: **Combat Vehicle and Automotive Advanced Technology** Budget Activity: **#2**

- (U) Award contract for CATTB full vehicle system integration laboratory

(U) **FY 1993 Planned Program:**
- (U) Continue CATTB system integration laboratory effort
- (U) Continue design, fabrication and integration efforts for CATTB demonstration
- (U) Validate the technical approach and designs for an optimized composite structure
- (U) Perform material and ballistic testing on composite structure sections

(U) Project D441 - Combat Vehicle Propulsion Technology: Propulsion technology 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. The added need to do this 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, the propulsion system is the number two hardware spares replenishment cost driver. In a typical combat vehicle, the mobility components contribute to about 40% of the vehicle volume and weight. For these reasons, this project is vital to demonstrate engines, transmissions and related components which meet stringent ground combat mobility goals. Current activities are focused on the demonstration of a compact, fuel efficient, diesel engine in the Component Advanced Technology Test Bed (CATTB). Future efforts will seek to further reduce the weight and volume of propulsion systems, especially for light and medium classes of vehicles to make possible lighter, more deployable and highly agile systems with low sustainment requirements.

(U) **FY 1991 Accomplishments:**
- (U) Modified diesel Advanced Integrated Propulsion System (AIPS) propulsion system laboratory hardware for use in the CATTB

(U) **FY 1992 Planned Program:**
- (U) Demonstrate the diesel AIPS in the CATTB
- (U) Begin additional modifications to the propulsion system to support 270 volt vehicle accessory power requirements on the CATTB

(U) **FY 1993 Planned Program:**
- (U) Conclude demonstration of initial vehicle testing of propulsion system in CATTB

(U) Project D444 - Combat Vehicle Track, Wheel and Suspension: In the case of the Abrams tank, track is the number one hardware spares replenishment cost driver. In a typical combat vehicle, the mobility components account for about 40% of the vehicle volume and weight. For these reasons, this project is being pursued to demonstrate advanced track, wheel and suspension technologies to improve performance, reduce weight and ownership costs. Current activities 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

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0603005A
PE Title: **Combat Vehicle and Automotive Advanced Technology** Budget Activity: #2

about the same amount and save room inside the vehicle now used for torsion bars. Future efforts will seek to further improve these systems, especially for light and medium classes of vehicles, to make possible lighter, more deployable and highly agile systems with low sustainment requirements.

(U) **FY 1991 Accomplishments:**

- (U) Completed fabrication and delivered hybrid XT-166 advanced track for CATTB and CMV ATTD integration and demonstration
- (U) Designed and initiated fabrication of external suspension height control system for test bed integration and demonstration
- (U) Completed dynamic track tensioner system design and initiated fabrication; anticipated to increase fuel economy by 15 percent
- (U) Expanded capability to perform highly complex track and suspension model simulation

(U) **FY 1992 Planned Program:**

- (U) Complete hull modifications for advanced suspension demonstrator
- (U) Initiate test and evaluation of dynamic track tensioning system
- (U) Initiate test and evaluation of external suspension system
- (U) Complete engineering vehicle test and evaluation of hybrid XT-166 track and configuration redesign for optimized weight reduction
- (U) Initiate validation and refinement of track pad and bushing laboratory simulation

(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) Significantly reduce track and suspension R&D costs and development time by implementing validated Computer Aided Design and laboratory simulation test capabilities

(U) Project D497 - Combat Vehicle Electronics (VETRONICS): Included in this project are demonstrations of technologies that enable information and power distribution 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 (SMI); 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 ASM vehicles, such as the AFAS. Demonstrations of these technologies will enable operation of combat vehicles with smaller crews than currently fielded systems. Operation with smaller crews is important because of its impact on vehicle size and weight, survivability implications and reduced force structure requirements. This initiative 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

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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 1991 Accomplishments:**
- (U) Defined CATTB crew interfaces using vehicle crew display demonstrator
- (U) Developed command and control module for CVC2 program and CATTB
- (U) Built prototype SAVA hardware and software modules for CATTB
- (U) Initiated electronic integration of CATTB

(U) **FY 1992 Planned Program:**
- (U) Complete electronic integration of CATTB hull
- (U) Conduct CVC2 interoperability demonstration with Germany
- (U) Complete electronics architecture specifications, military standard and application manual
- (U) Demonstrate full CATTB integration in a system integration laboratory
- (U) Complete development of vehicle electronics system architecture demonstrator
- (U) Initiate reduced crew technology demonstration development/integration
- (U) Enhance crew station simulation facility
- (U) Initiate AI/autonomous systems development in support of reduced crew demonstration

(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 system architecture demonstrator
- (U) Continue reduced crew technology demonstration development, integration and coordination
- (U) Complete enhancement of TACOM crew station development facility
- (U) Support reduced crew technology demonstration and Battalion and Below Command and Control (B2C2) ATTD (PE #0603772A)
- (U) Continue AI/autonomous function development supporting reduced crew demonstration

(U) **Work Performed By:** The U.S. Army Tank-Automotive Command (TACOM), Warren, MI, is responsible for the management, development and systems integration of this program. The Program Executive Officer for Armored Systems Modernization (ASM) is responsible for key demonstrations such as the CCATTD and CMV ATTD. Major contractors are: 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.

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PE Title: **Combat Vehicle and Automotive Advanced Technology** Budget Activity: **#2**

(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 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.

AMENDED FY 1992/1993 BIENNIAL RDTE 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 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D247	Tactical Command, Control & Communications Technology Integration				
	3829	6401	6501	Cont	Cont
D492	Space Technology Integration				
	3675	6290	8849	Cont	Cont
PE TOTAL	7504	12691	15350		

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Army must provide the soldier with a superior quality and quantity of real-time information by applying rapidly advancing computer automated battlefield technology. The Commander's ability to synchronize battle and have rapid and complete battle status is dependent on integrated data capable communications and automated real-time software command and control applications tailored to the soldier's needs. Program provides software applications development, demonstration, communications system integration and prototype products for distributed, mobile, secure, fully automated spread spectrum radio networks with measures to enhance survivability, efficiency and efficacy of Army tactical command, control, communications and computer systems. Software products are developed for ease of porting to the new common hardware software (CHS). Program conducts joint services demonstrations in support of Joint Director of Laboratories (JDL) Technology Applications and Demonstrations Panel. Provides key demonstrations of systems integration on Army Battlefield Functional Areas. Program 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. In addition, the program supports 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. This program supports the Global Surveillance and Communications and Precision Strike Science and Technology Thrust areas.

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 Communication and Control System (ATCCS) whose goal is automated real-time information transfer.

(U) **FY 1991 Accomplishments:**

- (U) Established impact of expanded capacity and survivability of Fiber Optic Tactical Local Area Network (FOTLAN) on future command post communications with Army experimental site (AES)/Future Battle Laboratory (FBL)

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603006A**
PE Title: **Command, Control and Communications Advanced Technology** Budget Activity: **#2**

- (U) Started definition of automated network management capability for ATCCS
- (U) Awarded contract and initiated prototype ultra high frequency (UHF) technology, error correcting coder/decoder (CODEC), and Adaptive Antenna System (AAS)
- (U) Continued coordination and support to Army frequency management community
- (U) Demonstrated global positioning system/situation map integration on common hardware and distribution, using packet single channel ground and airborne radio systems (SINCGARS)
- (U) Evaluated Phase I prototype large screen display, terrain visualization capability, overlay repro/transmission capability and upgrade prototypes based on evaluation results
- (U) Initiated integration of Common Hardware/Software (CHS) with TRUSTED GUARD (computer security capability) for joint service applications
- (U) Continued security support to Army Tactical Command and Control Data Systems (ATCCS)

(U) FY 1992 Planned Program:

- (U) Make FOTLAN transition recommendations as part of proposed ATTD evolving CHS products
- (U) Utilize results on Army/Navy cooperative testing in modifying local area network (LAN) hardware
- (U) Complete automated network management definition phase in context of ATCCS architecture
- (U) Fabricate UHF electronic counter countermeasures (ECCM) prototype of CODEC and AAS for Band I equivalent of the Mobile Subscriber Equipment (MSE) Line-of-Sight (LOS) multichannel radio system
- (U) Continue coordination and support to Army frequency engineering community
- (U) Demonstrate Maneuver Control System (MCS) position location interface integration on CHS laptop and distribution using packet Single Channel Ground and Airborne Radio System (SINCGARS)
- (U) Determine audio/video signal processing requirements
- (U) Continue demonstration of TRUSTED GUARD at AES
- (U) Continue engineering support to ATCCS community

(U) FY 1993 Planned Program:

- (U) Expand FOTLAN capability by augmenting test hardware with optical bypass to enhance fault tolerance
- (U) Start automated network management prototype design
- (U) Start extensive hardware test of CODEC and AAS prototypes
- (U) Provide concept roadmap to define interface of local access communication elements to PEO Command and Control Systems (CCS) and PEO Communications objective
- (U) Examine MSE LOS UHF LOS radio compatibility
- (U) Award Digital Multimode Radio contract and start proposed ATTD phase
- (U) Continue coordination and support to Army frequency engineering community
- (U) Analyze multimedia messaging requirements/applications and define network requirements
- (U) Continue security engineering support to ATCCS community
- (U) Continue integration of Army Secure Operating System (ASOS)/TRUSTED GUARD with FOTLAN capability

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0603006A
PE Title: Command, Control and Communications Advanced Technology Budget Activity: #2

(U) Project D492 - Space Technology Integration: This project develops computer and communication systems in common hardware software format to support battleifled 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 Communication and Control (ATCCS) whose goal is automated real time information transfer.

(U) FY 1991 Accomplishments:

- (U) SPACE UNIQUE EXPERIMENTS:
  - Continued work to fabricate micro-encapsulation experiment flight hardware
  - Completed fabrication and flight qualification of space (micro-gravity) tissue loss experiment
- (U) TACTICAL SPACE SYSTEM/LIGHTSAT:
  - Prepared for manifested flight of STAR TRACKER attitude azimuth unit
  - Initiated research in technologies designed to enhance Tactical Satellite (TACSAT) payload capabilities, such as High-Density Power and high interest threat signals
- (U) MILITARY MAN IN SPACE:
  - Continued Military-Man-in-Space experimentation support
- (U) SPACE ASSET UTILIZATION:
  - Continued development of software for real-time automated revision of Intelligence Preparation of the Battlefield template
  - Obtained Program Manager MLRS funding and support for proof-of-principle efforts for Azimuth Determining System (ADS)
  - Demonstrated a prototype system for fusing weather and doctrinal information as part of the weather/terrain Automatic Intelligence Preparation of the Battlefield Templates activity
- (U) COMMUNICATIONS:
  - Participated in the DARPA Lightsat User Coordination Group, which successfully launched a UHF communications satellite using the Pegasus launch vehicle

(U) FY 1992 Planned Program:

- (U) SPACE UNIQUE EXPERIMENTS:
  - Perform instrument level flight qualification testing for STAR TRACKER experiment
  - Continue research and development on micro-encapsulation experiment hardware
  - Fly space (micro-gravity) tissue loss experiment
- (U) TACTICAL SPACE SYSTEM/LIGHT SATELLITE (LIGHTSAT):
  - Continue research in technologies designed to enhance TACSAT payload capabilities, such as acousto-optic tunable filters, uncooled infrared sensors and detection of chemical/biological
- (U) MILITARY MAN IN SPACE:
  - Continue Military-Man-in-Space experimentation support
- (U) SPACE ASSET UTILIZATION:
  - Continue research to integrate real time weather/terrain data sources into tactical decision aids (TDA) processes
  - Continue efforts to transition ADS to Program Manager MLRS
- (U) COMMUNICATIONS:
  - Initiate action for the Army participation in NASA's Advanced Communications Technology Satellite Program (ACTS).
  - Begin preparation for ACTS experiments and demonstrations

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603006A**
PE Title: **Command, Control and Communications Advanced Technology** Budget Activity: **#2**

(U) FY 1993 Planned Program:

- (U) SPACE UNIQUE EXPERIMENTS:
  - Compare uniformity and purity of medications fabricated during initial microencapsulation flight with normally fabricated medication
  - Complete fabrication and flight qualification of upgraded experimental micro-encapsulation hardware
  - Evaluate results obtained during initial flight and design a follow-on tissue loss experiment
- (U) TACTICAL SPACE SYSTEM/LIGHTSAT:
  - Transition technology-based capabilities for enhanced TACSAT payloads
  - Demonstrate exploitation capabilities for remotely-sensed data to support Army missions
- (U) MILITARY MAN IN SPACE:
  - Continue Military-Man-in-Space experimentation support
- (U) SPACE ASSET UTILIZATION:
  - Continue research for integration of real time weather/terrain data sources into TDAs
  - Demonstrate the use of GPS azimuth on self propelled howitzers
  - Continue integration of space/terrestial sources into Electronic Support Module (ESM)
- (U) COMMUNICATIONS:
  - As the Army part of a DARPA-ied Joint service technology demonstration, initiate development of the EHF Communications technology demonstration. Start planning for the demonstration
  - Begin ACTS technology demonstration

(U) Work Performed By: C3 Advanced Technology - In-House: Center for C3 Systems-US Army CECOM, Fort Monmouth, NJ. Principal contractors: SRI International, Menlo Park, CA; Bolt, Beranek & Newman, Boston, MA; and Jet Propulsion Laboratories, Pasadena, CA. Space Technology Integration - In-House - US Army Corps of Engineers Engineer Topographic Laboratories, Fort Belvoir, VA; US Army Surgeon General Medical Research and Development Command, Fort Detrick, MD; US Army Laboratory Command Atmospheric Sciences Laboratory, White Sands, NM; National Aeronautics and Space Administration; Contractors - Applied Physics Laboratory of John Hopkins University, Columbia, MD; Perkin Elmer, Norwalk, CN.

(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, PE #0203740A, PE #0203726A, and PE #0602783A 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.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603007A**
PE Title: **Human Factors, Personnel and Training Advanced Technology** **Budget Activity: #2**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
A792 Manpower and Personnel	6091	3813	4154	Cont	Cont
A793 Human Factors in Training & Operational Effectiveness	5746	6631	6480	Cont	Cont
A794 Education & Training	4471	2838	5280	Cont	Cont
A795 Training Simulation	2043	1387	0	Cont	Cont
A796 Human Factors Engineering in Systems Design	759	1003	986	Cont	Cont
PE TOTAL	19110	15672	16900		

The reduction in FY 1992/1993 represents an OSD-recommended transfer to a management and support (6.5) program, PE #0605803, Project D730.

During FY 1992, funds were reprogrammed from Project A795 to Project A794 to reflect the fact that efforts under the PE are concerned mostly with the development of training strategies leading to the cost-effective utilization of training resources and less with the design of simulator and training device hardware and software. FY 1993 funding has been adjusted to reflect this change.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This is the Army's advanced development program in Soldier-Oriented R&D in personnel performance, training, and human factors engineering. Personnel and personnel-related costs account for more than 60% of the Army's budget. With major reductions in the Army force structure, it is critical that the Army assure that (1) high quality soldiers are assigned to the job that best utilizes his/her abilities, (2) individuals and units are fully trained to execute their missions, and (3) human performance in systems is maximized. This R&D program develops and demonstrates "people" technologies that include: theory-based individual and collective (unit) training strategies; design strategies for lower cost, less complex simulators that still achieve training objectives, improved methods for recruiting, selecting and retaining quality soldiers; and human factors/soldier-machine interface design alternatives to ensure total system operational effectiveness. The work in this program element is consistent with the resource-constrained Army Technology Base Master Plan and the Science and Technology Objective (STOs) therein.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project A792 - Manpower & Personnel: This project develops and evaluates technology for improved methods of: 1) attracting personnel, 2) selecting the most qualified, 3) assigning them to Military Occupational Specialties (MOS) that capitalize on their aptitudes and vocational interests, and 4) retaining the best performers. It also includes major research and development efforts to quantify the effect of family factors on readiness and retention, and to build a technology for the development

of executive-level Army leaders.

(U) FY 1991 Accomplishments:
- (U) Developed and validated the Life Cycle Army Manpower Cost Model for manpower costing for weapon systems
- (U) Empirically identified psychosocial and demographic variables that best predict retention of high quality officer and enlisted personnel
- (U) Conducted small-scale field test of alternative selection and classification system
- (U) Validated paper-and-pencil tests for predicting successful completion of the JFK Special Warfare Center and Qualifications Course

(U) FY 1992 Planned Program:
- (U) Evaluate contribution of psychomotor and spatial tests to computerized selection and classification
- (U) Validate optimal selection and classification battery for predicting first tour performance
- (U) Develop and test new methodology for selecting Ranger and Special Forces candidates
- (U) Develop methodology for identifying needs for additional or replacement selection and classification tests to support changes in Army Military Occupational Specialties (MOS)

(U) FY 1993 Planned Program:
- (U) Empirically test role of Army community support programs in retaining high performing soldiers
- (U) Develop preliminary versions of new methods for qualifying soldiers for promotion and reenlistment
- (U) Initiate field test of a totally restructured selection and classification system for all enlisted personnel
- (U) Develop and test new methodology for improving selection to the U. S. Military Academy

(U) Project A793 - Human Factors in Training and Operational Effectiveness: The soldier must be systematically considered throughout the weapon system development and acquisition process. Efforts within this project will develop and evaluate: (1) improved methods for estimating human factors, manpower, personnel and training (HMPT) requirements early in the combat development and weapon system design phases, (2) improved, empirically-based, methods for assessing the impact of HMPT variables on weapon system operability and maintainability, and (3) prototype technologies for integrating soldier performance considerations into complex, information-based weapon systems and command, control, communications and intelligence (C3I) systems.

(U) FY 1991 Accomplishments:
- (U) Developed an empirical method for making cost-benefit trade-offs among performance requirements, personnel availability, training requirements and equipment design
- (U) Determined validity of operator/maintainer workload predictors for artillery, air defense, and target handoff systems
- (U) Evaluated impact on personnel and training of different maintenance concepts for field artillery and non-line-of-sight components of air defense systems
- (U) Developed empirically-based, Manpower and Personnel Integration (MANPRINT) methods

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0603007A
PE Title: **Human Factors, Personnel and Training Advanced Technology** **Budget Activity: #2**

for improved analyses of reliability, availability and maintainability, battle damage assessment, and accident prevention
- (U) Developed a field artillery automated battle simulation facility
- (U) Developed field training exercise (FTX) "lessons learned" database for the Battle Command Training Program
- (U) Determined quantitative relationships among weapon system design characteristics, personnel performance and unit performance effectiveness

(U) FY 1992 Planned Program:
- (U) Develop a behavioral model for determining future Military Intelligence manpower, personnel, and training requirements
- (U) Determine the factors which affect the reliability of information flow and decision making in field artillery systems

(U) FY 1993 Planned Program:
- (U) Complete development of the HARDMAN III system, a computer-based system that allows prediction of MPT 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 model for predicting the impact of variations in staff size on command and control performance
- (U) Develop techniques for performing tradeoff analyses to assist the Military Occupational Specialty restructuring process
- (U) Develop a comprehensive behavioral data base of aviation maintainer attributes and abilities for use by systems designers

(U) Project A794 - Education and Training: This project leads to theory-based training strategies -- prescriptions for cost-effective allocation of training resources -- that produce proficient soldiers and units with a decrease in training resources (personnel, time, facilities, and travel). It will also experimentally investigate alternative, cost-effective applications of electronic technology and cognitive (intellectual) learning technology for training of individual combat, technical and maintenance skills.

(U) FY 1991 Accomplishments:
- (U) Developed methods for use by the Army Training and Doctrine Command (TRADOC) to derive "Lessons Learned" from Joint Readiness Training Center (JRTC) data
- (U) Empirically determined the relationship of home station training, leadership, and cohesion, to improved unit performance in realistic simulated combat exercises at Combat Training Centers (CTC)
- (U) Developed techniques to objectively measure unit performance at the Joint Readiness Training Center (JRTC)
- (U) Developed procedures for improving National Training Center after-action reports and take-home unit training based on collective (unit) training theory
- (U) Empirically tested prototype tank gunnery training strategies, incorporating crew and platoon

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0603007A
PE Title: **Human Factors, Personnel and Training Advanced Technology** **Budget Activity: #2**

training devices to maximize training effectiveness

(U) FY 1992 Planned Program:
- (U) Determine effectiveness of home station innovations by assessing their impact on CTC performance
- (U) Develop and test alternative training strategies for Reserve Component combat skills
- (U) Develop prototype unit training strategies incorporating various combinations of networked combined arms simulations and field training at CTCs
- (U) Develop tank gunnery training strategies involving elements of simulation, live fire, and individual soldier part-task training
- (U) Develop prototype computer-based decision aids for advanced communications equipment operators and maintainers

(U) FY 1993 Planned Program:
- (U) Evaluate and refine prototype unit training strategies
- (U) Develop prototype unit methods to improve training for communication of the commander's intent, and casualty management for the light forces
- (U) Refine a prototype unit performance feedback system for use at CTCs
- (U) Develop prototype automated classroom for maintenance training
- (U) Develop methodology and guidelines for designers of simulators and training devices to perform improved cost and training-effectiveness design trade-off analyses

(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 Project Manager for Training Devices (PM TRADE) with scientifically based recommendations for the design of lower-cost, lower-complexity simulators and training devices, focusing on aviation and armor.

(U) FY 1991 Accomplishments:
- (U) Developed strategies for applying expert systems-based instruction to maintenance skills training
- (U) Developed strategies for conducting and soldier-in-the-loop simulations with NATO allies

(U) FY 1992 Planned Program: Dollars transition from this project to Project A794, this PE

(U) FY 1993 Planned Program: Not applicable.

(U) Project A796 - Human Factors Engineering in System Design: Rapid changes in technology combined with increased emphasis on the soldier-machine interface have resulted in increased demands for human factors engineering expertise and the transfer of this technology into the materiel development and acquisition process. This project develops the methods, models, analysis tools, techniques, design guidelines, and non-system specific technology demonstrators for human factors engineering integration throughout the combat development and weapon system design process.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603007A**
PE Title: **Human Factors, Personnel and Training Advanced Technology** **Budget Activity: #2**

(U) FY 1991 Accomplishments:

- (U) Refined expert system development and expanded the application of the Human Factors Engineering (HFE) knowledge-based system to other Army materiel development programs
- (U) Enhanced HFE system to include the MANPRINT domains of manpower, personnel, training, health hazards, and safety; and coordinated application with Navy and Air Force human factors elements
- (U) Added joint motion and strength to the man-model for use in evaluating the soldier-machine interface in computer-aided design (CAD)

(U) FY 1992 Planned Program:

- (U) Continue efforts to expand expert system application to include all domains of MANPRINT, Tri-service coordination, and demonstrations in all Army systems under development
- (U) Add torso rotation function, and standing mobility to the man-model and demonstrate/validate model in Line-of-Sight Anti-tank (LOSAT), 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, and transition to human factors engineers in the field
- (U) Complete software development to add motion (walking), enhanced strength, reach and facial animation. The model to several materiel developers for use with their computer-aided design (CAD) systems.

(U) Work Performed By: The in-house developing organization for Projects A792, A793. A794, and A795 is the US Army Research Institute for the Behavioral and Social Sciences (ARI), Alexandria, VA. The in-house developing organization for Project A796 is the US Army Laboratory Command (LABCOM) Human Engineering Laboratory (HEL), Aberdeen Proving Ground, MD. Principal contractors employed at this time are: Advanced Technology, Inc., Reston, VA; Allen Corporation of America, Alexandria, VA; Analytics, Inc., Willow Grove, PA; The BDM Corporation, McLean, VA; Carlow Associates, Fairfax, VA; Carnegie Federal Systems Corp., Pittsburgh, PA; Consolve, Inc., Wayland, MA; Delfin Systems, San Jose, CA; Human Resources Research Organization, Alexandria, VA; Lica Systems, Inc., Fairfax, VA; University of Pennsylvania, Philadelphia, PA; and the Canadian Commercial Corporation, Ottawa, Canada.

(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.

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

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603053A**
PE Title: **Future Command and Control Vehicle Development (FC2V)** Budget Activity: **#4**

NO PICTURE AVAILABLE

POPULAR NAME: **Command and Control Vehicle**

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

SCHEDULE	FY 1991	FY 1992	FY 1993	To Complete
Program Milestones		Begin Development Effort		
Engineering Milestones			Begin Design Effort	
T&E Milesones				
Contract Milestones				
BUDGET ($000)	**FY 1991**	**FY 1992**	**FY 1993**	**Program Total (To Complete)**
Major Contract		6500	12300	27600
Support Contract		4500	4700	10000
In-House Support		3000	3300	7800
GFE/ Other		900	1700	1600
Total		14900	22000	47000

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603053A**
PE Title: **Future Command and Control Vehicle Development (FC2V)** Budget Activity: **#4**

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The FC2V will provide a fully tracked, armored vehicle that will ensure a mobile, responsive and survivable command and control capability for the heavy force. FC2V will be capable of command and control while on the move and incorporate communications and electronic systems compatible with Army Tactical Command and Control Systems. This program is a new start in FY 92, as a result of Operation Desert Storm initiatives.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS

(U) FY 1992 Planned Program:
- **(U)** Begin development of FC2V
- **(U)** Concept and requirements definition ongoing
- **(U)** Integration design and prototype production awaiting approved program

(U) FY 1993 Planned Program:
- **(U)** Begin integration design effort
- **(U)** Initiate prototype production

D. (U) WORK PERFORMED BY: TBD

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY: N/A

F. (U) PROGRAM DOCUMENTATION: None; requirements are currently in development at TRADOC.

G. (U) RELATED ACTIVITIES: Future Electronic Fighting Vehicle. There is no unnecessary duplication of effort within the Army or DOD.

H. (U) Other Appropriation Funds:
Weapons and Tracked Combat Vehicles
Future Command and Control Vehicle - SSN G84200

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603053A**
PE Title: **Future Command and Control Vehicle Development (FC2V)** Budget Activity: **#4**

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: TBD

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603102A**
PE Title: **Materials and Structures Advanced Technology** Budget Activity: **#2**

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

Project Number / Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D071	Components Scale Up				
	2954	1229	1343	Cont	Cont
DC08	Low Intensity Conflict				
	1	0	0	0	1671
DJ01	Combat Engineering Components				
	3309	1796*	1834	Cont	Cont
PE TOTALS	6264	3025	3177		

* Supplemental appropriation funds for Operation Desert Storm (ODS) in the amount of $155K are included.

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, 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; and a howitzer suitable for airborne and other light forces, thereby improving the Army's capability to deploy and sustain itself. Other tasks concern audio and moving-target simulators, deception devices and countersurveillance schemes which enhance the survivability for our combat forces. The Low Intensity Conflict project (DC08) was completed in FY 1991. The work in this program is consistent with the resource constrained Army Technology Base 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.

(U) **FY 1991 Accomplishments:**

- (U) Completed structural and ballistic design verification for 55-ton composite hull
- (U) Designed hull and fabricated tooling/molds for Phase III composite hull structure
- (U) Delivered phase II Combat Infantry Vehicle design and processing technical data package for 30-ton hull

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603102A**
PE Title: **Materials and Structures Advanced Technology** Budget Activity: **#2**

(U) FY 1992 Planned Program:
- (U) Transition phase II composite hull technology into Composite Armored Vehicle (CAV) Advanced Technology Transition Demonstration (ATTD)
- (U) Complete structural testing of 55-ton composite hull structure
- (U) Prepare and distribute Phase III composite hull manufacturing process, procedures, and structural test report and final technical report
- (U) Mold, machine and assemble 55-ton composite hull structure

(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) Project DC08 - Low Intensity Conflict: This project investigated the use of low cost surveillance devices in a Low Intensity Conflict (LIC) environment to monitor the movements of insurgent forces around friendly bivouacs and on supply trails. This project was completed FY 1991.

(U) FY 1991 Accomplishments:
- (U) Demonstrated existing technologies as alternatives to high-cost airborne platforms for intelligence gathering in LIC environments

(U) FY 1992 Planned Program: Not Applicable

(U) FY 1993 Planned Program: Not applicable

(U) Project DJ01 - Combat Engineering Components: This project seeks 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 materiel through improved countersurveillance 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 also be incorporated into the next generation heavy dry support bridge and the family of light bridging. Work previously outlined in this project for tactical logistics (Logistics-Over-The-Shore, material handling, fuel handling and electric power) was moved to PE #0603001A, Project DC44 in FY 1992.

(U) FY 1991 Accomplishments:
- (U) Demonstrated Joint Logistics-Over-the-Shore (JLOTS) technology of Pontoon Air Cushion Kit (PACK) and High Sea State Container Transfer System (HISEACOTS)
- (U) Evaluated suitability of composite bridge decks
- (U) Designed a 46 meter composite load-bearing beam for launching support bridges
- (U) Developed and fielded ultralightweight camouflage net systems for Operation Desert Storm

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603102A**
PE Title: **Materials and Structures Advanced Technology** Budget Activity: **#2**

- (U) Developed test data and finite element models for predicting the behavior of "Nitinol" shape memory fibers for smart beams
- (U) Designed, fabricated and evaluated a tactical hard wired command system for the Tank Gun Flash Simulator System
- (U) Tested the 30KW generator thermal signature suppression kit and implemented revisions to improve performance

(U) FY 1992 Planned Program:
- (U) Evaluate thermal tarp for semi-mobile and mobile applications
- (U) Conduct pyrotechnic evaluations on flash simulator for M1A1 Tank main gun;
- (U) Demonstrate general purpose infrared (IR) suppressive tarp
- (U) Demonstrate infrared (IR) suppression kit for 15-30KW generators
- (U) Determine feasibility of using ultralightweight for general purpose applications and high mobility camouflage
- (U) Build and test a 46 meter composite load bearing traversing beam for the Heavy Dry Support Bridge
- (U) Continue smart beam studies for flaw detection and fatigue life assessment

(U) FY 1993 Planned Program:
- (U) Conduct final field evaluation of complete flash systems
- (U) Initiate conception design studies for rapid gap crossing concepts
- (U) Integrate smart beam development into Heavy Dry Support Bridge program
- (U) Demonstrate multispectral camouflage using best technologies for visual, IR and radar suppression

(U) Work Performed By: In-house efforts will be accomplished by Belvoir Research, Development and Engineering Center, Ft. Belvoir, VA; Materials Technology Laboratory, Watertown, MA; Armament Research, Development and Engineering Center, Picatinny, NJ; Ballistics Research Lab, Aberdeen Proving Ground, MD; and Tank-Automotive Command, Warren, MI. Primary contractors are 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; 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 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.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0603105A
PE Title: Military Human Immunodeficiency Virus (HIV) Research **Budget Activity: #2**

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

Project Number / Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
DH29 Military HIV Research	44001	27770	0	Cont	Cont
PE TOTAL	44001	27770	0 *		

* These medical resources transferred to OSD, Health Affairs, effective FY 1993

B. (U) BRIEF DESCRIPTION OF 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. Research is focused on five thrust areas: diagnosis, natural history, epidemiology, vaccine development and drug therapy.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project DH29 - Military HIV Research: Medical Protection Against Human Immunodeficiency Virus (HIV) Infections: This project element funds Congressionally-mandated, militarily relevant HIV research in the areas of: vaccine development, diagnosis, natural history, epidemiology, and chemotherapy. Efforts are directed to answer militarily unique questions affecting manning, mobilization and deployment. Beginning in FY 1992, tasks that had been supported in this Project Element and Project in FY 1991 were transferred to 6.1 (0601102.BS17) and 6.2 (0602787.A873) programs.

(U) FY 1991 Accomplishments:

- (U) For the first time in medicine, proved the feasibility of post-infection vaccination to modify viral-specific immune response in the setting of chronic infection during a Phase I study of the safety of the gp160 vaccine in patients with early stage HIV infection.
- (U) Documented levels of psychiatric disorder, cognitive impairment, and psychosocial dysfunction in early HIV disease using a core battery of psychiatric, neuropsychological, and psychological assessment techniques administered to HIV-infected personnel in the three services.
- (U) Demonstrated that AZT treatment decreased progression to AIDS in patients with early HIV infection.
- (U) Documented the HIV infection incidence rate and changes over time among members of active and reserve components; demonstrated that the risk of acquiring HIV infection from soldiers on active duty continues to slowly decline.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0603105A
PE Title: Military Human Immunodeficiency Virus (HIV) Research **Budget Activity: #2**

- (U) Instituted systematic collection of HIV-1 isolates from diverse geographic areas for genetic analysis which will enable development of a globally useful vaccine.
- (U) Demonstrated through a prospective study that many high risk individuals with indeterminant HIV-1 serologies (ELISA and/or Western Blot) progress to confirmed positive within 4-6 months of initial testing.
- (U) Demonstrated the efficacy of a Simian Immunodeficiency Virus (SIV) vaccine in non-human primates as a model for an HIV human product.
- (U) Designed and evaluated new methods based on the polymerase chain reaction method and DNA sequencing to discriminate HIV-1 variants.

(U) FY 1992 Planned Program:
- (U) Continue evaluation of promising prophylactic and immunotherapeutic vaccines.
- (U) Initiate studies for identification of possible vaccine testing sites.
- (U) Continue to monitor the prevalence of HIV infections in military recruits and incidence in military populations.
- (U) Continue to assess behavior modification to control the spread of HIV infection.
- (U) Evaluate HIV variants for their impact on vaccine development.
- (U) Evaluate unique HIV peptides for enclosure in future vaccines.

(U) FY 1993 Planned Program:
These funds transferred to OSD, Health Affairs, effective FY 1993.

(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; Cambridge Biotech Corp., Rockville, MD; and Harvard University, Cambridge, MA.

(U) Related Activities:

PE #0601102A (Defense Research Sciences)
PE #0602787A (Medical Technology)
PE #0603002A (Medical Advanced Technology)
PE #0603807A (Medical Systems-Advanced Development)
PE #0604807A (Medical Materiel/Medical Defense Equipment-Engineering Development)

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.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603105A**
PE Title: **Military Human Immunodeficiency Virus (HIV) Research** Budget Activity: **#2**

(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.

AMENDED FY 1992/1993 BIENNIAL BUDGET DESCRIPTIVE SUMMARY

Program Element: #0603238A
PE Title: Air Defense/Precision Strike Technology Demonstration **Budget Activity: #2**

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

Project Number / Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D197 Seeker Advanced Development	NA	NA	5000	Cont	Cont
D189 Tractor Hike	NA	NA	27000	Cont	Cont
D160 Missile System Demo	NA	NA	18000	Cont	Cont
PE TOTAL	NA	NA	50000		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element provides for advanced development of relatively short range anti-air capabilities with emphasis on low altitude helicopter. In particular the Army urgently needs to be able to attack helicopters buried in background clutter from both ground and helicopter platforms. The demise of the Air Defense Anti-Tank System (ADATS) program has underlined the need for this new technology base program to develop approaches to short range air defense that are both effective and affordable. New missile technology is also needed. The Stinger missile is an excellent high speed light weight anti air missile, but new approaches to its seeker will be demonstrated to make it a more versatile weapon. This program will also demonstrate technology for more sophisticated future multipurpose missile capable of attacking targets that may be temporarily masked from the defended platform. Work in this program element complies with the Army Technology Base Master Plan and supports the DoD Science and Technology Thrusts for Air Superiority / Air Defense and Precision Strike.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project D197 - Seeker Advanced Development: This project includes the demonstration of infrared (IR) seekers using advanced technology to track targets in clutter.

(U) **FY 1991 Accomplishments:** N/A

(U) **FY 1992 Planned Program:** N/A

(U) **FY 1993 Planned Program:**
- (U) Demonstrate IR seeker with sophisticated clutter rejection signal processing
- (U) Design miniature imaging IR seeker appropriate for Stinger upgrade

(U) Project D189 - Tractor Hike: This is a classified program.

(U) Project D160 - Missile System Demo: This project will demonstrate a semi-active (laser designated) version of the Stinger missile.

(U) **FY 1991 Accomplishments:** N/A

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603238A**
PE Title: **Air Defense/Precision Strike Technology Demonstration** Budget Activity: **#2**

(U) **FY 1992 Planned Program: N/A**

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

- (U) Design and begin fabrication of a semi-active laser seeker for a Stinger missile
- (U) Begin development of tracker modifications to ensure counter-countermeasure resistance and track continuity in clutter for a laser designator system for semi-active Stinger

(U) **Work Performed By:** In-house efforts will be accomplished by U.S. Army Missile Command, Research Development and Engineering Center, Huntsville, AL, and Center for Night Vision and Electro Optics, Ft. Belvoir, VA. The missile system demonstration project will be managed by Program Manager, Air to Air Missiles (PM ATAM), Huntsville, AL.

(U) **Related Activities:** This program adheres to Tri-Service Reliance agreements on conventional air/surface weaponry and sensors and ground vehicles with oversight provided by Joint Directors of Laboratories. Work in the program element 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, Germany, and the United Kingdom, for infrared system and technology.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603270A**
PE Title: **Electronic Warfare Technology** Budget Activity: **#2**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
DK15	Advanced Communications Electronics Countermeasures Demonstration				
	4267	3197	4293	Cont	Cont
DK16	Non-communications Electronic Countermeasures Technology Demonstration				
	2637	3925	4643	Cont	Cont
PE TOTAL	6904	7122	8936		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program provides the Technology Base funding for current and future Electronic Warfare (EW) systems. The program provides technology demonstrations in communication countermeasures and information collection and reporting for transition to Army Intelligence Electronic Warfare (IEW) systems through the use of common module and open architecture processes. The effective use of specific components, software, and hardware for multiple applications will enable the Army to collect intelligence from modern modulation threat electronic systems and disrupt their operation, denying the enemy use of their command and control assets. The program also demonstrates the feasibility and effectiveness of non-communications electronic warfare hardware and software countermeasures and electronic support measures/electronic intelligence (ESM/ELINT) to protect our forces from radar, electro-optical, and infrared guided anti-aircraft artillery, surface to air missiles, artillery, and top attack weapons, and provide precise targeting information on non-communications emitters. Project DO25 is classified. Project A042, Tactical EW Technology, and Project A904, Tactical EW Techniques, were transferred to PE #0602270A, Projects A442, and Project A906, respectively, beginning in FY 1991 as a zero sum change. Project D025 was transferred to PE #0603271A, Project DC15, beginning in FY 1991 as a zero sum change. This program supports the Precision Strike Science and Technology Thrust area.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project DK15 - Advanced Communications Electronics Countermeasures Demonstration

(U) FY 1991 Accomplishments:

- (U) Initiated Stand-In Communications Countermeasure Demonstration to merge exploratory development efforts to form the baseline for prototype UAV application

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603270A**
PE Title: **Electronic Warfare Technology** Budget Activity: **#2**

- **(U)** Completed field demonstration of fusion technology advancements

(U) FY 1992 Planned Program:

- **(U)** Provide enhanced map, terrain and analysis displays

(U) FY 1993 Planned Program:

- **(U)** Initiate effort to determine platform and payload compatibility

- **(U)** Field validate next generation fusion technology prior to incorporation into the development process
- **(U)** Provide the battlefield commander with the capability of assessing situations in a rapid and timely manner

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603270A**
PE Title: **Electronic Warfare Technology** Budget Activity: **#2**

(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 1991 Accomplishments:

- (U) Completed development and integration of knowledge based expert system power management into Apache Escort Jammer (AEJ) and interfaced power management with early Rotorcraft Pilots Associate (RPA) multi-function display
- (U) Conducted Air Force-Electronic Warfare Environment Simulator testing of generic electronic countermeasures (ECM) versis command guided missiles and 2-6 GHz acquisition radars for use in the Radar Deception and Jamming (RDJ) advanced technology transition demonstration (ATTD)
- (U) Initiated armored system modernization (ASM) EW survivability study

(U) FY 1992 Planned Program:

- (U) Award contract for RDJ ATTD to demonstrate sensor fusion and power management of ASE, non-cooperative information friend or foe, target cueing and commmand control and communications data fusion with real time reprogramming of EW
- (U) Continue Joint Electronic Warfare Center (JEWC) RDJ threat/performance modeling
- (U) Initiate ECM field testing for insertion into RDJ ATTD
- (U) Complete ASM EW study and transition results to enhance survivability of ground vehicles for subsequent technology demonstration

(U) FY 1993 Planned Program:

- (U) Complete JEWC modeling for RDJ ATTD
- (U) Complete fabrication of RDJ hardware and perform acceptance testing at contractor facility
- (U) Initiate integration into aircraft test bed and coordinate test plans

(U) Work Performed By:

DK15: In-House - US Army Communication-Electronics Command (CECOM) Signals Warfare Directorate, Warrenton, VA. Contractor - GTE Government Systems Corporation, Mountain View, CA; DIRAD, Redondo Beach, CA; SCS Telecom, Port Washington, NY; Hughes Corporation, Fullertor, CA; Microwave Semiconductor Corporation, Somerset, NJ; PAR Technology, Utica, NY.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603270A**
PE Title: **Electronic Warfare Technology** Budget Activity: **#2**

DK16: In-House - CECOM Electronic Warfare/Reconnaissance Surveillance and Target Acquisition (EW/RSTA) Directorate, and Engineering Support Activity (ESA), Fort Monmouth, NJ; US Navy Naval Weapons Center, China Lake, CA; US Army; Test and Experimentation Command, Fort Rucker, AL; and U.S. Army Aviation Research and Development Activity (AVRADA), Fort Monmouth, NJ. Contractor - SEDCO Systems, Inc., Melville, Long Island, NY; Booz-Allen Hamilton, Bethesda, MD. Contractors for the Radar Deception and Jamming ATTD to be determined.

(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, PE #0603270N, PE #0603792N, PE #0602204F, and PE #0603270F in accordance with the ongoing Reliance joint planning process and contains no unwarranted duplication of effort among the Military Departments.

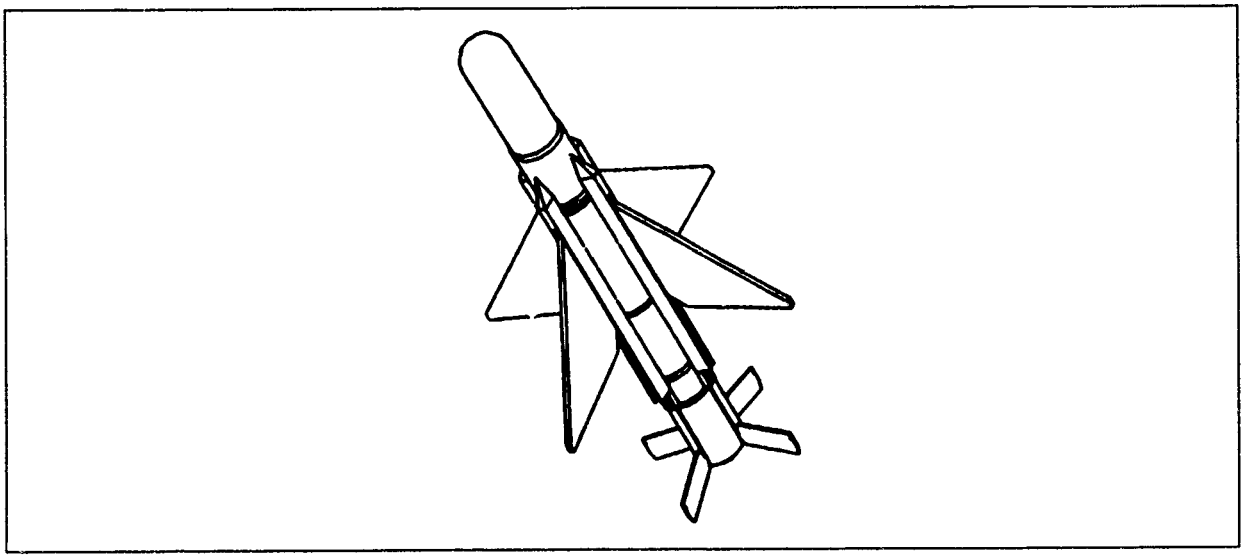
(U) Other Appropriation Funds: ($ in Thousands) Not applicable.

(U) International Cooperative Agreements: Current Memorandum of Understanding (MOU) on Electro-Optical Countermeasures (EOCM) with United Kingdom. Pending MOU with Canada on MEDFLI/SILENT FOX effort, a NATO electronic support measure (ESM) payload. The Technical Cooperation Program (TTCP) Subgroup Q (EW), Defense Exchange Agreement (DEA) with Israel and France.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603303A**
PE Title: **Surface-to-Surface Missile Rocket System**
Project Title: **Multiple Launched Rocket System-Terminal Guidance Warhead**

Project Number: **#D216**
Budget Activity: **#4**



POPULAR NAME: **MLRS-TGW**

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

SCHEDULE	FY 1991	FY 1992	FY 1993	To Complete
Program Milestones				N/A
Engineering Milestones	Rev sys demo substage	RSDS		
T&E Milestones	Cpt Flt Test Ball Flt Test Sled/Drop Test	ECFT/Drop/ Disp/EDT-C Flt/EMR/ROAD/HWIL		
Contract Milestones				
BUDGET ($000)	**FY 1991**	**FY 1992**	**FY 1993**	**Program Total (To Complete)**
Major Contract	26147	28496		194223 (0)
Support Contract	6449	5709		44975 (0)
In-House Support	8385	5269		26662 (0)
GFE/Other	750	7045		36730 (0)
Total	41731	46519	-0-	302600 (0)

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0603303A
PE Title: Surface-to-Surface Missile Rocket System
Project Title: Multiple Launched Rocket System-Terminal Guidance Warhead

Project Number: #D216
Budget Activity: #4

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The concept of a Terminal Guidance Warhead (TGW) for the Multiple Launch Rocket System (MLRS) envisions the attack of armored targets from above using highly accurate and lethal submunitions dispensed from an MLRS rocket. This is an autonomous, terminal homing, indirect fire-and-forget capability to defeat hard, point targets such as armored vehicles and equipment before they are committed into the central battle. The TGW for the MLRS will contain three submunitions packaged within the rocket warhead section. The Army is developing this warhead in cooperation with France, Germany and the United Kingdom under a memorandum of understanding dated 11 September 1981 for the Multiple Launch Rocket System (MLRS) with December 1983 supplement that established the TGW Program and will continue through the completion of the System Demonstration Substage (SDS) phase in September 1992.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) Project D216 - Multiple Launch Rocket System Terminal Guidance Warhead (MLRS-TGW)

(U) FY 1991 Accomplishments:
- (U) Continued captive prototype flight testing with Doppler Beam improved seeker for detection and tracking of targets in severe clutter conditions
- (U) Conducted ballistic flight tests to provide trajectory data for algorithm development
- (U) Verified tactical detection algorithm
- (U) Conducted sled tests to confirm submunition dispense
- (U) Began delivery of subsystem prototype
- (U) Initiated subsystem assembly and test
- (U) Continued hardware fabrication
- (U) Continued prototype software development
- (U) Began cost reduction studies
- (U) Initiated rocket ballistic flight for trajectory algorithm
- (U) Conducted dummy drop tests in preparation for drop test series

(U) FY 1992 Planned Program:
- (U) European captive flight tests of Enhanced Special Phase Resinace (ESPR) and Doppler Beam Seeker (DBS) including countermeasures
- (U) Countermeasure testing
- (U) Road shock and vibration tests
- (U) Continue delivery of subsystem prototypes
- (U) Conduct Electro-Magnetic Radiation (EMR) series of tests
- (U) Initiate subsystem and system level EMR testing
- (U) Initiate Hardware-In-The-Loop (HWIL) of tactical configuration
- (U) Complete component TGW/Terminally Guided Submunitions (TGSM) system integration assembly test
- (U) Conduct TGSM subsystem environmental test
- (U) Conduct Engineering Design Test-Contractor (EDT-C) Dispense Flight tests
- (U) Initiate system level TGW dispense and drop tests with tactical configuration hardware
- (U) Begin system Advanced Development Test-Contractor (ADVT-C) flight tests
- (U) Continue system level TGW dispense and drop tests with tactical configuration hardware

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603303A** Project Number: **#D216**
PE Title: **Surface-to-Surface Missile Rocket System** Budget Activity: **#4**
Project Title: **Multiple Launched Rocket System-Terminal Guidance Warhead**

- (U) Complete RSDS phase in FY92
- (U) Continue cost reduction studies
- (U) Complete drop tests of tactical TGSMs
- (U) Complete HWIL testing of tactical configuration
- (U) Complete system level EMR testing
- (U) Conduct TGW system level environmental testing

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

D. (U) WORK PERFORMED BY: This program is managed by the MLRS Project Manager. Development contractor for TGW is MDTT, Inc., Orlando, Florida, an international joint venture comprised of Martin Marietta Corporation of the United States; Thomson CFS of France, Thorn EMI Electronics of the United Kingdom, and Diehl GmbH of Germany. MDTT acts as the managing partner of the joint venture. The LTV Corporation of Dallas, Texas, prime contractor for the MLRS, will integrate the TGW into the MRLS. TGW is being jointly developed under an international memorandum of understanding (MOU) dated 11 Sep 81 for the Multiple Launch Rocket System (MLRS) with Dec 83 supplement that established the TGW Program. The overall program is supervised by the Joint Steering committee (JSC) composed of flag rank national representatives of the MOU member countries (France, Germany, United Kingdom, and the United States). Under the terms of the MOU the United States pays 40 percent of the development costs and NATO partners pay 20 percent each.

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** None
2. **(U) SCHEDULE CHANGES:** FY91/92 funds have been reinstated with zero cost/schedule impact. Delays in hardware deliveries and hardware/software integration have produced a projected delay of four months to completion. Impact of these deferrals will ripple through the remainder of the development program and the SDS phase will not be completed on time.
3. **(U) COST CHANGES:** Program is currently executable within FY 92 funding line. Should contract go to ceiling, an additional $4.0M may be required. The program is not funded in FY93 and outyears to support participation in FSD. Full participation in the international FSD effort would require $185.0M in the FY93-95 time frame.

F. (U) DOCUMENTATION:

Letter of Agreement	10/83
MOU Supplement Number 3 to Basic MLRS Co-development MOU	12/83
Secretary of Defense Decision Memorandum	11/84
System Coordinating Paper Updated for SDS	02/89
SDS Contract Option Exercised	07/89
Test Evaluation Master Plan (TEMP)	11/89

G. (U) RELATED ACTIVITIES: SSN: C67600 (Multiple Launch Rocket System)
There is no unnecessary duplication of effort within the Army or DoD.

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands) Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603303A** Project Number: **#D216**
PE Title: **Surface-to-Surface Missile Rocket System** Budget Activity: **#4**
Project Title: **Multiple Launched Rocket System-Terminal Guidance Warhead**

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: TGW is being jointly developed under an international memorandum of understanding (MOU) dated 11 Sep 81 for the Multiple Launch Rocket System (MLRS) with Dec 83 supplement that established the TGW Program. The overall program is supervised by the Joint Steering Committee composed of flag rank national representatives of the MOU member countries (France, Germany, United Kingdom and the United States). The contractor is an international joint venture of MDTT Inc., Martin-Marietta (US), Diehl GmbH (FRG), Thomson CFS France and Thorn (UK). MDTT acts as the managing partner of the joint venture. Under the terms of the MOU the US pays 40 percent of the development costs and NATO partners pay 20 percent each.

J. (U) TEST AND EVALUATION DATA:

1. Development Test and Evaluation:

a. Concept: Multiple Launch Rocket System/Terminal Guidance Warhead (MLRS/TGW) testing will be continued under the single integrated development test concept. Co-development and test will be conducted under the provision of the TGW MOU supplement among the United States, United Kingdom, Federal Republic of Germany, and France. The MLRS Project Manager (PM) will maintain total weapons system responsibility. The Project Management Office will manage both the US and international aspects of the test program through a formally charted MLRS International Test Integration Working Group (ITIWG). The ITIWG integrates the testing requirements, data requirements, and specific test and evaluation requirements from all participating organizations and countries into a combined MLRS TGW test program. International aspects of the test program management will be accomplished through the International TIWG consisting of representatives from each of the participating countries, the development contractor, and the integration contractor. The International TIWG, functioning in accordance with approved terms of reference as specified in MLRS MOU, will integrate test requirements, interchange test data and coordinate the use of test resources to achieve cost effective testing throughout the life cycle of the test program.

b. Development Test and Evaluation (DT&E):

(1) Validation Stage, Component Demonstration Substage - DT&E during this phase was designed to reduce technical risk and cost exposure by demonstrating technological maturity of components and subsystems. The program was designed to provide a logical progression of DT&E from the piece part, component, subassembly, and assembly through the subsystem level. The first phase of validation was not intended to fully develop the MLRS-TGW component/subsystem design. Full development and verification of the engineering solutions will be accomplished during the revised system demonstration substage (RSDS).

(2) Validation Stage, Revised System Demonstration Substage - DT&E during this phase will be a weapon system integration demonstration phase designed to provide component, subsystem, and system level confidence. This second phase of the validation stage will include completion of the component/subsystem engineering effort to more fully develop these items and to integrate them into a functional MLRS/TGW rocket. This data, RDTE results, and other M270 family of munitions operational testing will be incorporated in the operational assessment.

U.S. participation in the MLRS-TGW program will end with the completion of the System Demonstration Substage (SDS) phase.

AMENDED FY 1992/1993 BIENNIAL 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 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D085 Demonstration of Advanced Radar Techniques (DART)*	2317	240	0	0	*
D206 Missile Simulation	3386	3364	3472	Cont	Cont
D263 The Army Combined Arms Weapon System (TACAWS): Technology Demonstration(s)	0	4350	8066	Cont	Cont
D271 Multi-role Survivable Radar	5523	3652	3514	0	48610
D401 Insensitive Munitions for Missile Propulsion	0	7900	5972	Cont	Cont
D494 Dual Mode Seeker	0	0	141	Cont	Cont
PE TOTAL	11226	19506	21165		

*Program will continue until completion of 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; a kinetic energy penetrator to defeat heavy armor; 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 Technology Base Master Plan and Science and Technology Objectives (STOs) therein and supports DoD Science and Technology (S&T) Thrusts in Precision Strike and Air Defense.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0603313A
PE Title: Missile and Rocket Advanced Technology Budget Activity: #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 1991 Accomplishments:
- (U) Supported international and national field trials in The Netherlands, France and the Federal Republic of Germany
- (U) Continued analysis of radar performance

(U) FY 1992 Planned Program:
- (U) Conduct international DART/Advanced Flyable Generic Arms Seeker (AFGAS) trials at Redstone Arsenal, AL
- (U) Complete development of DART ARM simulation
- (U) Support national trials for France and conduct national trials for U.S.
- (U) Analyze international and national trial data
- (U) Maintain U.S. antennas for trials

(U) FY 1993 Planned Program:
- (U) U.S. participation concluded -- no planned program

(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 1991 Accomplishments:
- (U) Development of the updated Scene Generation Analysis System (SGAS) to provide real time target image generation for missile hardware-in-the-loop (HWIL) simulation continued throughout FY 1991
- (U) SGAS capability was extended to accommodate applications to particular missile system development (Non-Line of Sight (NLOS) and JAVELIN)

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603313A**
PE Title: **Missile and Rocket Advanced Technology** Budget Activity: **#2**

- (U) Support to the development of new millimeter wave/microwave simulation capabilities for missile system development into the next century was continued.
- (U) Addition of the Electronic Counter Measure (ECM) signal generation channel in the Millimeter Simulation System (MSS) was completed
- (U) Upgrade of the MSS control and modelling computers was commenced with the acquisition of a realtime with the acquisition of a realtime UNIX based control computer and a pair of vector array processors and associated software development workstation
- (U) Infrared scene projector development based on deformable mirror/spatial light modulation was initiated
- (U) The Battlefield Environment Future Weapon System Simulator (BEFWSS) and Battlefield Environment Automated Scenario Development (BEADS) were combined to allow interactive display of target scene and interactive target selection

(U) FY 1992 Planned Program:

- (U) Expand capability of hardware-in-the-loop (HWIL) millimeter simulation system to provide greater accuracy and scenario fidelity for smart weapons support
- (U) Replace obsolete computational capability in microwave and millimeter wave HWIL simulation areas to provide necessary support for next generation missiles
- (U) Improve signal generation power and flexibility at microwave and millimeter frequencies
- (U) Complete the development of the updated SGAS and integrate into the electro-optical simulation laboratory
- (U) Continue development of deformable mirror/spatial light modulator infrared scene projector and also investigate alternative approaches
- (U) Improve computational capabilities and user interfaces and add full Ada capability to Simstar simulation processors
- (U) Incorporate models for haze and clouds in 3-5 micron and 8-12 micron in terms of extent, extension and emissivity
- (U) Incorporate/refine models of obscurant radiance, path radiance, and infrared (IR) emitters (IR Controlled Flares and Gunflash)
- (U) Extend/refine IR target/background signature models using measured data for verification
- (U) Develop cyanamic statistical models of target/clutter scenes using measured data for verification

(U) FY 1993 Planned Program:

- (U) Acquire and install upgraded real-time simulation control and missile simulation processors in radio frequency and millimeter simulation systems
- (U) Initiate development of high performance, low cost digital signal processors for target and background scenario modelling in RF and MMW HWIL simulation laboratories
- (U) Continue developmental support to new millimeter wave and weapon systems HWIL simulators
- (U) Expand bandwidth capabilities of digital quadrature modulators
- (U) Finish conversion of the Advanced Simulation Processor Complex (ASPC) to Ada language operation

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603313A**
PE Title: **Missile and Rocket Advanced Technology** Budget Activity: **#2**

- **(U)** Continue development infrared and visual dynamic scene generators and projectors
- **(U)** Continue development of high performance host processor ASPC for SIMSTAR computers
- **(U)** Develop/incorporate synthetic blending of MMW target data with MMW clutter data
- **(U)** Develop/incorporate MMW obscurant counter measure models & verify with field test data collected in 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 and systems technology including seekers, propulsion, airframes, warheads, and guidance and control. Work is conducted through Technology Demonstration (TD) and Advanced Technology Transition Demonstration (ATTD). 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 helo's buried in cluttered backgrounds and 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. This project is transitioning from PE #0602303A, Project A214.

(U) FY 1991 Accomplishments: Project not funded

(U) FY 1992 Planned Program:
- **(U)** Conduct limited tower tests with candidate multi-role seeker hardware/software
- **(U)** Finalize TACAWS program planning document based on developer and user input
- **(U)** Conduct trade studies to determine optimal missile design for multi-role/multi-target/multi-platform mission

(U) FY 1993 Planned Program:
- **(U)** Complete definition of Best Technical Approach in support of TACAWS missile system design criteria
- **(U)** Complete development of Technology Development Plan for TACAWS demonstration
- **(U)** Initiate preliminary design of TACAWS missile system

(U) Project D271 - Multi-role Survivable Radar (MRSR): This project will make available to the Army 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

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603313A**
PE Title: **Missile and Rocket Advanced Technology** Budget Activity: **#2**

technologies such as very low sidelobe antennas, microwave integrated circuits (MIC), and very high speed integrated circuits (VHSIC).

(U) FY 1991 Accomplishments:
- **(U)** Complete sub-system tests for MRSR
- **(U)** Antenna hardware fabrication and assembly
- **(U)** Complete hardware/software integration of the radar

(U) FY 1992 Planned Program:
- **(U)** Deliver MRSR to the U.S. Army Missile Command
- **(U)** Complete in-plant system test of the radar
- **(U)** Initiate field tests for MRSR
- **(U)** Conduct acceptance test at MICOM

(U) FY 1993 Planned Program:
- **(U)** Complete field tests at U.S. Army Missile Command
- **(U)** Conduct field tests at White Sands Missile Range
- **(U)** Complete data reduction and produce final report
- **(U)** Transition technology

(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. This project is transitioning from PE #0602303A, Project A214.

(U) FY 1991 Accomplishments: Project not funded.

(U) FY 1992 Planned Program: (This program is a transition from exploratory development (6.2)
- **(U)** Develop tough, lightweight motor cases and mitigating devices to reduce propulsion hazards
- **(U)** Develop and demonstrate a high performance minimum smoke propulsion system to meet IM requirements
- **(U)** Evaluate the effects of propellant/case interactions on IM characteristics
- **(U)** Initiate development and evaluation of new high performance minimum signature IM propulsion concepts with thrust control
- **(U)** Initiate development of very high performance IM minimum signature propulsion

(U) FY 1993 Planned Program:
- **(U)** Initiate development of high performance smoke ammonium perchlorate composite propulsion system that meets IM requirements
- **(U)** Evaluate IM ignition system in a prototype IM missile propulsion system

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603313A**
PE Title: **Missile and Rocket Advanced Technology** Budget Activity: **#2**

- (U) Evaluate alternate propulsion cycles for high performance thrust-controllable IM missile systems
- (U) Perform demonstration test of high performance IM minimum signature rocket motor in the fielded missile configuration

(U) Project D404 - Dual Mode Seeker: This project provides only for monitoring of an Air Force program that will continue development of dual mode (millimeter wave/infrared) technology through the captive flight test phase. This project is transitioning from PE #0602303A, Project A214.

(U) **FY 1991 Planned Program:** Project not funded

(U) **FY 1992 Planned Program:** Project not funded

(U) **FY 1993 Planned Program:**
- (U) The dual mode seeker effort is a continuation (transition) from an earlier 6.2 program
- (U) Monitor the Air Force dual mode seeker (millimeter wave/infrared (MMW/IR)) program
- (U) Attend contractor reviews and make recommendations to Air Force management
- (U) Analyze the developing dual mode technology for use in Army missile systems

(U) **Work Performed By:** The Research, Development, and Engineering Center, U.S. Army Missile Command, Redstone Arsenal, AL, has the primary responsibility for execution of this program. The major contractors are Raytheon Company, Bedford, MA; LTV Aerospace and Defense Company, Dallas, TX; Boeing Aerospace Company, Seattle, WA; and Electronic Associates, Inc., West Long Branch, NJ.

(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, PE #0602303A, and PE #0603363F in accordance with the ongoing Reliance joint planning process and contains no unwarranted duplication of effort among the Military Departments.

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

(U) **International Cooperative Agreements:** Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603392A**
PE Title: **Anti-Satellite Weapons (ASAT)**
Project Title: **Anti-Satellite Weapons**

Project Number: **#DE16**
Budget Activity: **#3**

NO PICTURE AVAILABLE

POPULAR NAME: **ASAT**

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

SCHEDULE	FY 1991	FY 1992	FY 1993	To Complete
Program Milestones				
Engineering Milestones	SRR-May	SDR-Jan SSR-Aug		
T&E Milestones				
Contract Milestones				
BUDGET ($000)	**FY 1991**	**FY 1992**	**FY 1993**	**Program Total (To Complete)**
Major Contract	62993	36050	17400	Cont
Support Contract	16369	7471	3200	Cont
In-House Support	17804	6899	3668	Cont
GFE/Other	601	580	500	Cont
Total	97767	51000	24768	Cont

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603392A** Project Number: **#DE16**
PE Title: **Anti-Satellite Weapons (ASAT)** Budget Activity: **#3**
Project Title: **Anti-Satellite Weapons**

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The objective of the Kinetic Energy (KE) Anti-Satellite (ASAT) 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. Funding allows completion of the RDTE DEM/VAL program and positions the program for a Major Decision Review in 3rd Qtr, FY 94; focuses on development, fabrication, and testing of the prototype kill vehicle and weapon control subsystem; completes modified Preliminary Design Review (PDR), 2Q94 and augments ongoing booster development.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- (U) Conducted System Requirement Review (SRR)
- (U) Conducted Strategic System Committee (SSC) Review
- (U) Continued risk reduction program and KE ASAT booster studies
- (U) Performed component test to support engineering issue resolution
- (U) Completed A-Specs for booster design
- (U) Initiated parts procurement for prototype kill device
- (U) Initiated development of weapon control subsystem testbed

(U) FY 1992 Planned Program:
- (U) Conduct KE ASAT System Design Review (SDR)
- (U) Conduct Hover Test to verify simulation
- (U) Perform Missile Subsystems Simulations, Hardware-In-The-Loop Testing and Hardware/Software Integration testing
- (U) Conduct System Software Review (SSR)

(U) FY 1993 Planned Program:
- (U) Conduct risk reduction program, KE ASAT booster development, Kill Enhancement Device testing and system design
- (U) Conduct Kill Vehicle simulations and hardware-in-the loop testing
- (U) Continue ground test on critical components
- (U) Conduct Early User Test and Evaluation

(U) Program Plan to Completion: Near term development and demonstration of prototype kill vehicle and weapons control subsystem.

(U) WORK PERFORMED BY: U.S. Army Strategic Defense Command; KE ASAT DEM/VAL prime contractor, Rockwell International Corporation, Los Angeles, CA; Teledyne Brown Engineering, Huntsville, AL; Johns Hopkins University/Applied Physics Laboratory, Laurel, MD; Nichols Research Company, Huntsville, AL; Coleman Research Corporation, Huntsville, AL; Booz-Allen Hamilton, Huntsville, AL; Kaman Sciences Corporation, Colorado Springs, CO; Applied Research, Incorporated, Huntsville, AL; Advanced Sciences, Incorporated, Albuquerque, NM; and Colsa, Incorporated, Huntsville, AL.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603392A** Project Number: **#DE16**
PE Title: **Anti-Satellite Weapons (ASAT)** Budget Activity: **#3**
Project Title: **Anti-Satellite Weapons**

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: Reduced emphasis on entering Engineering and Manufacturing Development; Increased emphasis on developing kill vehicle and weapons control subsystem prototypes.

2. (U) SCHEDULE CHANGES: Modified Preliminary Design Review, 2QFY94 with Major Decision Review scheduled 3QFY94.

3. (U) COST CHANGES: The total program cost has been reduced to provide only for completion of the DEM/VAL phase.

F. (U) PROGRAM DOCUMENTATION:

Defense Acquisition Board Acquisition Decision Memorandum (S), 9 March 1989.
Defense Acquisition Board Acquisition Decision Memorandum for Kinetic Energy Anti-Satellite (KE ASAT) Concept Definition Selection (U), 15 December 1989.
System Concept Paper - 1 November 89
System Threat Assessment Report, 1 November 1989
Test and Evaluation Master Plan, 1 October 1989
Cost and Operational Effectiveness Analysis, 1 December 1989

The Acquisition Decision Memorandum (ADM), 15 December 1989, 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 February 1990 authorized the program to proceed into Dem/Val Phase.

G. (U) RELATED ACTIVITIES:
PE #0102424F, (SPACETRACK); Includes 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: ($ in Thousands)

1. (U) PROCUREMENT: None

2. (U) MILITARY CONSTRUCTION: None.

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

J. (U) TEST AND EVALUATION DATA: The KE ASAT Test and Evaluation Master Plan was completed, staffed, and approved by OSD April 1990.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603604A**
PE Title: **Nuclear Munitions - Advanced Development** Budget Activity: **#4**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D135 Nuclear Development Support	1155	1496	1426	Cont	Cont
D153 Nuclear Effects Support Team (NEST)	2191	1855	1788	Cont	Cont
PE TOTAL	3346	3351	3214		

B. (U) BRIEF DESCRIPTION OF ELEMENT: Modern, effective, and safe nuclear weapon systems are needed to fight successfully on the nuclear battlefield. This program funds efforts to effectively terminate R&D efforts within the office of the Project Manager for nuclear munitions. The Nuclear Effects Support Team provides nuclear weapons effects expertise to developers of Army materiel with nuclear survivability requirements. The Nuclear Survivability Assessment Team assesses the nuclear survivability of mission essential deployed equipment and identifies corrective measures to improve nuclear survivability where needed. These teams of experts support the Army research and development community in developing nuclear hardened systems and identifying nuclear survivability improvements needed in mission essential deployed equipment.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND 1993:

(U) Project D135 - Nuclear Development Support: This project provides funding for a core of personnel to effectively terminate the RDT&E effort under the auspices of the Project Manager for Nuclear Munitions (PM NUC).

(U) FY 1991 Accomplishments:
- (U) Funded civilian salaries, travel, supplies, equipment and other operating expenses of PM NUC Office, Picatinny Arsenal, NJ

(U) FY 1992 Planned Program:
- (U) Funds civilian salaries, travel, supplies, equipment and other operating expenses of PM NUC Office, Picatinny Arsenal, NJ for project completion and termination.

(U) FY 1993 Planned Program:
- (U) Funds civilian salaries, travel, supplies, equipment and other operating expenses of PM NUC Office, Picatinny Arsenal, NJ for orderly termination of R&D efforts.

(U) Project D153 - Nuclear Effects Support Team: This project provides funding for the Nuclear Effects Support Team (NEST) and the Nuclear Survivability Assessment Team (NSAT). NEST provides nuclear weapons effects expertise to developers of Army materiel with nuclear survivability requirements. NSAT assesses the nuclear survivability of mission essential deployed Army systems/equipment critical in nuclear conflict and identifies corrective measures as needed.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603604A**
PE Title: **Nuclear Munitions - Advanced Development** Budget Activity: **#4**

(U) FY 1991 Accomplishments:
- (U) Provided nuclear survivability design assistance to approximately 60 project managers
- (U) Continued development of expert system design aids to assist Army project managers for nuclear survivability
- (U) Conducted nuclear survivability assessments of developmental and non-developmental systems as requested by the Assistant Secretary of the Army for Research Development and Acquisition. Assessed test and evaluation master plans for adequacy in nuclear survivability
- (U) Maintained and updated the Army databases on nuclear survivability of systems

(U) FY 1992 Planned Program:
- (U) Provide nuclear survivability design assistance to approximately 60 project managers
- (U) Continue the development of expert system design aids to assist project managers for nuclear survivability
- (U) Conduct nuclear survivability assessments of developmental systems as requested by the Assistant Secretary of the Army for Research Development and Acquisition. Assess test and evaluation master plans for adequacy in nuclear survivability
- (U) Maintain and update the Army databases on nuclear survivability of systems

(U) FY 1993 Planned Program:
- (U) Provide nuclear survivability design assistance to approximately 60 project managers
- (U) Continue development of expert system design aids to assist project managers for nuclear survivability
- (U) Conduct nuclear survivability assessments of developmental systems as requested by the Assistant Secretary of the Army for Research, Development and Acquisition. Assess test and evaluation master plans for adequacy in nuclear survivability
- (U) Maintain and update the Army databases on nuclear survivability of systems

(U) Work Performed By: In-house efforts are performed by the Project Manager for Nuclear Munitions, Picatinny Arsenal, NJ; at U.S. Army Armament Research, Development, and Engineering Center, Picatinny Arsenal, NJ; Harry Diamond Laboratories, Adelphi, MD; and Ballistic Research Laboratory, Aberdeen Proving Ground, MD. Major contractors are Booz, Allen & Hamilton, Bethesda, MD; and, Kaman Sciences Corporation, Colorado Springs, CO.

(U) Related Activities: PE #0602120A (Electronic Survivability and Fuzing Technology). This PE is used in the transfer of survivability and hardening technology. Nuclear survivability is a tri-service effort in coordination with the Defense Nuclear Agency. It has been coordinated with the Quadripartite and NATO nations by standardization agreements. PE #0604603A (Nuclear Munitions) is the engineering development of nuclear munitions, associated components, and the survivability overpack container, the transportation safety container, and the maintenance and assembly secure storage. There is no unnecessary duplication of effort within the Department of the Army or the DoD. These efforts are being terminated in an orderly manner.

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

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603606A**
PE Title: **Landmine Warfare and Barrier Advanced Technology** Budget Activity: **#2**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D006	Landmine Warfare Dev				
	3371	2645	2732	Cont	Cont
D608	Countermine & Barrier Dev				
	9242	17159*	16401	Cont	Cont
D609	Heavy Assault Bridge				
	0	8000	0**		
PE TOTAL	12613	27804	19133		

*Supplemental appropriation funds for Operation Desert Storm (ODS) in the amount of $1076K are included.
**Funding transferred in FY 1992 to PE # 0604804A, Project DH01.

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, such as those developed under Project D006, are significantly more effective, can be emplaced rapidly, are controllable and require less time and 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. Following the Congress' lead, DoD provided an increase of $10000K in FY 1993. Work in this Program Element complies with the Army Technology Base Master Plan and 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 Vehicles.

C. (U) JUSTIFICATION FOR PROJECTS:

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603606A**
PE Title: **Landmine Warfare and Barrier Advanced Technology** Budget Activity: **#2**

(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 effective command and control capability will not only provide a means to selectively activate and deactivate minefields, but also provides a remote surveillance source through mines capable of transmitting battlefield activity data to commanders via secure radio. 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.

(U) **FY 1991 Accomplishments:**
- (U) Conducted evaluation of intelligent minefield model
- (U) Evaluated test results of Command and Control (C2) brassboard system for transition to Improved Wide Area Mines (WAM)

(U) **FY 1992 Planned Program:**
- (U) Complete transition of WAM C2 to advanced system development
- (U) Initiate development of prototype anti-helicopter mine
- (U) Initiate programs with the Defense Advance Research Projects Agency (DARPA) for intelligent minefield elements and Very Wide Area Mine (VWAM) concepts

(U) **FY 1993 Planned Program:**
- (U) Demonstrated prototype anti-helicopter mines at Sandia National Laboratory
- (U) Fabricate intelligent minefield elements and conduct initial demonstration

(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 mine neutralization efforts are applicable to the full range of conflict, from heavy force scenarios to low intensity conflicts. Improved hand held 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 a Directed Energy Breacher, which employs microwave technology, and the Improved Dispersed Explosives (IDX) for stand-off breach of minefields.

(U) **FY 1991 Accomplishments:**
- (U) Conducted a technical demonstration with two munition configurations for the IDX payload and initiated downselection trade off study
- (U) Conducted the final phase (Phase II) of an Advanced Technology Transition Demonstration (ATTD) for the Standoff Minefield Detection System (STAMIDS)
- (U) Developed, fabricated, tested, and fielded 36 mine rakes in four months in support of Operation Desert Storm (ODS)

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603606A**
PE Title: **Landmine Warfare and Barrier Advanced Technology** Budget Activity: **#2**

(U) FY 1992 Planned Program:
- **(U)** Initiate demonstration program for the Directed Energy Breacher
- **(U)** Initiate munition development and weapon system studies for IDX
- **(U)** Transition STAMIDS to system Advanced Development (6.3b)
- **(U)** Initiate demonstration program in magnetic signature silencing of combat vehicles to counter magnetic influence fuzed mines.
- **(U)** Complete design and fabrication of a separated aperture antenna and data acquisition systems for a hand held detector

(U) FY 1993 Planned Program:
- **(U)** Demonstrate Directed Energy Breacher capability in an operational environment
- **(U)** Finalize IDX munition hardware design; conduct tests
- **(U)** Continue magnetic signature silencing demonstrations
- **(U)** Complete fabrication of separated aperture brassboard for improved hand held mine detection

(U) Project D609 - Heavy Assualt Bridge: Funding for this effort was provided by the Congress in FY 1992. However, it will be executed in PE #0604804A, Project DH01.

(U) FY 1991 Accomplishments:
- **(U)** This project did not exist in FY 1991

(U) FY 1992 Planned Program:
- **(U)** Transferred to PE #0604804A, Project DH01.

(U) FY 1993 Planned Program: Not applicable.

(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. Major contractors are 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, Directed energy weapontry, and Ground vehicles with ove sight provided by the Joint Directors of Laboratories. Work in this Program Element is related to and fully coordinated with PE #0602784A and PE #0602786A and contains no unwarranted duplication of effort among the Military Departments.

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

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603606A**
PE Title: **Landmine Warfare and Barrier Advanced Technology** Budget Activity: **#2**

(U) **International Cooperative Agreements:** Data Exchange Agreements with France, Great Britain, and Federal Republic of Germany for Countermine Systems and Technology

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603607A**
PE Title: **Joint Service Small Arms Program** Budget Activity: **#2**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D627	Joint Service Small Arms Program (JSSAP)				
	4451	5431	5772	Cont	Cont
PE TOTAL	4451	5431	5772		

B. (U) BRIEF DESCRIPTION OF ELEMENT: Joint Service Small Arms Program (JSSAP): 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 and munitions for individual and crew-served weapons, and materials to achieve substantial improvements in threat defeat with a goal of lightening 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, Navy requirements. The main efforts include the following: (1) Advanced Combat Rifle (ACR) field evaluation; (2) Lightweight Ground Mount for the MK19/M3 machine guns; (3) Common Module Fire Control: Reduce life cycle cost and improve effectiveness; (4) Canister Cartridge: Provide anti-personnel capability (90% hit probability) at 100 meters; (5) Training Ammunition: Provide realistic training with 50-90% range reduction; (6) Multi-platform Ballistic Sight: 24-hour capability against materiel and personnel, increasing first burst hit probability from 15% to 90%; (7) 40mm Improved Penetration: 50% increase in penetration against lightly armored vehicles and (8) Objective Individual Combat Weapon: the first of the next generation of small arms.

C. (U) JUSTIFICATION FOR PROJECT:

(U) Project D627- Joint Service Small Arms Program

(U) FY 1991 Accomplishments:
- (U) Completed Advanced Combat Rifle (ACR) data analysis, published final reports
- (U) Fabricated 7.62mm Short Range Training Ammunition prototypes
- (U) Awarded Modular Fire Control brassboard development contract
- (U) Conducted fabrication of improved 40mm High Explosive, Dual Purpose (HEDP) rounds and shipped to test sight for demonstration and evaluation

(U) FY 1992 Planned Program:
- (U) Award brassboard development contract(s) for Multi-platform Ballistic Sight
- (U) Complete 7.62mm Short Range Training Ammunition demonstration test

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603607A**
PE Title: **Joint Service Small Arms Program** Budget Activity: **#2**

- (U) Fabricate initial Modular Fire Control prototypes and initiate testing
- (U) Complete demonstration of improved 40mm HEDP ammunition and 40mm Canister cartridge for MK19

(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
- (U) Complete Modular Fire Control engineering design testing, accept delivery of 3 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 ready for transition to engineering development

(U) **Work Performed By:** This program is directed by the Joint Service Small Arms Program Management Committee. The prime in-house organization is US Army Armament Research, Development and Engineering Center, Picatinny Arsenal, NJ, with major efforts at Naval Weapon Support Center, Crane, IN; and Air Force Armament Technology Laboratory, Eglin Air Force Base, FL. Primary contractors are: Olin Corp., East Alton, IL; Heckler and Koch, Inc., Arlington, VA; Steyr-Daimier-Puch AG, Steyr, Austria; Colt Industries, Hartford, CT; and AAI Corp., Baltimore, MD.

(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, PE #0602624A, PE #0603802A and PE #0604802A in accordance with the on-going Reliance joint planning process and contains no unwarranted duplication of effort among the Military Departments.

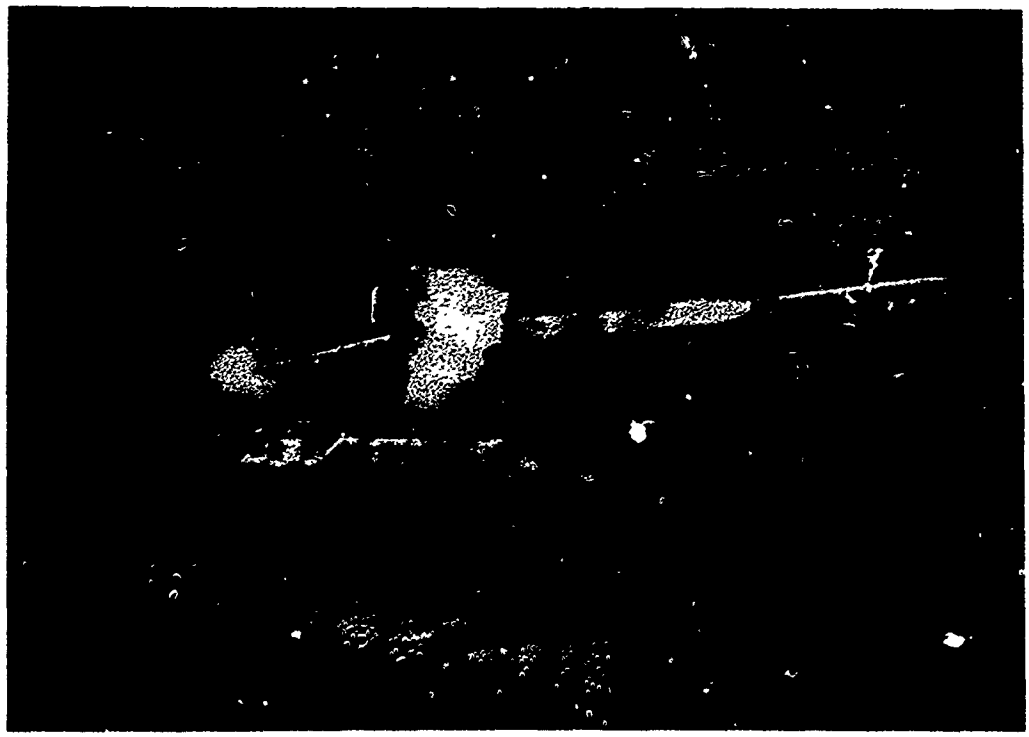
(U) **Other Appropriation Funds:** ($ in Thousands) Not applicable.

(U) **International Cooperative Agreements:** Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603612A**
PE Title: **Advanced Antitank Weapon System**
Project Title: **Line-of-Sight Antitank**

Project Number: **#D096**
Budget Activity: **#4**



POPULAR NAME: **LOSAT**

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

SCHEDULE	FY 1991	FY 1992	FY 1993	To Complete
Program Milestones		ASARC 9/92	MS II 11/92	
Engineering Milestones		SDR 4/92		
T&E Milestones	Compl Flt Tests 6/91	TEMP Compl 11/91		
Contract Milestones	Sys Dgn Award 9/91			
BUDGET ($000)	**FY 1991**	**FY 1992**	**FY 1993**	**Program Total (To Complete)**
Major Contract	32355	105285		205331 (0)
Support Contract	4468	6357		14956 (0)
In-House Support	9233	14193		36898 (0)
GFE/Other	7390	10993		27809 (0)
Total	53446	136828	-0-	284994 (0)

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603612A** Project Number: **#L096**
PE Title: **Advanced Antitank Weapon System** Budget Activity: **#4**
Project Title: **Line-of-Sight Antitank**

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The current and projected armor threat and operational concept envisioned for fighting the antiarmor battle requires an effective, extended range, vehicular mounted, heavy anti-tank capability for the infantry. The Line-of-Sight Antitank (LOSAT) will be capable of operating out to the maximum range of direct fire combat engagements and will perform under day/night adverse weather and obscurants. The LOSAT program will develop a replacement system(s) for the Improved Tube-Launched, Optically-Tracked, Wire-Guided (TOW) Missile Vehicle (ITV) platforms. The Infantry's dedicated heavy antitank system, LOSAT, will be counter-measures hardened to perform effectively in a dirty battlefield environment. LOSAT will incorporate kinetic energy capabilities to defeat the evolving armor threat. This effort transitions to Program Element #0604819A/DE07 in FY 1993 for Engineering and Manufacturing Development (EMD).

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- (U) Integrated Kinetic Energy Missile (KEM) on a Bradley chassis
- (U) Completed KEM demonstration and validation (DEMVAL) flight tests from the prototype LOSAT system (KEM integrated on a Bradley chassis)
- (U) Conducted simulation network (SIMNET) evaluation of crew stations with user
- (U) Awarded System Design Contract

(U) FY 1992 Planned Program:
- Conducted dirty battlefield/target tracker tests
- Conducted system requirements review
- Conduct System Design Review (SDR) and Software Specification Review (SSR)
- Release EMD Request for Proposal
- Complete LOSAT DEMVAL program
- Conduct follow-up User Tests using Simulator-Network Development
- Complete Automotive Test Rig Tests
- Conduct Nuclear Effects Component Tests

D. (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. LTV of Dallas, TX, was the selected contractor for the LOSAT DEMVAL Program and has since teamed with Texas Instruments of Dallas, TX. (fire control subcontractor) and FMC of San Jose, CA, (chassis subcontractor) to perform the DEMVAL effort.

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: None
2. (U) SCHEDULE CHANGES: The Milestone II EMD decision slipped from June 1991 to November 1992 due in part to funding delays and test failures which impacted the DEM/VAL flight test program schedule and in part due to the addition of risk reduction efforts in response to an Army decision for a more robust DEM/VAL LOSAT program
3. (U) COST CHANGES: The cost increase of $168,196K is the result of estimating changes reflecting the schedule slip and the additional risk reduction activities required to implement an Army decision for a

more robust LOSAT DEM/VAL program prior to entry into Engineering and Manufacturing Development (EMD).

F. (U) PROGRAM DOCUMENTATION:

Letter of Agreement	10/86
Advanced Anti-tank Weapon System-Heavy (AAWS-H) DAB	8/86
Special In-Process-Review (IPR)	12/87
AAWS-H HQDA Program Review	8/88
Organizational and Operational Plan	3/89
Acquisition Plan	2/91
Required Operation Capabilities	5/91
Critical Resource Life Cycle Management Plan	7/91
Test and Evaluation Master Plan	11/91

G. (U) RELATED ACTIVITIES:
PE #0604819A (Line-of-Sight Antitank (LOSAT)
PE #0603313A (Missile and Rocket Advanced Technology)
PE #0602709A (Night Vision Technology)
PE #0603710A (Night Vision Advanced Technology)
There is no unnecessary duplication of effort within the Army or other services/agencies within the Department of Defense. This is assured by continuous coordination with other services and agencies and oversight of the program by the OSD-level Conventional Systems Committee.

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands) Not applicable.

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

J. (U) TEST AND EVALUATION DATA: From June 1989 to June 1991 a total of 15 flight test missions were conducted including three unguided Forward Looking Infrared (FLIR) calibration (CAL) flights, two engineering data flights (EDF), nine scored rounds and one instrumented missile. Scored round objectives were met, with five full successful single firings and three partially successful dual firings. Only two flight missions were unsuccessful. Dual firing capability was fully demonstrated. Simulator-Network Development (SIMNET-D) tests were run in December 1990 and February 1991 and are continuing to assess operational capability and design features of the LOSAT concept. An automotive test rig on a LOSAT similar chassis is undergoing tests. A highly successful dirty battlefield test was conducted in the fall of 1991 using the current FLIR and an advanced focal plane array (FPA).

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element #0603619A
PE Title: **Landmine Warfare and Barrier-Advanced Development** Budget Activity #4

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D005 Landmine Advanced Development	630	4339	- 0 -	Cont	Cont
D606 Countermine and Barrier Advanced Development	- 0 -	7117	13497	Cont	Cont
PE TOTAL	630	11456	13497		

B. BRIEF DESCRIPTION OF ELEMENT: This program element provides for advanced development of new mine, countermine, and explosive demolition systems by prototyping modern munitions technology, advanced development sensors, logic networks, fuzes, power sources, warheads, components and modules into complete systems. Minefield command and control development will provide new capabilities in landmine warfare and will move the future Army toward the intelligent minefield. Modern conventional explosive technologies can provide a significant enhancement in capabilities to destroy large demolition targets. They provide an alternative to nuclear demolition systems. It provides for initiation of engineering and manufacturing development of the Stand-off Minefield Detection System (STAMIDS) and mine neutralization with improved dispersed explosives.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND 1993:

(U) Project D005 - Landmine Advanced Development: Program to improve the capability of mines used by the U.S. Army. This project will modernize M15 mines by providing an advanced technology fuze. Follow-on efforts will provide command and control of mines, and Improved Conventional Mine System (ICOMS).

(U) FY 1991 Planned Accomplishments:
- (U) Initiated development for an improved fuze for conventional mines
- (U) Continued development and operational testing of improved fuzing for conventional mines

(U) FY 1992 Planned Program:
- (U) Complete M15 fuze advanced development
- (U) Initiate Minefield Command and Control (MC&C) Advanced Development

(U) FY 1993 Planned Program:
- (U) Project 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. Contractors are to be selected.

AMENDED FY 1992/1993 BIENNIAL RDTE 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 with 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.

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

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element **#0603619A** Project Number **#D606**
PE Title: **Landmine Warfare and Barrier-Advanced Development** Budget Activity **#4**

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

Popular Name	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
Countermine and Barrier Advanced Development	- 0 -	7117	13497	Cont	Cont

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project provides for advanced development of new countermine systems by evaluating and prototyping advanced sensors, neutralizing, clearing, breaching and detection concepts which will enhance the U.S. capability in countermine warfare. The program provides for proof-of-principle for these systems.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- (U) Project not funded

(U) FY 1992 Planned Program:
- (U) Prepare and coordinate Stand-OFF Minefield DetectionSystem (STAMIDS) management documentation for Milestone I.
- (U) Prepare STAMIDS solicitation and Source Selection Documentation
- (U) Conduct STAMIDS multi-spectrum sensor demonstration.
- (U) Conduct technical and cost analysis for countermine systems

(U) FY 1993 Planned Program:
- (U) Complete STAMIDS source selection
- (U) Initiate STAMIDS advanced development design
- (U) Conduct STAMIDS component system design review
- (U) Initiate improved explosives mine neutralization system component design

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

D. (U) WORK PERFORMED BY: The Project Manager for Mines, Countermines and Demolitions, Picatinny Arsenal, NJ is assigned responsibility for countermine development. The contractors are to be selected.

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:
1. **(U) TECHNICAL CHANGES:** None.
2. **(U) SCHEDULE CHANGES:** Milestone I for STAMIDS slipped from 1QFY92 to 3QFY92
3. **(U) COST CHANGES:** Milestone II for STAMIDS sipped from 4QFY92 to 1QFY96

F. (U) PROGRAM DOCUMENTATION: Not applicable.

G. (U) RELATED ACTIVITIES: Component work and explorative development of the program are conduc

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element **#0603619A** Project Number **#D606**
PE Title: **Landmine Warfare and Barrier-Advanced Development** Budget Activity **#4**

ted in (Landmine Warfare/Barrier Advanced Technology). There is no unnecessary duplication of effort within the Army or DoD.

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands) Not applicable.

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

J. (U) MILESTONE SCHEDULE:

Milestones	Milestones Dates
STAMIDS Milestone I	3QFY92
STAMIDS Milestone II Proof-of-Principle complete	1QFY96

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603627A**
PE Title: **Smoke, Obscurant and Equipment Defeating Systems - Advanced Development**
Budget Activity: **#4**

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

Project Number / Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
DE78 Equipment Defeating	46	3349	6803	Cont	Cont
DE79 Smoke, Obscurant-Advanced Development	6384	10583	12138	Cont	Cont
PE TOTAL	6430	13932	18941		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program supports the conduct of advanced development in smoke and obscurant agents, munitions, and devices. 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. Improvements and new developments are required across the entire multispectral range from visual through infrared and millimeter (radar) wavelengths. These improvements will be applied to projectile, rocket, missile, ground and air combat vehicular defense and large area obscuration/smoke systems. The Combat Vehicle Defensive Obscurating System (CVDOS) project expands previous vehicular smoke systems by providing a mixture of capabilities that will screen the vehicle and accompanying vehicles while in motion. CVDOS is being developed for the M1A1 Tank and the M2/3 Bradley Fighting Vehicles. The Large Area Mobile Projected Smoke System (LAMPSS) mounts the XM56 Smoke Generator System on an armored chassis to provide a mechanized capability. Additionally, a Hydra 70 smoke rocket launching system will also be mounted on the LAMPSS to augment insufficient mortar and artillery projected smoke/obscurants. The Advanced Riot Control Agent Device will deliver a high safety ratio, immobilization compound which will provide a rapid onset of effects against relatively close targets where safe immobilization is of prime concern. The device will be used as the military operation dictates.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND 93:

(U) Project DE78 - Equipment Defeating:

(U) FY 1991 Accomplishments: Completed classified program termination.

(U) FY 1992 Planned Program:
- (U) Initiate Advanced Development for the Advanced Riot Control Agent Device
- (U) Award Advanced Development Contract for the Advanced Riot Control Agent Device

(U) FY 1993 Planned Program:
- (U) Conduct proof of principle test for Advanced Riot Control Agent Device

(U) Work Performed By: US Army Chemical Research, Development and Engineering Center, APG, MD, and contractor TBD.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603627A**
PE Title: **Smoke, Obscurant and Equipment Defeating Systems - Advanced Development**
Budget Activity: **#4**

(U) Related Activities: Not applicable.

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

(U) International Cooperative Agreements: Not applicable.

AMENDED FY1992/1993 BEENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603627**
PE Title: **Smoke, Obscurant and Equipment Defeating Systems - Advanced Development**

Project Number: **#DE79**
Budget Activity: **#4**

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

Project Title: Smoke, Obscurant-Advanced Development

Popular Name	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
Smoke, Obscurant Advanced Development	6384	10583	12138	Cont	Cont

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The Large Area Mobile Projected Smoke System (LAMPSS) will provide large area screening in the visual, infrared and millimeter wave portions of the electromagnetic spectrum. This will support the commander's scheme of maneuver and deception plans, providing visual projected smoke screening capability with a range up to 10,000 meters in response to pre-planned fires and call-for-fire missions. The XM81 infrared/millimeter (RADAR) wave screening grenade is designed to be launched from standard and developmental smoke grenade launchers, to provide organic self protecting obscuration for armored vehicles. The grenade will provide screening in the infrared through millimeter regions of the spectrum as needed to defeat enemy sensors.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- (U) Completed technical feasibility test for the XM81 Infrared/Millimeter Wave Screening Grenade
- (U) Cancelled request for proposal for LAMPSS development contract (See Schedule Changes, below.)
- (U) Completed concept studies of LAMPSS subsystems
- (U) Revised LAMPSS acquisition strategy to use standard subsystems.

(U) FY 1992 Planned Program:
- (U) Conduct LAMPSS Milestone I In-Process Review
- (U) Initiate design of XM56 Smoke Generator and HYDRA 70 smoke rocket screening subsystems integration for LAMPSS
- (U) Complete LAMPSS Mock-Up and demonstration
- (U) Conduct Milestone I/II In-Process Review for XM81 IR/MMW Screening Grenade.

(U) FY 1993 Planned Program:
- (U) Fabricate LAMPSS prototype for test
- (U) Conduct LAMPSS Critical Design Review (CDR).

D. (U) WORK PERFORMED BY: The Product Manager for Smoke/Obscurants, Aberdeen Proving Ground (APG), MD; U.S. Army Chemical Research, Development, and Engineering Center, APG, MD; U.S. Army Missile Command, Redstone Arsenal, AL; PM M113/M60 and USA Tank-Automotive Command, Warren, MI; and US Army Communications & Electronics Command Fire Support Service Center, Ft. Sill, OK.

AMENDED FY1992/1993 BEENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603627** Project Number: **#DE79**
PE Title: **Smoke, Obscurant and Equipment Defeating Systems - Advanced Development** Budget Activity: **#4**

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** None.
2. **(U) SCHEDULE CHANGES:** LAMPPS acquisition process redirected Sep 91 following requirements revision by US Army Combined Arms Center and US Army Chemical School. Revised strategy to integrate standard components onto existing mechanized chassis and develop rocket fire control system, in lieu of developing all new system.
3. **(U) COST CHANGES:** None.

F. (U) PROGRAM DOCUMENTATION: The XM81 Millimeter Wave Screening Grenade will remain in advanced development an additional year. The US Armor School expanded the requirement to include both infrared and millimeter (radar) wave screening for the grenade. The Milestone I/II IPR will be held 2/92 and the Milestone III date for the XM81 be 3/95.

G. (U) RELATED ACTIVITIES:
PE #0602622A (Chemical, Smoke and Equipment Defeating Technology)
PE #0604609A (Smoke, Obscurant and Equipment Defeating Systems - Engineering Development)
In order to meet the other Services needs and to prevent unnecessary duplication of effort, coordination is maintained with the other Services through joint participation in the Smoke and Aerosol Working Group of the Joint Technical Coordinating Group, joint participation and attendance at Smoke Weeks and Smoke/Obscurants symposia, personal contacts, and joint distribution of technical and other reports. There is no unnecessary duplication of effort within the Army or DoD.

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands) Not applicable.

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

J. (U) MILESTONE SCHEDULE:

Milestones	Milestone Dates
1. LAMPSS	
Milestone I IPR	4/92
ODR Approval Critical Design Review	6/93
Milestone II/III In-Process Review	8/95
2. XM81 MMW Grenade Milestone I/II IPR	2/92
Milestone III/TC (Type Classification)	3/95

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603640A** Project Number: **#DB91**
PE Title: **Artillery Propellant Development** Budget Activity: **#4**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
Unicharge	- 0 -	7990	7057	21187	36234

B. (U) BRIEF DESCRIPTION OF ELEMENT: Unicharge provides for improved solid propellant technology for artillery and other direct/indirect weapons systems. Includes RDTE funding to continue development of Unicharge propellant. Effort includes design of propellant for current cannons, and key technologies associated with automated loading and handling.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 92 AND FY 93.

(U) Project DB91 - Unicharge: An improved solid propellant for use with currently fielded howitzers. Use of this propellant technology could be applied to other direct and indirect fire weapons systems.

(U) FY 1991 Accomplishments:
- (U) Project funded in Advanced Technology Development (program element #0603004A).

(U) FY 1992 Planned Program:
- (U) Finalize insensitive munitions (IM) propellant formulation
- (U) Improve combustable case
- (U) Select additives
- (U) Investigate alternative ignition approaches
- (U) Develop improved packaging
- (U) Investigate automated handling of Unicharge

(U) FY 1993 Planned Program:
- (U) Freeze design of complete charge
- (U) Select final packaging configuration
- (U) Demonstrate alternate ignition
- (U) Produce materials for TT/UT sequence

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603640A** Project Number: **#DB91**
PE Title: **Artillery Propellant Development** Budget Activity: **#4**

(U) Work Performed By: Management will be 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 support is provided by the Ballistic Research Laboratory, Fredrick, Maryland and Watervliet Arsenal, New York. Major contractors currently include Hercules (Radford Army Ammunition Plant, Virginia), Olin, Armtec, and ICI Americas (Indiana Army Ammunition Plant, Indiana).

(U) Related Activities: None

(U) Other Appropriation Funds: N/A

(U) International Cooperative Agreements: Joint Ballistic Memorandum of Understanding

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603645A**
PE Title: **Armored Systems Modernization-Future (ASM-F) - Advanced Development**
Budget Activity: **#4**

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

Project Number / Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
DB82 System Engineering Analysis (SEA)	0	995	2941	Cont	Cont
DB83 Common Chassis Advanced Technology Transition Demo	0	196159	227441	Cont	Cont
DB86 Combat Mobility Vehicle--Advanced Development	0	9488	0	9488	9488
DB87 Combat Vehicle Survivability--Advanced Development	0	1990	0	1990	1990
DB88 Future Armored Resupply Vehicle--Ammunition--Adv Development	0	0	21467	Cont	Cont
D409 Advanced Field Artillery System--Advanced Development	0	91185	115413	Cont	Cont
PE TOTAL	0	299817	367262	Cont	Cont

B. (U) BRIEF DESCRIPTION OF ELEMENT: The ASM-F is a concept for fielding the next generation of armored vehicles. It provides the architecture for developing, fielding, training, fighting, maintaining and supporting the follow-on combat and combat support vehicles for the 21st century. The program goal is to provide improved effectiveness to the close combat heavy combined arms team while reducing operations and support cost through optimum vetronics and component commonality. The key to the effort is development and integration of advanced technologies for combat vehicle applications through the use of technology demonstrators, computer simulation, modeling and full scale mockups, as well as through joint services technology maturation programs such as the Army/DARPA/USMC Joint Armor/Anti-armor program. ASM-F has been restructured to reflect the Advanced Field Artillery System (AFAS) and the Future Armored Resupply Vehicle-Ammunition (FARV-A) as the lead ASM-F systems based on common componentry. Consequently, the Common Chassis Advanced Technology Transition Demonstrator (CCATTD) program has been revised to focus on AFAS/FARV-A. Further development of the Block III Tank, the Future Infantry Fighting Vehicle (FIFV) and Combat Mobility Vehicle (CMV) systems have been deferred. Future development options for these systems will be retained, based on recurring threat assessments and the pace of technological maturation. This program element also provides for a systems engineering analysis effort in support of PEO management, and follow-on prototype programs for the AFAS and FARV-A in order to mitigate program risk prior to proceeding to engineering and manufacturing development.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10 MILLION IN BOTH FY 1992 AND 1993:

(U) **Project DB82** -- System Engineering Analysis (SEA): SEA is a contract effort in support of the PEO/PM's, assisting in the preparation of technical plans for ASM-F, coordinating data/information flow between ASM-F variants, and ensuring optimum commonality and reduced performance risk

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603645A**
PE Title: **Armored Systems Modernization-Future (ASM-F) - Advanced Development** Budget Activity: **#4**

(U) FY 1991 Accomplishments:
- (U) Extensive requirements review and synthesis effort of the CCATTD program
- (U) Trade studies/analysis performed for AFAS, FARV-A and CMV

(U) FY 1992 Planned Program:
- (U) Continue SEA contract support

(U) FY 1993 Planned Program:
- (U) Continue SEA contract support.

(U) **Project DB86** -- Combat Mobility Vehicle (CMV)--Advanced Development: The CMV ATTD program is being redirected to support the M1 Breacher program which is the near and mid-term in-stride breaching capability solution. The CMV ATTD effort will be effectively utilized by the user and developer to provide sufficient information to finalize the M1 Breacher performance specification requirements for follow-on breacher efforts. This project was previously funded in a Non-System Advanced Development Program PE #0603005A.

(U) FY 1991 Accomplishments:
- (U) RFP issued
- (U) Source Selection Board held
- (U) CMV ATTD contract award to BMY, HARSCO Corp
- (U) Design of the ATTD
- (U) Vulnerability Analysis
- (U) Component Maturation
- (U) Software Development and Documentation
- (U) System Safety Analysis and Report
- (U) Program reports and assessments
- (U) Mine blast modeling and automatic depth control modeling
- (U) Mission modeling by TRADOC
- (U) Mine Blade Plowing modeling

(U) FY 1992 Planned Program:
- (U) Design of the ATTD/Breacher vehicle
- (U) Vulnerability Analysis
- (U) Component Maturation
- (U) Software Development and Documentation
- (U) System Safety Analysis and Report
- (U) Program reports and assessments
- (U) Mine blast modeling and automatic depth control modeling
- (U) Mission modeling by TRADOC
- (U) Mine Blade Plowing modeling

(U) FY 1993 Planned Program:
- (U) Program deferred; funded under PE # 0603649A Engineer Mobility Equipment--Advanced Development

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603645A**
PE Title: **Armored Systems Modernization-Future (ASM-F) - Advanced Development** Budget Activity: **#4**

(U) Project DB87 -- Combat Vehicle Survivability--Advanced Development: This effort provides for the armor technology for the ASM-F systems in preparation for the prototype development maturation phases of the program. By the first part of FY 1992, the Army/DARPA/USMC joint Armor/Anti-armor Phase II armor contractors will have developed armor systems addressing the ASM-F threats. CATTD contractors will have designed modular armor attachment systems and armor concepts as part of their ATTDs. Before the ASM-F program proceeds to selection of a contractor team for prototype and possible EMD, it is essential that this spectrum of possible armor technologies be stressed for (1) compatibility to meet the projected threat, (2) compatibility with the alternative ASM variants designs, and (3) technical and schedule risk for EMD on the ASM-F variants schedule. The outcome of this assessment will be a subset of technologies and armor concepts which will be matured in FY 1994-97 time-frame through both the technology base and prototype development programs.

(U) FY 1991 Accomplishments:
- (U) NA

(U) FY 1992 Planned Program:
- (U) Acquisition of full scale test targets from joint Army/DARPA/USMC armor contractors for frontal, side and top protection of the ASM-F lead variants. This acquisition will be via options on the existing joint program contracts.
- (U) Acquisition/construction of armor targets from other sources as deemed necessary; these may include industrial sources not part of the joint program, as well as in-house Army programs.
- (U) Acquisition of surrogate threat munitions, both KE and CE, which replicate the projected threat as closely as possible.
- (U) Full-scale testing of frontal, side and top armor configurations.

(U) FY 1993 Planned Program:
- (U) Complete SIM/SIL efforts for CATTB (initiated under Budget Activity 2)

(U) Work Performed By: The Program Executive Officer for Armored Systems Modernization (ASM), Warren, MI, in conjunction with its various PMs, is responsible for the management, development and systems integration of this program. The two contractors for the CCATTD are AVTA of Sterling Heights, MI, and Teledyne Continental Motors, General Products Division of Muskegon, MI. The AVTA Corp is a joint venture of General Dynamics Land Systems Division (GDLS) of Sterling Heights, MI, and FMC of San Jose, CA. Major AFAS contractors currently include GE, Olin, ARMTECH, Morton Thiokol, Hercules (Radford Army Ammunition Plan, VA) and ICI Americas (Indiana Army Ammunition Plant). Major effort within the Survivability program is from General Dynamics Land Systems (GDLS) of Sterling Heights, MI, Alliant Tech Systems of Minneapolis, MN and DuPont Corporation of Wilmington, DE. Various development efforts and program support is provided to the PEO ASM and its PMs by AMC and its major subordinate commands, labs and arsenals. The SEA contractor is TRW of Anaheim, CA.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603645A**
PE Title: **Armored Systems Modernization-Future (ASM-F) - Advanced Development**
Budget Activity: *#4*

(U) Related Activities:
PE #0602601A (Combat Vehicle and Automotive Technology)
PE #0602105A (Materials Technology)
PE #0603102A (Materials & Structures Advanced Technology)
PE #0602624A (Weapons and Munitions Technology)
PE #0203735A (Combat Vehicle Improvement Programs)
PE #0602120A (Electronic Survivability and Fuzing Technology)
PE #0602716A (Human Factors Engineering Technology)
PE #0603004A (Weapons and Munitions Advanced Technology)
PE #0603005A (Combat Vehicle and Automotive Advanced Tech)
PE #0603774A (Night Vision System Advanced Development)
PE #0604645A (Armored System Modernization-Future (ASM-F)-EMD)

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

(U) International Cooperative Agreements: A close relationship is maintained with industry and other Services and Government agencies to preclude duplication and take advantage of their work. Information concerning allies' technology is shared via data exchange agreements, memoranda of understanding and separate bilateral agreements. There is no unnecessary duplication of effort within the Department of Defense.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603645A** Project Number **#DB83**
PE Title: **Armored Systems Modernization-Future (ASM-F) Advanced Development** Budget Activity **#4**
Project Title: **Common Chassis Advanced Technology Transition Demonstrator**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
DB83 Common Chassis Advanced Technology Transition Demo	- 0 -	196159	227441	Cont	Cont

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The CCATTD is the core of the entire ASM-F effort. It is a competitive dual contractor effort which will design, fabricate, demonstrate and mature the common components which will be the basis for the Advanced Field Artillery System (AFAS) and the Future Armored Resupply Vehicle - Ammunition (FARV-A) and other potential variants. This project incorporates technologies such as the Standard Army Vetronics Architecture (SAVA), Modular Armor, Signature Reduction, and NBC Protection. A System Integration Lab (SIL) is also incorporated. Logistically, the CCATTD will allow for early identification/start of work on the Level of Repair Analysis (LORA), Automated Log Book, Embedded Training and other logistics support activities. User and developer analyses will take place up front to include 1) software; 2) MANPRINT; 3) design to unit cost (DTUC) 4) hardware/cost trade off; 5) modeling validation; 6) weight vs hardware design; 7) survivability; 8) vulnerability; 9) and others. The competitive designs and technological approaches meet the ASM-F systems acquisition strategy. Competition will provide the leverage to reduce costs, maintain schedule and design cheaper to produce and maintain vehicles.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:

- **(U)** Awarded two competitive contracts and initiated design and development of CCATTD (under Budget Activity 2)
- **(U)** Conducted System Requirements Reviews (SRR) and System Design Reviews (SDR) for each Contractor (under Budget Activity 2)

(U) FY 1992 Planned Program:

- **(U)** Continue CCATTD design and fabrication, Component Maturation, and System Fabrication
- **(U)** Initiate SIM/SIL efforts for ASM lead variants
- **(U)** Complete Systems Engineering Master Plan (SEMP)

(U) FY 1993 Planned Program:

- **(U)** Continue SIM/SIL activities for the lead ASM-F variants
- **(U)** Complete CCATTD Competitive Development and begin demonstration
- **(U)** Delivery of System (A) Specifications

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603645A** Project Number **#DB83**
PE Title: **Armored Systems Modernization-Future (ASM-F) Advanced Development** Budget Activity **#4**
Project Title: **Common Chassis Advanced Technology Transition Demonstrator**

D. (U) WORK PERFORMED BY: The Program Executive Officer for Armored Systems Modernization (ASM), Warren, MI. in conjunction with system PMs is responsible for the management, development and systems integration of this program. The two contractors for the CCATTD are AVTA of Sterling Heights, MI. and Teledyne Continental Motors , General Products Division of Muskegon, MI. The AVTA Corp. is a joint venture of General Dynamics Land Systems Division (GDLS) of Sterling Heights, MI. and FMC of San Jose, CA. There are over 15 major subcontractors in several states involved with the CCATTD contracts.

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: The Common Chassis program has been focused to address the needs of the AFAS and FARV-A efforts. Block III tank specific work has been removed from the CCATTD contracts.

2. (U) SCHEDULE CHANGES: Based on refocusing the CCATTD effort from Block III to AFAS and FARV-A.

3. (U) COST CHANGES: Funding reductions resulting from congressional directed changes were absorbed in FY92 by the Block III Tank efforts through scope reduction and by shifting component maturation efforts which allows for the integration of AFAS and FARV-A acceleration into the program.

F. (U) PROGRAM DOCUMENTATION:

System Concept Paper (SCP)	12/89
Organization & Operational (O&O) Plan	02/90
International Armament Cooperative Opportunities Plan	04/90
Capstone ASM Required Operational Capability (ROC)	05/90
ASM (future) Acquisition Strategy	09/90
Test and Evaluation Master Plan (TEMP)	09/90
Integrated Logistics Support (ILSP)	12/90
System MANPRINT Management Plan	12/90

G. (U) RELATED ACTIVITIES:

PE #0602601A (Combat Vehicle and Automotive Technology)
PE #0602105A (Materials Technology)
PE #0603102A (Materials & Structures Advanced Technology)
PE #0602624a (Weapons and Munitions Technology)
PE #0203735A (Combat Vehicle Improvement Programs)
PE #0602120A (Electronic Survivability and Fuzing Technology)
PE #0602716A (Human Factors Engineering Technology)
PE #0603004A (Weapons and Munitions Advanced Technology)
PE #0603005A (Combat Vehicle and Automotive Advanced Tech)
PE #0603774A (Night Vision System Advanced Development)
PE #0604645A (Armored System Modernization-Future --EMD)
PE #0602709A (Night Vision Investigations)
PE #0602622A (Chemical and Smoke Munition)

H. (U) OTHER APPROPRIATION FUNDS: N/A

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603645A** Project Number **#DB83**
PE Title: **Armored Systems Modernization-Future (ASM-F) Advanced Development** Budget Activity **#4**
Project Title: **Common Chassis Advanced Technology Transition Demonstrator**

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: A close relationship is maintained with industry and other Services and Government agencies to preclude duplication and take advantage of their work. Information concerning allies' technology is shared via data exchange agreements, memoranda of understanding and separate bilateral agreements. A Future Tank Main Armament Memorandum of Understanding has been signed by the United States, Great Britain, France and Germany. There is no unnecessary duplication of effort within the Department of Defense.

J. (U) MILESTONE SCHEDULE: N/A

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603645A** Project Number: **#DB88**
PE Title: **Armored Systems Modernization-Future (ASM-F) Advanced Development** Budget Activity **#4**
Project Title: **Future Armored Resupply Vehicle-Ammunition (FARV-A)**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
DB88 Future Armored Resupply Vehicle-Ammunition (FARV-A)	0	0	21467	Cont	Cont

B. (U) BRIEF DESCRIPTION OF THE MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project initiates the FARV-A with a Concept Exploration and Component Technology Maturation effort commencing in FY93. The project conducts the Demonstration and Validation (DEM/VAL) effort on the FARV-A which provides the necessary ammunition to meet the expected mission profile of the Advanced Field Artillery System (AFAS). The FARV-A matures and integrates key technologies in automated ammunition for AFAS, well forward in the battle area. The FARV-A will provide increased payload, decreased rearm times, reduced crew size, and improved survivability and mobility required to support the autonomous operations and increased firepower of AFAS. The FARV-A DEM/VAL program culminates in an Early User Test and Evaluation with the AFAS in FY97. This is a new start in FY 93.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments: N/A

(U) FY 1992 Planned Program: N/A

(U) FY 1993 Planned Program:
- (U) Prepare Documentation for Milestone
- (U) Prepare mission Module System Specification
- (U) Prepare request for Proposal

D. (U) WORK PERFORMED BY: Management will be accomplished by the Project Manager for the Future Armored Resupply Vehicle-Ammunition and engineering support by the U.S. Army Armament Research, Development and Engineering Center, both of which are located at Picatinny Arsenal, New Jersey.

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY: N/A

F. (U) PROGRAM DOCUMENTATION: N/A

G. (U) RELATED ACTIVITIES: N/A

H. (U) OTHER APPROPRIATION FUNDS: N/A

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: N/A

J. (U) MILESTONE SCHEDULE: N/A

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603645A** Project Number:**#D409**
PE Title: **Armored Systems Modernization-Future (ASM-F) Advanced Development** Budget Activity: **#4**
Project Title: **Advanced Field Artillery System (AFAS)**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D409 Advanced Field Artillery System - Advanced Development					
	0	91185	115413	Cont	Cont

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: AFAS is the Army's next generation 155MM self-propelled howitzer system providing high pay-off technological capabilities in support of the maneuver force. This project develops the AFAS Advanced Technology Transition Demonstrator (ATTD); which will mature the Regenerative Liquid Propellant Gun (RLPG) system; technically demonstrate the multi-option fuze for artillery (MOFA); provide for AFAS requirements of the common component chassis for the ASM-F vehicles; and fabricate AFAS prototypes. AFAS will be designed to satisfy user requirements of extended range (40 - 50 KM); increased rate of fire (12-16 rds/minute), automated ammunition handling, ballistic and non-ballistic threat protection, and autonomous operations. The AFAS will displace the current family of M109 A2/A3 and M109A6 HIP Self-Propelled Howitzers. This is not a new start in FY 1992.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- (U) Project funded in advanced Technology Development PE#0603004A

(U) FY 1992 Planned Program:
- (U) Design mission module for AFAS ATTD
- (U) Design AFAS cannon/mount for liquid propellant system
- (U) Initiate fabrication of cannon assembly
- (U) Design AFAS fire control hardware and software
- (U) Complete MOFA technical demonstration/transition to EMD (PE #0604645/D417)

(U) FY 1993 Planned Program:
- (U) Fabricate ATTD mission module
- (U) Fabricate three gun mounts
- (U) Complete fabrication of Regenerative Liquid Propellant Gun (RPLG) system for AFAS-ATTD
- (U) Conduct fatigue test of cannon assemblies
- (U) Complete design and fabrication of fire control and battlefield management and initiate Proof-of-Principal testing

(U) Program to Completion:
- (U) Complete AFAS ATTD
- (U) Integrate ATTD onto surrogate chassis
- (U) Build and test full up DEM VAL prototypes on ASM-F common component chassis
- (U) Transition prototypes into EMD in FY98 (PE#0604645/D417)

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603645A** Project Number:**#D409**
PE Title: **Armored Systems Modernization-Future (ASM-F) Advanced Development** Budget Activity: **#4**
Project Title: **Advanced Field Artillery System (AFAS)**

D. (U) WORK PERFORMED BY: Management will be 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 support is provided by the Tank Automotive Command, MI, Harry Diamond Laboratory Adelphi, MD, Human Engineering Laboratory, MD, Ballistic Research Laboratory, Aberdeen Proving Grounds, MD, Rock Island Arsenal, IL, and Watervliet Arse.., NY. Major contractors currently include FMC, Magnavox, GE, Olin, Morton Thiokol, AVTA, Teledyne Continental Motors, Hercules (Radford Army Ammunition Plant, VA).

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:
Per direction of the FY1991 Congressional/OSD budget process all AFAS related development efforts were combined into one program element. Previously funded in PE's # 0603004A, #0603802A and #0603645A are now all funded on PE #0603645A.

1. **(U) TECHNICAL CHANGES:** AFAS is now lead variant in ASM-F family
2. **(U) SCHEDULE CHANGES:** Potential acceleration
3. **(U) COST CHANGES:** None

F. (U) PROGRAM DOCUMENTATION: N/A

G. (U) RELATED ACTIVITIES:
PE #0603004 (Weapon and Munitions Advanced Technology)
PE #0604645 (Armored System Modernization (ASM) - Engineering Development

H. (U) OTHER APPROPRIATION FUNDS: N/A

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: N/A

J. (U) MILESTONE SCHEDULE: N/A

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603649A**
PE Title: **Engineer Mobility Equipment Development - Advanced Development**

Project Number **#DG24**
Budget Activity: **#4**

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

Project Number / Title		FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
DG24	M1 Breacher System	- 0 -	- 0 -	12155	31389	43544

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The M1 Breacher will be developed around the heavy protection M1 chassis and will integrate a versatile/survivable mine clearing blade, an automatic depth control, and an Commander's armored control station. The M1 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 M1 Breacher will be capable of moving with and be as survivable as the force it is supporting. It will provide the force with the freedom of maneuver required to successfully execute AirLand Battle doctrine. The M1 Breacher is a new start in FY 1993.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS

(U) FY 1991 Accomplishments: N/A

(U) FY 1992 Planned Program: N/A

(U) FY 1993 Planned Program:

- (U) Design and fabrication M1 Breacher vehicle
- (U) Vulnerability analysis
- (U) Component maturation
- (U) Software development and documentation
- (U) System safety analysis and report
- (U) Program reports and assessments
- (U) Mine blast modeling and automatic depth control modeling
- (U) Mission modeling by TRADOC
- (U) Mine Blade Plowing modeling

D. (U) WORK PERFORMED BY: The Combat Mobility Vehicle (CMV) Program Management Office is assigned responsibility for the comparative design testing and development of the M1 Breacher System. The major supporting commands/laboratories are Tank Automotive Command, Belvoir Research and Development Center, Waterways Experimental Station, and Test and Evaluation Command. The contractors involved in this effort have not been determined at this time.

E. (U) COMPARISON WITH FY1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY: N/A

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603649A** Project Number **#DG24**
PE Title: **Engineer Mobility Equipment Development - Advanced Development** Budget Activity: **#4**

F. (U) PROGRAM DOCUMENTATION: The Mission Need Statement (MNS) was approved at TRADOC 9 Jan 92. The Operational Requirements Document (ORD), is in draft. Other program documentation is currently being developed for a 3QFY92 Milestone I decision review.

G. (U) RELATED ACTIVITIES:

PE# 0603645A Armored Systems Modernization Advanced Development, Project DB86. Efforts accomplished under this project will be transitioned to the M1 Breacher program.

PE# 0604649A Engineer Mobility Equipment Development, Engineering Development, Project DG24.

H. (U) OTHER APPROPRIATION FUNDS: N/A

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: N/A

J. (U) MILESTONE SCHEDULE:

Milestone	Milestone Date
IPR	2QFY92
MS I/II	3QFY92
Contract Mod	1QFY93
Testing	3QFY94 - 1QFY95
Production Conract	2QFY94
LRIP Deliveries	1QFY96
PQT/IOT&E	2QFY96-3QFY96
MS III	3QFY96
IOC	4QFY96

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603710A**
PE Title: **Night Vision Advanced Technology** Budget Activity: **#2**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
DK70 Night Vision Advanced Technology	12881	12266	15492	Cont	Cont
DK86 Night Vision Airborne Systems	6983	7745	10493	Cont	Cont
DK87 Night Vision Combat Vehicles	3178	2609	2451	Cont	Cont
PE TOTAL	23042	22620	28436		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program follows a night vision and electro-optic technology base investment strategy as a principle DoD effort to develop new and improved tactical stand alone, fire control, 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 weapon systems upgrades. 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. Technology advancements 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 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. 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 Precision Strike, Advanced Land Combat Vehicle, Air Superiority/Defense and Improved Acquisition Science and Technology Thrust areas.

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 on streamlining acquisition cycles to enhance transition of technology to field units via Advanced Technology Transition Demonstrations (ATTDs). Demonstrators are developed to support individual soldier, mechanized infantry, air defense, aviation and combat vehicle applications.

(U) **FY 1991 Accomplishments:**

- (U) Completed fabrication of Advanced Air Defense Electro-Optical Systems (AADEOS) prototype sensor and initiated laboratory test/field demonstration

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603710A**
PE Title: **Night Vision Advanced Technology** Budget Activity: **#2**

- (U) Collected tactical multi-sensor data base at Baltimore-Washington International Airport
- (U) Defined multi-sensor aided targetting (MSAT) Technical Approarch/Program Cluster
- (U) Continued development of Standardized Advanced DEWAR Assemblies for Tri-Service second generation Forward Looking Infrared (FLIR) applications

(U) FY 1992 Planned Program:

- (U) Complete fabrication and demonstrate the Advanced Air Defense Electro-Optical System (AADEOS) ATTD on a Forward Area Air Defense (FAAD) platform. The AADEOS is a Infrared Search and Track system designed to passively acquire and track multiple fixed and rotary wing aircraft for Air Defense assets
- (U) Complete fabrication and testing of Standardized Advanced Detector/DEWAR Assemblies to provide cost effective modular components to produce affordable second generation thermal Imaging systems for advanced airborne/combat vehicles

(U) FY 1993 Planned Program:

- (U) Complete integration of multiple sensor and processor modules onto an automated target acquisition suite to demonstrate the economical fusion of high performance, 2nd generation FLIRs and millimeter wave radars to acquire and recognize targets for airborne vehicles. This is the completion of the Army's Multisensor Target Acquisition (Airborne) ATTD
- (U) Initiate the development of a manportable sensor suite of Night Vision and Electro-Optics devices that can be implanted in remote regions behind enemy lines for surveillance and intelligence gathering. The sensor suite will have remote activation features as well as data transmission via secure communications
- (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) Project DK86 - Night Vision, Airborne Systems: This project concentrates on the demonstration of sensor suites to meet the pilotage and obstacle avoidance requirements of advanced airborne vehicles. Specifically, 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 1991 Accomplishments:

- (U) Completed evaluation of Non-Developmental Item millimeter wave and electric field sensing sensors
- (U) Initiated program for flyable Advanced Obstacle Avoidance System (OASYS) prototype system
- (U) Completed range performance analysis, simulations, and design tradeoffs in support of OASYS Preliminary Design Review
- (U) Completed analysis of helicopter accident data for wire and obstacle strikes

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603710A**
PE Title: **Night Vision Advanced Technology** Budget Activity: **#2**

(U) FY 1992 Planned Program:
- (U) Complete fabrication of Obstacle Avoidance Sensor Suite and initiate integration to airborne platform in preparation for field trials in FY 1993
- (U) Continue development of Advanced Helicopter Pilotage Prototype Sensor

(U) FY 1993 Planned Program:
- (U) Complete integration of OASYS to Airborne Platform, conduct flight trials and implement transition to weapon system managers
- (U) Complete fabrication of Advanced Helicopter Pilotage Prototype and initiate laboratory testing in preparation for integration to the Army's Rotorcraft Pilots Associatione (RPA) in FY 1994
- (U) Initiate prototype hardware effort to demonstrate Advanced Aviator Night Vision Goggles to enhance operational effectiveness and reduce pilots workload

(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 1991 Accomplishments:
- (U) Demonstrated sensor fusion concepts in field evaluation of Multi-Sensor Aided Targeting-Ground program
- (U) Developed specifications for second generation tank sight in support of next generation/future combat vehicles
- (U) Designed sensor suite commensurate with overall 2nd generation FLIR standardization concept

(U) FY 1992 Planned Program:
- (U) Continue demonstration of second generation tank sight in preparation for integration to combat vehicle platform in FY 1993

(U) FY 1993 Planned Program:
- (U) Complete fabrication of second generation tank sight, integrate to tank platform and implement field trials for transition to weapon systems managers in FY 1994

(U) Work Performed By: The work is performed by the US Army Communications and Electronics Command (CECOM) Center for Night Vision and Electro-Optics (C2NVEO) at Fort Belvoir, VA. Major 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, PE #0603774A, and PE #0604710A in accordance with ongoing Reliance joint planning process and contains no unwarranted duplication of effort among the Military Departments.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0602710A
PE Title: **Night Vision Advanced Technology** Budget Activity: #2

(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.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603713A**
PE Title: **Army Data Distribution System (ADDS)**
Project Title: **PJH-Position Location Reporting System (PLRS)/ Joint Tactical Information Distribution System (JTIDS) Hybrid**

Project Number: **D370**
Budget Activity: **#4**

POPULAR NAME: **ADDS**

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

SCHEDULE	FY 1991	FY 1992	FY 1993	To Complete
Program Milestones			JTIDS MS III	EPLRS FUE & Prod Dec Rev 94
Engineering Milestones		Initial NCS Downsizing	Continue NCS Downsizing	Complete NCS Downsizing
T&E Milestones	Complete JTIDS TT, CL2M	Initial & complete JTIDS System TT/IOA	TTIII EPLRS JTIDS IOTE	FDTE 95 Init & Complete EPLRS OTE, 94
Contract Milestones		EPLRS FAT	EPLRS OPTI deliveries	AWD EPLRS Prod, FY 95 JTIDS PROD 94
BUDGET ($000)	**FY 1991**	**FY 1992**	**FY 1993**	**Program Total (To Complete)**
Major Contract	10431	13524	8529	Cont
Support Contract	1040	800	200	Cont
In-House Support	2293	4400	2848	Cont
GFE/Other	611	341	332	Cont
Test	1200	3440	1500	Cont
Total	15575	22506	13409	Cont

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603713A** Project Number: **D370**
PE Title: **Army Data Distribution System (ADDS)** Budget Activity: **#4**
Project Title: **PJH-Position Location Reporting System (PLRS)/ Joint Tactical Information Distribution System (JTIDS) Hybrid**

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The single project under this program element provides secure, jam-resistant data communications, position location reporting, navigation and identification capability to support the Army's Data Distribution System (ADDS). ADDS consists of the Enhanced Position Location Reporting System (EPLRS) and the Joint Tactical Information Distribution System (JTIDS), providing support to the Army's air defense, fire support, maneuver control, intelligence and combat service support automated systems. ADDS is a Corps/Division based system which will employ up to three Net Control Station-JTIDS (NCS-J) to perform net management/support connectivity and five Dedicated JTIDS Relay Units (DJRU) to provide connectivity, and eight JTIDS Class 2M terminals for Air Defense users with high throughput requirements. The ADDS will satisfy equipped unit's data communications needs and additionally 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 Very High Speed Integrated Circuit (VHSIC) insertion and EPLRS Downsized Net Control Station efforts are within this project.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- (U) Completed JTIDS class 2M terminal technical test (TT)
- (U) Completed Delivery of Net Control Station - JTIDS (NCS-J) engineering development models (EDM)
- (U) Delivered of DJRU EDM

(U) FY 1992 Planned Program:
- (U) Initiate and complete JTIDS systems technical test
- (U) Initiate EPLRS Downsized Net Control Station-EPLRS (NCS-E) development

(U) FY 1993 Planned Program:
- (U) Initiate and complete JTIDS initial operational test and evaluation (IOT&E)
- (U) JTIDS first unit equipped (FUE) with R&D assets
- (U) JTIDS Class 2M (CL2M) and NCS/DJRU production
- (U) Continue EPLRS Downsized NCS-E development
- (U) System Demonstration
- (U) Conduct EPLRS TT III

(U) Program Plan to Completion:
- (U) Complete EPLRS Downsized NCS-E development
- (U) Conduct testing of downsized NCS-E
- (U) JTIDS production buyout of CL2M's

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 Communications-Electronics Command (CE- COM), Fort Monmouth, NJ Program management support is provided by the MITRE Corporation, Bedford, MA. The major

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603713A** Project Number: **D370**
PE Title: **Army Data Distribution System (ADDS)** Budget Activity: **#4**
Project Title: **PJH-Position Location Reporting System (PLRS)/ Joint Tactical Information Distribution System (JTIDS) Hybrid**

contractors are Hughes Aircraft Company, Fullerton, CA and GEC-MARCON/Electronics Systems Corporation, Totowa, NJ.

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** Downsizing of the EPLRS Net Control Station is initiated in FY92.
2. **(U) SCHEDULE CHANGES:** Award to FY94. Funding losses delay JTIDS production.
3. **(U) COST CHANGES:** FY 92/93 increases due to EPLRS downsizing effort

F. (U) PROGRAM DOCUMENTATION:

	EPLRS
Required Operational Capability (ROC)	09/86
Organization and Operation Plan (O&O)	10/86
Class 2M (SCN-1) (Final)	02/87
Baseline Cost Estimate (BCE)	07/91
Cost and Operational Effectiveness Analysis (Draft)	02/89
Net Control Station (NCSJ)/Dedicated JTIDS Relay Unit (DJRU) (Draft)	03/89
Test and Evaluation Master Plan (TEMP) update	08/91
Basis of Issue Plan (BOIP) Feeder Data	07/89
Computer Resource Management Plan (CRMP) (Draft)	08/89
Systems Segment Specification update	08/89
Quantitative and Qualitative Personnel Requirement Information (QQPRI)	01/90

G. (U) RELATED ACTIVITIES:

PE #0203740A (Maneuver Control System)
PE #0604805A (Command, Control, Communications Systems - Engineering Development)
PE #0203726A (Advanced Field Artillery Tactical Data System)
PE #0604741A (Air Defense Command, Control and Intelligence - Engineering Development)
PE #0604321A (Joint Tactical Fusion Program)

The above related activities rely on EPLRS and/or JTIDS to provide data communication service in order to meet their data communication requirements.

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

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
Other Procurement, Army BU 1400	8885	44199	27297

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

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603713A**
PE Title: **Army Data Distribution System (ADDS)**
Project Title: **PJH-Position Location Reporting System (PLRS)/ Joint Tactical Information Distribution System (JTIDS) Hybrid**

Project Number: **D370**
Budget Activity: **#4**

J. (U) TEST AND EVALUATION DATA:

(U) FY 1991 Accomplishments:

- (U) Completed JTIDS CL2M TT in FY91

(U) FY 1992 Planned Program:

- (U) Initiate and complete JTIDS System Tech Test/Initial Operational Assessment (IOA)

(U) FY 1993 Planned Program:

- (U) Participate in Forward Area Air Defense Command, Control and Intelligence (FAADC2I) IOT&E

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603730A (TIARA)** Project Number: **#D560**
Title: **Tactical Surveillance System - Advanced Development** Budget Activity: **#4**

A. (U) RESOURCES: ($ in Thousands)
Project Title: **Tactical Surveillance System - Advanced Development**

Popular Name	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
Tactical Surveillance System	7369	16740	14937	Cont	Cont

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project supports advanced development work directed at meeting the deep intelligence and targeting needs of tactical commanders as stated in Field Manual 100-5 and under Airland Battle tactics to fight out-numbered and win. Specific tactical imagery exploitation studies 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. Advanced development of the Tactical Radar Correlator (TRAC) which enhances survivability and ensures receipt of selected theater imagery sources directly to the IPDS for exploitation was performed in this project, but transfers to engineering development (PE #0604740A) in FY 1991. 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 1991 Accomplishments:
- (U) Completed development of the initial IPDS softcopy capability under the JSIPS program for European fielding
- (U) Fielded the advanced development model of TRAC to the European theater for integration, testing and evaluation

(U) FY 1992 Planned Program:
- (U) Complete and field total capability of initial IPDS (softcopy and hardcopy)
- (U) Perform user evaluation of the initial IPDS
- (U) Continue imagery studies for tactical field exploitation and reporting support.
- (U) Initiate testing using the modularized antenna for aircraft dual datalink capability with TRAC
- (U) Continue development funding of IPDS within the joint (JSIPS) program.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603730A (TIARA)** Project Number: **#D560**
Title: **Tactical Surveillance System - Advanced Development** Budget Activity: **#4**

(U) FY 1992 Planned Program:

- **(U)** Conduct testing of the initial IPDS development model, and testing interoperability with the TRAC system
- **(U)** Conduct 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 imagery exploitation studies to include secondary imagery dissemination and low-volume tactical terminals
- **(U)** Develop tactical processing and exploitation enhancements for new sensor technology

D. (U) WORK PERFORMED BY: In-house efforts accomplished by US Army Topographic Engineering Center (TEC), Ft Belvoir, Virginia. Contractors: E-Systems, Garland, Texas; Aerospace Corp, El Segundo, California; MRJ, Inc., Fairfax, Virginia; and Science Applications Inc., Tucson, Arizona.

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** None
2. **(U) SCHEDULE CHANGES:** Final Acceptance of first IPDS slipped from FY 91 to FY 92.
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 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.

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

J. (U) MILESTONE SCHEDULE:

Milestones	Milestones Dates
Field initial IPDS (less Hardcopy segment)	10/91
Field Hardcopy segment initial IPDS	06/92
IPDS User Evaluation	08/92
Begin second IPDS development	10/92

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603734A**
PE Title: **Military Engineering Advanced Technology** Budget Activity: **#2**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
DT08	Combat Engineering Systems				
	2350	3043*	3404	Cont	Cont
PE TOTAL	2350	3043*	3404		

* Supplemental appropriation funds for Operation Desert Storm (ODS) in the amount of $610K are included.

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 1991 Accomplishments:**

- (U) Transitioned software to an Intel 80486, personal computer based platform operating in the open systems environment in support of emerging Army systems

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0603734A
PE Title: **Military Engineering Advanced Technology** Budget Activity: #2

- (U) Integrated an initial set of TDA software modules with the ALBE Geographic Information System
- (U) Coordinated with the Army Command and Control (ACCS) community for the inclusion of ALBE software to meet ACCS requirements
- (U) Coordinated a study of available Line-of Sight algorithms to determine the standard model for the ACCS community

(U) FY 1992 Planned Program:
- (U) Integrate remaining set of original TDA software modules with the ALBE geographic information system (GIS)
- (U) Integrate ALBE TDAs on the Common Hardware Software (CHS) equipment
- (U) Demonstrate and transition appropriate TDAs to the ACCS community
- (U) Integrate and demonstrate new technology TDAs on the ALBE test bed

(U) FY 1993 Planned Program:
- (U) Integrate capabilities to use weather and terrain data from remote sensing platforms to increase the area of coverage and accuracy of TDAs
- (U) Integrate advanced visualization capabilities into the ALBE test bed
- (U) Provide improved TDA software to the ACCS community

(U) Work Performed By:

DT08 - Combat Engineering Systems. The work is 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.

AMENDED FY 1992/1993 BEINNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603742A**
PE Title: **Advanced Electronic Devices Development** Budget Activity: **#2**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
DF32	Advanced Electronic Devices				
	5661	4036	6645	Cont	Cont
PE TOTAL	5661	4036	6645		

B. (U) BRIEF DESCRIPTION OF ELEMENT: Provides essential funding to permit proof of design for major technology advances in electronic devices, component assemblies and subsystems, and insertion into ongoing systems developments. Technology demonstrations provide vital assessments of emerging technologies for smart munitions, air defense and electronic warfare. This program provides the multicolor, high resolution thin film electroluminescent (TFE) displays to permit unit commanders to rapidly access and assess intelligence, targeting and command and control information for timely response to mobile battlefield situations. The program provides for the development of high power solid state switches for electro-thermal chemical (ETC) gun pulsars. The program reduces escalating procurement costs by replacing old or obsolete electronic circuits with modern technology on high-density custom or standard integrated circuits. The Hardness Assurance/Hardness Maintenance (HA/HM) program develops HA/HM procedures and associated practices, test techniques and testers for all nuclear weapons effects hardening areas. The program also develops the proper techniques and procedures for application throughout the production and operational life of a hardened system that will keep the system survivable. Develops methods for modifying non-developmental items (NDI) to survive in a nuclear battlefield. Supports Science and Technology Thrust areas in Precision Strike and Air Defense.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project DF32 - Advanced Electronic Devices:

(U) **FY 1991 Accomplishments**

- (U) Radiosonde battery study to reduce battery cost by 66%
- (U) Developed magnesium battery with 50% increase in performance for PRC-70
- (U) Developed 2-watt gallium arsenide amplifier and dielectric resonator for beacon/transponder
- (U) Developed 4 KW DC circuit breaker switching 4 MW
- (U) Demonstrated 1.0 KW traveling wave tube module for Apache escort jammer module
- (U) Demonstrated 9 GHz dielectric resonator source for x-band radar
- (U) Provided 10.1 reduction in size of 94 GHz monopulse transceiver and increased performance/reliability in detecting 1 kilometer missile targets
- (U) Developed new low temperature cathode incorporated into AMRAAM, ASPJ, ALQ-136, 135, 131, and PATRIOT downlink
- (U) Transitioned color flat panel display technology to airland battle management system, fiber optic guided-missile (FOG M), and Forward Area Air Defense Command, Control, Communications and Intelligence (FAADC3I)

AMENDED FY 1992/1993 BEINNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603742A**
PE Title: **Advanced Electronic Devices Development** Budget Activity: **#2**

- (U) Applied single channel ground and airborne radio systems (SINCGARS) proven Very High Speed Integrated Circuit (VHSIC) Hardware Description Language (VHDL) design methodology to more advanced complex Army systems, such as RAH-66 Commanche, Armored Systems Modernization (ASM)

(U) FY 1992 Planned Program:
- (U) Demonstrate interactive digital maps on full color flat panel displays for C3 systems and future battle lab
- (U) Improve stereoscopic sensor and displays for Caleb
- (U) Develop ruggedized projection display technology for future battle lab
- (U) Demonstrate proof of principle model traveling wave tube amplifier (TWTA) for aircraft survivability equipment (ASE) and the Radar Deception and Jamming advanced technology transition demonstration (ATTD)
- (U) Deliver first brassboard high power Ku-band TWTA f unmanned aerial vehicle (UAV)/moving target indicator (MTI) radar technology
- (U) Deliver engineering model seeker TWT to PATRI d deliver K-band transmitter for PATRIOT upgrade field testing
- (U) Demonstrate submicron polyphase filter chip f signal recognition and classification

(U) FY 1993 Planned Accomplishments:
- (U) Complete 1.0 KW traveling wave tube module for tronic warfare/reconnaissance, surveillance, and target acquisition for AN/ALQ-136 systems
- (U) Demonstrate mini-moving target indicator radar module with low phase noise oscillator
- (U) Develop producible active phased-array antenna/seeker for next generation smart munitions
- (U) Demonstrate producible miniaturized sensor for active tank defense
- (U) Demonstrate cost effective millimeter wave imaging arrays for surveillance application

(U) Work Performed By: In-house effort: Electronics Technology & Devices Lab (ETDL), Fort Monmouth, NJ, and Harry Diamond Labs, Adelphi, MD. Contractors: TRW, Redondo Beach, CA; AT&T Technology Systems, Greensboro, NC, Northrop, Rolling Meadows, IL; Hughes EDD, Torrance, CA; Booz-Allen & Hamilton, Bethesda, MD; Pianar 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, and PE #0602705A in accordance with the ongoing Reliance joint planning process and contains no unwarranted duplication of effort among the Militarty Departments.

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

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE 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 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D535 Intelligence Fusion Analysis Demonstration	4768	3348	3107	Cont	Cont

B. (U) BRIEF DESCRIPTION OF ELEMENT: Program funds development of advanced intelligence fusion analysis technologies and validation. This project satisfies 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 BOTH FY 1992 AND 1993:

(U) Project D535 - Intelligence Fusion Analysis Demonstration:

(U) FY 1991 Accomplishments:

- (U) Continued to prototype and validate applications of improved map display and knowledge base technology to ASAS intelligence fusion functions
- (U) Continued development of very large scale integration (VLSI) building-block chips for compact electronic neural computers
- (U) Began to design, prototype and test specific neural net configurations of VLSI building-block chips tailored to selected compute-intensive fusion applications. Initial candidates are: (1) auto-generation of topographic products from raw digital map data; (2) high-performance implementation of terrain/weather/movement analysis algorithms
- (U) Began comparative test and evaluation of alternative correlation algorithms using the established correlation test bed
- (U) Began to apply techniques, algorithms and software for parallel/distributed processing to large-scale tactical intelligence fusion (correlation and database) operations configured on distributed hardware in support of improved ASAS performance and reliability under expanding functional requirements
- (U) Investigated and developed applications of artificial intelligence technology to intelligence fusion problems
- (U) Continued to develop and expand the open, distributed Fusion Test Bed architecture; prototype and evaluate on the testbed feasible applications of artificial intelligence-based technology and con- current processing technology to the current/emerging ASAS and related systems environments, with emphasis on distributed processing across heterogeneous hardware and software

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603745A (TIARA)**
PE Title: **Tactical Electronic Support Systems - Advanced Development** Budget Activity: **#4**

(U) FY 1992 Planned Program:

- (U) Continue prototype/validate applications of improved map display and knowledge base technology to intelligence fusion functions with emphasis on nodal analysis and predictive intelligence (situation/threat assessment)
- (U) Continue to evaluate alternative correlation and aggregation algorithms, using the correlation test bed
- (U) Continue to investigate and develop applications of artificial intelligence technology to intelligence operations, particularly in the area of predictive intelligence
- (U) Continue to investigate and validate applications of parallel/concurrent processing technology to large-scale tactical intelligence fusion operations
- (U) Continue to prototype specific electronic neural net technology configurations tailored to high-pay-off applications, with emphasis on terrain/weather/spatial analysis, complex target identification, and predictive intelligence
- (U) Continue to integrate and evaluate applications of artificial intelligence and advanced processing technology on the Fusion Test Bed
- (U) Investigate hybrid architectures-combinations of parallel digital, neural net, and conventional serial processing - for improved tactical intelligence fusion
- (U) Continue to explore emerging hardware and software processing, storage and display technologies

(U) FY 1993 Planned Program:

- (U) Continue to prototype high payoff fusion applications of neural net technology, to include the investigation and application of optical and opto-electronic approaches for greater speed and improved learning/self-programming capabilities
- (U) Continue fusion applications investigations and prototype validation of integrated advanced processing techniques, to include parallel/neural net/hybrid implementation of expert systems/artificial intelligence techniques, particularly in the areas of predictive intelligence and distributed operations
- (U) Continue to integrate and evaluate advanced fusion technology applications on ASAS and related systems current/emerging/potential distributed software and hardware environments, via the Fusion Test Bed
- (U) Continue to explore emerging hardware and software processing, storage and display technologies
- (U) Investigate and evaluate applications of advanced concepts and technology in natural language understanding to more effective man-machine interaction and database parsing, interpretation and reporting

(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 (CECOM) Center for Signals Warfare, Vint Hill Farms Station, Warrenton, Va; and the Program Manager, ASAS McLean, Va.

(U) Related Activities: PE #0604321A All Source Analysis System is a related program. As in the ASAS Project, extended coordination is conducted with other Services to avoid duplication of effort. There is no unnecessary duplication of effort within the Army or DoD.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603745A (TIARA)**
PE Title: **Tactical Electronic Support Systems - Advanced Developm**

Budget Activity: **#4**

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

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE 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 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D555 Single Channel Ground and Airborne Radio Systems (SINCGARS) Advanced Development	- 0 -	171	214	319	704

B. (U) BRIEF DESCRIPTION OF ELEMENT: The single project in this element funds advanced development of SINCGARS Objective/Improved Combat Net Radio to enhance electronic counter countermeasures capability, to initiate interoperability improvements, to reduce power and to include other improvements generating from the user. Generally improvements will include backward compatibility with current SINCGARS family of radios; over the shoulder handset, reduced weight of Manpack, joint/combined interoperability; integration of Global Positioning System technology to provide common net timing, friend identification capabilities , automatic position reporting, and navigation assistance. Other key features as required by the user will likely include extended battery life through improved power efficiency, improved message completion performance, reduced cosite interference, automatic interface into the Area Common User System (ACUS), improved MANPRINT for better manpower and personnel integration and maintainability.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND 1993:

(U) Project D555 - SINCGARS-V Advanced Development (Project Restructured from PE #0604805. D282, in FY 1992)

(U) FY 1991 Accomplishments: Project not funded.

(U) FY 1992 Planned Program:
- (U) Begin concept exploration for an Improved Combat Net Radio
- (U) Begin development of system requirements

(U) FY 1993 Planned Program:
- (U) Begin development of specification

(U) Work Performed By: Project Manager SINCGARS is responsible for the Objective/Improved Combat Net Radio. Project Manager SINCGARS reports to the Program Executive Officer for Communications Systems, Fort Monmouth, NJ and is supported by Communications Electronics Command. No contractors are employed at this time.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603746A**
PE Title: **Single Channel Ground and Airborne Radio Systems (SINCGARS) Advanced Development** Budget Activity: **#4**

(U) Related Activities:
PE #0604751A (SINCGARS-Engineering Development) relates to the SINCGARS radio, the predecessor of the SINCGARS Objective/Improved Combat Net Radio. 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.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element **#0603747A**
PE Title: **Soldier Support and Survivability** Budget Activity **#4**

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

Project Number Title	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D610	Food Advanced Development				
	2467	2249	2140	Cont	Cont
D669	Clothing and Equipment				
	4800	5277	4906	Cont	Cont
DC09	Unit/Organizational Equipment				
	1317	910	875	Cont	Cont
PE TOTAL	8584	8436	7921		

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. New food items and food service equipment developed for all of the Department of Defense to meet high nutrition requirements, reduce food service personnel staffing, food procurement costs, and total food logistics support requirements. Individual clothing and equipment items being developed 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 mission requirements ofthe total force as well as specialized requirements for aviators, combat vehicle crew, Special Operations Forces, the Light Infantry Division, and other users. This program supports preliminary design, demonstration and validation of a new generation of field service support items; small, large and collective protection soft shelters; decontamination items; and improved field space heaters to sustain the soldier in the field.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND 1993:

(U) Project D610 - Food Advanced Development: Conduct advanced development on improved subsistence and improved subsistence items to enhance soldier effectiveness

(U) FY 1991 Accomplishments:

- (U) Obtained prototype components of a series of self-powered, multifuel-fired appliances including a mini-burner unit, convection oven and griddle for evaluation to support small unit food service operations on the battlefield
- (U) Completed development of the 18 Soldier T-Ration Meal Module that provides cost effective and improved logistical issue characteristics reducing weight by 50%, as well as waste
- (U) Completed limited user testing of the Long Life Ration Packet (LLRP) to meet requirements for a large portion of the Pre-Positioned War Reserve Stock (PWRS) with minimum rotation and restocking
- (U) Field tested and initiated a producibility contract for a New Generation Survival Ration

(U) FY 1992 Planned Program:

- (U) Evaluate effectiveness of a self-heating meal module which integrates process and packaging technologies with heater capabilities
- (U) Complete development of new MRE entree, dessert and snack items to increase acceptability and

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element #0603747A
PE Title: **Soldier Support and Survivability** Budget Activity #4

improve soldiers nutrition
- (U) Conduct large scale field test of LLRP and demonstrate acceptability as the force insertion initial ration and long shelf-life assault type ration
- (U) Continue development and evaluation of selected components for a containerized kitchen on the battlefield

(U) FY 1993 Planned Program:
- (U) Conduct market investigation of energy efficient food service equipment and/or devices to reduce energy consumption of equipment for all military food service operations
- (U) Evaluate new subsistence items that are cost effective, commercially producible and have logistical advantages for inclusion in the military food service system
- (U) Complete Customer Test/Candidate Evaluation for the containerized kitchen and proceed to a Milestone I/II In-Process Review (IPR)
- (U) Initiate Operational Test and Evaluation/Developmental Test (IOT&E/DT) for the containerized kitchen following MSI/II IPR

(U) Project D669 - Clothing and Equipment: Improve clothing and individual equipment to enhance soldier effectiveness and survivability.

(U) FY 1991 Accomplishments:
- (U) Developed prototypes of individual micro-climate cooling system and a flechette/fragment protective vest
- (U) Continued development of final prototypes of a chemical suit for depot workers and joint service EOD
- (U) Type classified an interim chemical protective suit for depot workers and joint service EOD

(U) FY 1992 Planned Program:
- (U) Evaluate concepts and develop prototypes for chemical protective underwear and outergarments
- (U) Test and type classify a special purpose tap hood
- (U) Conduct design review to select and test final chemical suit prototypes for depot workers and joint service EOD
- (U) Initiate developmental program on a chemical/biological tactile glove
- (U) Evaluate prototypes of micro-climate cooling and flechette/fragment protective vest
- (U) Provide technical support to field the interim depot workers chemical protective suit

(U) FY 1993 Planned Program:
- (U) Conduct TT/UT of the chemical protective suit for depot workers and joint service EOD
- (U) Transition an integrated soldier system from advanced technology to technical demonstration
- (U) Develop prototypes in initial testing for chemical protective underwear and outergarments
- (U) Review test results for individual micro-climate cooling and flechetle/fragment protective vest for transition to engineering development

(U) Project DC09 - Unit/Organizational Equipment Advanced Development: Develop and deploy new generation of lightweight tents, shelters and decontamination devices for unit level sustainability improvements.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element #0603747A
PE Title: **Soldier Support and Survivability** Budget Activity #4

(U) FY 1991 Accomplishments:

- (U) Awarded development contract for the New Family of Tents (NFOT)
- (U) Completed technical test of the Laundry and Dry Cleaning Decontamination System (LADDS)
- (U) Awarded contract to redesign LADDS based on test results

(U) FY 1992 Planned Program:

- (U) Procure prototypes for the New Family of Tents and conduct testing
- (U) Initiate advanced development of the Light Division Heater (LDH)
- (U) Continue with prototype fabrication contract for LADDS

(U) FY 1993 Planned Program:

- (U) Transition the New Family of Tents to EMD
- (U) Conduct Technical Feasibility Test (TFT) of the Light Division Heater
- (U) Initiate Advanced Development of Night Maintenance Shelter and Large Area Shelter
- (U) Conduct technical test of LADDS with redesigned prototypes

(U) Work Performed By: In-house efforts will be accomplished by US Army Natick Research, Development and Engineering Center, Natick, MA; Project Manager for Clothing and Individual Equipment, Woodbridge, VA; Project Office, Army Field Feeding, Woodbridge, VA; Belvoir RD&E Center, Ft. Belvoir, VA. Other supporting government agencies include US Army Test and Evaluation Command, Aberdeen Proving Ground (APG), MD; Yuma Proving Ground, AZ; US Army Chemical Research, Development and Engineering Center, APG, MD; and US Army Research Institute of Environmental Medicine, Natick, MA; U.S. Army Aviation Research Laboratory, Ft. Rucker, AL; Oakridge National Laboratories, Oakridge TN; U.S. Army Tank Automotive Command; US Army Cold Regions Test Center; and US Army Quartermaster Center and School. 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; International Thermal Research; Teledyne; New Born Industries; and Evironmental Technologies Group.

(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. DOD Explosive Ordnance Disposal Board provides joint Service interest in STEPO. Joint Logistics Commanders Panel on Chemical Protection supports multipurpose overboot development. 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 the DOD.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element **#0603747A**
PE Title: **Soldier Support and Survivability** Budget Activity **#4**

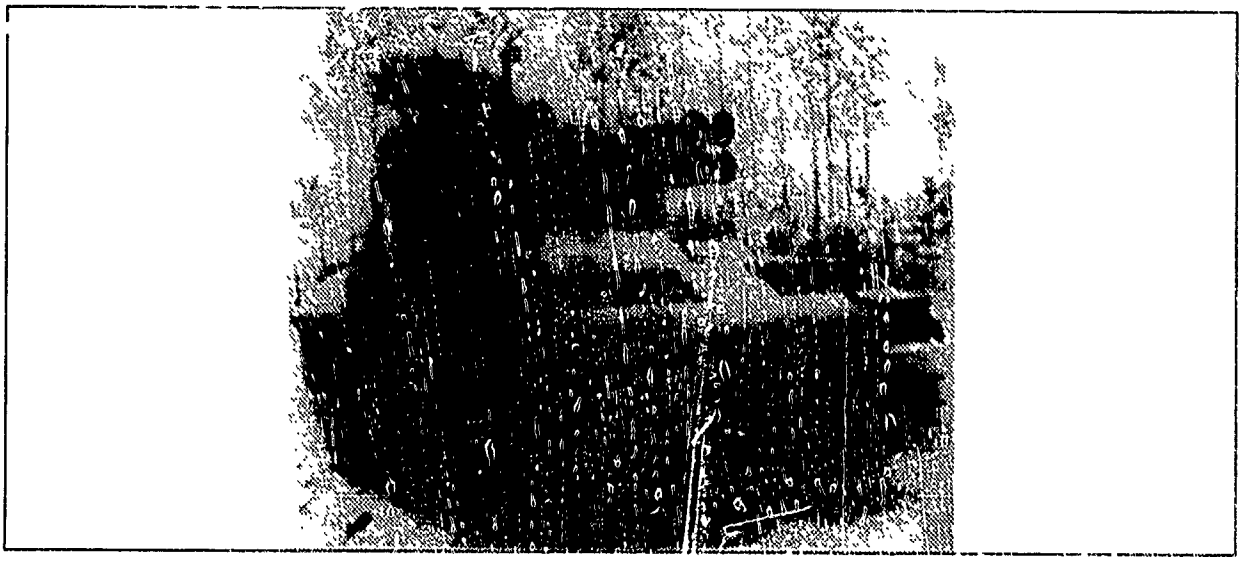
(U) Other Appropriation Funds: ($ in Thousands) Not applicable.

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603757A**
PE Title: **Forward Area Air Defense (FAAD) System**
Project Title: **Line-of-Sight - Forward-Heavy (LOS-F-H) Air Defense System**

Project Number: **# D463**
Budget Activity: **#4**



POPULAR NAME ADATS

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

SCHEDULE	FY 1991	FY 1992	FY 1993	To Complete
Program Milestones				
Engineering Milestones				
T&E Milestones				
Contract Milestones		Definitized TPEP Contract 4Q91		
BUDGET ($000)	**FY 1991**	**FY 1992**	**FY 1993**	**Program Total (To Complete)**
Major Contract	76155	54522	0	337304 (0)
Support Contract	1504	3252	0	36304 (0)
In-House Support	11087	24100	0	58777 (0)
GFE/ Other	6103	25178	0	42515 (0)
Total	94849	107252	0	485500

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603757A** Project Number: **# D463**
PE Title: **Forward Area Air Defense (FAAD) System** Budget Activity: **#4**
Project Title: **Line-of-Sight - Forward-Heavy (LOS-F-H) Air Defense System**

B. BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Line of Sight Forward-Heavy (LOS-F-H) component of the Forward Area Air Defense System (FAADS) consists of an armored, tracked vehicle (XM1069-a derivative of the M3A2 Bradley) that integrates a missile system; communications equipment; and detection, identification, and tracking sensors. To field an effective air defense capability as soon as possible, the Army selected a Non-Development Item (NDI) acquisition strategy to overcome current air defense deficiencies, with concurrent pre-planned product improvements (P3 I) to keep pace with the advancing threat. During operational testing, the system met or exceeded all operational requirements except reliability. A two year reliability, availability, and maintainability (RAM) maturation phase was added to allow the system reliability to grow to the required values. Program alternatives were presented at the LOS-F-H Army Systems Acquisition Review Council (ASARC) in Jun 90 and August 90 and a Defense Acquisition Board (DAB) in process review (IPR) in Nov 90. The maturation phase was composed of a contractor-funded corrective action program and various R&D funded test efforts. A production planning and integrated logistics support program will be conducted as a parallel effort in order to have the system ready for production and fielding when the RAM corrective actions are completed. The RAM maturation phase which was implemented into this statement of work (SOW) ensures that the reliability criteria are met before the Army commits to further system procurement. The ADATS program was terminated in January 1992.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- (U) Completed reliability growth program and retrofit of corrected actions into fire units
- (U) Completion of initial realibility growth demo and verification test (exceeded criteria of 30 hours MTBFHMF with 75.9 hours)
- (U) Began Exit Point B test
- (U) Definitized TPEP Contract

(U) FY 1992 Planned Program:
- (U) Completed Exit Point B test which exceeded criteria of 54 hours for Exit Point B and 85 hours for Exit Point C with MTBHMF of 92.2 hours

(U) FY 1993 Planned Program:
- (U) Program terminated

D. (U) WORK PERFORMED BY: In-house technical effort accomplished by Program Executive Officer for Air Defense Systems, Project Manager-Line of Sight-Forward-Heavy, U.S. Army Missile Command, Redstone Arsenal, AL , and US Army Air Defense School, Ft Bliss, TX Prime contractor for LOS-F-H is Martin Marietta Missile Systems, Orlando, FL.

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: None
2. (U) SCHEDULE CHANGES: Complete the development contract and do not proceed with production

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603757A** Project Number: **# D153**
PE Title: **Forward Area Air Defense (FAAD) System** Budget Activity: **#4**
Project Title: **Line-of-Sight - Forward-Heavy (LOS-F-H) Air Defense System**

3. (U) **COST CHANGES:** None

F. (U) PROGRAM DOCUMENTATION:

ROC	3/87	Acquisition Plan (Draft)	12/91
DCP	5/90	Acquisition Strategy Rpt	12/91
COD	5/90	Health Hazard Assessment	1/90
MER	3/90	Human Factors Engineering	3/90
CRMP	3/90	Health & Safety Data Sheet	3/90
PRMP	3/90	Safety Release	4/90
STAR	1/90	ILSP	12/90
CMP	3/90	TPS Management Plan	5/90
NETP	10/91	BOIP/QQPRI	1/90
DCP	5/90	Program Baseline	11/90

G. (U) RELATED ACTIVITIES: There is no unnecessary duplication of effort with other Army or other service/agency programs. Related activities include the FAAD family of systems as follows: PE #0604741A (Air Defense Command, Control and Intelligence) PE #0604810A (Fiber Optic Guided Missile) PE #0203801A (Missile and Air Defense Product Improvement Program)

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

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
Missile Procurement, Army SSN HO1700 (ADS Heavy Missile System)	0	0	0

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: The Canadian Army is procuring 36 low-level air defense system (LLADS) versions of ADATS mounted on a M113A3 chassis. An Annex for ADATS to the existing master data exchange agreement for the mutual development of weapon systems between the US and Canada was approved in Oct 88. This annex provides for exchange of scientific and technical data in test and evaluation, integrated logistics support, system integration and quality control. No cost sharing or joint funding is required.

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

AMENDED FY 1992/1993 BIENNIAL RDTE 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 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
DE83	Chemical Biological Defense Systems Advanced Technology				
	4320	3180 *	3496	Cont	Cont
PE TOTAL	4320	3180 *	3496		

* Supplemental appropriation funds for Operation Desert Storm (ODS) in the amount of $6K are included.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element funds Advanced Technology Transition Demonstrations (ATTD), Advanced Technology Demonstrations (ATD) and Technology Demonstrations (TD) of technologies and materiel in support of deterrence and defense against chemical and biological warfare as well as ATTDs for equipment defeating munitions. Army is the DOD Executive Agent for Chemical Warfare (CW) and Chemical and Biological Defense (CBD) research. These ATTDs 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 CBD.

C. (U) JUSTIFICATION FOR PROJECT:

(U) Project DE83 - Chemical Biological Defense Systems Advanced Technology: This project establishes an Advanced Technology Transition Demonstration (ATTD), Advanced Technology Demonstration (ATD) and Technology Demonstration (TD) Program in the areas of agent detection and identification, decontamination, individual and collective protection, and munitions which will speed maturing of advanced technologies to reduce risk in system-oriented Demonstration/Validation (Dem/Val) (6.3B).

(U) **FY 1991 Accomplishments:**

- (U) Restructured the Advanced Chemical and Biological Defense ATTD into individual TDs
- (U) Completed penetrant assessment testing on filters and transitioned information to improve filter performance
- (U) Completed Chemical and Biological (CB) detector TD for transition to system-oriented Dem/Val; demonstrated integration of components, addressed technical and operational requirements.
- (U) Continued CB Mass Spectrometer TD, demonstrated small mass analyzer, demonstrated algorithm, and initiated integration of system components
- (U) Initiated Army TD for light weight standoff chemical agent detector (LSCAD) using passive infrared technology. This will provide rapid, detection on-the-move with a significant reduction in size, weight and power.

AMENDED FY 1992/1993 BIENNIAL PDTE DESCRIPTIVE SUMMARY

Program Element: **#0603759A**
PE Title: **Chemical Biological Defense and Smoke Advanced Technology** Budget Activity: **#2**

- (U) Initiated Self-Stripping Coating Decontamination TD. This program will exploit candidate technologies for hasty decontamination of vehicles to increase decontamination effectiveness and decrease mission oriented protective posture (MOPP). Downselected to most promising sacrificial coating

(U) FY 1992 **Planned Program**:
- (U) Complete CB Mass Spec and Self Stripping coating TDs; transition to system-oriented Dem/Val
- (U) Initiate Nuclear Biological Chemical (NBC) Soldier Survivability ATD
- (U) Initiate Respo 21 subsystem of NBC Soldier Survivability ATD: this program will provide the next generation individual protective mask
- (U) Continue TD of LSCAD. Test prototypes and develop algorithms to detect nerve and blister agents

(U) FY 1993 **Planned Program**:
- (U) Continue Respo 21 subsystem of NBC Soldier Survivability ATD
- (U) Initiate sorbent decontamination subsystem of Nuclear, Biological and Chemical (NBC) Soldier Survivability ATTD for use by individual soldier to decontaminate personal equipment and parts of vehicle/crew served weapon
- (U) Initiate collective protection subsystem of NBC Soldier Survivability ATTD for collective protection of fixed sites
- (U) Complete TD of LSCAD and transition to Army Dem/Val

(U) **Work Performed By**: CG, U.S. Army Chemical Research, Development and Engineering Center (CRDEC), has responsibility for program management. The major supporting laboratory is CRDEC, Aberdeen Proving Ground, MD. Principle contractors are 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) Not applicable.

(U) **International Cooperative Agreements.** International Memorandum of Understanding (MOU) with United Kingdom/Canada/U.S. on cooperative development of the Biological and Chemical Detector.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603766A (TIARA)** Project Number: **#D907**
PE Title: **Tactical Electronic Surveillance Systems - Advanced Development** Budget Activity: **#4**

A. (U) RESOURCES: ($ in Thousands)
Project Title: Tactical Electronic Surveillance Systems - Advanced Development

Popular Name	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
Tactical Electronic Surveillance Systems	13301	15768	14813	Cont	Cont

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Supports the tactical commanders intelligence requirements for contingency force deployment 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 1991 Accomplishments:

- (U) Continued analyses to define optimum tactical interfaces to emerging national capabilities
- (U) Continued refinement of advanced capabilities for integration of Tactical Data Information Exchange System - B/Tactical Receive Equipment (TADIXS-B/TRE) capabilities into existing Electronic Process and Dissemination Systems (EPDS)
- (U) Continued on-going interface/coordination with other service TENCAP activities
- (U) Deployed 4 EPDS, 3 Enhanced Tactical User Terminals (ETUT), 5 Tactical High Mobility Terminals (THMT), and 7 Forward Area Secondary Imagery Dissemination Tactical Related Application (FAST) prototyped TADIXS-B/TRE and imagery receive and display terminals to SW Asia in support of Desert Shield/Desert Storm
- (U) Integrated TADIXS-B/TRE receive capability into 17 designated TENCAP systems which supported targetry and provided early SCUD missile warning to maneuver Corps and Divisions
- (U) Began efforts to configure THMT capabilities for increased rapid response (TENCAP) support for light/contingency forces
- (U) Initiated development of Mobile Integrated Tactical Terminal (MITT) downsized TENCAP interface(s) for special combat requirements within non-intelligence/electronic warfare (IEW) mission areas (i.e., Air Defense, Field Artillery, Aviation)

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603766A (TIARA)** Project Number: **#D907**
PE Title: **Tactical Electronic Surveillance Systems - Advanced Development** Budget Activity: **#4**

(U) FY 1992 Planned Program:

- **(U)** Initiate evaluations for: testing the prototype MITT; prototype miniaturized systems for integration into non-intelligence/electronic warfare tactical systems; and design (in conjunction with Program Executive Office, IEW) of standardizing commercial ""open architecture" hardware and software standards, to enhance application transfer

(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)** Continue to refine concepts, procedures, applications and systems to insure compatibility of source interfaces, and maintain close/joint efforts with other service TENCAP offices to enhance intelligence dissemination

D. (U) WORK PERFORMED BY: In-house development agencies: US Army Information Systems Command, Fort Huachuca, AZ. Contractor: Aerospace Corporation, El Segundo, CA.

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** None.
2. **(U) SCHEDULE CHANGES:** None.
3. **(U) COST CHANGES:** None.

F. (U) PROGRAM DOCUMENTATION: Technological Objective (TO), Army Tactical Application of special (ATASS), 7/81 Appendix I, Technological Objective (TO), ATASS, 1/89

G. (U) RELATED ACTIVITIES: Program Element #0604766A (Tactical Electronic Surveillance Systems - Engineering Development) provides continuing related engineering developments. 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) Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603766A (TIARA)**
PE Title: **Tactical Electronic Surveillance Systems - Advanced Development**

Project Number: **#D907**
Budget Activity: **#4**

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

J. (U) MILESTONE SCHEDULE:

Milestones	Milestones Dates
Field and Test Initial Prototype MITT	1/93 - 4/93

AMENDED FY 1992/1993 BIENNIAL RDTE 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 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D101 Tactical Automation	5302	3460	2544	Cont	Cont
D243 Sensors and Signal Processing	0	5164	5129	Cont	Cont
D289 Joint ALS Precision Strike DEMO	0	0	14768	Cont	Cont
PE TOTAL	5302	8624	22441		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program contains projects in two technology areas. Project D101 develops advanced computer science and technology for solution of Army unique Command, Control, Communications (C3) and Intelligence deficiencies in the areas of Maneuver Control, Fire Support, Intelligence Electronic Warfare, Air Defense and Combat Service Support. Program thrusts address solutions of these critical Army Command and Control (C2) automation deficiencies via application of (a) "expert system" decision support technology; (b) advanced distributed/parallel computer processing; (c) advanced information filtering and correlation processing techniques; (d) advanced information display automation; (e) digital terrain/mapping technology; and (f) natural language processing technologies. A major program focus is demonstration of advanced Army C2 Mission Planning and Battle Execution Monitoring decision support software systems for Corps through Battalion commanders and their staffs. Development of an "expert system" environment of reusable software modules/tools for use in implementing these advanced technology transition demonstration (ATTD) capabilities is an underlying requirement. Demonstrators will be validated at the Fort Leavenworth Combined Arms Center (CAC) Technology Assessment Center (TAC), the Army Tactical Command and Control System (ATCCS) Experimental Site (AES), US Army Communication-Electronics Command (CECOM) and various U.S. Army Training and Doctrine Command user evaluation sites. 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 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 21 century critical mobile and fixed targets. The demonstration will integrate surveillance, target acquisition, processing and attack for rapid response execution at extended range short-dwell targets. End-to-end systems capabilities to sucessfully 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. Work in

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603772A**
PE Title: **Advanced Tactical Computer Science and Sensor Technology** **Budget Activity: #2**

this program element complies with the Army Technology Base Master Plan and supports the DoD Science and Technology Thrusts for Air Superiority / Air Defense and Precision Strike.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project D101 - Tactical Automation: This project supports The Airland Battle Management (ALBM) ATTD that involves cooperating expert systems in tactical decision aids.

(U) **FY 1991 Accomplishments:**
- (U) Awarded Airland Battle Management (ALBM) advanced technology transition demonstration (ATTD) contract: Decision aid application prototype/environmental tools; development of initial demonstrations/evaluations and specifications
- (U) Demonstrated command, control and communication (C3) Taxonamy Analysis/(ATCCS) Functional Description Storyboard
- (U) Developed Corps Battlefield Simulation (CBS) System driver for ALBM ATTD prototypes
- (U) Selected best Lower Echelon command, control and information (LEC2I) prototypes and complete form and function definitions of Lower Echelon C2 Decision Process
- (U) Demonstrated and evaluated Automatic Message Heading and Information Extraction software
- (U) Initiated story boarding and simulation of Lower Echelon C2 decision support aids
- (U) Completed Multiple Mission Area Sensor (MMAS) field evaluation and integrating into LEC2I program
- (U) Initiated ATCCS/Armored System Modernization (ASM) software interoperability and function commonality study

(U) **FY 1992 Planned Program:**
- (U) Demonstrate ALBM ATTD Threat Decision Aid Application Prototype
- (U) Demonstrate ALBM ATTD Terrain Decision Aid Application Prototype
- (U) Demonstrate ALBM ATTD Friendly Capability Decision Aid Application Prototype
- (U) Begin transition of ALBM ATTD products to Program Executive Officer Command and Control Systems (PEO-CCS)
- (U) Demonstrate ALBM ATTD Plan Generation Decision Aid Application Prototype
- (U) Expand Automatic Message Heading software to include analog voice recognition capabilities
- (U) Complete ATCCS/ASM software interoperability and functional commonality study
- (U) Simulate Lower Echelon/ASM interoperability

(U) **FY 1993 Planned Program:**
- (U) Demonstrate ALBM ATTD Task Generation Decision Aid Application Prototype
- (U) Demonstrate ALBM ATTD Course Of Action (COA) Evaluation Decision Aid Application Prototype
- (U) Demonstrate ALBM ATTD Execution Monitor Decision Aid Application Prototype
- (U) Demonstrate ALBM ATTD Operational Order/Operational Planning Decision Aid Application Prototype
- (U) Initiate LEC2I Integrated Smart Communications/Processing Infrastructure

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603772A**
PE Title: **Advanced Tactical Computer Science and Sensor Technology** **Budget Activity: #2**

- (U) Expand LEC2I Pre-Planned Product Improvement (P3I) Programs

(U) Project D243 - Sensor and Signal Processing: This project provides for advanced development of new radar and signal processing concepts. Project transferred from PE #0603706A, Positive Hostile Identification - Advanced Development.

(U) **FY 1991 Accomplishments:** Project not funded

(U) **FY 1992 Planned Program:**
- (U) Initiate internal and contractual work for the Bistatic Radar for Weapons Location (BRWL) ATTD
- (U) Continue Unmanned Aeriel Vehicle (UAV) moving target indicator (MTI) Radar Technology Concept demonstration, modify a non-developmental item (NDI) radar for integration into surrogate UAV platform

(U) **FY 1993 Planned Program:**
- (U) Continue BRWL ATTD
- (U) Conduct UAV MTI Radar Technology Concept demonstration: initiate technology evaluation program of fused high range profiling and velocity classification algorithms to demonstrate recognition of moving ground vehicles, i.e., MTI classification
- (U) Convert surrogate UAV platform to airborne multisensor testbed

(U) Project D289 - Joint ALS 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 21 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 EB and correlated to test execise data.

(U) **FY 1991 Accomplishments:** Project Not Funded

(U) **FY 1992 Planned Program:** Project Not Funded

(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 ene-to-end precision strike execution capability

(U) **Work Performed By:** In-House | CECOM C3 and Electronic Warfare/Reconnaissance Surveillance and Target Acquisition Directorates, Fort Monmouth, NJ; Contract | Lockheed Corp, Austin

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603772A**
PE Title: **Advanced Tactical Computer Science and Sensor Technology** **Budget Activity: #2**

TX; SRI International, Menlo Park, CA; Computer Science Corp, Shrewsbury, NJ; TRW, Redondo, CA; GE Corp, Valley Forge, PA; TELOS Corp, Shrewsburry, NJ; 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, PE #0602782A, PE #0603006, PE #0502709, and PE #0603710 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.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603774A**
PE Title: **Night Vision Systems Advanced Development** Budget Activity: **#4**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D131 Night Vision Systems Advanced Development	2631	5438	7868	Cont	Cont

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element encompasses the advanced development phase of the Army acquisition cycle for Night Vision and Electro-Optic (NV&EO) devices/systems and prepares them for engineering development. The key objective of this program is to provide NV&EO 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 the Multi-sensor Target Acquisition System (MTAS), directed energy weapons, and electro-optic sensors for individual soldiers to meet stated Army deficiencies in the close combat heavy and light mission areas.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND 1993:

(U) Project D131 - Night Vision Systems Advanced Development (AD) - Project objectives are to develop night vision technology for transition to engineering development and for insertion into other technology and products related to night vision.

(U) **FY 1991 Accomplishments:**
- (U) Continued MTAS advanced development to include fabrication and testing of the Pathfinder Radar. MTAS is a dual sensor system supporting extended range surveillance, acquisition and engagement requirements of future armor systems.

(U) **FY 1992 Planned Program:**
- (U) Completion of MTAS Pathfinder Radar and transition specification to Program Executive Officer - Armored Systems Modernization.
- (U) Initiated development of AN/PLQ-04, Laser Countermeasures System (LCMS). LCMS is a hand-held laser countermeasure system used to detect and jam optical and electro-optical threats on armored vehicles, aircraft and infantry target acquisition systems.

(U) **FY 1993 Planned Program:**
- (U) Conduct field test on LCMS and transition to full scale development

(U) **Work Performed By:** In-house efforts accomplished by the U.S. Army Communications and Electronics Command (CECOM), Ft. Monmouth, NJ and the Center for Night Vision and Electro Optics (C/NVEO), Ft. Belvoir, VA. Major contractors are Rockwell International, Anaheim, CA and Martin Marietta Corp, Orlando, FL.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603774A**
PE Title: **Night Vision Systems Advanced Development** Budget Activity: **#4**

(U) Related Activities:
PE #0602709A (Night Vision Technology) relates to development of components and techniques
PE #0603710A (Night Vision Advanced Technology) relates to development of prototype demonstrators
PE #0604710A (Night Vision Systems-Engineering Development) supports engineering development of night vision and electro-optic devices and systems

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

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0603801A
PE Title: **Aviation-Advanced Development** Budget Activity: #4

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
DB32 Advance Maintenance Concepts and Equipment	2472	3357	3864	Cont	Cont
DB33 Cargo Handling Equipment	24	1664	1597	Cont	Cont
DB45 Aviation Life Support Equipment Advanced Development	4877	9869	8568	Cont	Cont
PE TOTAL	7373	14890	14029	Cont	Cont

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program provides RDTE advanced development funds for aviation support of tactical programs associated with air mobility support and advance maintenance concepts/equipment.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND 1993:

(U) Project DB32 - Advance Maintenance Concepts and Equipment: Project enhances utilization of current and future aircraft by improving the efficiency of maintenance (primarily in the area of diagnostics/prognostics) and servicing operations, through: replacing obsolete, unsupportable ground support equipment with new, 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 this project is the Intelligent Fault Locator Battalion-Level Demonstration, a program to test artificial intelligence-based troubleshooting software on a battalion of AH-64 Apache aircraft.

(U) FY 1991 Accomplishments:
- (U) Conducted assessments of candidate health usage monitoring system equipment
- (U) Continued Intelligent Fault Locator Diagnostics Program and Battalion-Level demonstration
- (U) Completed new aircraft tool system technical data packages (H-60, H-1, H-58)
- (U) Initiated advanced boresight equipment development
- (U) Completed skill level enhancement aid requirement and specification
- (U) Completed mechanical component diagnostic system bench test

(U) FY 1992 Planned Program:
- (U) Complete Intelligent Fault Locator Diagnostics Program and demonstration
- (U) Complete health usage monitoring system technical assessments and specification
- (U) Continue advanced boresight equipment development
- (U) Initiate unit maintenance aerial recovery kit advanced development design and fabrication
- (U) Initiate composite structure non-destructive inspection development
- (U) Conduct Milestone I/II in-process review (IPR) for new aircraft tool system (H-60, H-1 H-58)
- (U) Initiate definitization of new aircraft tool system for AH-64, CH-47 aircraft

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603801A**
PE Title: **Aviation-Advanced Development** Budget Activity: **#4**

(U) FY 1993 Planned Program:
- (U) Contract for new Aircraft Tool System technical data (AH-64, CH-47)
- (U) Complete unit maintenance aerial recovery kit fabrication
- (U) Initiate artificial intelligence usage monitoring contract and perform subsystem component analysis and candidate selection
- (U) Perform advanced boresight equipment developmental test and evaluation
- (U) Continue advanced composite structures non-destructive test equipment and procedures

(U) **Project DB33** - Cargo Handling Equipment: Project focuses on the development of equipment and operational improvements in loading and offloading helicopter cargo in all-weather, around-the-clock combat scenarios.

(U) FY 1991 Accomplishments:
- (U) Initiated Advanced Material Aerial Cargo Sling development
- (U) Initiated Aerial Cargo Handling Heavy-Lift system development

(U) FY 1992 Planned Program:
- (U) Complete Advanced Material Aerial Cargo Sling development
- (U) Continue Aerial Cargo Handling Heavy-Lift system development
- (U) Initiate advanced development of helicopter internal/external pallet system

(U) FY 1993 Planned Program:
- (U) Initiate design of the Advanced Aerial Cargo Handling System
- (U) Initiate design of heavy lift cargo handling demonstration system
- (U) Complete fabrication of Internal/External Pallet System and conduct developmental/operational tests
- (U) Continue design, and fabrication of the Advanced Aerial Cargo Handling System
- (U) Initiate design of advanced material cargo slings

(U) **Project DB45** - Aviation Life Support Equipment (ALSE) Advanced Development: Project will provide 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, integrated with greatly improved lightweight helmet technology; 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).

(U) FY 1991 Planned Program:
- (U) Tested Laser eye protection for SPH-4 and HGU-56P Aviator Helmet
- (U) Awarded joint Army/Navy contract for advanced Laser eye protection to protect against additional wavelengths
- (U) Completed Aircrew Integrated Helmet advance development components
- (U) Continued finalizing Aircrew Microclimate Conditioning System engineering development procurement specifications

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603801A**
PE Title: **Aviation-Advanced Development** Budget Activity: **#4**

- (U) Awarded contract for advanced development program for the Non-Carbon Based Regenerative NBC Filtration System for Army aircraft
- (U) Continued competitive procurement staffing for Inflatable Body and Head Restraint System (IBAHRS)

(U) FY 1992 Accomplishments:
- (U) Initiated Tri-Service Agile (tunable)laser eye protection program
- (U) Prepared statement of work and initiate advanced development effort for NBC Contamination Avoidance Program
- (U) Designed, fabricated and initiated testing for Inflatable Body and Head Restraint System (IBAHRS)
- (U) Fabricate, install, and test Non-Carbon Based Regenerative NBC Cockpit Filtration System for proof-of-concept

(U) FY 1993 Planned Program:
- (U) Fabricate advance laser eye protector visor and evaluate
- (U) Design and fabricate initial NBC advanced cockpit filtration devices
- (U) Initiate design development of NBC contamination avoidance system
- (U) Complete evaluation and testing of IBAHRS followed by Milestone III IPR

(U) Work Performed By: Projects DB32/DB33: 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. AVSCOM 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; and CAS, Inc., 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 Army Aeromedical Research Laboratories, Ft. Rucker, AL; US Army Aviation Systems Command, St. Louis, MO. Project DC29: TBD.

(U) Related Activities: Projects DB32/DB33: PE #0602211A (Aviation Technology) includes related technology base work. Project DB45: PE #0604801A (Aviation-Engineering Development)

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

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE 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 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D266 Airdrop Equipment Adv. Dev.	4165	4831	4064	Cont	Cont
D428 Tactical Rigid Wall Shelters Adv. Dev.	6454	5249	1454	Cont	Cont
D526 Marine Oriented Logistic Equipment Adv. Dev.	- 0 -	85	98	Cont	Cont
DG01 Combat Engineer Equipment Adv. Dev.	418	2130	2875	Cont	Cont
DG10 Advanced Tactical Power Sources Adv. Dev.	1100	1480	1287	Cont	Cont
DG11 Advanced Electrical Energy Concepts Adv. Development	788	1720	2466	Cont	Cont
DG14 Logistics Support Equipment Adv. Dev.	1089	3047	1480	Cont	Cont
DK39 General Support Equipment Adv. Dev.	305	741	741	Cont	Cont
DK41 POL Distribution Equipment Adv. Dev.	484	684	839	Cont	Cont
PE TOTAL	14803	19967	15304		

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. Air-drop, rigid wall shelters, marine, bridging, electric power generators and batteries, potable water and petroleum equipment development will increase the tactical 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 BOTH FY 1992 AND 1993:

(U) Project D266 - Airdrop Equipment Advanced Development. Develop and test air-drop equipment to improve soldier mobility, sustainment and survivability.

(U) FY 1991 Accomplishments:

- (U) Completed formal market investigation of Low Altitude Retro-Rocket System (LARRS)
- (U) Completed initial technical feasibility test (TFT) of LARRS
- (U) Initiated flight testing of 20,000lb parachute system (improved design)
- (U) Completed environmental test of ground sensor and logic systems for LARRS
- (U) Completed 250 knot Parachute Study

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603804A**
PE Title: **Logistics and Engineer Equipment - Advanced Development** Budget Activity: **#4**

(U) FY 1992 Planned Program:
- (U) Modify LARRS contract to permit development of light and heavy (30 and 60K) systems
- (U) Initiate development of heavy LARRS
- (U) Fabricate advanced lightweight prototype system and conduct advanced TFT of system
- (U) Initiate test to enhance load extraction ratio of LARRS

(U) FY 1993 Planned Program:
- (U) Complete test to enhance load extraction ratio of LARRS
- (U) Complete test of advanced lightweight prototype system of LARRS
- (U) Conduct Milestone I/II In-Process Review (IPR) of lower weight LARRS systems
- (U) Initiate advanced development of Linked Platform for 300 foot airdrop system

(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 1991 Accomplishments:
- (U) Began advanced development of lightweight hardened Standard Integrated Command Post System (SICPS) shelter and awarded 2 competing contracts to provide a design and producibility study
- (U) Procured prototypes for SICPS M113 track integration
- (U) Completed Advanced Development (AD) of SICPS Tent Pre-planned Product Improvement (P3I) and transitioned to EMD
- (U) Initiated P3I on Lightweight Integrated Turbine Power and Environmental Control System (T-PECS) for SICPS shelter

(U) FY 1992 Planned Program:
- (U) Begin component testing of the T-PECS
- (U) Initiate AD of Family of Built-Up Shelters
- (U) Initiate AD of Height Reducible Medium Tactical Vehicle (MTV) shelter

(U) FY 1993 Planned Program:
- (U) Complete procurement of prototypes for lightweight hardened SICPS shelter
- (U) Conduct system testing of T-PECS
- (U) Award contract to design and fabricate Family of Built-Up Shelters prototypes for testing on the HMMWV
- (U) Conduct market survey on height reducible MTV shelter

(U) Project D526 - Marine Oriented Logistic Equipment Advanced Development: This is a new start in FY 1992.

(U) FY 1991 Accomplishments: Project not funded.

(U) FY 1992 Planned Program:
- (U) Design and initiate fabrication of the Air Cushion Landing Platform

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603804A**
PE Title: **Logistics and Engineer Equipment - Advanced Development** Budget Activity: **#4**

(U) FY 1993 Planned Program:
- (U) Complete fabrication of the Air Cushion Landing Platform

(U) Project DG01 - Combat Engineer Equipment Advanced Development: Conduct advanced development of tactical bridging.

(U) FY 1991 Accomplishments:
- (U) Provided support for Foreign Comparative Test of German Leguan Bridge
- (U) Conducted ballistics comparison between Leguan and Armored Vehicular Launched Bridge (AVLB)
- (U) Restructured Heavy Assualt Bridge (HAB) program to identify affordable alternatives for the HAB requirement program

(U) FY 1992 Planned Program:
- (U) Initiate Heavy Dry Support Bridge (HDSB) program
- (U) Continue support for Foreign Comparative Test of German Leguan Bridge

(U) FY 1993 Planned Program:
- (U) Continue HDSB program

(U) Project DG10 - Advanced Tactical Power Sources Advanced Development: Develop advanced tactical power sources to improve soldier mobility, sustainability and survivability.

(U) FY 1991 Accomplishments:
- (U) Conducted laboratory evaluation of state-of-change indicator
- (U) Reduced size/weight of power processor for Microwave/Millimeter Monolithic Integrated Circuit (MIMIC) utilizing micro-circuit technology
- (U) Completed field evaluation of rechargeable lithium batteries
- (U) Fabricated prototype low cost, advance charger/analyzer

(U) FY 1992 Planned Program:
- (U) Continue development of first generator smart lithium throw away battery, rechargeable lithium batteries, and MIMIC
- (U) Evaluate/test first generators universal field battery and lithium solid cathode batteries
- (U) Initiate development of advanced charger/analyzer

(U) FY 1993 Planned Program:
- (U) Test family of enhanced throw away and rechargeable lithium batteries
- (U) Evaluate/test Super-Conducting Magnetic Energy Storage Power Source and lithium solid cathode batteries

(U) Project DG11 - Advanced Electrical Energy Concepts Advanced Development: Develop advanced elect-

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0603804A
PE Title: Logistics and Engineer Equipment - Advanced Development
Budget Activity: #4

rical energy concepts and devices to improve soldier mobility, sustainability and survivability. This project is scheduled to produce proof-of-principle prototypes supporting the Other Procurement, Army tactical electric power procurement, and to introduce Auxiliary Power Units (APUs) as a higher mobility, lower cost alternative to the present family of stand alone generator sets rated at 1 1/2, 3, 5, 10, 15, 30, 60, 100 and 200 kW.

(U) FY 1991 Accomplishments:
- (U) Developed 10kW demonstrator using composite materials for the generator set and assemblages effort
- (U) Tested and modified 5kW DC prototype compact engine generator set

(U) FY 1992 Planned Program:
- (U) Fabricate low power prototype demonstrator for the generator set and assemblages effort
- (U) Fabricate 5kW AC and 10kW AC 18K BTUH auxiliary power units (APUs) for the compact engine generator set

(U) FY 1993 Planned Program:
- (U) Test the low power prototype demonstrator and initiate fabrication of the medium power prototype demonstrator for the generator set and assemblages effort
- (U) Complete testing of the 5kw and 10kw 18K BTUH auxiliary power units (APUs) for the Compact Engine Generator

(U) Project DG14 - Logistics Support Equipment Advanced Development:

(U) FY 1991 Accomplishments:
- (U) Completed technical feasibility testing of All-Terrain Lifter, Articulated System (ATLAS)

(U) FY 1992 Planned Program:
- (U) Award contract for proof-of-principle (POP) for family of containers
- (U) Award contract for POP for 40 foot container unstuffing capability for ATLAS

(U) FY 1993 Planned Program:
- (U) Conduct Advanced Development (AD) for tests for mobility containers system (in conjunction with the U.S. Marine Corps)
- (U) Complete fabrication of 40 foot container unstuffing capability for ATLAS
- (U) Conduct Milestone I/II IPR for ATLAS
- (U) Initiate program documentation and contracts for prototype of ammunition handling capability for arming helicopters at forward area rearm/refuel points (FARRPs)

(U) Project DK39 - General Support Equipment Advanced Development: Develop new environmental support equipment to improve soldier mobility, sustainability and survivability.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603804A**
PE Title: **Logistics and Engineer Equipment - Advanced Development** Budget Activity: **#4**

(U) FY 1991 Accomplishments:
- (U) Continued evaluation of lightweight materials, and alternate configurations of reverse osmosis elements as part of Reverse Osmosis Water Purification Unit (ROWPU) components
- (U) Completed pre-treatment evaluation
- (U) Completed evaluation of improved water storage devices

(U) FY 1992 Planned Program:
- (U) Evaluate state-of-the art water treatment components to include intake systems, cartridge filters and lightweight media filters
- (U) Evaluate high turbidity clarification system for 600 GPH ROWPU

(U) FY 1993 Planned Program:
- (U) Complete evaluation of high turbidity clarification system for 600 GPH ROWPU
- (U) Evaluate state-of-the-art water treatment components for alternative disinfection methods, oil-water separation methods and improved component applications
- (U) Initiate design and fabricate the Radiological Water Monitor prototype

(U) Project DK41 - POL Distribution Equipment Advanced Development: Design new POL transfer surveillance and distribution items to improve soldier mobility and survivability.

(U) FY 1991 Accomplishments:
- (U) Awarded second-generation prototype contract for Standard Army Refueling System (SARS)
- (U) Obtained type classification of Modular Base Petroleum Laboratory (MBPL)

(U) FY 1992 Planned Program:
- (U) Initiate component testing of second-generation SARS prototypes
- (U) Conduct design reviews and finalize prototype SARS design
- (U) Initiate SARS prototype fabrication

(U) FY 1993 Planned Program:
- (U) Initiate development of Tactical Fuel Distribution and Storage Systems (TFDSS)
- (U) Initiate development of next-generation Petroleum Quality Analysis System (PQAS)
- (U) Conduct prototype testing and initiate final Technical Data Package (TDP) for SARS

(U) **Work Performed By:** In-house efforts will be accomplished by the U.S. Army Troop Support Command, Natick Research Development and Engineering Center, Natick, MA, and U.S. Army Belvoir Research, Development and Engineering Center, Fort Belvoir, VA. Other supporting government agencies will include Sandia National Laboratories, Albuquerque, NM; Oakridge National Laboratories, Oakridge, TN; Aberdeen Proving Ground, MD; White Sands Missile Range, NM; Harry Diamond Laboratory, MD; U.S. Army Laboratory Command, Adelphi, MD; 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,

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603804A**
PE Title: **Logistics and Engineer Equipment - Advanced Development**
Budget Activity: **#4**

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; FMC, Jonesboros, AR; Wheatly Pump and Valve Company, Tulsa, OK; VSE, Alexandria, VA; Law Environmental, Inc., Springfield, VA; Fluid Systems Division, San Diego, CA; ILMTEC Inc., Minneapolis, MN; and MEMCOR, Inc., Baltimore, MD; Keco Industries, Florence, KY; U.S. Laboratory Command, Adelphi, MD; Electronic Technology & Devices Laboratory, Ft. Monmouth, NJ; 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; Moli-Energy (Canadian Commercial Corp), Maple Ridge, B.C. Canada; Saft America, Cockeysville, MD; Whittaker-Yardney Power Systems, Pawcatuck, CT.

(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.

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

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603805A**
PE Title: **Combat Service Support Control System (CSSCS) Evaluation and Analysis**
Budget Activity: **#4**

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

Project Number / Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
XFFF Maintenance Trainer	2034	6734	- 0 -	- 0 -	10182
D091 Combat Service Support Control System	9078	21839	17683	Cont	Cont
D246 Tactical Communications System - Adv Dev	- 0 -	- 0 -	2122	Cont	Cont
PE TOTAL	11112	28573	19805	Cont	Cont

B. (U) BRIEF DESCRIPTION OF ELEMENT: 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 a rapid decision support capability and supportive information 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 process and analyze data for internal CSS functional command and control. The 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). The CSSCS must be available in the 1993 timeframe to coincide with the introduction of automation in all battlefield functional areas.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $[illegible].0 MILLION IN BOTH FY 1992 AND 1993:

(U) Project 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 1991 Accomplishments:
- (U) Completed System design review
- (U) Awarded Option 1 Contract
- (U) Conducted courseware interim process
- (U) Completed preliminary design review.

(U) FY 1992 Planned Program:
- (U) Award Option 2
- (U) Conduct critical design review
- (U) Fabricate dual instructor station and 8 student stations

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603805A**
PE Title: **Combat Service Support Control System (CSSCS) Evaluation and Analysis**
Budget Activity: **#4**

(U) FY 1993 Planned Program: Project completed in FY 1992.

(U) Project D246 - Tactical Communications System - Adv Dev: This project provides for insertion of proven communications technology from AH92 exploratory development into advanced development. Examples of these potential programs are frequency hopping multiplexers, which allow up to four radios to utilize a single antenna, high power solid state amplifiers, and packet appliques to increase network efficiency. This is not a new start, effort is transitioning from PE #0602782A Project AH92.

(U) FY 1991 Accomplishments: Project not funded

(U) FY 1992 Planned Program: Project not funded

(U) FY 1993 Planned Program:
- **(U)** Perform laboratory and field demonstrations to prove usefulness of evaluated technology
- **(U)** Evaluate potential technologies including frequency hopping multiplexers, high power solid state amplifiers, and packet appliques

(U) Work Performed By: In-house development for FIREFINDER Intermediate Maintenance Trainer will be conducted by PM-TRADE, Orlando, FL. In-house effort for the Communications Advanced development project is performed by Communications and Electronics Command (CECOM) Center for C3, Ft. Monmouth, NJ. Contractors to be selected.

(U) Related Activities:
PE #0604823A (FIREFINDER)
PE #0602783A (Computer and Software Technology)
PE #0604818A (Army Tactical C3I Systems Engineering)
There is no unnecessary duplication within the Army and DoD.

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

(U) International Cooperative Agreements: Not applicable

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603805A**
PE Title: **Combat Service Support Control System (CSSCS) Evaluation and Analysis**

Project Number # **D091**
Budget Activity: **#4**

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

Project Title: Combat Service Support Control System

Popular Name	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
CSSCS	9078	21839	17683	Cont	Cont

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 a rapid decision support capability and supportive information 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 process and analyze data for internal CSS functional command and control. The 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). The CSSCS must be available in the 1993 timeframe to coincide with the introduction of automation in all battlefield functional areas.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) Project D091 - Combat Service Support Control System:

(U) FY 1991 Accomplishments:
- (U) Completed development of Version 2 (Division Capability)
- (U) Conducted Milestone I/II review
- (U) Awarded full-scale development contract
- (U) Designed CSSCS Segment 3 software to provide ATCCS initial capabilities for operational readiness assessments, and sustainment planning to support combat operations
- (U) Enhanced the operational division level prototypes at 1st Cavalry Division and the 9th Infantry Division to corps level prototypes (III Corps)
- (U) Completed integration of critical Common ATCCS Software Support (CASS) modules into CSSCS processing architecture

(U) FY 1992 Planned Program:
- (U) Full-scale development of version 3
- (U) Prototyping to refine user requirements and resolve design issues
- (U) Develop embedded training package
- (U) Support Early User Test & Evaluation (EUT&E) and Force Development Test & Evaluation (FDT&E)
- (U) Begin development of Version 4

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603805A** Project Number # **D091**
PE Title: **Combat Service Support Control System (CSSCS) Evaluation and Analysis** Budget Activity: **#4**

(U) FY 1993 Planned Program:

(U) Complete development of Version 3 (Corps Capability)

- **(U)** Initial operational capability (IOC) and first unit equipment (FUE)
- **(U)** Support Corps level Initial Operational Test and Evaluation (IOT&E)
- **(U)** Army Systems Acquisition Review Council (ASARC) III for full-scale production

D. (U) WORK PERFORMED BY: Contractors are TRW Inc., Carson, CA (Version 1/2 Developer); Engineering and Economic Research Inc (EER), Vienna, VA (Technical Support Services); Engineering Professional Services, Shrewsbury, NJ/Springfield, VA (Acquisition Support Contractor). In-house developing organizations are: the US Army Information Systems Engineering Commands, Ft Huachuca, AZ; the US Army Combined Arms Support Command, Ft. Lee, VA; US Army Communications-Electronics Command, Ft Monmouth, NJ.

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE 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)	5/82
Required Operational Capability (ROC)	10/90
Operational and Organizational (O&O) Concept	10/90

G. (U) RELATED ACTIVITIES:

PE #0602783A (Computer and Software Technology)
PE #0604818A (Army Tactical Command and Control Hardware and Software)
The Combat Service Support Computer System (CSSCS) is part of the overall Army Tactical Command and Control System (ATCCS) and is managed by the Program Executive Office Command and Control Systems (PEO-CCS) who ensures total system integrity and interoperability and that no unnecessary duplication exists.

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands) Not applicable.

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

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603805A**
PE Title: **Combat Service Support Control System (CSSCS) Evaluation and Analysis**

Project Number **# D091**
Budget Activity: **#4**

J. (U) MILESTONE SCHEDULE:

MILESTONES	MILESTONES DATES
ASARC I/II	12/90
Development Contract Award for Objective System	1/91
Development of Version 3	1/91
Development of Version 4	7/93
ASARC III	9/93
First Unit Equipped (FUE)	10/93
Initial Operational Capability (IOC) Version 3	10/93
Fielding Version 3	10/93
Development Contract Award for Version 5	3/95
Development of Version 5	3/95
Follow-on Operational Test & Evaluation (FOT&E)	8/95
Fielding of Version 4	9/95
Follow-on Operational Test & Evaluation (FOT&E)	9/97
Fielding of Version 5	10/97

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603806A**
PE Title: **Chemical/Biological Defense Equipment - Advanced Development**
Budget Activity: **#4**

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

Project Number / Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D483 Radiac Equipment Advanced Development	2774	257	5820	6509	38275
D601 Chemical Detection and Warning Concepts	30611	20703 *	6660	Cont	Cont
D604 Chemical Biological Collective Protection Concepts	- 0 -	2469	6539	Cont	Cont
DE80 Chemical Biological Individual Protection Concepts	1500	4129	3296	- 0 -	8925
DE81 Chemical Biological Decontamination Materiel Concepts	6094	3722	8758	Cont	Cont
DJ30 Nuclear, Biological, and Chemical Survivability	1735	5101	4960	Cont	Cont
PE TOTAL	42714	36381	36033		

* Supplemental appropriation funds for Operation Desert Storm (ODS) in the amount of $7472K are included

B. (U) BRIEF DESCRIPTION OF ELEMENT: Department of Defense Directive 5160.5 designates the Army as Executive Agent for the development of nuclear, biological and chemical (NBC) defensive equipment. This program element provides for the advanced development and demonstration testing of radiological and chemical/biological/toxin agent detection and warning systems, individual and collective protection systems, and decontamination systems. It also funds a technical cell which supplies expertise in NBC survivability criteria and assistance to major equipment development agencies.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND 1993:

(U) Project D483 - Radiac Equipment Advanced Development: Provides for advanced development of personnel and equipment-mounted detection, monitoring and warning materiel for nuclear battlefield hazards.

(U) FY 1991 Accomplishments:

- (U) Approved the required operational capabilities (ROC) for the Pocket Radiac and conducted a Milestone I/II in-process review (IPR)
- (U) Completed Advanced Development (AD) for the Advanced Airborne Radiac
- (U) Completed AD for the Alpha Radiac Monitor

(U) FY 1992 Planned Program:

- (U) Type classify the Alpha Radiac Monitor
- (U) Initiate advanced development for a Pocket Radiac trainer

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0603806A
PE Title: **Chemical/Biological Defense Equipment - Advanced Development**
Budget Activity: #4

- (U) Conduct Milestone I/II IPR for Advanced Airborne RADIAC

(U) **FY 1993 Planned Program:**
- (U) Initiate advanced development on the Radiation Analyzer
- (U) Initiate advanced development efforts to integrate radiation detection systems data into the automated nuclear, biological and chemical information system
- (U) Initiate development contract for pocket radiac trainer

(U) Project D604 - Chemical Biological Collective Protection Concepts: The Advanced Integrated Collective Protection System (AICPS) will integrate NBC filtration environmental controls and power source components for combat systems. Combining components will provide an overall size, weight, and energy reduction as well as the needed additional electrical power. Advanced filtration technology (regenerable filtration or catalytic oxidation) will (1) significantly reduce filter change logistics burden, (2) meet future threat, and (3) alleviate disposal problems associated with hazardous material impregnated carbon filters. This is a new start in FY 1992.

(U) **FY 1991 Accomplishments:**
- (U) Project not funded

(U) **FY 1992 Planned Program:**
- (U) Initiate advance development (AD) for AICPS
- (U) Award AD contract and approve Acquisition Plan for AICPS

(U) **FY 1993 Planned Program:**
- (U) Conduct Milestone I IPR for AICPS
- (U) Design and fabricate prototype hardware

(U) Project DE80 - Chemical Biological Individual Protection Concepts: This project provides for advanced development of new respiratory protection technology for soldiers.

(U) **FY 1991 Accomplishments:**
- (U) Initiated advanced development (AD) for the new Aircrew Protective Mask

(U) **FY 1992 Planned Program:**
- (U) Complete design and fabricate prototype Aircrew Protective Mask System
- (U) Approve Aircrew Protective Mask System Operational Requirements Document (ORD)

(U) **FY 1993 Planned Program:**
- (U) Conduct Milestone I/II IPR for the Aircrew Protective Mask System

(U) Project DE81 - Chemical Biological Decontamination Materiel Concepts: Provides for advanced development of new, non-aqueous and aqueous decontaminants and, decontamination methods and systems for use on the contaminated battlefield.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603806A**
PE Title: **Chemical/Biological Defense Equipment - Advanced Development** Budget Activity: **#4**

(U) FY 1991 Accomplishments:
- (U) Awarded development contracts for all modules of the Modular Decontamination System (MDS)
- (U) Completed engineering testing and awarded follow-on development contract for XM19 NAEDS
- (U) Completed Milestone I IPR for Decontaminating Agent: Multipurpose (DAM)

(U) FY 1992 Planned Program:
- (U) Fabricate prototypes of the Modular Decontamination System for technical/user testing
- (U) Approve Operational Requirements Document (ORD) for MDS
- (U) Complete Non-aqueous Decontamination System (NAEDS) Level III drawing package and prototype upgrades
- (U) Prepare Acquisition Plan for Decontaminating Agent: Multipurpose (DAM)
- (U) Award DAM development contract

(U) FY 1993 Planned Program:
- (U) Initiate technical testing on MDS
- (U) Complete Milestone I for Self Stripping Coating and begin Advanced Development
- (U) Initiate technical and early user testing for DAM
- (U) Terminate XM19 NAEDS 6.3 development until completion of 6.2 solvent replacement effort

(U) Project DJ30 - Nuclear, Biological, and Chemical (NBC) Survivability: This project provides for design integration support in advanced development to numerous weapons systems to ensure NBC survivability concepts are adequately addressed in the development phase.

(U) FY 1991 Accomplishments:
- (U) NBC survivability support provided to over fifty separate programs
- (U) Prepared/submitted report to Congress on armored systems NBC protection
- (U) Hosted NBC Contamination Survivability Symposium showcasing NBC survivability to industry/government
- (U) Initiated NBC survivability evaluation of wooden pallets for PM, Ammunition Logistics
- (U) Continued update of American Society for Testing Materials (ASTM) standards for surety materials

(U) FY 1992 Planned Program:
- (U) Initiate NBC survivability assessment of Command, Control and Intelligence systems
- (U) Establish industry/DoD forum to standardize NBC survivability testing methods
- (U) Provide NBC survivability support to 50 developing systems

(U) FY 1993 Planned Program:
- (U) Provide NBC survivability support to over fifty separate programs
- (U) Continue update of ASTM test standards
- (U) Continue NBC survivability assessment of Communications, Control and Intelligence Systems

(U) **Work Performed By:** The Project Manager for NBC Defense Systems, Aberdeen Proving Ground

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603806A**
PE Title: **Chemical/Biological Defense Equipment - Advanced Development** Budget Activity: **#4**

(APG), MD; U.S. Army Chemical Research, Development and Engineering Center, APG MD; U.S. Army Tank-Automotive Command, Warren, MI; U.S. Army Test and Evaluation Command, APG, MD; Night Vision Electro-Optics Laboratory, Ft Belvoir, VA; Human Engineering Laboratory, APG, MD; and Electronic Warfare/Reconnaissance, Surveillance and Target Acquisition Center, Ft Monmouth, NJ. Contractors include Brunswick, Delmarua, FL; TRW Defense Systems Group, Redondo, CA; Texas Instruments, Dallas, TX, Environmental Analytical Systems Inc., (EASI) Towson, MD; and General Atomics, San Diego, CA; SAIC LaJolla, CA; Booz-Allen, NJ; and Environmental Technology Group, Inc., Baltimore, MD.

(U) Related Activities:

PE #0602622A (Chemical, Smoke and Equipment Defeating Technology)
PE #0604806A (Chemical/Biological Defense Equipment Engineering Development)
Department of Defense Directive 5160.5 assigns the Army responsibility for research and development in chemical-biological defense for joint requirements of the Army with other Services in order to meet other Services' needs and to prevent unnecessary duplication of effort. Execution of this responsibility is coordinated through the Joint Services Requirements Group; the Joint Panel on CB Defense of the Joint Logistics Commanders;and the Joint periodic reviews of the Joint Chemical-Biological Research, Development, Test and Evaluation Program. Coordination and cooperation are maintained with allied countries via data exchange agreements and through meetings of the North Atlantic Treaty Organization (NATO) AC/225 (Panel VII). 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.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603806A**
PE Title: **Chemical/Biological Defense Equipment - Advanced Development**

Project Number **D601**
Budget Activity: **#4**

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

Project Title: Chemical Detection and Warning Concepts

Popular Name	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
NBC Reconnaissance, Detection, and Identification (RDI)	30611	20703	6660	Cont	Cont

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project is vital to the advanced development of new manned and unmanned Nuclear, Biological and Chemical (NBC) detectors and alarms that will greatly enhance the U.S. capability to detect, provide alarm, and identify threat agent on the battlefield. The project will provide for smaller, more dependable systems that will detect, locate, mark and identify contamination. The new systems will also evaluate the effectiveness of the decontamination of personnel and equipment. The development of long-range laser detectors for ground employment will greatly improve the U.S. capability to avoid contaminated areas and provide timely, early warning of NBC attack.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- (U) Completed Chemical Agent Detector Network (CADNET) TFT and initiated fabrication of technical test/user test (TT/UT) hardware
- (U) Continued MICAD concept feasibility development and fabricated prototype hardware
- (U) Developed and deployed Chemical/Biological Detection and Warning system supporting Operation Desert Shield using $20m increase provided by Congress for FY91

(U) FY 1992 Planned Program:
- (U) Complete CADNET TT/UT fabrication and conduct TT/UT tests
- (U) Perform MICAD concept feasibility test and evaluation; complete 6.3B development
- (U) Initiate 6.3B development of BIOCHEM Detector; initiate fabrication of feasibility hardware

(U) FY 1993 Planned Program:
- (U) Continue concept feasibility development of BIOCHEM Detector; initiate feasibility testing
- (U) Complete CADNET Milestone III and type classify

D. (U) WORK PERFORMED BY: In-house work will be performed by USACRDEC, APG, Md., USATECOM, APG, Md., and Sandia National Lab, N.M. Current known contractors are Environmental Technology Group (ETG) Inc., Towson, Md. and Battelle Inc, Columbus, OH.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603806A** Project Number **D601**
PE Title: **Chemical/Biological Defense Equipment - Advanced Development** Budget Activity: **#4**

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** Design problems associated with electronic chips (hybrid and analog) caused delay in completion of CADNET design
2. **(U) SCHEDULE CHANGES:** CADNET TC slipped to 4QFY93
3. **(U) COST CHANGES:** CADNET +$1000 in FY92, +$1000 in FY93

F. (U) PROGRAM DOCUMENTATION:
CADNET - O&O 8706; ORD Planned 10/92
MICAD - O&O 01/85; ORD Planned 03/92
BIOCHEM Detector - O&O 06/91: ORD Planned 02/94

G. (U) RELATED ACTIVITIES: Program Elements #0604806A/D020 (Chemical/Biological Defensive Equipment-ED) and #0602622A (CB Defense Exploratory Development.) There is no unnecessary duplication of effort within the Department of Army or Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands) Not applicable.

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

J. (U) MILESTONE SCHEDULE:

Milestones	Milestones Dates
CADNET	
Milestone III IPR	07/93
MICAD	
MS I/II IPR	9/92
BIOCHEM Detector	
MS II IPR	9/93

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603807A**
PE Title: **Medical Systems-Advanced Development** Budget Activity: **#4**

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

Project Number / Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D808 DoD Drug and Vaccine - Advanced Development	4840	3916	-0-	Cont	Cont
D809 Medical Biological Defense Drug and Vaccine - Advanced Development	4470	5082	-0-	Cont	Cont
D811 Military Human Immunodeficiency Virus (HIV) Vaccine and Drug - Advanced Development	- 0 -	6320	-0-	Cont	Cont
D836 Combat Medical Materiel - Advanced Development	13231	2972	-0-	Cont	Cont
D837 Soldier System Protection - Advanced Development	- 0 -	3148	-0-	Cont	Cont
D993 Medical Defense Against Chemical Threats - Advanced Development	6450	10881	-0-	Cont	Cont
PE TOTAL	28991	32319	-0-*		

*These medical resources transferred to OSD, Health Affairs, effective FY 1993.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element (PE) addresses joint Service and Army-unique requirements for development of medical materiel necessary to field an effective capability for medical defense against chemical and biological warfare agents. Products developed in this program will provide for maximum soldier survivability and enhanced sustainability of performance in an environment contaminated with chemical and biological threats. This program also funds advanced development 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 program supports advanced development of field medical equipment essential for combat casualty care on the low, mid, and high intensity battlefield. Included are special and contingency force operations through reduction in logistical support requirements and increased mobility. 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 protective devices against emerging laser threats, environmental health monitoring equipment, and medical water quality monitoring equipment. Systems include resuscitation, blood substitutes, field x-ray, and field production of medical grade water and oxygen. Project D811, Military HIV Vaccine and Drug — AD, was created to accommodate a redistribution of work across appropriate PEs. The establishment of Project D837, Soldier System Protection — AD, does not represent a new start but is a restructuring and realignment of existing resources within this PE. The restructuring was essential in order to align new products with appropriate resources and is a zero sum transfer within the PE.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603807A**
PE Title: **Medical Systems-Advanced Development** Budget Activity: **#4**

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND 1993:

(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 1991 Accomplishments:**
- (U) Continued Phase I/II trials of malaria sporozoite, dengue, and hepatitis A vaccines.
- (U) Initiated Phase II clinical tests of anti-leishmaniasis drug WR 6026.
- (U) Submitted Investigational New Drug (IND) application to the Food and Drug Administration for Lipid A analog vaccine for prophylaxis and therapy of gram negative sepsis and shock.
- (U) Completed a long-term toxicity study of halofantrine, prophylactic indication for severe and complicated malaria.
- (U) Completed Phase I trial of Adenovirus-vectored hepatitis B vaccine.

(U) **FY 1992 Planned Program:**
- (U) Conduct Phase I trials of antimalarial drug WR 238605 and meningococcal Group B vaccine.
- (U) Complete long-term toxicology studies of prophylactic antimalarial drug halofantrine and preclinical testing of vaccinia-vectored Korean Hemorrhagic Fever vaccine.
- (U) Initiate Phase I trials of multivalent live dengue vaccines.
- (U) Initiate Phase I vivax malaria sporozoite vaccine, liposome-encapsulated and adjuvant-enhanced falciparum malaria vaccines.
- (U) Initiate Phase II trials of Cholera vaccine.
- (U) Initiate Phase II trials of C-1/C-6 lipid A analog for treatment of septic shock.

(U) **FY 1993 Planned Program:**
- (U) Complete Phase II trials of antileishmanial drug WR 6026 and antimalarial drug WR 238605.
- (U) Initiate Phase II trials of antimalarial drug halofantrine for prophylaxis.
- (U) Complete Phase I preclinical studies of falciparum malaria merozoite vaccine.
- (U) Complete Phase I preclinical studies of generic immune modulators for stimulation of nonspecific, broad spectrum immunity.
- (U) Initiate Phase I trials of vaccinia-vectored Korean Hemorrhagic Fever 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.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603807A**
PE Title: **Medical Systems-Advanced Development** Budget Activity: **#4**

(U) FY 1991 Accomplishments:

- (U) Terminated the Antiviral Drug Development Program and redirected resources to higher priority programs.
- (U) Terminated advanced development of vaccines and drugs against aerosol-transmissible, vector- and rodent-borne viral diseases which do not appear on the Armed Forces Medical Intelligence Center (AFMIC) validated threat list. Vaccines and drugs against these viral diseases will henceforth be developed in the Infectious Disease Research Program.
- (U) Evaluated the safety and immunogenicity of the Chloroform-Methanol-Residue (CMR) Q Fever vaccine in volunteers and found that it can be administered safely in doses of up to 60 micrograms and that it elicits a cellular immune response.
- (U) Completed preclinical studies of Type F botulinal toxoid. Assembled information for IND submission, including protocol for safety and immunogenicity testing in volunteers.
- (U) Completed Phase I trial of Botulinal $F(ab')_2$ Antitoxin.
- (U) Validated safety and immunogenicity of a live-attenuated tularemia vaccine in 30 volunteers and determined that the vaccine is safe. Preliminary indications are that the vaccine stimulates a good immune response.
- (U) Conducted pre-clinical testing on a pilot lot cell culture derived smallpox vaccine (vaccinia).
- (U) Demonstrated for the first time, interference between two live attenuated alphavirus vaccines (Chikungunya [CHIK] and Venezuelan Equine Encephalitis [VEE]) in volunteers in the absence of detectable antibodies.
- (U) Provided technical training in rapid diagnostic test operations to personnel deployed to field medical laboratories during Operation Desert Storm/Shield (ODS/S).
- (U) Generated recombinant vaccinia viruses expressing VEE structural proteins; evaluated recombinants for immunogenicity and protection in laboratory models. Equal protection was shown with both the recombinant vaccine and the inactivated C-84 VEE vaccine, but not as well as with the live, attenuated TC-83 vaccine.
- (U) Demonstrated that the live, attenuated CHIK vaccine poses no risk of transmission by mosquitoes, including natural vectors of wild virus.
- (U) Continued evaluation of safety and immunogenicity of a commercially available killed tick borne encephalitis vaccine in volunteers and a preliminary determination was made that the vaccine is safe.
- (U) Described, evaluated, and submitted for patent an improved method to identify viral antigen from filovirus infected individuals. Created an improved immunoassay and produced reagents sufficient for several thousand assays to measure antibodies for filoviruses, and demonstrated the superior sensitivity and specificity of this assay in comparison to currently used techniques.
- (U) Continued preclinical testing of a live attenuated Rift Valley Fever virus vaccine to determine safety and immunogenicity. Drafted and prepared human use protocol and IND documents for submission to regulatory agencies. Continued current (inactivated) vaccine validation in volunteers.
- (U) Prepared protocol and supporting documentation for FDA approval and supplied ribavirin for treatment and post-exposure prophylaxis of Crimean-Congo Hemorrhagic Fever during ODS/S.
- (U) Continued support of the Salk Institute (Swiftwater, PA) production facility for experimental vaccines, monoclonal antibodies and other non-commercial research and diagnostic reagents that require specialized biocontainment facilities for their production.
- (U) Initiated Environmental Assessment of the Salk Institute, Government Services Division (Swiftwater, PA).

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603807A**
PE Title: **Medical Systems-Advanced Development** Budget Activity: **#4**

(U) FY 1992 Planned Program:
- (U) Initiate Phase I trials of vaccinia-virus (smallpox) vaccine
- (U) Complete expanded safety studies of Q Fever CMR extract vaccine
- (U) Initiate Phase I studies of type F botulinal toxoid

(U) FY 1993 Planned Program:
- (U) Produce pilot lots of recombinant anthrax vaccine.
- (U) Initiate Phase I trials of type G botulinal toxoid.
- (U) Continue Phase I trials of vaccinia virus (smallpox) vaccine.
- (U) Conduct preclinical studies on infectious clone alphavirus vaccines.

(U) Project D811 - HIV Vaccine and Drug - Advanced Development: This project was created to accommodate a FY92-97 redistribution of work and funds across appropriate Program Elements 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 1991 Planned Program: NA

(U) FY 1992 Planned Program:
- (U) Initiate clinical trials using hyperimmune anti-human immunodeficiency virus (HIV) immune globulin in high-risk infants born to HIV infected mothers in order to evaluate protective efficacy of passive immunization.
- (U) Initiate an immunotherapy trial using molecularly cloned and expressed viral envelope peptides.
- (U) Continue the p24 immunotherapeutic trial.
- (U) Initiate phase I clinical trial of antiretroviral gene therapy in preterminal late-stage patients

(U) FY 1993 Planned Program:
- (U) Continue advanced development of both chemo- and immunotherapeutic agents focused on the prevention of disease progression in volunteers with early infections and on prevention of infection in military forces.

(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 1991 Accomplishments:
- (U) Initiated development of lightweight resuscitation fluids production systems and lightweight medical x-ray system.
- (U) Transitioned microencapsulated antibiotics into Advanced Development
- (U) Continued user testing of Field Computed Tomography (CT) Scanner

(U) FY 1992 Planned Program:
- (U) Compete a development RFP for microencapsulated antibiotic (MEAA)
- (U) Continue development of lightweight medical x-ray
- (U) Initiate development of combat digital radiographic system

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603807A**
PE Title: **Medical Systems-Advanced Development** Budget Activity: **#4**

(U) FY 1993 Planned Program:

- (U) Initiate development of Combat Emergency Medicine Expert System and field Medical Filmless System
- (U) Award contract for development of Microencapsulated Antibiotics (Ampicillin)
- (U) Initiate phase II trials and customer tests of antimicrobial dermal dressing
- (U) Continue advanced development of intravenous access device

(U) Project D837 - Soldier System Protection - Advanced Development: Supports demonstration and validation of medical materiel, including devices, pharmacologics and other tools, to provide protection and sustainment of the physiological and psychological capabilities of soldiers in the face of combat operations under all environmental conditions. This project was created to accommodate a FY92-97 redistribution of funds from Program Element 0603807A, Project D836, and does not represent a new start.

(U) FY 1991 Accomplishments: (This Project was created to accommodate a FY92-97 redistribution of funds and does not represent a new start. FY91 accomplishments are therefore listed under Project D836).

(U) FY 1992 Planned Program:

- (U) Transfer concept technology for an externally mounted rescue hoist for medical evacuation support to the Army Program Executive Officer, Aviation Systems, for final advanced development and fielding
- (U) Transfer concept technology for laser protective eyewear to the Army non-medical materiel development community for final advanced development and fielding of laser protective equipment
- (U) Complete technical testing and modify, if needed, commercially available "dip stick" technology to rapidly measure cyanide, magnesium, arsenic, sulfates, and chlorides in field water supplies
- (U) Complete advanced development of a water sampling submission kit for the collection and sampling of field water to support field operations
- (U) Continue advanced development of a heat strain monitor to compute work rest cycles and water consumption requirements of soldiers under field operational conditions

(U) FY 1993 Planned Program:

- (U) Complete advanced development of a hand-held heat stress monitor capable of measuring wet bulb, dry bulb and globe temperature and integrating these with a heat stress prediction algorithm
- (U) Initiate advanced development of an expanded water quality monitoring kit for field water potability analysis
- (U) Complete advanced development of a rapid bacteriological test kit for testing field water potability, designed to upgrade current field preventive medicine assets
- (U) Initiate a Phase I/II field trial on a sedative for sleep management to sustain soldier performance during prolonged operations

(U) Work Performed By:

D808 - Work is performed in-house by Walter Reed Army Institute of Research, Washington, DC; and its field units in Thailand, Korea, Kenya, and Brazil; Letterman Army Institute of Research, San Francisco, CA; U.S. Army Medical Materiel Development Activity, Fort Detrick, MD; and Naval Medical Research and Development Command, Bethesda, MD. Primary civilian contractors:

Engineering and Economics Research Inc., Germantown, MD; Johns Hopkins University Hospital, Baltimore, MD; University of Illinois, Chicago, IL; Worldwide Biologicals, Cincinnatti, OH; and South Florida Drug Research Corp., Miami, FL.

D809 - Work is performed in-house by U.S. Army Medical Research Institute of Infectious Diseases, Fort Detrick, MD; Walter Reed Army Institute of Research, Washington, DC; and U.S. Army Medical Materiel Development Activity, Fort Detrick, MD. Primary civilian contractors: Porton Products, International, Washington, D.C.; Columbia University, New York, NY; and Salk Institute, San Diego, CA.

D811 - Work is performed in-house by the following organizations: U.S. Army Medical Materiel Development Activity, Fort Detrick, MD; Walter Reed Army Institute of Research, Washington, DC. Research facilities of the Navy and the Air Force collaborate in this effort. The top three extramural contractors are the Henry M. Jackson Foundation for the Advancement of Military Studies, Bethesda, MD; SRA Technologies, Inc., Alexandria, VA; and the National Institutes of Health, Bethesda, MD.

D836 - Work is performed in-house by U.S. Army Medical Materiel Development Activity, Fort Detrick, MD; U.S. Army Bioengineering Research and Development Laboratory, Fort Detrick, MD; U.S. Army Institute of Dental Research, Washington, DC; Letterman Army Institute of Research, San Francisco, CA; Harry Diamond Laboratories, Adelphi, MD; and National Institute of Standards and Technology, Gaithersburg, MD. Primary civilian contractors: American Optical Corporation, Southbridge, MA; Travenol Laboratories, Deerfield IL; and Imatron Inc., San Francisco CA.

D837 - Work is performed in-house by the U.S. Army Medical Materiel Development Activity, Fort Detrick, MD; U.S. Army Biomedical Research and Development Activity, Fort Detrick, MD; U.S. Army Institute of Environmental Medicine, Natick, MA; and the U.S. Army Aeromedical Research Laboratory, Fort Rucker, AL. Primary civilian contractor is to be determined.

(U) Related Activities:

PE#0601102A (Defense Research Sciences)
PE#0602787A (Medical Technology)
PE#0603002A (Medical Advanced Technology)
PE#0603105A (Acquired Immune Deficiency Syndrome Research)
PE#0604807A (Medical Materiel/Medical Biological Defense Equipment-ED)

There is no unnecessary duplication of effort 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 Deputy Director, Defense Research and 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-Pan American Health Organization

(U) Other Appropriation Funds: ($ in Thousands) Procurement of transitioned products is provided for in Other Procurement, Army, or Operation and Maintenance, Army, or passed to other procuring agencies as appropriate.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603807A**
PE Title: **Medical Systems-Advanced Development** Budget Activity: **#4**

(U) **International Cooperative Agreements:** Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603807A** Project Number: **#D993**
PE Title: **Medical Systems-Advanced Development** Budget Activiy: **#4**

A. (U) RESOURCES: ($ in Thousands)
Project Title: Medical Defense Against Chemical Threats-Advanced Development

Popular Name	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
Project D993 Medical Defense Against Chemical Threats - Advanced Development					
	6450	10881	- 0 -	Cont	Cont

*These medical resources transferred to OSD, Health Affairs, effective FY 1993.

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: 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.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- (U) Initiated development of second generation nerve agent antidote and pretreatment
- (U) Initiated user testing of Life Detector
- (U) Transitioned a Topical Skin Protectant (TSP) to advanced development

(U) FY 1992 Planned Program:
- (U) Complete advanced development of the Life Detector
- (U) Initiate animal efficacy studies with optimized formulation of second generation nerve agent antidote
- (U) Prepare and compete a Request for Proposals for full scale development of the Multichamber Autoinjector (MA)

(U) FY 1993 Planned Program:
- (U) Conduct Early User Test and Evaluation (EUT&E) of Topical Skin Protectant
- (U) Continue efficacy studies with optimized formulation of second generation nerve agent antidote

D. (U) WORK PERFORMED BY: Work is performed in-house by the following organizations; U.S. Army Medical Materiel Development Activity, Fort Detrick, MD; Walter Reed Army Institute of Research, Washington, D.C.; Letterman Army Institute of Research, San Francisco, CA; U.S. Army Research Institute of Environmental Medicine, Natick, MA; Uniformed Services University of Health Sciences, Bethesda, MD; Wright-Patterson AFB, Dayton, OH. Major contractors include: Battelle Columbus Laboratories, Columbus, OH; SRI International, Menlo Park, CA.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0603807A
PE Title: Medical Systems-Advanced Development Budget Activity: #4

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: None.
2. (U) SCHEDULE CHANGES: None.
3. (U) COST CHANGES: None.

F. (U) PROGRAM DOCUMENTATION:

Letter of Agreement (LOA), NBC Casualty Vital Signs Monitor	01/83
Operational and Organizational (O&O), Plan for a Family of Chemical Agent Pretreatment Compounds	11/86
O&O Plan for a Family of Chemical Agent Antidotes	11/86
DJSOR, CWA Resistant Battle Dressing Cover	01/87
O&O Plan for a Family of Chemical Agent Therapeutic Compounds	02/87
Required Operational Capability (ROC), Chemical Warfare Agent (CWA) Resuscitator	05/87
Joint Services Operational Requirement (JSOR), Nerve Agent Pretreatment, Pyridostigmine	04/88
Defense Joint Services Operational Requirement (DJSOR), Advanced Life Detector	08/88
JSOR, Life Detector	08/88
JSOR, Multichambered Autoinjector	11/88
JSOR, Nerve Agent Anticonvulsant	11/88
JSOR, Vesicant Antidotes	11/88
DJSOR, NBC Casualty Vital Signs Monitor	01/89
DJSOR, Aerosolized Nerve Agent Antidote	05/89
JSOR, Powered Ventilator	07/89
ROC, Resuscitation Device	03/90
O&O Annex, Topical Skin Protectant	01/91

G. (U) RELATED ACTIVITIES:

- (U) PE #0601102A (Defense Research Sciences, Project BS11)
- (U) PE #0602787A (Medical Technology, Project A875)
- (U) PE #0603002A (Medical Advanced Technology, Project D995)
- (U) PE #0604807A (Medical Materiel/Medical Biological Defense Equipment-Engineering Development, Project D848)
- (U) There is no unnecessary duplication of efforts in Army or DOD programs. 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.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603807A**
PE Title: **Medical Systems-Advanced Development** Budget Activity: **#4**

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands) Procurement of transitioned products is funded through Other Procurement, Army, or Operation and Maintenance, Army, or passed to other procuring agencies, as appropriate.

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

J. (U) MILESTONE SCHEDULE:

Milestones	Milestones Dates
Milestone II/III IPR for Sustained Release Oral Nerve Agent Pretreatment	1Q FY 1991*
Milestone III for Convulsant Antidote Nerve Agent	1Q FY 1991**
Milestone II IPR for Life Detector	4Q FY 1991
Milestone IB IPR for Multi-chambered Autoinjector	1Q FY 1992
Milestone II IPR for Powered Ventilator	2Q FY 1992

*Respond to Food and Drug Administration requirement for additional study
** Delay in JSOR approval.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603811A**
PE Title: **Meteorological Data Systems** Budget Activity: **#4**

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

Project Number / Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Complete	Total Program
DAB6 Target Area Meteorological Systems	- 0 -	3456	4288	7959	15703

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. In addition to the upper air atmospheric profiles, the dropsonde provides surface weather information in denied areas. There are three efforts in this program element consisting of: (1) Atmospheric Profiler - Significantly reduces the number of Meteorological Data Systems (MDS) and significantly reduces logistics requirements. (2) Dropsonde - An atmospheric sensor that provides limited upper air profiles and functions as a surface sensor once in contact with the ground, in the target or denied areas. It will be deployed utilizing unmanned aerial vehicles, helicopters, or other suitable aircraft. (3) Computer-Assisted Artillery Meteorological (CAAM): Develop software to integrate Q-37 FIREFINDER RADAR winds and artillery Meteorological Upper Air profiles from up to three MDS/Meteorological Measurement Set stations to improve time and space validity of meteorologic information.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND 1993:

(U) Project DAB6 Target Area Meteorological System:

(U) FY 1991 Accomplishments: Project not funded.

(U) FY 1992 Planned Program:
- (U) Award advanced development contract for profilers, CAAM and Dropsondes
- (U) Conduct proof-of-principal demonstration
- (U) Prepare procurement data package for development of profilers, CAAM and Dropsondes
- (U) Testing and validation of system specifications

(U) FY 1993 Planned Program:
- (U) After proof-of-principal, conduct Milestone II decision review
- (U) Complete technology data package for production prove-out
- (U) Award procurement contract.

(U) Work Performed By: Center for Electronic Warfare/Reconnaissance, Surveillance & Target Acquisition (EW/RSTA), US Army Field Artillery School, US Army Atmospheric Sciences Laboratory, US Army Communications Command, US Army Training and Doctrine Command.

(U) Related Activities:
PE #0604726A (Integrated Meteorological System)

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0603811A**
PE Title: **Meteorological Data Systems** Budget Activity: **#4**

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

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

(U) International Cooperative Agreements: NATO Target Area Met Feasibility study, $250K.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604202A**
PE Title: **Aircraft Weapons** Budget Activity: **#4**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D132 Air Self Defense	5537	2996	- 0 -	- 0 -	70900

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element funds the integration and qualification of a generic air-to-air missile system (using the STINGER missile) onto the AH-64 and AH-1 helicopters. The system provides aircrews with an urgently needed air-to-air, self-defense capability to defeat current fielded threats and projected near-term threat improvements. Funding is also provided for the development of a compatible training device to evaluate aircrew performance. This program element will also provide the base for 6.4 development integrations of follow-on far-term Air Defense missiles.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND 1993:

(U) Project D132 - Air Self Defense:

(U) FY 1991 Accomplishments:
- (U) Continued the integration and qualification testing of Air-to-Air STINGER (ATAS) on the AH-64 and completed AH 1F and OH58C helicopter integration
- (U) Continued Reprogrammable Microprocessor (RMP) missile qualification
- (U) Support integration planning for LONGBOW and Comanche aircraft

(U) FY 1992 Planned Program
- (U) Complete the integration and qualification testing of ATAS on the AH-64A helicopter
- (U) Complete RMP qualification for air-to-air usage
- (U) Develop new automatic link and Electronic Counter-Countermeasures compatible HF radios
- (U) Improve Automated Airborne Command and Control Console

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

(U) Work Performed By: The prime contractors for the ATAS system are General Dynamics, Pomona, CA and Bell Helicopter Textron, Ft. Worth, TX. McDonnell Douglas Helicopter Company, St Louis, MO is prime for integration of ATAS on the AH-64. The contract for integration of ATAS on the AH-1F is American Electronics Laboratories (AEL), Lansdale, PA. The leads for Army in-house efforts are the Aviation, Program Executive Office (PEO) at the US Army Aviation Systems Command (AVSCOM), St Louis, MO; the US Army Test and Evaluation Command (TECOM), Aberdeen, MD; and the US Army Missile Command, Huntsville, AL.

The leads for the development efforts on the HF radio and automated Airborne Command and Control Console are the Aviation Program Executive Office and the Aviation Research and Development Activity, Fort Monmouth, New Jersey.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604202A**
PE Title: **Aircraft Weapons** Budget Activity: **#4**

(U) Related Activities: Close liaison is maintained with other services and industry to avoid duplication of effort. The Army participated in the Tri-Service Joint Technical Coordinating Group for Air-Launched Non-Nuclear Ordnance, through which technical information is exchanged. Close liaison is maintained through the Joint Tactical Air-to-Air Missile Office (JTAAMO) indirectly to avoid duplication of effort and share technology. Related program elements are:

PE #0602211A (Aviation Technology)
PE #0603003A (Aviation Advanced Technology)
PE #0604315F (Advanced Short Range Air-to-Air Missile (ASRAAM))

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

	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate
Aircraft Procurement, Army*			
OH-58 Kits (AA0400)	4200	1100	100
AH-64 Non Recurring Engine Kits (AA6605)	- 0 -	18900	1300

*Funding shown includes only the amount actually associated with this program element.

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 AMENDED BUDGET RDTE DESCRIPTIVE SUMMARY

Program Element: #0604220A
PE Title: Armed, Deployable OH-58D
Project Title: Armed, Deployable OH-58D

Project Number: # D518
Budget Activity: #4

POPULAR NAME: Armed OH-58D

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

SCHEDULE	FY 1991	FY 1992	FY 1993	To Complete
Program Milestones		FUE		
Engineering Milestones				
T&E Milestones	Development Qualifications & Testing 8/91	Force Development Test & Evaluation 1/93		
Contract Milestones	Award Development Contract 4/91	Award Retrofit Contract 12/91		
BUDGET ($000)	FY 1991	FY 1992	FY 1993	Program Total (To Complete)
Major Contract	15901	7740		23641 (0)
Support Contract	2222	362		2584 (0)
In-House Support	2839	1185		4024 (0)
GFE/Other	591			591 (0)
Total	21553	9287		30840 (0)

AMENDED FY 1992/1993 AMENDED BUDGET RDTE DESCRIPTIVE SUMMARY

Program Element: #0604220A
PE Title: Armed, Deployable OH-58D
Project Title: Armed, Deployable OH-58D

Project Number: # D518
Budget Activity: #4

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This provides for the integration and testing required for the addition of air-to-ground weapons (ATGW) systems 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 ATGW capability, to include 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 with the ability to see, fight, and survive day and night. This addresses a current battlefield deficiency until the fielding of the Light Helicopter (LH). The MPLH is required to meet the Operational Needs Statement of the 82nd Airborne Division. It will support rapid deployment and forced entry missions. The MPLH mission configuration uses flexible/multi-role components consisting of a cargo hook (2000 pound capability), external troop seats (three personnel per side), litter capability (two per side), and a day or night rapid deployment capability (two fully armed OH-58D aircraft unloaded from a C-130 on a dirt strip, assembled as required, and flown away within 15 minutes).

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- (U) Awarded development contract

(U) FY 1992 Planned Program:
- (U) Award retrofit contract
- (U) Begin delivery of retrofit aircraft
- (U) First unit equipped

(U) FY 1993 Planned Program: Project completed in FY 1992

(U) Program Plan to Completion: Continued deliveries to FY 1997

D. (U) WORK PERFORMED BY: Bell Helicopter Textron, Incorporated, Fort Worth, Texas; Honeywell, Inc.; and Allison, Inc.

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** None.
2. **(U) SCHEDULE CHANGES:** FY 1991 funds withhold caused a five-month program slippage.
3. **(U) COST CHANGES:** None.

F. (U) PROGRAM DOCUMENTATION:

Decision Coordinating Paper	8/89
Test and Evaluation Master Plan Approved	1/92

G. (U) RELATED ACTIVITIES: There is no unncessary duplication of effort within the Army or DOD.

AMENDED FY 1992/1993 AMENDED BUDGET RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604220A**
PE Title: Armed, Deployable OH-58D
Project Title: Armed, Deployable OH-58D

Project Number: **# D518**
Budget Activity: **#4**

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

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
AIRCRAFT PROCUREMENT, ARMY:			
AZ2200	28404	138644	96157
OSD SUPPLEMENTAL (12 AIRCRAFT)	90200		

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

J. (U) TEST AND EVALUATION DATA: Qualification testing will begin in January 1991 and continue through FY 1992.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604223A**
PE Title: **Comanche** Budget Activity: **#4**

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

Project Number / Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D327 Comanche	290925	497145	385000	Cont	Cont
D397 Longbow-Comanche	- 0 -	- 0 -	11000	Cont	Cont
DC72 T800 Engine Engineering Development (LH)	42732	41611	47007	Cont	Cont
PE TOTAL	333657	538756	443007		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This Program provides for the development of the RAH-66 Comanche, development of T800 Engine, and integration of the Longbow Fire Control Radar (FCR) onto the Comanche. The Comanche will replace current light fleet of tactically obsolescent helicopters (AH-1, OH-6, and OH-58). Longbow consists of a mast-mounted Fire Control Radar (which will be integrated into the Comanche Helicopter airframe) and a radio frequency (RF) autonomous seeker in a Hellfire missile. Project D397, Longbow-Comanche, is a new start for FY 1993. Project DC72, T800 Engine Engineering Development, is a restructure from PE #0604216A.

AMENDED FY 1992\1993 BIENNIAL RDTE 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 1991	FY 1992	FY 1993	TO Complete
Program Milestones	Program Review 12/90		PDR 01/92	
Engineering Milestones		Preliminary Configuration Design Review 6/92		First Flight 08/95
T&E Milestones				
Contract Milestones	Dem/Val Prototype Contract Award 4/91			Complete ACM/VAL 9/97
BUDGET ($000)	**FY 1991**	**FY 1992**	**FY 1993**	**Program Total (To Complete)**
Major Contract	268733	477197	362726	Cont
Support Contract	7900	8491	9827	Cont
In-House Support	14292	11457	12447	Cont
GFE/Other				
Total	290925	497145	385000	Cont

AMENDED FY 1992\1993 BIENNIAL RDTE 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 for the armed reconnaissance, attack in support of light forces and air combat missions. The Comanche will replace the current light fleet of tactically obsolescent helicopters (AH-1, OH-6, and OH-58). The project will provide leap-ahead combat lethality and battlefield survivability to defeat the threat of the late 1990's and beyond and to modernize the Army's light attack/scout fleet. Comanche will be integrated within the force structure to complement the AH64 attack helicopter. The Comanche will correct major light fleet deficiencies such as marginal night and adverse weather capability; poor position location/navigation accuracy; inability to self -deploy to overseas theaters of operations; and inadequate reliability, high altitude/hot environment performance, and survivability. Comanche improvements include: lightweight composite airframe structures for enhanced power to weight ratios that provide increased agility, maneuverability, increased speed and excellent high altitude/hot day performance; advanced technology target acquisition and night vision sensors which allow greater standoff range and shorter exposure time to the threat as well as effective night/adverse weather operations; the tri-service common avionics architecture, compatible with Navy and Air Force Advanced Aircraft; and built-in diagnostics/prognostics. The planned Comanche characteristics have been addressed through design and demonstration during the Advanced Rotorcraft Technology Integration (ARTI) program, associated government technical base programs, and industry-funded efforts. The competitive Comanche demonstration/ validation (DEM/VAL) phase will provide for essential system level application, and demonstration of these technologies to the Army's Comanche. The Dem/Val Prototype Phase will demonstrate the capabilities of flying prototype aircraft prior to a decision to enter EMD. Specific objectives are to finalize system requirements and reduce technical, supportability, producibility, cost, and schedule risk for a possible Engineering and Manufacturing Development (EMD) phase.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- (U) Completed source selection and award DEM/VAL prototype contract to one contractor
- (U) Initiated fabrication of Comanche prototype aircraft
- (U) Initiated component and subsystem qualification test program
- (U) Conducted system design reviews
- (U) Continued aircraft MEP and integrated training system (ITS) development
- (U) Completed Spec[illegible]n Review and review by Conventional Systems Committee

(U) FY 1992 Planned Program:
- (U) Complete qualification test of T800 engine
- (U) Continue Comanche aircraft/MEP/ITS development
- (U) Fabricate ground test vehicle, static test article and flight test vehicles
- (U) Conduct subsystem level analyses and tests
- (U) Initiate T800 growth program

(U) FY 1993 Planned Program:
- (U) Continue Comanche aircraft/MEP/ITS development

(U) Program Plan to Completion:
- (U) Conduct prototype flight testing

AMENDED FY 1992\1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604223A**
PE Title: **Comanche**
Project Title: **Comanche**

Project Number: **D327**
Budget Activity: **#4**

- (U) Prepare for EMD phase
- (U) Complete T800 growth engine qualification

D. (U) WORK PERFORMED BY: Boeing Helicopter/Sikorsky Aircraft Co., Philadelphia, PA.

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** None.
2. **(U) SCHEDULE CHANGES:** Program has been restructured to extend the DEM/VAL through FY 1997.
3. **(U) COST CHANGES:** Restructuring has resulted in a revised funding profile.

F. (U) PROGRAM DOCUMENTATION:

System Concept Paper	04/88
T&E Master Plan	07/90
Integrated Logistics Support Plan	04/88
Cost & Operational Effectiveness Analysis	04/90
Independent Cost Estimate	04/88
Common Use Alternative Statement	04/88

G. (U) RELATED ACTIVITIES:

- PE #0603776A (LONGBOW-AD)
- PE #0604816A (LONGBOW-ED)
- Joint Integrated Avionics Working Group (JIAWG) 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: ($ in Thousands) Not applicable

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

J. (U) TEST AND EVALUATION DATA: Comanche first flight with integrated MEP is scheduled for June 1995. 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, live fire testing, and reliability growth and maintainability parameters.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0604223A
PE Title: **Comanche**
Project Number: **#D397**
Budget Activity: **#4**

A. (U) RESOURCES: ($ in Thousands)
Project Title: Longbow/Comanche

Popular Name	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
LONGBOW COMANCHE	- 0 -	- 0 -	11000	Cont	Cont

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Longbow consists of a mast-mounted Fire Control Radar (FCR) and a radio frequency (RF) autonomous seeker in a Hellfire missile. Integrated into the RAH-66 Comanche airframe, Longbow will provide the Light Helicopter 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 is a new start in FY 1993.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments: No planned program

(U) FY 1992 Planned Program: No planned program

(U) FY 1993 Planned Program:
- **(U)** Initiate Comanche Longbow FCR design efforts
- **(U)** Initiate Comanche Longbow integration design efforts
- **(U)** Initiate procurement of FCR and Comanche prototype Mission Equipment Package hardware/equipment

(U) Program Plan to Completion:
- **(U)** Complete design and integration efforts to incorporate Longbow on Comanche
- **(U)** Complete design and operational testing of integrated system

D. (U) WORK PERFORMED BY: The work will be performed Boeing-Sikorsky.

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** None
2. **(U) SCHEDULE CHANGES:** New start delayed to FY 1993.
3. **(U) COST CHANGES:** None

F. (U) PROGRAM DOCUMENTATION: New Start in FY 1993. Program documentation being developed.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0604223A
PE Title: **Comanche**

Project Number: **#D397**
Budget Activity: **#4**

G. (U) RELATED ACTIVITIES:

PE #0604223A (Comanche T800 Engine Engineering Development)
PE #0604816A (Longbow ED)
PE #0603776A (Longbow AD)

Joint Integrated Avionics Working Group (JIAWG) 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: ($ in Thousands) None

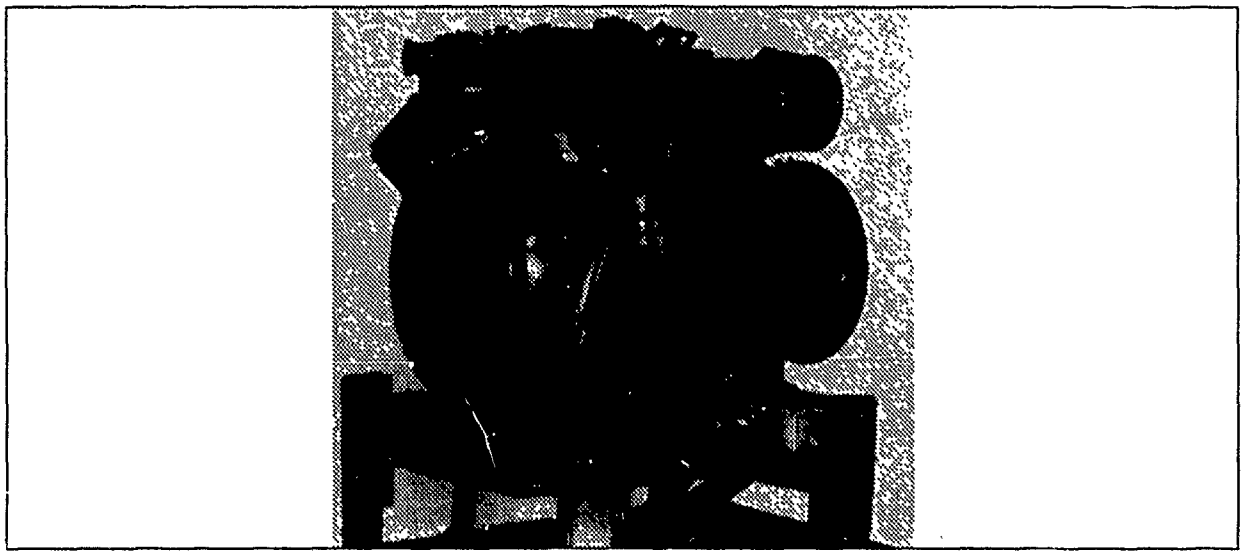
I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

J. (U) MILESTONE SCHEDULE: Not applicable

AMENDED FY 1992/1993 BIENNIAL RDTE 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 1991	FY 1992	FY 1993	To Complete
Program Milestones		Program Review 1/3Qtr	Program Review 1/3Qtr	
Engineering Milestones	Air Veh Spt	Complete Qual Tests		Air Vehicle Support Continues
T&E Milestones				
Contract Milestones				Complete DEM/VAL Sep 97
BUDGET ($000)	**FY 1991**	**FY 1992**	**FY 1993**	**Program Total (To Complete)**
Major Contract	29798	32696	40034	Cont
Support Contract	5873	6366	5773	Cont
In-House Support	7061	2549	1200	Cont
GFE/Other				
Total	42732	41611	47007	Cont

AMENDED FY 1992/1993 BIENNIAL RDTE 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 (see Project D327, Comanche, in this PE). The Army has elected to exercise an engine growth program of 12% to accommodate new projected Comanche growth and application of Longbow to Comanche. This effort will begin in FY 1992. This project is a restructure from PE #0604216A.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) Project DC72 - T800 Engine Engineering Development (LH)

(U) FY 1991 Accomplishments:
- (U) Initiated air vehicle support program
- (U) Conducted reviews of engine progress against contract requirements
- (U) Initiated maintainability demonstration IIA effort
- (U) Procured LH flight test engines
- (U) Delivered of flight-rated (YT) engines
- (U) Conducted critical design reviews
- (U) First flight of HH-65A/T800 aircraft
- (U) Continued full qualification testing

(U) FY 1992 Planned Program:
- (U) Implement engine pre-production effort and life verification program
- (U) Continue air vehicle support development
- (U) Complete qualification of engine
- (U) Complete phase I of HH-65A/T800 proof of concept program
- (U) Initiate development of T800 growth engine

(U) FY 1993 Planned Program:
- (U) Deliver flight test engines
- (U) Install LH T800 engine in prototype Comanche air vehicle
- (U) Continue development of T800 growth engine

(U) Program Plan to Completion: This is a continuing program.
- (U) Complete engine growth program
- (U) Initiate component improvement program
- (U) Complete engine Engineering and Manufacturing Development

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604223A** Project Number: **DC72**
PE Title: **Comanche** Budget Activity: **#4**
Project Title: **T800 Engine Engineering Development (LH)**

D. (U) WORK PERFORMED BY: The major contractor is Light Helicopter Turbine Engine Co., Indianapolis, IN; Phoenix, AZ.

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** Engine growth option exercised.
2. **(U) SCHEDULE CHANGES:** Production no longer scheduled.
3. **(U) COST CHANGES:** FY 1993 cost increased to pay for development of T800 growth development.

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: ($ in Thousands) Not applicable

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

J. (U) TEST AND EVALUATION DATA: RAM validation will be a part of the production phase.

AMENDED FY 1992/1993 BIENNIAL BUDGET RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604270A**
PE Title: **Electronic Warfare Development** Budget Activity: **#4**

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

Project Number Title	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D540 Protective Electronic Warfare Systems Engineering Development	- 0 -	20050			
D611 Tactical Deception Army-Wide	2831	1352			
D653 Aircraft Survivability Equipment (ASE) Advanced Development (This Project is merged with Project D665 effective in FY92)	21952	- 0 -	- 0 -	- 0 -	83355
D665 Aircraft Survivability Equipment (ASE) Development	9962	34844	30551	Cont	Cont
DK12 Communications Electronic Countermeasures Advanced Development	1270	- 0 -	- 0 -	- 0 -	90550
DL12 Signal Warfare Development	24325	140083			
DL14 Expendable Jammers Engineering Development	2398	- 0 -	- 0 -	- 0 -	30927
PE TOTAL	62738	196329			

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program encompasses advanced and engineering development for tactical electronic warfare (EW), aircraft survivability equipment (ASE), and battlefield deception. 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 and infrared/optical battlefield surveillance systems. 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 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. 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. These threat systems include infrared, radar, laser, and optical/electro-optical capabilities. Projects in development include new or upgrading systems to counter mono-pulse, millimeterwave, frequency agile, pulse doppler, and continuous wave radars; passive infrared missile seekers; and laser directed weapon systems. This program responds to user requirements based on documented threats for both current and development Army aircraft. Battlefield deception encompasses efforts to provide the friendly force commander the ability to hide his forces and to portray false targets to threat

AMENDED FY 1992/1993 BIENNIAL BUDGET RDTE DESCRIPTIVE SUMMARY

Program Element: #0604270A
PE Title: Electronic Warfare Development Budget Activity: #4

weapons, targeting and intelligence systems. A multispectral approach using physical decoys, electromagnetic signals, will portray false target arrays. These false targets will disrupt the threat's timing and battlefield synchronization of command and control to create windows of opportunity for friendly forces to continue or regain the initiative.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND 1993:

(U) 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 o 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.

(U) FY 1991 Accomplishments:
- (U) Continued Multispectral Close Combat Decoys (MCCD) production prove-out test.
- (U) Completed prototype fabrication of Communications Deception System (CDS) for engineering tests.
- (U) Conducted critical design review of hardware and software for CDS.

(U) FY 1992 Planned Program:
- (U) Complete MCCD prove-out test.
- (U) Conduct Initial Operational Test and Evaluation (IOT&E) for MCCD.
- (U) Complete CDS Engineering and Manufacturing Development (EMD); conduct initial operational test and evaluation; and type classify standard.
- (U) Issue solicitation and award EMD contract for Log Base Critical Node (LB/CN).
- (U) Issue solicitation for Acoustic Simulation Device (ASD).
- (U) Award production contract for CDS.

(U) FY 1993 Planned Program:
- (U) Continue EMD on LB/CN and ASD.

AMENDED FY 1992/1993 BIENNIAL BUDGET RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604270A**
PE Title: **Electronic Warfare Development** Budget Activity: **#4**

(U) Project D653 - Aircraft Survivability Equipment (ASE) Advanced Development:

(U) FY 1991 Accomplishments:

- **(U)** Continued development of infrared expendables to incorporate advanced technologies to expand the range of threats and increase effectiveness.
- **(U)** Continued risk reduction/effectiveness analysis prior to starting development for Optical Countermeasure (OCM).
- **(U)** Initiated Advanced Development of Advanced Threat Infrared Countermeasure (ATIRCM).
- **(U)** Conducted ASE effectiveness analysis and evaluations against actual threats.
- **(U)** Continued advanced development of a common modular radar jammer for both SEMA and scout/attack aircraft.
- **(U)** Developed modular architecture strategy for advanced Integrated Suite.
- **(U)** Provided for in-house support.

(U) FY 1992 Planned Program: D653 combines with D665 in FY92

(U) FY 1993 Planned Program: None

(U) Project DK12 - Communications Electronic Countermeasures Advanced Development:

(U) FY 1991 Accomplishments:

(U) FY 1992 Planned Program: DK12 combines with DL12 in FY 1992.

(U) FY 1993 Planned Program:

AMENDED FY 1992/1993 BIENNIAL BUDGET RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604270A**
PE Title: **Electronic Warfare Development** Budget Activity: **#4**

(U) Project DL14 - Expendable Jammers Engineering Development (EXJAM):

(U) FY 1991 Accomplishment:
- **(U)** Continued development of AD EXJAM test models.
- **(U)** Completed AD EXJAM technical documentation and technical testing.

(U) FY 1992 Planned Program: No planned program. The program was terminated.

(U) FY 1993 Planned Program: No planned program.

(U) Work Performed By:
D611 - Project Office for Battlefield Deception, Fort Belvoir, VA. Contractor for MCCD is Teledyne Brown, Huntsville, AL. Contractor for CDS is Motorola, Scottsdale, AZ.

D653 - In-house developers are: US Army Aviation Systems Command (AVSCOM), St. Louis, MO; US Army Laboratory Command (LABCOM), Adelphi, MD; Electronic Warfare Reconnaissance Surveillance Target Acquisition (EW/RSTA) Center, Fort Monmouth, NJ; US Army Armament Munitions and Chemical Command (AMCCOM), Dover, NJ; U.S. Army Missile Command, Huntsville, AL; Aviation Applied Technology Laboratory, Ft. Eustis, VA; Vulnerability Analysis Laboratory, White Sands Missile Range, NM; US Army Missile Command, Huntsville, AL; Redstone Arsenal, Huntsville, AL. Contractors are: Lockheed Sanders Associates, Nashua, NH; SAIC, San Diego, CA; ITT Corporation, Nutley, NJ; CAS, Huntsville, AL.

DK12 - Program Executive Officer IEW and Project Manager Signals Warfare, Vint Hill Farms Station, Warrenton, VA. Support Contractors and Quest/ERI, McLean, VA and Vitro, Silver Springs, MD. Major development contractors for HIU and Advanced QUICKFIX have not been selected.

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).

AMENDED FY 1992/1993 BIENNIAL BUDGET RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604270A**
PE Title: **Electronic Warfare Development** Budget Activity: **#4**

(U) Related Activities: The XM867 Artillery Delivery Expendable Jammer (ADEXJAM) would have provided 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 including participation in action office-level quarterly reviews. There is no duplication of effort within Army or DOD.

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)

(U) Other Appropriation Funds: ($ in Thousands) None.

(U) International Cooperative Agreements: Joint Programs are a possibility. Agreements are pending with Spain, Australia, Germany, and Denmark. Nunn Amendment/International Agreement on Optical Countermeasures.

AMENDED FY 1992/1993 BIENNIAL BUDGET RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604270A**
PE Title: **Electronic Warfare Development**
Project Title: **Protective Electronic Warfare Engineering Development**

Project Number **D540**
Budget Activity: **#4**

NO PICTURE AVAILABLE

POPULAR NAME: **STINGRAY**

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

SCHEDULE	FY 1991	FY 1992	FY 1993	To Complete
Program Milestones	ASARC II 7/91		CDR 2QTR	MSIII 1QFY95 FUE 1Q97
Engineering Milestones		PDR 4QTR	CDR 2QTR	
T&E Milestones				IOTE 2QFY TTE 1QFY94
Contract Milestones	RFP Release 4QTR	EMD Awarded 2/92	1st EML Delivered 4QTR	
BUDGET ($000)	**FY 1991**	**FY 1992**	**FY 1993**	**Program Total (To Complete)**
Major Contract		16513		
Support Contract		1035		
In-House Support		545		
GFE/ Other		1957		
Total	- 0 -	20050		

AMENDED FY 1992/1993 BIENNIAL BUDGET RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604270A** Project Number **D540**
PE Title: **Electronic Warfare Development** Budget Activity: **#4**
Project Title: **Protective Electronic Warfare Engineering Development**

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project provides for engineering and manufacturing development (EMD) of protective electro-optic (EO) equipment for ground vehicles, troops and installations to increase their combat survivability and mission effectiveness. STINGRAY protects friendly forces by detecting and negating threat fire control systems. The system is an adjunct of the Bradley Fighting Vehicle and this technology will be transferred to the Armored Systems Modernization (ASM) Program. The system operates while the host vehicle is moving and engages targets that are stationary or moving. STINGRAY is DoD's most mature directed energy system.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- (U) Acquisition Plan approved 3QFY91.
- (U) Finalized and issued RFP 4QFY91.
- (U) Began evaluation of proposals 4QFY91.
- (U) Milestone II decision 4QFY91.

(U) FY 1992 Planned Program:
- (U) Complete evaluation of proposals 2QFY92.
- (U) Award engineering and manufacturing development contract 2QFY92.
- (U) Conduct preliminary design review 4QFY92.

(U) FY 1993 Planned Program:
- (U) Conduct critical design review 2QFY93.
- (U) Deliver first engineering development 4QFY93.

(U) Program Plan to Completion:
- (U) Conduct technical test and evaluation 1QFY94 - 4QFY94.
- (U) Conduct initial operational test and evaluation 2QFY94.
- (U) Achieve Milestone III 1QFY95.
- (U) Award 1st production option 2QFY95.
- (U) Acceptance testing (AT) 3QFY96.
- (U) This is a continuing program.

D. (U) WORK PERFORMED BY: The prime contractor for E&MD is currently being competitively selected. In-house development is conducted by the Project Manager Electronic Warfare/Reconnaissance, Surveillance and Target Acquisition Ft. Monmouth, NJ; the Program Executive Officer, Intelligence and Electronic Warfare, Vint Hill Farms Station, Warrenton, VA; and the Communications-Electronics Command Center for Electronic Warfare/Reconnaissance, Surveillance and Target Acquisition, Ft. Monmouth, NJ.

AMENDED FY 1992/1993 BIENNIAL BUDGET RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604270A** Project Number **D540**
PE Title: **Electronic Warfare Development** Budget Activity: **#4**
Project Title: **Protective Electronic Warfare Engineering Development**

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** Addition of a required diode laser pump source for the E&MD program.
2. **(U) SCHEDULE CHANGES:** The schedule has slipped approximately 4 months.
3. **(U) COST CHANGES:** None

F. (U) PROGRAM DOCUMENTATION:

Operational and Organizational (O&O) Plan	7/87
Required Operational Capability (ROC)	4/90
Acquisition Decision Memorandum	7/91

G. (U) RELATED ACTIVITIES:

- Navy developments are conducted in PEs #0604554N (Surface Electronic Warfare), #020457N (Electronic Warfare Support) and #0604573 (Shipboard Electronic Warfare Improvements).
- Air Force developments are conducted in PEs #0604738F (Protective Systems), #0604793F (Tactical Protective Systems) and #0604710F (Reconnaissance Electronics Warfare Systems).
- Coordination is effected between services to minimize duplication of effort and ensure 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 including participation on action officer level quarterly reviews. There is no duplication of effort within Army or DoD.

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands) Not applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS:

- (U) Memorandum of Understanding (MOU) was signed in 1988. Objective was to make direct comparisons and joint evaluations of the surveillance, target acquisition, weapon jamming, and jamming laser performance of two equipments.
- (U) Both participants have parallel programs on-going with a potential for mutual benefit in system definition and for technology exchange in development.
- (U) Each participant was responsible to bear its own costs for any work undertaken.
- (U) U.S. Nunn funds received and obligated during FY 1989 were $3.6M and .6M in FY 1990. No additional funds are programmed or expected.

J. (U) TEST AND EVALUATION DATA:

- (U) Risk Reduction Testing Completed - Nov & Dec 89.
- (U) Concept Evaluation Plan Test Completed - Mar 90.
- (U) Neutron Density Filter Test Completed - May 90.
- (U) Technical Test & Evaluation (TT&E) to begin - Nov 93.
- (U) Initial Operational Test & Evaluation (IOT&E) to begin - Mar 94.

FY 92/93 AMENDED BIENNIAL BUDGET RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604270A** Project Number: **#D665**
PE Title: **Electronic Warfare Development** Budget Activity: **#4**

A. (U) RESOURCES: ($ in Thousands)
Project Title: Aircraft Survivability Equipment (ASE) Development

Popular Name	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
Aircraft Survivability Equipment Development	9962	34844	30551	Cont	Cont

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Provides for the development and system integration of Aircraft Survivability Equipment 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 element 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. Project D653 combines with project D665 in FY 1992.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:

- (U) Continued development of AN/APR-39A (XE-2) Radar Signal Detecting Set (RSDS)
- (U) Continued training device development
- (U) Continued development of AN/APR-48 Radar Frequency Interferometer (RFI)
- (U) Provided for in-house and software support

(U) FY 1992 Planned Program:

- (U) Complete development of AN/APR-39A(XE-2)RSDS
- (U) Continue development of AN/APR-48 RFI
- (U) Continue training device development
- (U) Continue development of Advanced Threat Radar Jammer, Advanced Threat Infrared Countermeasures, and Infrared Expendables
- (U) Continue effectiveness evaluations
- (U) Continue Advanced Integrated Aircraft Survivability Equipment (AIASE) development
- (U) Continue Rapid Reprogramming Effort
- (U) Participate in Air Force/Navy Straight Through Repeater Antenna Performance (STRAP) decoy program
- (U) Provide for in-house and software support

FY 92/93 AMENDED BIENNIAL BUDGET RDTE DESCRIPTIVE SUMMARY

Program Element: #0604270A
PE Title: **Electronic Warfare Development**

Project Number: #D665
Budget Activity: #4

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

- (U) Complete development of AN/APR-48 RFI
- (U) Complete training device development
- (U) Continue development of Advanced Threat Radar Jammer, Advanced Threat Infrared Countermeasures and Infrared Expendables
- (U) Continue ASE effectiveness evaluations
- (U) Continue AIASE development
- (U) Continue Rapid Reprogramming effort
- (U) Continue participation in STRAP decoy program
- (U) Initiate development of Passive Infrared Measures Program
- (U) Monitor technology development programs conducted by DARPA in support of Optical Countermeasures (OCM) program
- (U) Provide for in-house and software support

(U) **Program Plan to Completion:**

- (U) Continue development of Advance Threat Radar Jammer, Advanced Threat Infrared Countermeasures, and Infrared Expendables
- (U) Continue ASE effectiveness evaluations and AIASE development
- (U) Continue Rapid Reprogramming effort
- (U) Continue participation in STRAP decoy program
- (U) Continue development of Passive Infrared and Optical Features Program
- (U) Continue to participate in DARPA development of OCM
- (U) Initiate development of Multi-Spectral Jammer
- (U) Monitor technology development programs conducted by DARPA in support of OCM program
- (U) Provide for in-house and software support
- (U) This is a continuing program

D. (U) WORK PERFORMED BY: In-house developers are: US Army Aviation Command (AVSCOM), St. Louis, MO; US Army Laboratory Command (LABCOM), Adelphi, MD; Electronic Warfare Reconnaissance Surveillance Target Acquisition (EW/RSTA) Center, Fort Monmouth, NJ; US Army Armament Munitions and Chemical Command (AMCCOM), Dover, NJ; Aviation Applied Technology Laboratory, Ft. Eustis, VA; Vulnerability Analysis Laboratory, White Sands Missile Range, NM; US Army Missile Command, (MICOM), Huntsville, AL; Redstone Arsenal, Huntsville, AL. Contractors are: ITT Corporation, Nutley, NJ; LITTON, Belmont, CA; Lockheed Sanders, Nashua, NH; IBM, Owego, NY; BHTI, Fort Worth, TX; Teledyne Brown, Huntsville, AL; LTV, Buffalo, NY; CAS, Huntsville, AL; and SAK, San Diego, CA.

FY 92/93 AMENDED BIENNIAL BUDGET RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604270A**
PE Title: **Electronic Warfare Development**

Project Number: **#D665**
Budget Activity: **#4**

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** None
2. **(U) SCHEDULE CHANGES:** None
3. **(U) COST CHANGES:** The FY92 Congressional appropriation increase of $53.5M to the Electronic Warfare program, resulted in an increase to this project of $4.0M (+$6.0M offset by -$2.0M for optical countermeasures). Because Congressional intent for these funds was unclear, the increase has been offset by a similar reduction in FY93. The FY92 Congressional increase will be expended in FY93 for the efforts identified in FY93 Planned Program.

F. (U) PROGRAM DOCUMENTATION: Required Operational Capability (ROC) Dec 1984

G. (U) RELATED ACTIVITIES:

- (U) Program Element #0604270N
- (U) Program Element #0604270F

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

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
Aircraft Procurement, Army			
AZ3504 ASE	105858	49134	75154
AA0720 ASE MOD	21452	19045	7141
AZ5700 ASE Training	-0-	-0-	15969

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

J. (U) MILESTONE SCHEDULE: Not applicable.

FY 92/93 AMENDED BIENNIAL BUDGET RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604270A**
PE Title: **Electronic Warfare Development**

Project Number: **#DL12**
Budget Activity: **#4**

A. (U) RESOURCES: ($ in Thousands)
Project Title: Signals Warfare Development

Popular Name	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
IEW COMMON SENSOR	24325	140083			

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project provides for an integrated groundbased and heliborne Intelligence and Electronic Warfare Common Sensor (IEWCS). The various tasks under the IEWCS project are:

(1) (U) Advanced QUICKFIX (AQF)

(2) (U) IEW Ground Based Common Sensor (GBCS) is the ground-based equivalent of Advanced QUICKFIX. The GBCS will leverage technology to provide a single system to perform the missions of four field IEW systems - TRAILBLAZER, TEAMMATE, TACJAM, 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 utilizes a Heavy High Mobility Multi-Purpose Wheeled Vehicle (H-HMMWV); two, GBCS-Heavy, for Armored and Mechanized Infantry Divisions utilizes a derivative of the Bradley Fighting Vehicle.

(3) (U) TACJAM-A

(4) (U) Host Interface Unit (HIU) provides for effective sensor data reporting utilizing the Enhanced Position Location Reporting System (EPLRS) which is the objective U.S. Army Tactical Data Distribution System. The HIU will be used in the GBCS, Advanced QUICKFIX, and the fielded IEW system (see above) and will permit a message level interface between these IEW systems and the Tactical Command and Control (TCAC) system, and subsequently the All Source Analysis System (ASAS) for analysis, fusion and reporting of the intelligence information gathered.

(5) (U) Electronic Fighting Vehicle System (EFVS) provides a tracked carrier with enclosure which is utilized by both IEW GBCS-H and the Army Joint STARS Ground Station Module. This EFVS will meet the mobility, maintainability, availability, reliability and survivability requirements of IEW systems deployed with Armored, Mechanized Infantry, and Armored Cavalry units.

(6) (U) This project is joint with the National Security Agency's Tactical Cryptologic Program (TCP), Program Element #0303885G, 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.

(7) (U) Also within this project are funds to support the Rapid Reprogramming of fielded IEW systems, Aircraft Survivability Equipment (ASE) and Air Defense Systems.

FY 92/93 AMENDED BIENNIAL BUDGET RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604270A** Project Number: **#DL12**
PE Title: **Electronic Warfare Development** Budget Activity: **#4**

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- (U) Completed Advanced Development of Enhance Position Location Reporting System (EPLRS) Host Interface Unit (HIU).
- (U) Continued integration of Host Interface Unit (HIU) into IEW systems
- (U) Awarded a contract for E&MD of IEWCS (GBCS-L, GBCS-H and Advanced QUICKFIX).
- (U) Updated plans for TACJAM-A Electronic Countermeasures (ECM) subsystem development.
- (U) Awarded an option on the PM Bradley multi-year contract to procure EFVS for GBCS-H.

(U) FY 1992 Planned Program:
- (U) Complete development of TACJAM-A prototype Electronic Support Measures (ESM) subsystems.
- (U) Deliver TACJAM-A ESM subsystems to IEWCS integration contractor, start integration and antenna development.
- (U) Exercise Option for fabrication of TACJAM-A ESM E&MD subsystems.
- (U) Exercise Option for fabrication of TACJAM-A ECM E&MD subsystems.
- (U) Deliver first EFVS to the IEWCS integration contractor.
- (U) Exercise option for two additional EFVS for GBCS-H and continue E&MD.
- (U) Deliver first GBCS-L prototype to the IEWCS integration contractor.
- (U) Continue E&MD of IEWCS (GBCS-L, GBCS-H and Advanced QUICKFIX).
- (U) Complete development of HIU, test, and make production decision.
- (U) Exercise Option on Contract for Precision Location System (CHALS-X).

(U) FY 1993 Planned Program:
- (U) Start production of HIU.
- (U) Integrate CHALS-X and ELINT subsystems into Advanced QUICKFIX and GBCS.
- (U) Continue Advanced QUICKFIX and GBCS integration, complete antenna development.
- (U) Complete fabrication and test of TACJAM-A ESM E&MD subsystems and delivery to IEWCS integration contractor.
- (U) Continue EFVS E&MD.

(U) Program Plan to Completion:
- (U) Complete development test and initiate production of the GBCS and Advanced QUICKFIX systems.

D. (U) WORK PERFORMED BY: Program Executive Officer Intelligence and Electronic Warfare and Project Manager Signals Warfare (PMSW), Vint Hill Farms Station, Warrenton, VA. Support contractors are Quest/ERI, McLean, VAF 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.

FY 92/93 AMENDED BIENNIAL BUDGET RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604270A** Project Number: **#DL12**
PE Title: **Electronic Warfare Development** Budget Activity: **#4**

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** None
2. **(U) SCHEDULE CHANGES:** None
3. **(U) COST CHANGES:** The FY92 Congressional appropriation increase of $53.5M to the Electronic Warfare program, resulted in an increase to this project of $42.352M. Because Congressional intent for these funds was unclear, the increase has been offset by a similar reduction in FY93. The FY92 Congressional increase will be expended in FY93 for the TACJAM-A, GBCS and ASE efforts identified in FY93 Planned Program. The intent of the redistribution of the FY92 increase is that there be no change in the Total Cost/Schedule of this program as a result of the above identified Congressional action.

F. (U) PROGRAM DOCUMENTATION:

TACJAM-A ROC	07/88	
82d Airborne Division Operational Needs Statement (ONS)		07/88
HIU Materiel Change 1-89-07-0012	03/90	
IEW GBCS ROC	10/90	
Advanced QUICKFIX Materiel Change	12/91	

G. (U) RELATED ACTIVITIES:

- (U) Program Element #0604770A (JOINT STARS)
- (U) Program Element #0603743F (Electronic Combat Technology)
- (U) Program Element #0603718F (Electronic Warfare Technology)
- (U) Program Element #0205764N (Electronic Warfare Technology)
- (U) Program Element #06037497N (Surface Electromagnetic and Optional Systems)
- (U) Program Element #03058850 (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 Cooperation Program of the Joint Logistics Commanders Organization. Coordination of classified programs is accomplished as part of the programs reviews conducted by the Joint Requirements Oversight Council. There is no unnecessary duplication of effort within Army or DoD.

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

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
Other Procurement, Army			
(SSN BA6100) MOD EW Equip	- 0 -	- 0 -	- 0 -
(SSN BZ7326) IEW Ground Based Common Sensor	- 0 -	- 0 -	- 0 -
NSA RDTE			
(PEO303885G) Tactical Cryptologic Program (TCP)	12,312	12,072	

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

FY 92/93 AMENDED BIENNIAL BUDGET RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604270A**
PE Title: **Electronic Warfare Development**
Project Number: **#DL12**
Budget Activity: **#4**

J. (U) MILESTONE SCHEDULE:

Milestones	Milestones Dates
Transitioned TACJAM-A to Engineering Development (ED)	11/88
Initiated HIU Development	05/89
Start TACJAM-A ED Phase II	07/89
Awarded HIU Development Contract	09/90
Initiate system integration of Advanced QUICKFIX	08/91
Award GBCS/AQF integration contract	09/91
Award EFVS development contract	12/91
Deliver first ESM Prototype	02/92
Complete EFVS tests	07/92
Complete HIU development and tests	11/92
Start HIU production	06/93
Initiate GBCS ONE Production	10/93
GBCS Independent Government tests	03/94
Deliver first ECM subsystems	03/94
Complete development and test of Advanced QUICKFIX/GBCS	07/94
Complete TACJAM-A tests	08/94
Initiate GBCS/AQF Production	03/95

AMENDED FY 1992/1993 BIENNIAL RDTE 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 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D396	TACSIM-Tactical Simulation				
	2728	2760	2693		
D926	ASAS-All Source Analysis System Engineering Development				
	46346	57693	- 0 -	- 0 -	968517
DB19	ASAS Evolutionary Acquisition				
	3993	54222	48061		
DB20	ASAS Soft Block Improvement				
	10701	- 0 -	- 0 -	- 0 -	10701
PE TOTAL	63768	114675	50754		

B. (U) BRIEF DESCRIPTION OF ELEMENT:

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND 1993:

(U) Project DB20 - ASAS Soft Block Improvement Program: Evolutionary development, Block III of the US Army All Source Analysis System. Block III upgrades will provide new capability in automated support for image intelligence (IMINT), human intelligence (HUMINT), operational security (OPSEC), electronic warfare (EW), and will update current capabilities in all source/situation analysis, communication intelligence (COMINT), electronic intelligence (ELINT), collection management and target analysis. The evolutionary software development will be accomplished using Ada.

(U) FY 1991 Accomplishments:
- (U) Definition of collateral enclave requirements through the system design review (SDR) as specified by DoD Standard 2167A
- (U) Prepare draft functional requirement documentation for block II

(U) FY 1992 Planned Program:
- (U) Efforts in this project have been restructured into Project DB19.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604321A (TIARA)**
PE Title: **All Source Analysis System (ASAS)** Budget Activity: **#4**

(U) Project D396 - TACSIM-Tactical Simulation is used as the intelligence module of the Corps Battle Simulation (CBS), formerly Joint Exercise Support System (JESS). In this use, TACSIM provides critical, raw, intelligence data depicting the simulated battlefield. The data are analyzed within the training exercise to support command and control decision making by Corps/Division commanders and staffs.

(U) FY 1991 Accomplishments:
- (U) Continued to develop P3 I of sensor models in accordance with changes to the sensor systems that are modeled in the TACSIM software
- (U) Developed system description for an intelligence simulation system with vastly increased functionality, taking advantage of advanced computing technologies
- (U) Completed development of an automated scenario preparation system through integration of the available graphics tools on the Portable ASAS Workstation (PAWS), and the TACSIM Exercise Preparation System (TEPS)
- (U) Released version 2.0 which included: graphics-based scenario preparation capability with on-line exercise monitoring new national level models new sensor models with significantly increased fidelity in product reports
- (U) Designed a Rapid Scenario Preparation Unit for Intelligence (RASPUTIN), that incorporates 1) digital map data, 2) weather, 3) real-world and notional force structures, and 4) tactics and doctrine in a way that will allow a user to script a high-fidelity scenario with minimal input
- (U) Commenced development of RASPUTIN
- (U) Commenced Development of first phase of TACSIM enhancements to improve interface to CBS (TACSIM Version 2.1)

(U) FY 1992 Planned Program:
- (U) Continue development of RASPUTIN for final operating capability
- (U) Continue development of an intelligence simulation system that takes advantage of vastly improved computing technologies and provides for a generic interface design to support inter operability among simulation systems
- (U) Introduce new models paralleling the fielding of new or enhanced intelligence collection systems
- (U) Compete integration of TACSIM as a part of the embedded training system for the ASAS
- (U) Complete TACSIM Version 2.1 Training Enhancements
- (U) Commence second phase of training enhancements (TACSIM Version 2.2)

(U) FY 1993 Planned Program:
- (U) Introduce new models paralleling the fielding of new or enhanced intelligence collection systems
- (U) Continue development of an intelligence simulation system that takes advantage of vastly improved computing technologies and provides for a generic interface design to support interoperability among simulation systems
- (U) Continue TACSIM training enhancements as needed for CBS interface (maintain complete interface on CBS enhancements change interface requirements)

(U) Work Performed By:
1) Hardware. Contel Federal Systems
2) Software. Mystech Associates, Falls Church, VA; Training and Doctrine Command (TRADOC) Test and Experimental Command (TEXCOM), Ft. Hood, TX.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604321A (TIARA)**
PE Title: **All Source Analysis System (ASAS)** Budget Activity: **#4**

(U) Related Activities: PE #0603745A (Tactical Electronic Support Systems). Extended coordination is conducted with the other services and agencies to avoid duplication of effort.

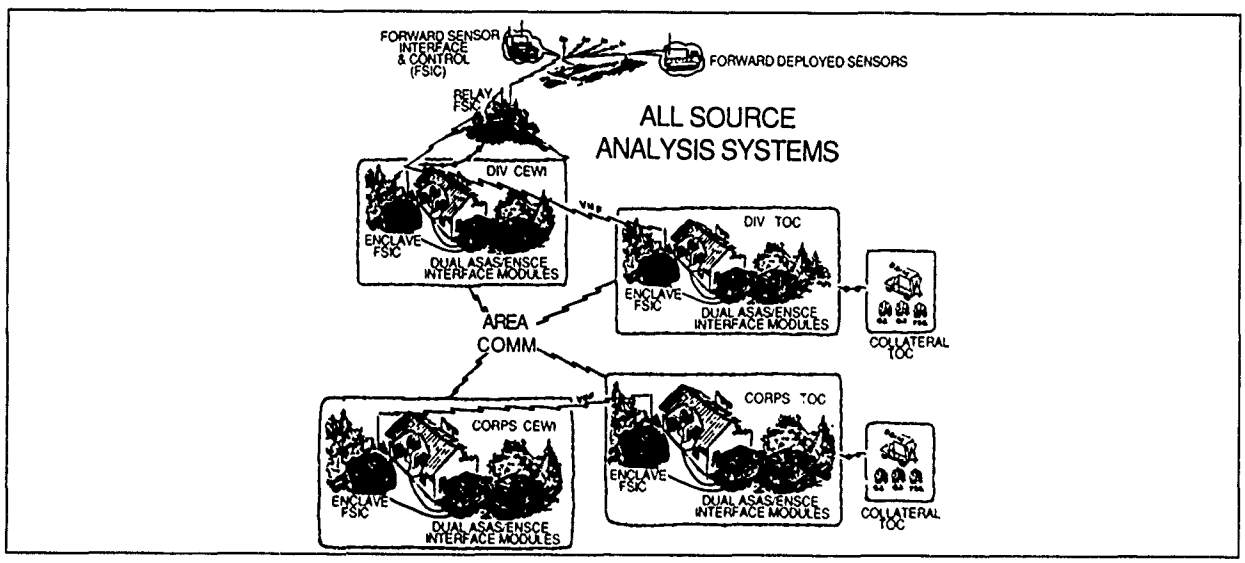
(U) Other Appropriation Funds: ($ in Thousands) Not applicable.

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0604321A (TIARA)
PE Title: **All Source Analysis System (ASAS)**
Project Title: **All Source Analysis System - Engineering Development**

Project Number **#D926**
Budget Activity: **#4**



POPULAR NAME: **ASAS**

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

SCHEDULE	FY 1991	FY 1992	FY 1993	To Complete
Program Milestones	Del V2.0 IOT&E LCSSC Spt, USAISC Spt	Complete IOT&E Develop X.25 MSE Interface	Blk II S/W Develop CHS Conversion	
Engineering Milestones				
T&E Milestones		V2.0 HW/SW Integ ICT&E prep Begins		
Contract Milestones				
BUDGET ($000)	**FY 1991**	**FY 1992**	**FY 1993**	**Program Total (To Complete)**
Major Contract	40199	51051	- 0 -	861981 (0)
Support Contract	6147	6642	- 0 -	106536 (0)
In-House Support				
GFE/ Other				
Total	46346	57693	- 0 -	968517 (0)

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604321A (TIARA)** Project Number **#D926**
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 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. ASAS is a tactically deployable ADP system used to manage intelligence and electronic warfare (IEW) operations and to develop targets within the Army Command and Control System respectively. ASAS systems are located in Army active & reserve divisions, corps, and echelons-above-corps (EAC) units. These systems are comprised of several hardware modules: Data Processor Set Module (Common name: ASAS Interface Module) (AIM) which processes intelligence data; Communications Control Set (Common name: Forward Sensor Interface & Control Set) (FSIC) module, which provides inter-enclave communications and security protection Workstation Computer Graphics (Common name: Portable ASAS Workstation) (PAWS), which is the primary user interface with the system, at the Tactical Operations Center Support Element. HAWKEYE is the primary workstation at the Military Intelligence Battalion. TIGER provides the relay between the forward sensors and the FSIC The Technical Control and Analysis Center (TCAC) provided the communications interface for HAWKEYE at the Communications Electronic Warfare Intelligence (CEWI) unit. Fielding to Force Package I units begins in FY 93.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- (U) Completed delivery and installation of initial operational test and evaluation (IOT&E) ASAS hardware and V2.0 software to III Corps, Ft Hood, TX
- (U) Initiated V2.0 software integration & test
- (U) Communications Certification Testing
- (U) Conducted new equipment training team, team and troop training
- (U) Conducted functional configuration audit/physical configuration audit (FCA/PCA)
- (U) Developed USA Intelligence Center & School (USAICS) Training Packages
- (U) Conducted security assurance test for IOT&E system
- (U) Maintained V.2 Life Cycle Software Support Center (LCSSC) Support

(U) FY 1992 Planned Program:
- (U) Security Accreditation Testing
- (U) Conduct IOT&E using Version 2.0 software
- (U) Conduct pre-production prove-out qualification testing (PPQT) for IOT&E system
- (U) Complete Version 2.1 (POST-IOT&E) software development
- (U) Deliver Version 2.1 software

(U) FY 1993 Planned Program:
- (U) Material Release Army Systems Acquisition Review Council (ASARC)
- (U) Begin fielding to priority units

D. (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 contractor is Jet Propulsion Laboratory, Pasadena, CA. Major subcontractors are: Martin Marietta Corp.,

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604321A (TIARA)** Project Number **#D926**
PE Title: **All Source Analysis System (ASAS)** Budget Activity: **#4**
Project Title: **All Source Analysis System - Engineering Development**

Denver, CO; Loral Corp., San Jose, CA; McDonnel Douglas, Huntington Beach, CA; TRW, Redondo Beach, CA; and Mantech, Pasadena, CA.

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** None.
2. **(U) SCHEDULE CHANGES:** None.
3. **(U) COST CHANGES:** None.

F. (U) PROGRAM DOCUMENTATION:

ASAS/ENSCE Integrated Support Plan	01/84	
Required Operational Capability (ROC) approved	01/86	
Joint ROC (JROC) Validation		11/91
Test and Evaluation Master Plan (TEMP) approved	11/91	
Acquisition Strategy Approved	12/91	
Baseline Approved	12/91	

G. (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.

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

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
OTHER PROCUREMENT ARMY: KA4400	33338	58485	54319

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. After the completion of contractor testing, the Government will conduct both technical and operational testing on each major development block. The U.S. Army Electronic Proving Ground will conduct a Pre-Production Qualification Test (PPQT). These test results will be evaluated and reported by the Army Materiel System Analysis Agency. The operational test will be conducted by the Operational Test and Evaluation Command using trained soldiers to operate and maintain the system. A tactical simulator (TACSIM) will be used to provide realistic sensor input to systems being tested. Test results will be supplemented with simulation data provided by US Army TRADOC Analysis Center, White Sands Missile Range, NM. Development test and evaluation (DT&E) for the Data Processor Set (Common name: ASAS/ENSCE Interface Module) (AIM) and the Communications Control Set (Common name: Forward Sensor Interface and Control) (FSIC) module as well as operational test and evaluation field trials of both modules took place at Ft

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604321A (TIARA)** Project Number **#D926**
PE Title: **All Source Analysis System (ASAS)** Budget Activity: **#4**
Project Title: **All Source Analysis System - Engineering Development**

Hood in October 1986. Force Development Test and Evaluation (FDT&E) of the limited capability configuration (LCC) occurred in early FY 1990. The field trials were primarily an investigative test activity to determine how to conduct the ASAS initial IOT&E operational test and evaluation (IOT&E) scheduled for FY 1992.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604321A (TIARA)**
PE Title: **All Source Analysis System**
Project Title: **ASAS Block Improvement**

Project Number **#DB19**
Budget Activity: **#4**

NO PICTURE AVAILABLE

POPULAR NAME: **ASAS**

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

SCHEDULE	FY 1991	FY 1992	FY 1993	To Complete
Program Milestones	OSD C3I Program Restructure Approval 11/91		Material Release ASARC Begin Block 1 Fielding Complete IOTE	
Engineering Milestones				
T&E Milestones	TEMP Approved 11/91			
Contract Milestones	RFP Released 01/92			
BUDGET ($000)	**FY 1991**	**FY 1992**	**FY 1993**	**Program Total (To Complete)**
Major Contract		22500	19200	
Support Contract		30776	22600	
In-House Support	3993	946	6261	
GFE/ Other				
Total	3993	54222	48061	

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604321A (TIARA)** Project Number **#DB19**
PE Title: **All Source Analysis System** Budget Activity: **#4**
Project Title: **ASAS Block Improvement**

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The ASAS Block II Evolutionary Acquisition Program provides funds during FY92-96 for converting ASAS systems to Army Tactical Command and Control System (ATCCS) Common Hardware and Software. Additional software functionality to include jump capability, degraded operations, collateral enclave, and hardware and software diagnostics will be developed. Hardware improvements will include modifications to existing hardware to convert to ATCCS common hardware systems.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- (U) Developed A-Spec and released draft Request for Proposals (RFP)

(U) FY 1992 Planned Program:
- (U) Release RFP
- (U) Source Selection
- (U) ATCCS Communications Interoperability efforts
- (U) In-House Prototyping
- (U) Preparing for IOTE
- (U) HAWKEYE integration & testing

(U) FY 1993 Planned Program:
- (U) Initiate conversion of software to Army Tactical Command and Control System (ATCCS) Common Hardware and Software (CHS)
- (U) Initiate ASAS equipment conversion to CHS
- (U) Convert existing integrated logistics support (ILS) manuals, training, maintenance to ATCCS training and maintenance concepts

(U) Program Plan to Completion:
- (U) Produce and deliver incremental prototype HW/SW modules for demonstration and feedback
- (U) Conduct system integration and test
- (U) Conduct IOTE

D. (U) WORK PERFORMED BY: The Project Manager, ASAS, McLean, VA. Contract award in FY 1992.

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** Block II delayed 6 months due to restructure of Block I program
2. **(U) SCHEDULE CHANGES:** Contract Award delayed until Jan 93.
3. **(U) COST CHANGES:** Congressional reduction associated with restructure of ASAS program.

F. (U) PROGRAM DOCUMENTATION: Not applicable

G. (U) RELATED ACTIVITIES:
PE #0603745A, Tactical Electronic Support Systems

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604321A (TIARA)**
PE Title: **All Source Analysis System**
Project Title: **ASAS Block Improvement**

Project Number **#DB19**
Budget Activity: **#4**

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: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604603A**
PE Title: **Nuclear Munitions - Engineering Development** Budget Activity: **#4**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D385 Improved 155mm Nuclear Projectile	39	- 0 -	- 0 -	- 0 -	208600
D584 Safety and Security Systems	2787	4362	4801	Cont	Cont
PE TOTAL	2826	4362	4801		

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 for the orderly termination of the container program that was initiated to increase the safety, security and survivability of the Army's nuclear munitions.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND 1993:

(U) Project D385 - Improved 155mm Nuclear Projectile: The Secretary of Defense directed in July 1990 that this project be terminated in an orderly manner. This direction is a result of the President's recent decision not to continue modernization of nuclear projectiles in Europe.

(U) FY 1991 Accomplishments:
- (U) Continued Project termination

(U) FY 1992 Planned Program: Project terminated.

(U) FY 1993 Planned Program: Project terminated.

(U) Project D584 - Safety and Security Systems: This project funds the orderly termination of the Survivability Overpack Container (SOC).

(U) FY 1991 Accomplishments:
- (U) Continued full-scale engineering development
- (U) Continued drawings update
- (U) Developed interim technical data package (TDP)
- (U) Finalized engineering design
- (U) Fabricated limited hardware for engineering development testing

(U) FY 1992 Planned Program:
- (U) Conduct limited development test
- (U) Complete draft technical manuals

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604603A**
PE Title: **Nuclear Munitions - Engineering Development** Budget Activity: **#4**

- (U) Complete Technical Data Package
- (U) Initiate project termination

(U) FY 1993 Planned Program:
- (U) Complete termination of project

(U) Work Performed By: In-house support includes: Project manager for nuclear munitions, Picatinny Arsenal, NJ; U.S. Army Armament Research, Development and Engineering Center (ARDEC), Picatinny Arsenal, NJ; Harry Diamond Laboratories, Adelphi, MD; Army Materiel and Mechanics Research Center, Watertown, MA; Ballistics Research Laboratory, Aberdeen Proving Ground, MD; U.S. Army Electronic Warfare/Reconnaissance, Surveillance, and Target Acquisition Center, Ft. Monmouth, NJ; and Army Depots (at Seneca, NY and Herlong, CA). Locations of Department of Energy-Defense Program activities and contractors include: Germantown, MD; Albuquerque, NM; Amarillo, TX; Kansas City, MO; Los Alamos, NM; Las Vegas, NV; Livermore, CA; Denver, CO; and Aiken, SC. Contractor support includes: Ferrulmatics Inc., P , 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: ($ in Thousands) Not applicable.

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604604A**
PE Title: **Medium Tactical Vehicles** Budget Activity: **#4**

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

Project Number / Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
DH07 Family of Medium Tactical Vehicles (FMTV)	6810	8830	- 0 -	3676	66610
DH08 Service Life Extension Program (SLEP)	- 0 -	2985	2941	1245	7171
PE TOTAL	6816	11815	2941	4921	

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element meets the urgent need to replace and replenish the Army's inventory of medium tactical wheeled vehicles with state-of-the-art vehicle upgrades. The SLEP program is a part of the overall truck modernization strategy to reduce operational and support (O&S) costs for the Army's truck fleet. SLEP is an interim rehabilitation effort for overaged and maintenance intensive medium truck assets. The Family of Medium Tactical Vehicles (FMTV) is the "next generation vehicle" for the medium truck fleet.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND 1993:

(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 1991 Accomplishments:
- (U) Assigned Program to the Program Executive Officer (PEO) for Combat Support
- (U) Established Program Office
- (U) Released Solicitation for prototype test phase

(U) FY 1992 Planned Program:
- (U) Award prototype contracts
- (U) Conduct prototype testing

(U) FY 1993 Planned Program:
- (U) Complete prototype testing
- (U) Award SLEP production contract

(U) Work Performed By: The Program Executive Officer for Combat Support located at TACOM, Warren, MI, is assigned responsibility for the Service Life Extension Program.

(U) Related Activities: The Family of Medium Tactical Vehicles (FMTV) program is the other major effort which in conjunction with SLEP will upgrade the medium tactical truck fleet.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604604A**
PE Title: **Medium Tactical Vehicles** Budget Activity: **#4**

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

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
Other Procurement, Army (OPA 1)	0	0	15000*

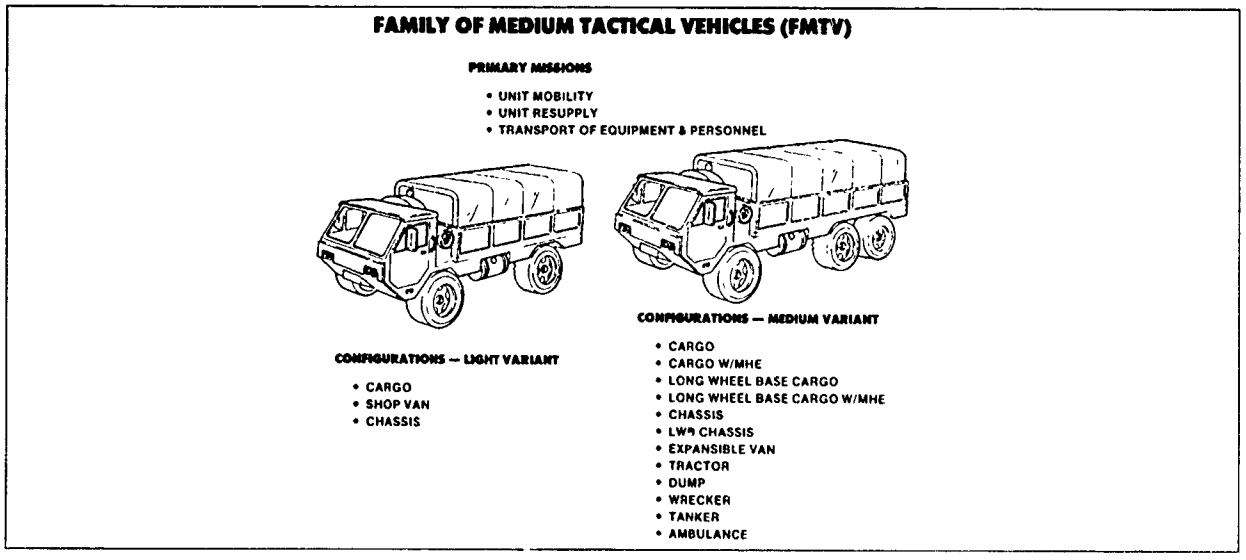
*Dedicated National Guard funding

(U) International Cooperative Agreements: None.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604604A**
PE Title: **Medium Tactical Vehicles**
Project Title: **Family Medium Tactical Vehicles (FMTV)**

Project Number **DH07**
Budget Activity: **#4**



POPULAR NAME: **FMTV**

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

SCHEDULE	FY 1991	FY 1992	FY 1993	To Complete
Program Mil stones	ASARC IIIA 6/91		ASARC IIIB 9/93	
Engineering Milestones		First Prod Veh 4Q92		
T&E Milestones	Proto Test Compl 12/90			
Contract Milestones		Production C ıtract Award 10/9ı		
BUDGET ($000)	**FY 1991**	**FY 1992**	**FY 1993**	**Program Total (To Complete)**
Major Contract	6816	8830		68610
Support Contract				
In-House Support				
GFE/ Other				
Total	6816	8830		68610

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604604A** Project Number **DH07**
PE Title: **Medium Tactical Vehicles** Budget Activity: **#4**
Project Title: **Family of Medium Tactical Vehicles (FMTV)**

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: There is an urgent need to replace the aging 2 1/2 ton truck fleet and fill the shortfall in the 5 ton truck fleet with state-of-the-art tactical wheeled vehicles. The requirement is for vehicles which are lighter and more mobile, reliable, supportable and deployable than the existing fleet of trucks. The Family of Medium Tactical Vehicles (FMTV) consists of 2 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 trailers. The FMTV variants maximize the commonality of components to reduce the logistics burden in the field. The following models are included-LMTV: cargo, van; and MTV: cargo, van, tanker, wrecker, tractor and dump. This family of vehicles will be characterized by incorporation of state-of-the-art technology, maximum commonality of components, various body styles to accommodate special mission applications, and suited to a variety of multi-purpose missions. The FMTV will perform line haul, local haul, unit mobility, unit resupply and other required missions in combat, combat support and combat service support units. Vehicle operations will include around-the-clock, all-weather use in the climatic design types hot, basic and cold as defined in AR 700-38. Vehicles will operate worldwide on primary and secondary roads and trails. The FMTV will supplement existing and aging 2-1/2 ton trucks and provide a follow-on to the current 5 ton truck to initially fill 5 ton truck shortages.

SYSTEM OPERATIONAL/TECHNICAL REQUIREMENT

	GOAL	THRESHOLD
Highway Speed on 2% Grade at GVW	55 MPH	55 MPH
Highway Speed on 3% Grade at GVW	45 MPH	45 MPH
Highway Speed on 2% Grade at GVW	40 MPH	40 MPH
Highway Speed on 3% Grade at GVW	30 MPH	30 MPH
LMTV Payload	2 1/2 TON	2 1/2 TON
MTV Payload	5 TON	5 TON
LMTV Towed Load	7500 LBS	7500 LBS
MTV Towed Load	20,000 LBS	20,000 LBS
Longitudinal Grade Operations	60%	60%
Side Slope Operation	30%	30%
Fording without Kit	30 IN	30 IN
Fording with Kit	60 IN	60 IN
Operating Range on Integral Fuel at GCW	300 MI	300 MI

ACRONYMS:
GVW - Gross Vehicle Weight
GCW - Gross Combined Weight

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- **(U)** Conducted Milestone IIIA Production Decision Review
- **(U)** Completed prototype testing

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604604A** Project Number **DH07**
PE Title: **Medium Tactical Vehicles** Budget Activity: **#4**
Project Title: **Family of Medium Tactical Vehicles (FMTV)**

(U) FY 1992 Planned Program:
- (U) Awarded production contract
- (U) Initiate testing of modified prototypes in production configuration
- (U) Purchase of Technical Data Package (TDP) for FMTV variants included in the Initial Production Award

(U) FY 1993 Planned Program:
- (U) Continue Low Rate Initial Production (LRIP)
- (U) Conduct milestone IIIB Production Decision Review

(U) Program Plan to Completion: Project not funded

D. (U) WORK PERFORMED BY: In-house effort will be accomplished by the US Army Tank-Automotive Command, Warren, Michigan. Contractor for the production phase is Stewart/Stevenson Services Inc., Houston, TX.

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** None.
2. **(U) SCHEDULE CHANGES:** Production contract was scheduled for award in Jun 91 but was not awarded until Oct 91.
3. **(U) COST CHANGES:** None.

F. (U) PROGRAM DOCUMENTATION:

Operational & Organizational Plan	9/84
Joint Service Operational Requirement	9/87
Acquisition Plan	1/88
Program Baseline	1/88
Decision Coordination Paper	1/88
Test Evaluation Master Plan	8/88

G. (U) RELATED ACTIVITIES: There is no unnecessary duplication of effort within the Army or the Department of Defense The Family of Medium Tactical Vehicles is an Army, Marine Corps, Air Force effort and tri-service joint working groups insure coordination among the services.

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

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
OTHER PROCUREMENT, ARMY			
Family of Medium Tactical Vehicles (SSN D15500)	66329	171628	291101

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

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604604A**
PE Title: **Medium Tactical Vehicles**
Project Title: **Family of Medium Tactical Vehicles (FMTV)**

Project Number **DH07**
Budget Activity: **#4**

J. (U) TEST AND EVALUATION DATA: Prototype testing began 2Q FY 1990. The testing includes endurance, performance, reliability, mobility, and logistics testing. A separate initial operational test and evaluation started in 3Q FY 1990. All testing completed in Dec 1990. Initial Production Testing and IOT&E will be conducted using production vehicles.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604609A**
PE Title: **Smoke, Obscurant and Equipment Defeating Systems - Engineering Development**

Project Number: **# D200**
Budget Activity **# 4**

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

Project Title: Smoke/Obscurant Engineering Development

Popular Name	FY1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
Smoke/Obscurant ED	12247	12920	11309	Cont	Cont

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This program provides engineering development of smoke and obscurant munitions and devices. The program provides smoke and obscurant material to defeat or degrade threat surveillance and weapon system sights, guided munitions, and directed energy weapons. The XM56 Smoke Generator is a Large Area Mobile Multi-Spectral obscurant screening system that uses a gas turbine engine to disseminate smoke and obscurants. This system provides large area visual and infrared screening. The millimeter wave screening capability will be added through a preplanned product improvement (P3I). The XM56 is mounted on the M1097 High Mobility Multipurpose Wheeled Vehicle (HMMWV). The Combat Vehicle Defensive Obscurating System (CVDOS) uses the XM6 Multisalvo Smoke Grenade Launcher (MSGL) and interfaces with the Vehicle Integrated Defense System (VIDS) to provide Armored System Modernization (ASM) vehicles a multisalvo, 360 degree grenade screening protection from smart anti-tank guided missile (ATGM) and top attack weapons. The XM81 Infrared/Millimeter Wave Screening Grenades fired from the XM6 and all standard dischargers, provide armored vehicles the capability to defeat millimeter wave guided munitions.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- (U) Completed XM56 Smoke Generator initial design and manufacture of hardware for testing
- (U) Initiated engineering design tests for XM56 Smoke Generator
- (U) Completed first prototypes of the XM6 MSGL

(U) FY 1992 Planned Program:
- (U) Redesign and fabricate XM56 hardware for Pre-Production Qualification Testing
- (U) Conduct Milestone I/II In-Process Review (IPR) on the XM81 IR/MMW Screening Grenade
- (U) Initiate technical testing on the XM6 MSGL

(U) FY 1993 Planned Program:
- (U) Initiate Pre-Production Qualification Test of the XM56 Smoke Generator
- (U) Conduct initial operational test and evaluation of the XM56 Smoke Generator
- (U) Initiate engineering development for the XM81 Infrared/Millimeter Screening Grenade
- (U) Initiate technical tests on the XM81 Infrared/Millimeter Screening Grenade
- (U) Conduct Milestone III IPR on the XM6 MSGL

D. (U) WORK PERFORMED BY: The Product Manager for Smoke/Obscurants, Aberdeen Proving Ground

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0604609A
PE Title: **Smoke, Obscurant and Equipment Defeating Systems - Engineering Development**

Project Number: # D200
Budget Activity # 4

(APG), MD, the US Army Chemical Research, Development and Engineering Center, APG, MD, and the USA Tank and Automotive Command, Warren, MI. Contractors to be competitively selected.

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** None.
2. **(U) SCHEDULE CHANGES:** XM56 type classification rescheduled to May 94. The XM81 Millimeter Wave Screening Grenade will remain in advanced development an additional year. The US Armor School expanded the requirement to include both infrared and millimeter (radar) wave screening for the grenade. The Milestone I/II IPR will be held 2/92 and the Milestone III date for the XM81 will be 3/95.
3. **(U)COST CHANGES:** None.

F. (U) PROGRAM DOCUMENTATION:

<u>XM56 System Smoke Generator:</u>	
Acquisition Strategy	01/86
Required Operational Capability	11/86
Acquisition Plan	12/86
Decision Coordinating Paper	12/86
Test and Evaluation Master Plan	05/89
<u>Multisalvo Smoke Grenade Launcher:</u>	
Acquisition Strategy	04/89
Test and Evaluation MasterPlan	07/89
Acquisition Plan	08/89
Required Operational Capacity	03/90
<u>Infrared/Millimeter Wave Grenade:</u>	
Operational and Organizational Plan	01/87
Acquisition Strategy	04/89
Operational Requirements Document (ORD)	02/92

G. (U) RELATED ACTIVITIES:

- PE #0602622A (Chemical, Smoke and Equipment Defeating Technology)
- PE #0603627A (Smoke Obscurant and Equipment Defeating Systems - 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/ Obscurants symposia, personal contacts, and joint distribution of technical and other reports. There is no unnecessary duplication of effort within the Army or DoD.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604609A** Project Number: **# D200**
PE Title: **Smoke, Obscurant and Equipment Defeating Systems - Engineering Development** Budget Activity **# 4**

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands) Not applicable.

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

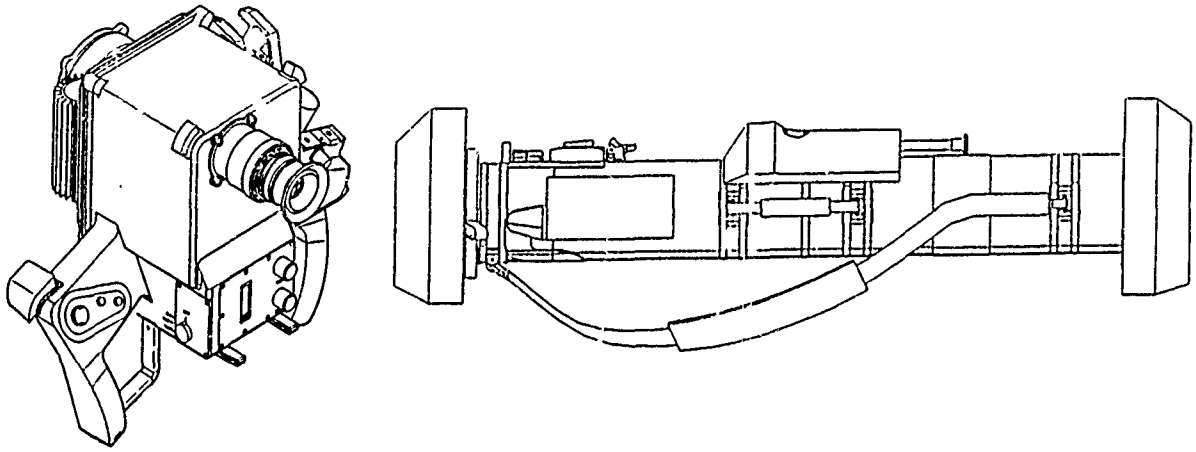
J. (U) MILESTONE SCHEDULE:

Milestone	Milestone Date	
<u>XM56 Mobile LASS Smoke Generator:</u>		
Initiate Engineering Design Test	08/91	
Initiate Early User Test Evaluation	10/91	
Initiate Pre-production Qualification Test	01/93	
Initiate Initial Operational Test and Evaluation	08/93	
Type Classification	05/94	
<u>Combat Vehicle Defense Obscuration System (CVDOS):</u>	MSGL	MMW GRENADE
Initiate Full-Scale Engineering Development	03/90	02/92
Complete development and user testing	03/93	06/94
Type Classification	09/93	03/95

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604611A**
PE Title: **JAVELIN (AAWS-M)**
Project Title: **JAVELIN (AAWS-M)**

Project Number: **D499**
Budget Activity: **#4**



POPULAR NAME: **JAVELIN**

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

SCHEDULE	FY 1991	FY 1992	FY 1993	To Complete
Program Milestones	Approved Restructured 54 month EMD Phase	Continued EMD Phase	Continued EMD Phase	MS IIIA FY94; MS III FY96; FUE FY96
Engineering Milestones			Prototype deliveries conduct FDTE	
T&E Milestones	Conducted Baseline Test Phase I & II Began PPQT Component/ Subsystem Testing Cont PPT Conducted GTV 1 Thru 4 Flights	Completed PPQT Component/Sub-system Testing Complete PPT (GTV 5-10 Flights) Began PPQT System Test	Initiate IOT&E	Conduct Dirty Battlefield tests, Comp IOTE & PPQT Sys Testing FY94 Initiate PQT FY95 Conduct LFT FY96 Complete PQT FY96
Contract Milestones		Release 2nd Source FPA RFP by JV Met OSD Directed FPA Milestones I & II Conduct OSD FY Milestone III & IV	Initiate Procurement of Production Long Lead Time Items (LLTI) For LRIP I	LRIP I Contract Award FY 94; LRIP II Contract Award FY95; Full Scale Production Contract Award FY96
BUDGET ($000)	**FY 1991**	**FY 1992**	**FY 1993**	**Program Total (To Complete)**
Major Contract	57880	101764	69700	443000 (15847)
Support Contract	2305	1425	1500	8030 (500)
In-House Support	10165	12261	14100	76029 (9500)
GFE/Other	5502	4334	6140	69022 (44726)
Total	75852	119784	91440	596081 (70573)

AMENDED FY 1992/1993 BIENNIAL RDTE 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 1991 Accomplishments:
- (U) Conducted Baseline Test Phase I & II
- (U) Successfully conducted Guided Test Vehicle (GTV) 1 through 4 flights
- (U) Approved 54 month EMD program
- (U) Began Production Proveout Qualification Testing (PPQT) component/subsystem testing
- (U) Continue Production Proveout Testing (PPT)

(U) FY 1992 Planned Program:
- (U) Complete Production Proveout Test (PPT) (GTV 5-10 flights)
- (U) Complete PPQT component/subsystem testing
- (U) Initiate PPQT system testing
- (U) Continued EMD phase
- (U) Release 2nd source focal plane array (FPA) Request for Proposal (RFP) by Joint Venture
- (U) Successfully met OSD directed Milestones 1 and 2 for Seeker Focal Plane Array (FPA)
- (U) Meet OSD directed Milestones 3 and 4 for FPA

(U) FY 1993 Planned Program:
- (U) Conduct Force Development Test and Experimentation (FDTE)
- (U) Prototype delivery
- (U) Initiate Procurement of Production Long Lead Time Items (LLTI) for Low Rate Initial Production LRIP I
- (U) Initiate Initial Operational Testing and Evaluation (IOT&E)
- (U) Continue EMD

(U) Program Plan to Completion:
- (U) Complete IOT&E (FY94)
- (U) Milestone IIIA (FY94)
- (U) LRIP I Contract Award (FY94)
- (U) Complete PPQT System Testing (FY94)
- (U) Conduct Dirty Battlefield Tests (FY94)
- (U) Initiate Production Qualification Test (PQT) (FY 95)
- (U) LRIP II Contract Award (FY95)
- (U) Conduct Live Fire Testing (FY96)

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604611A**
PE Title: **JAVELIN (AAWS-M)**
Project Title: **JAVELIN (AAWS-M)**

Project Number: **D499**
Budget Activity: **#4**

- (U) Complete PQT (FY96)
- (U) Milestone III (FY96)
- (U) Full Scale Production (FSP) contract award (FY96)
- (U) FUE (FY96)

D. (U) WORK PERFORMED BY: In-house efforts are being performed by JAVELIN Project Office, Program Executive Officer Fire Support, Redstone Arsenal AL. The prime contractor for the JAVELIN EMD phase is a Joint Venture, consisting of Texas Instruments Inc., Denton, TX, and Martin Marietta, Orlando, Florida.

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** None.
2. **(U) SCHEDULE CHANGES:** EMD phase restructured from a 36 month phase to a 54 month phase.
3. **(U) COST CHANGES:** Restructured EMD Phase resulted in an increased cost.

F. (U) PROGRAM DOCUMENTATION:

Required Operational Capability (ROC)	07/85
Test and Evaluation Master Plan	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 TEMP (OSD Approval)	02/92
Revised Acquisition Program Baseline (OSD Approval)	02/92

G. (U) RELATED ACTIVITIES: Other related Program Elements are:
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 #0702807E (Infrared Focal Plane Array) (IRFPA)
There is no unnecessary duplication of effort within the Army or other services/agencies within DOD. This is assured by continuous coordination with other services/agencies and oversight by the OSD-level Conventional Systems Committee.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604611A**
PE Title: **JAVELIN (AAWS-M)**
Project Title: **JAVELIN (AAWS-M)**

Project Number: **D499**
Budget Activity: **#4**

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

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
MISSILE PROCUREMENT, ARMY			
JAVELIN (SSN CC0007)	- 0 -	- 0 -	18305

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

J. (U) TEST AND EVALUATION DATA: The JAVELIN EMD test program began in 3QFY89 and will conclude in 2QFY94. EMD testing will consist of the following:

(1) Production Proveout Test (contractor component/subsystem/system testing/qualification).
(2) Preproduction Qualification Test (contractor/government system development testing/qualification)
(3) Training Force Development Test and Experimentation II (government training concept testing)
(4) Logistics demonstration (contractor/government evaluation)
(5) Live Fire Component Test (contractor/government)
(6) Initial Operational Test (government)

EMD test program schedule:
Technical test II (PPT, PPQT) - 4QFY89-1QFY94
User test II (FDTE, IOT) - 1QFY93-1QFY94

System Characteristics:

Operational/Technical Characteristics	Objectives	Demonstrated Performance
Weight	Less than 49.5lbs	
Range	2000 meters	
Configuration	man portable	
Countermeasure hardened	Yes	

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604619A** Project Number: **#D088**
PE Title: **Landmine Warfare** Budget Activity: **#4**

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

Project Title: Wide Area Mine (WAM)-Engineering Development

Popular Name	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
Wide Area Mine (WAM)	26844	35054	24187	186200	288000

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project provides for engineering development and validation of landmine systems which will enhance the U.S. capability in mine warfare. The program provides for full-scale development of the Wide Area Mine (WAM) deployed by hand emplaced (HE) and by VOLCANO delivery systems. WAM will use advanced sensors and warhead technology, and provide extensive range and lethality improvements over present mines. When employed with [illegible] mine systems, WAM provides a significant synergistic increase in land warfighting capability, battlefield shaping and airland battle operations.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- (U) Continued engineering design and system development
- (U) Fabricated components for initial system integrated demonstration test
- (U) Continued contractor development test

(U) FY 1992 Planned Program:
- (U) Continue contractor development testing
- (U) Program design review in the 3d Quarter
- (U) Conduct initial system integration demonstration test
- (U) Procure and fabricate WAM HE hardware for TT/UT
- (U) Initiate prototype qualification hardware procurement and fabrication

(U) FY 1993 Planned Program:
- (U) Continue contractor development testing
- (U) Complete prototype qualification fabrication
- (U) Initiate prototype hardware testing

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. Principal contractor is Textron Defense Systems, Wilmington, MA.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604619A** Project Number: **#D088**
PE Title: **Landmine Warfare** Budget Activity: **#4**

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** The Missile Delivery System (Deep Attack) has been added to the program.
2. **(U) SCHEDULE CHANGES:** Milestone II and design initiation occurred one quarter later than expected. Low rate initial production (LRIP) for hand emplaced (HE) WAM has been deleted. Type classification for HE WAM changed to 4Q 95.
3. **(U) COST CHANGES:** None

F. (U) PROGRAM DOCUMENTATION: Not applicable

G. (U) RELATED ACTIVITIES:

PE #0603619A (Landmine Warfare and Barrier-Advanced Development)
PE #0603606A (Landmine Warfare and Barrier-Advanced Technology) relates to advanced development efforts and component work. 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 there is no unnecessary duplication of effort within the Army or DoD. Deveopment information on mines is coordinated and exchanged among the services by the Tri-Service Joint Technical Coordination Group for Unpowered Weapons. The Department of Defense's Office of Munitions monitors the scatterable mine program to avoid service duplication.

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands) Not applicable

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

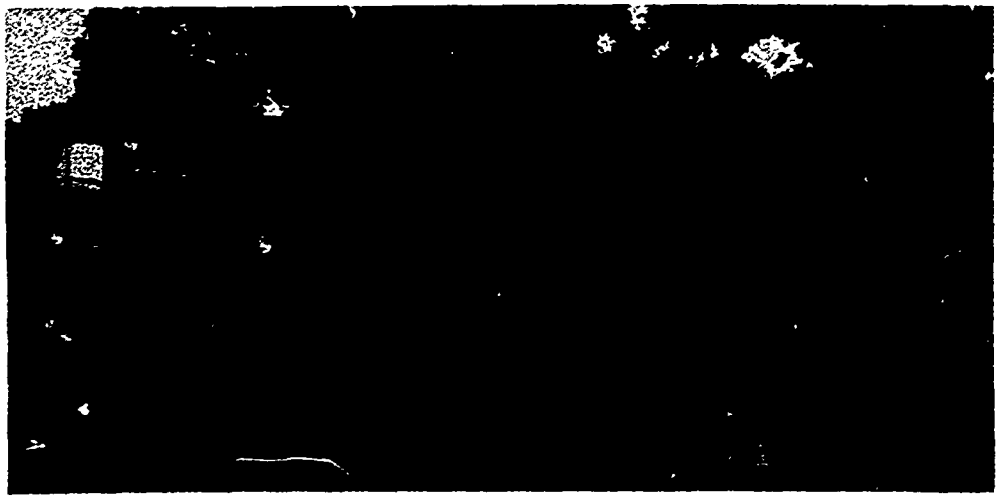
J. (U) MILESTONE SCHEDULE:

Milestones	Milestones Dates
WAM Milestone II	2Q90
Wide Area Mine (WAM)Engineer Design Initiation (Hand Emplaced)	3Q90
HE WAM Preliminary System Integration Test	2Q92
Design Initiation (Volcano WAM)	1Q94
WAM Milestone III/Type - Classification (HE WAM)	4Q95
Milestone III (Volcano WAM)	4Q97
Design Initiation (Deep Attack)	2Q98
Milestone III (Deep Attack)	3Q00

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604622A**
PE Title: **Family of Heavy Tactical Vehicles**
Project Title: **Family of Heavy Tactical Vehicles**

Project Number: **#D659**
Budget Activity: **#4**



POPULAR NAME: PLS - Palletized Load System

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

SCHEDULE	FY 1991	FY 1992	FY 1993	To Complete
Program Milestones	LRIP Oct		FUE 2/93 Full Rate Prod 9/93 MSIIIB 10/92	Full Rate Prod Complete 5/95
Engineering Milestones		Buy TDP-M10 FY92 PQT Complete 8/92 Design/Test New Design Flatrack	FHTV Study/Develop Perf Spec TBD	FHTV Study/Dev Perf Spec complete FY94 Ident/Test prototype FHTV 95-96 (TBD)
T&E Milestones		PQT Start 3/92 IOT&E Start 3/92		Test FHTV proto FY96 (TBD)
Contract Milestones			Full Rate Prod 9/93	FHTV proto continued FY 95 (TBD)
BUDGET ($000)	**FY 1991**	**FY 1992**	**FY 1993**	**Program Total (To Complete)**
Major Contract	- 0 -	5459	961	16267
Support Contract				
In-House Support				
GFE/ Other				
Total	- 0 -	5459	961	16267

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604622A** Project Number: **#D659**
PE Title: **Family of Heavy Tactical Vehicles** Budget Activity: **#4**
Project Title: **Family of Heavy Tactical Vehicles**

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: There is a need to develop a fleet of heavy tactical wheeled vehicles that maximizes commonality of trucks and repair parts. By maintaining a large varied fleet, operation and support costs are significantly increased. As budgeted resources decrease, commonality of trucks and repair parts will decrease the demand for system specific parts. 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.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments: Project not funded.

(U) FY 1992 Planned Program:
- **(U)** Buy Palletized Loading System technical data package
- **(U)** Begin development and testing of improved (second generation) PLS flatrack which is optimized for sea and air transport

(U) FY 1993 Planned Program:
- **(U)** In-house study of what the Family of Heavy Tactical Vehicles/Palletized Load System should be
- **(U)** Complete development and testing of enhanced flatrack and begin production

D. (U) WORK PERFORMED BY: In-house effort will be accomplished by Program Executive Officer for Combat Support located at TACOM, Warren, MI. Oshkosh Truck Corporation will develop the enhanced flatracks with a small business set aside program date.

E. (U) COMPARISON WITH FY 1992/93 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** None.
2. **(U) SCHEDULE CHANGES:** Contractor run shakedown test was delayed and caused the following schedule changes: PQT start and complete were Sep 91 and Mar 92 and is now Mar 92 and Aug 92; IOT&E start and complete were Nov 91 and May 92 and are now Apr 92 and May 92; Milestone IIIB was Aug 92 is now Oct 93; FUE and IOC were Jul 92 and are now Feb 93.
3. **(U) COST CHANGES:** None.

F. (U) PROGRAM DOCUMENTATION: Not applicable.

G. (U) RELATED ACTIVITIES: There is no unnecessary duplication of effort within the Army or the Department of Defense. This is an Army effort; no other Services are participating.

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

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
Other Procurement, Army FHTV (SSN D16500)	131336	99743	315730

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604622A**
PE Title: **Family of Heavy Tactical Vehicles**
Project Title: **Family of Heavy Tactical Vehicles**

Project Number: **#D659**
Budget Activity: **#4**

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Flatracks designed for NATO interoperability.

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

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604630A**
PE Title: **Advanced Tank Cannon (ATAC)**
Advanced Development

Budget Activity: **#4**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
DB80	Advanced Tank Cannon System (ATACS) - Ammunition				
	11700	6192	17916	170786	206594
DB81	Advanced Tank Cannon System (ATACS) - Cannon				
	14912	33758	23610	232844	305124
PE TOTAL	26612	39950	41526	403630	511718

B. (U) BRIEF DESCRIPTION OF ELEMENT: Development of this Tank Main Armament System - composed of gun, automatic loader, fire control, and ammunition is mandated by requirements to evolve the full potential of conventional armament systems. The objective of this program is to field a main armament system of sufficient capability to sustain technological superiority.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND 1993:
Not applicable

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604630A** Project Number **#DB80**
PE Title: **Advanced Tank Cannon (ATAC)** Budget Activity: **#4**

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

Project Title: **Advanced Tank Cannon Ammunition - ATAC**

Popular Name	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
ATAC AMMO	11700	6192	17916	170786	206594

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Development of the XM964 Armor Piercing Fin Stablized Discarding Sabot-Tracer (APFSDS-T) and XM965 High Explosive Multi-Purpose Tracer (HEMP-T) munitions will provide the kinetic and chemical energy munitions required for use in the XM291 gun. These munitions will sustain technological superiority.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS: Initial XM964 and XM965 designs have been established in accordance with internationally harmonized parameters. Contracts were awarded for fabrication of cartridge components. FY 1991 efforts were devoted to maturing baseline designs for the proof-of-principle demonstration scheduled for the 1QFY92.

(U) **FY 1991 Actual Program:** Restructured from PE # 063645A (Project DB80)
- (U) Initiated development of armament system for CATTB demonstration
- (U) Delivered hardware for Proof of Principle (POP) test
- (U) Developed/Demonstrated two piece propulsion system at ambient temperatures
- (U) Test fired baseline designs for Kenetic Energy - Chemical Energy (KE-CE) cartridges
- (U) Optimized penetrator forthe XM964

(U) **FY 1992 Planned Program:**
- (U) Continue development for CATTB demonstration
- (U) Conduct FTMA Phase 1 international armor tests
- (U) Support XM291 gun development efforts
- (U) Complete propulsion ignition efforts in support of gun development and ammo Future Tank Main Armament

(U) **FY 1993 Planned Program:**
- (U) Conduct CATTB integration
- (U) Continue development of critical ammunition technologies

D. (U) WORK PERFORMED BY: In-house work performed by Armament Research, Development and Engineering Center (ARDEC), Picatinny Arsenal, NJ; PM Tank Main Armaments Systems, Picatinny Arsenal, NJ; and Ballistics Research Laboratory, Aberdeen Proving Ground, MD; Test and Evaluation Command, Aberdeen Proving Ground, MD., and Battelle Northwest Laboratory, Richland, Washington.

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. (U) **TECHNICAL CHANGES:** Development efforts reduced in accordance with Block III deferrment.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604630A** Project Number **#DB80**
PE Title: **Advanced Tank Cannon (ATAC)** Budget Activity: **#4**

2. **(U) SCHEDULE CHANGES:** ATAC ammunition development schedule reduced to critical technology development only
3. **(U) COST CHANGES:** Program reduced to approximately $6.2M for FY92.

F. (U) PROGRAM DOCUMENTATION: Draft Required Operational Capabilities document in staffing.

G. (U) RELATED ACTIVITIES:
PE #0203735A (M1A1 Block Improvement Program, Project D330)
There is no unnecessary duplication of effort within the Army or DoD.

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands) Not applicable

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: A Future Tank Main Armament Memorandum of Understanding has been signed by the United States, the United Kingdom, France, and Germany.

J. (U) MILESTONE SCHEDULE:

Milestones	Milestone Dates
Complete International Armor Test	3QFY92
Establish Propellant-Ignition Baseline	4QFY92
Gen Propellant-Slug established	4QFY92
Electronic safe and arm/alternate sensor proof of concept	4QFY92
Penetrator processing/alloy optimization	4QFY93
Propellant Optimization	4QFY93
Sabot geometry/material enhancements	4QFY93
HEMP alternatives/analysis	4QFY93

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604630A** Project Number **#DB81**
PE Title: **Advanced Tank Cannon (ATAC)** Budget Activity: **#4**

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

Project Title: **Advanced Tank Cannon - ATAC**

Popular Name	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
Advanced Tank Cannon - ATAC	14912	33758	23610	232844	305124

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Development of this Tank Main Armament System - composed of gun, automatic loader, and fire control - is mandated by requirements to evolve the full potential of conventional armament systems. The objective of this program is to field a main armament system of sufficient capability to sustain technological superiority.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS: In FY 1990, engineering design tests were performed leading to a proof-of-principle demonstration in 2nd Qtr FY 1991. Integration of the armament system into a tank was initiated in FY 1990.

(U) FY 1991 Planned Program:
- **(U)** Conducted Proof-of-Principle Demonstration
- **(U)** Initiate development of armament system for CATTB demonstration

(U) FY 1992 Planned Program:
- **(U)** Continue development for CATTB demonstration
- **(U)** Deliver XM291 Gun hardware in support of CATTD effort

(U) FY 1993 Planned Program:
- **(U)** Conduct CATTB integration

D. (U) WORK PERFORMED BY: Computing Devices of Canada, Ottawa, Ontario, Canada; Cadillac Gage, Warren, MI; General Dynamics, Warren, MI; General Electric, Burlington, VT, General Motors, Indianapolis, IN. In-house - PM, Tank Main Armament Systems, Picatinny Arsenal, NJ; Armament Research, Development and Engineering Center, Picatinny Arsenal, NJ; and Tank-Automotive Command, Warren, MI; Anniston Army Depot, Anniston AL.

E. (U) COMPARISON WITH FY 1992/1993 AMENDED RDTE DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** Project retained in Advanced Development (AD) by Congressional direction.
2. **(U) SCHEDULE CHANGES:** None.
3. **(U) COST CHANGES:** None.

F. (U) PROGRAM DOCUMENTATION: Draft required operational capabilities document in staffing.

G. (U) RELATED ACTIVITIES:

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604630A** Project Number **#DB81**
PE Title: **Advanced Tank Cannon (ATAC)** Budget Activity: **#4**

PE #0203735A (M1A1 Block Improvement Program, Project D330)
There is no unnecessary duplication of effort within the Army or DoD.

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands) Not applicable

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: A Future Tank Main Armament Memorandum of Understanding has been signed by the United States, Great Britain, France and Germany.

J. (U) MILESTONE SCHEDULE:

Milestones	Milestones Dates
Proof-of-Principle demonstration initiated	2QFY91
Proof-of-Principle demonstration completed	2QFY92
EMD initiation	1QFY94
CATTB Demo	2QFY94 TO 1QFY95
-Extended range fire control system	
-Target acquisition suite	
-Autoloader (120/140mm)	
Safe Service life 120mm	3QFY94
Safe Service life 140mm*	2QFY97

* Could be adjusted based upon potential Tank Upgrade Program

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604633A**
PE Title: **Air Traffic Control** Budget Activity: **#4**

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

Project Number / Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D586 Air Traffic Control	- 0 -	8924	2463	- 0 -	11387

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element funds the integration and qualification of a tactical terminal control system (TTCS) and an air traffic navigation, integration, and coordination system (ATNAVICS). These systems provide an urgently needed mobile terminal communications and precision/non-precision capability in support of Army, joint services, and allied/host nation aviation operations at Army tactical airfields, remote landing zones, drop zones, pickup zones, and temporary helicopter operating areas worldwide. This is a non-developmental item (NDI) program. This element funds continuously evolving efforts for the development of ATC systems for both tactical and fixed-base applications. Other tactical ATC programs include the Tactical Airspace Integration System, the Forward Area Shelterized Terminal Tower and Army Developmental Test efforts for the Mobile Microwave Landing System. Fixed-Base ATC research and development efforts funded by this line include Precision Approach Radar, Low Activity Console, Navigation Aid Systems Modernization, and Air Traffic Control Modernization. This element funds continuously evolving efforts for the development of ATC systems fore both tactical and fixed-base applications. Other tactical ATC programs include the Tactical Airspace Integration System, the Forward Area Shelterized Terminal Tower and Army Developmental Test efforts for the Mobile Microwave Landing System. Fixed-Based ATC research and development efforts funded by this line include Precision Approach Radar, Low Activity Console, Navigation Aid Systems Modernization, Communication Systems Modernization, Precision Approach Modernization, and Air Traffic Control Modernization.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND 1993:

(U) Project D586 - Air Traffic Control:

(U) FY 1991 Accomplishments: Project not funded

(U) FY 1992 Planned Program:
- **(U)** Initial testing will be designed to determine transportability, installation procedures, and technology acceptability
- **(U)** Testing will include integration with existing air traffic control equipment as well as reliability, availability, and maintainability (RAM)

(U) FY 1993 Planned Program:
- **(U)** Continue integration and qualification testing of candidate systems
- **(U)** Conduct user testing to determine operational effectiveness and suitability of systems

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604633A**
PE Title: **Air Traffic Control** Budget Activity: **#4**

(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 Systems Command (AVSCOM), St. Louis, MO; the U.S. Army Aviation Research and Development Activity (AVRADA), Fort Monmouth, NJ.

(U) Related Activities: Close liaison is maintained with other services and industry to avoid duplication of effort. The Army participated in this tri-service Air Traffic Control Approach and Landing Aids (ATCALS) joint working group to share technical information and developmental programs being conducted by each service.

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

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
Procurement:			
Air Traffic Control (AA0050)	8690	1996	5921

(U) International Cooperative Agreements: Not applicable

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604645A**
PE Title: **Armored Systems Modernization (ASM) Engineering Development**
Budget Activity: **#4**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D175 AFAS MOFA FSD	- 0 -	5188	4951	18418	28557
D413 Armored Gun System	4937	37696	71231	106512	220376
PE TOTAL	4937	42884	76182	124930	248933

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element provides for a non-developmental integration item, high priority Armored Gun System (AGS) and Engineering Manufacturing Development (EMD) of the Multi-Option Fuze for Artillery (MOFA) in support of the AFAS.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND 1993:

(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 technological capabilities in support of the maneuver force. This project in fiscal years 1992 through 1996, inclusive, develops the Multi-Option Fuze for Artillery (MOFA). The MOFA will support AFAS automated ammunition handling requirements permitting the AFAS to meet extended range (40-50KM) rate-of-fire (12 rds/minute) and autonomous operations. This is not a new start in FY 1992.

(U) FY 1991 Accomplishments: Project funded in Advanced Technology Development (program element PE #0603004)

(U) FY 1992 Planned Program:
- (U) Initiate MOFA full-scale development
- (U) Fabricate fuze components
- (U) Conduct environmental and ballistic component tests

(U) FY 1993 Planned Program:
- (U) Integrate components into complete fuzes
- (U) Conduct environmental evaluation
- (U) Conduct full-up ballistic tests

(U) Program to Completion:
- (U) Initiate fabrication of fuses for engineering test
- (U) Conduct EMI rain, rammer and extended range
- (U) Production planning

(U) Work Performed By: Management will be accomplished by the Project Manager for the Advanced

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604645A**
PE Title: **Armored Systems Modernization (ASM)** Budget Activity: **#4**
Engineering Development

Field Artillery System, 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 support is provided by Harry Diamond Laboratory, Adelphi, MD; Ballistic Research Laboratory, Aberdeen Proving Ground, MD; Rock Island Arsenal, IL and Yuma Proving Grounds, AZ. Major contractors are to be determined.

(U) Related Activities:
PE #0603645A - AFAS AD There is no unnecessary duplication within the Army or OSD.

(U) Other Appropriation Funds: ($ in Thousands) None.

(U) International Cooperative Agreements: None.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604645**
PE Title: **Armored Systems Modernization (ASM) Engineering Development**

Project Number: **#413**
Budget Activity: **#4**

NO PICTURE AVAILABLE

POPULAR NAME: **Armored Gun System**

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

SCHEDULE	FY 1991	FY 1992	FY 1993	To Complete
Program Milestones	Acq Strat approved	Milestone I/II Review		Milestone IIIA Decision
Engineering Milestones		Prelim Design Rev Software Design Rev	Critical Design Rev	Production Readiness Review
T&E Milesones	TIWG initiated	TEMP approved	Ballistic Hull & Turret test	Technical Test Vulnerability test
Contract Milestones	RFP released	SSEB Complete EMD Contract Awd		LRIP Full Rate Production
BUDGET ($000)	**FY 1991**	**FY 1992**	**FY 1993**	**Program Total (To Complete)**
Major Contract		27700	59650	78950
Support Contract	1805	2874	6777	25466
In-House Support	532	2180	2060	2096
GFE/Other	2600	4942	2744	
Total	4937	37696	71231	106512

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604645** Project Number: **#413**
PF Title: **Armored Systems Modernization (ASM) Engineering Development** 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. Its role is to support infantry units in a direct fire mode, generally against bunkers, buildings, and in Military Operations in Urban Terrain (MOUT). It must also be able to defeat threat armor systems up to the frontal oblique of the tank most likely to be encountered in the XVIII Airborne Corps mission scenarios. Finally, our light contingency forces are required to be able to execute forced entry operations. To accomplish this they require an enhanced armor system that is capable of blowing entrances into buildings, defeating medium armored vehicles, and surviving. The AGS must be capable of insertion via low velocity air drop (LVAD). Project D413, Armored Gun System (AGS) will follow a non-developmental item (NDI) integration strategy. Initial funding was in FY 1991.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplsihments:
- (U) Initiated the program
- (U) Request for proposal (RFP) was released

(U) FY 1992 Planned Program:
- (U) Conduct source selection evaluation
- (U) Award contract for Engineering Manufacturing and Development (EMD) to produce six prototypes

(U) FY 1993 Planned Program:
- (U) Continue to fabricate EMD prototypes

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604645** Project Number: **#413**
PE Title: **Armored Systems Modernization (ASM) Engineering Development** Budget Activity: **#4**

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 laboratories are the Armament, Research, Development, and Engineering Center, Picatinny, NJ; Tank Automotive Command, Warren, MI. The contractors for the engineering manufacturing development (EMD) for these systems have yet to be selected.

E. (U) COMPARISON WITH FY 1991 AMENDED RDTE DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** XM35 Gun required to be GFE.
2. **(U) SCHEDULE CHANGES:** Contract Award moved to FY92.
3. **(U) COST CHANGES:** None.

F. (U) PROGRAM DOCUMENTATION: Not applicable.

G. (U) RELATED ACTIVITIES:
PE #0603004A (Weapons and Munitions Advanced Technology) relates to component work on advanced armaments development.
PE #0603005A (Combat Vehicle and Automotive Advanced Technology) relates to component work on advanced combat vehicle technology and advanced technology transition demonstrations.

ASM efforts are closely coordinated between all systems. Development information is coordinated and exchanged among the systems to avoid duplication and to capitalize on capabilities.

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

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
WEAPONS, COMBAT TRACKED VEHICLES			
Armored Gun System (SSN G82800)	- 0 -	- 0 -	4747
Production Base Support (PBS)	- 0 -	3000	- 0 -

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

J. (U) MILESTONE SCHEDULE:

MILESTONE	MILESTONE DATE
MS I/II	Mar92
MSIIIA	Dec94
MSIIIB	Dec97

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604649A** Project Number: **#DG26**
PE Title: **Engineer Mobility Equipment Development** Budget Activity: **#4**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
DG24	M1 Breacher System				
	- 0 -	- 0 -	- 0 -	31389	43544
DG26	Heavy Assault Bridge System				
	- 0 -	7900	2238	25425	32138

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program supports development of new and advanced combat engineer mobility equipment that will have mobility characteristics equal to the maneuver forces they support. Two systems are going to be developed. Both are Operation Desert Storm initiatives. The two systems currently under development are the Breacher and the Heavy Assault Bridge (HAB). Both systems will be built on the M1 chassis. The Heavy Assault Bridge will provide a 24 meter gap crossing capability (26 meter bridge) for military load class 70 vehicles. Launch time; 5 minutes: retrieve time 10 minutes. The M1 Breacher will provide the maneuver forces with the capability to conduct in-stride breaches of complex obstacles using a full width mine clearing blade and power driver excavating arm. The M1 Breacher is currently in advanced development.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND 1993:

(U) Project DG26 - Heavy Assault Bridge System: Evaluate all existing tactical military road class 70 bridging systems and select design that meets the Army's requirements. Develop and transition to procurement a 26 meter MLC 70 bridge and launcher on a refurbished M1 Abrams tank chassis.

(U) FY 1991 Accomplishments: Restructured from PE# 0604804, Project DH01
- (U) Program funding withdrawn
- (U) TT/EUT reduced to technical customer test
- (U) Source selection criteria/RFP canceled
- (U) GDLS and BMY delivered test vehicles

(U) FY 1992 Planned Program:
- (U) Begin comparative testing between GDLS and BMY versions
- (U) Program management assigned to PEO-ASM (ACATIII) Dec 92
- (U) Unsolicited Congressional funds ($8M) appropriated for 3rd bridge(NDI)
  - UK Contractor - NEI Thompson LTD can deliver 4QFY92
  - Letter contract to be issued Apr 92
- (U) Revise Acquisition Strategy to include 3rd competitor
- (U) IPR source selection process

(U) FY 1993 Planned Program:
- (U) Complete testing on all three competitors
- (U) Release RFP for down select
- (U) Begin source selection process

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604649A** Project Number: **#DG26**
PE Title: **Engineer Mobility Equipment Development** Budget Activity: **#4**

(U) Work Performed By: PEO-ASM (PM-CMV) has overall management responsibility for the HAB program. Day-to-day programmatics and conduct of the test program will continue to be managed by the Belvoir Research Development and Engineering Center. Matrix support will be provided by Troop Support Command and Tank-Automative Command. Production contract will be issued at TACOM. Principal contractors are GDLS, BMY, and Southwest Mobile Systems, (NEI Thompson (UK firm) to be subcontractor for bridge). The GDLS and BMY bridge systems are integrated onto a M1 chassis. The NEI system will be delivered for the FY93 test on a UK Chieftain chassis.

(U) Related Activities: N/A

(U) Other Appropriation Funds: N/A

(U) International Cooperative Agreements: NATO cooperative test.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604710A** Project Number: **#DL70**
PE Title: **Night Vision Systems - Engineering Development** Budget Activity: **#4**

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

Project Title: Night Vision Devices Engineering Development (ED)

Popular Name	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
Night Vision Devices Engineering Development	18681	34872 *	25325	Cont	Cont

* FY1992 Estimate includes $8M reimbursement for funds expended in support of Desert Shield/Desert Storm.

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 smoke, fog, and other battlefield obscurants. Development of and improvements to high performance night vision, electro-optic and laser systems will enable near to long-range target acquisition and engagement as well as improve battlefield command and control in "round-the-clock" combat operations. This project provides equipment required to meet stated deficiencies in close combat heavy and light mission areas to include fratricide, which are essential for the survivability of U.S. troops performing their operational mission.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:

- (U) Awarded Engineering and Manufacturing Development (EMD) contract for Thermal Weapon Sight (TWS) which is a manportable infrared imaging device used for surveillance and fire control on individual, crew served and heavy weapons during daylight or darkness and under extreme environmental battlefield conditions.
- (U) Completed EMD for Mini Eyesafe Laser Infrared Observation Set (MELIOS), a hand-held eyesafe laser rangefinder with integrated 7x observation telescope.
- (U) Initiated and completed technical and user test for MELIOS
- (U) Completed Technical and User Test for the Driver's Thermal Viewer (DTV), a thermal device for closed hatch driving or armored vehicles under adverse, dirty battlefield conditions.
- (U) Issued solicitation for AN/PLQ-04 Non Developmental Item (NDI) Laser Countermeasure System (LCMS) which is a hand-held laser countermeasure system used to detect and jam optical and electro-optical threats from aircraft, armor and infantry target acquisition systems.

(U) FY 1992 Planned Program:

- (U) Continue TWS EMD
- (U) Continue prototype development and user testing of Identification Friend or Foe (IFF) Thermal Identification Device (TID), the Quick Fix Plus Solution to provide a means to identify friend or foe.
- (U) Award EMD contract for AN/PLQ-04 NDI LCMS
- (U) Develop Scout Sensor Program (SSP) package providing scouts long range day/night target acquisition and observation with integrated laser rangefinder and stabilized optics.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604710A** Project Number. **#DL70**
PE Title: **Night Vision Systems - Engineering Development** Budget Activity: **#4**

(U) FY 1993 Planned Program:

- (U) Complete TWS EMD
- (U) Initiate technical and user test for TWS
- (U) Complete Development of AN/PLQ-04 NDI LCMS
- (U) Initiate and Complete Technical and User Test for AN/PLQ-04 NDI LCMS
- (U) Issue solicitations for AN/PLQ-05 LCMS EMD and AN/VAS-XX Drivers Vision Enhancer (DVE) ED. DVE is an infrared viewing device which will assist drivers of tactical wheeled vehicles to operate under blackout conditions at speeds up to 55 mph during conditions of degraded visibility.

D. (U) WORK PERFORMED BY: In-house efforts accomplished by US Army Communications and Electronics Command (CECOM), Ft. Monmouth, NJ and the CECOM Night Vision and Electro Optics Directorate (NVEOD), Ft. Belvoir, VA. Government management responsibility is the Program Executive Officer for Intelligence and Electronics Warfare and the Project Manager for Night Vision and Electro Optics (PM-NVEO). The Drivers Thermal Viewer is developed by Hughes Aircraft Corporation, El Segundo, CA. MELIOS is developed by Optic Electronics Corp. (OEC), Dallas, TX. TWS is developed by Hughes Aircraft Corporation, El Segundo, CA. Other contractors are to be determined.

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** None.
2. **(U) SCHEDULE CHANGES:** None.
3. **(U) COST CHANGES:** None.

F. (U) PROGRAM DOCUMENTATION:

Drivers Thermal Viewer (DTV)	
- Materiel needs statement from the M1A1 Block 2 improvement	5/82
Miniature Eyesafe Laser Infrared Observation Set (MELIOS)	
- Required Operational Capability (ROC)	2/87
- Acquisition Plan (AP)	11/87
Thermal Weapon Sight (TWS)	
- Acquisition Plan (AP)	5/89
- Operational and Organization (O&O) Plan	10/89
- Required Operational Capability (ROC)	8/90
Laser Counter Measure System (LCSM)	
- Operation and Organization (O&O) Plan	3/91
- Acquisition Plan (AP)	4/91
- Required Operation Capability (ROC)	9/91
Drivers Vision Enhancer (DVE)	
- Operational and Organization (O&O) Plan	6/91

G. (U) RELATED ACTIVITIES:
PE #0603710A (Night Vision Advanced Tech); PE #0603774A (Night Vision Systems Advanced Development)
There is no unnecessary duplication of effort within the Army or Department of Defense.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604710A** Project Number: **#DL70**
PE Title: **Night Vision Systems - Engineering Development** Budget Activity: **#4**

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

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
OTHER PROCUREMENT, ARMY (OPA2)	49.7M	102.9M	80.8M

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. (U) MILESTONE SCHEDULE:

- (U) DTV - Transition into production in FY 1992
- (U) MELIOS - Engineering and Manufacturing Development (EMD) contract from, FY 1989 to IQ FY 1991; testing from 1Q FY 1991 to 3Q FY 1991; production award 2Q FY92;
- (U) TWS - EMD contract from FY 1991-93; testing from FY 1993-94; production award 1Q FY95;
- (U) AN/PLQ-04 NDI LCMS - EMD contract from FY 1992-1993; Testing in FY 1993; Production Award FY 1994;
- (U) AN/PLQ-05 LCMS - EMD Contract from FY 1994-1996; Testing from FY 1996-1997; Production Award FY 1998;
- (U) DVE - EMD Contract from FY 1994-1997; testing from FY1996-1997; production award FY 1998

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604713A**
PE Title: **Combat Feeding, Clothing, and Equipment** Budget Activity: **#4**

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

Project Number / Title		FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D548	Military Subsistence Systems	703	1696	1471	Cont	Cont
D668	Soldier Enhancement Program	14693	22187	3459	Cont	Cont
DC40	Unit/Organizational Equipment	992	746	741	Cont	Cont
DL40	Clothing and Equipment	2677	3972	3792	Cont	Cont
PE TOTAL		19065	28601	9463		

B. (U) BRIEF DESCRIPTION OF ELEMENT: Enhanced soldier battlefield efficiency, survivability, and sustainment results from engineering development of improved unit/organizational equipment, clothing, individual equipment, fabric shelters, field service equipment, food and food service equipment. New food items and food service equipment will be developed to meet high nutrition requirements and reduce total food service logistics support requirements for all Services. This program involves engineering development of individual soldier protective items and systems. The protection counters existing and emerging enemy threats including ballistics, chemical/biological/nuclear, and directed energy surveillance as well as non-enemy threats such as environmental conditions. Mission essential items are developed for the total soldier force including the specialized requirements of aviator, combat vehicle crew members, Light Infantry Divisions, low intensity conflict units and ordnance personnel. This program supports development of a new generation of field service support items, small, large and collective protection shelters, decontamination items and improved field space heaters to sustain the soldier in the field.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND 1993:

(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 1991 Accomplishments:

- (U) Implemented required product improvements and design modifications/component changes of the Joint Service Medical Food Service-Navy identified with COMMZ system during Operation Desert Storm (ODS)
- (U) Design and develop improved food service equipment for Navy forces in the 1990's
- (U) Conducted field testing of the Multi-fuel Burner and issued a patent for this system

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604713A**
PE Title: **Combat Feeding, Clothing, and Equipment** Budget Activity: **#4**

(U) FY 1992 Planned Program:
- (U) Conduct a design review with user of an electric Initial Deployment Kitchen prototype for the Air Force that will be self-contained, rapidly deployable and operable in all climates

(U) FY 1993 Planned Program:
- (U) Conduct a Joint Service operational evaluation of Joint Service Medical Food Service System with Army/Air Force to assess and ensure compatibility of components with their field hospital requirements

(U) Project DC40 - Unit/Organizational Equipment: Develop new unit/organizational equipment and tentage to improve soldier mobility, sustainability and survivability.

(U) FY 1991 Accomplishments:
- (U) Completed testing and user evaluation of the Five Soldier Crew Tent (FSCT)
- (U) Conducted Production Proveout Testing (PPT) of the Improved Maintenance Shelter (IMS)
- (U) Conducted live agent testing of Nuclear, Biological, Chemical Protective Cover (NBC-PC)

(U) FY 1992 Planned Program:
- (U) Type Classify Standard the Five Soldier Crew Tent and transition to production
- (U) Complete PPT of the Improved Maintenance Shelter (IMS)
- (U) Type Classify Standard the NBC-PC and transition to production

(U) FY 1993 Planned Program:
- (U) Conduct initial operational test (IOT) of the Improved Maintenance Shelter (IMS)
- (U) Initiate EMD of the New Family of Tents (NFOT)

(U) Project DL40 - Clothing and Equipment: Develop new clothing and equipment items to improve soldier mobility, efficiency (lighten the soldiers load) and survivability.

(U) FY 1991 Accomplishments:
- (U) Type classified the intermediate Cold-Wet Boot and intermediate Cold-Wet Glove
- (U) Type classified the Desert Boot
- (U) Conducted test and evaluation on the ballistic/laser eye protection, the armored vehicle hearing protection and the chemical drinking system

(U) FY 1992 Planned Program:
- (U) Conduct test and evaluation on aviation cold weather clothing and artillery and combat vehicle crewman hearing protection
- (U) Type classify artillery and combat vehicle crewman hearing protection, improved chemical and environmental protective boots and gloves, and the interim chemical drinking system
- (U) Evaluate domestic and foreign chemical suit fabric/designs

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604713A**
PE Title: **Combat Feeding, Clothing, 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; the improved chemical and environmental protective boots and gloves; and the flechette/fragment protective vest
- (U) Type classify the ballistic/laser eye protection for combat soldiers
- (U) Type classify the aviation cold weather clothing

(U) Work Performed By: In-house work performed by US Army Natick Research and Development Center, Natick, MA; The Project Manager for Clothing and Individual Equipment, Woodbridge, VA;Project Office, Army Field Feeding, Ft. Belvoir, VA; Belvoir Research, Development and Engineering Center, Ft. Belvoir, VA; US Army Aviation Research Laboratory, Fort Rucker, AL; Ballistic Research Laboratory, Aberdeen Proving Ground (APG), MD; US Army Test and Evaluation Command, APG, MD; US Army Chemical Research, Development and Engineering Center, APG, MD; U.S. Army Armament, Munitions and Chemical Command, Rock Island Arsenal, Il; U.S. Army Communications and Electronics Command, Ft. Monmouth, NJ; Oakridge National Laboratories, Oakridge, TN; Contractors are: Kem-Tek Inc., Linwood, PA; American Optical Corp., South Bridge, MA; Safetech Inc., Newton, PA; and Research Inc., Waynesville, NC; International Thermal Research; Teledyne; New Born Industries; Environmental Technologies Group.

(U) Related Activities:

PE #0601102A (Defense Research Sciences) relates to basic research, PE #0602786A (Logistics Technology) relates to exploratory development of clothing subjects, food, food service equipment and organizational equipment PE #0603747A (Soldier Support/Survivability) provides advanced development of clothing and individual equipment items, food, food service equipment and organizational equipment PE #0203751A (Force enhancements-Active) relates to development of clothing and equipment items, food and food service items 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 fully coordinated joint Services effort. To prevent duplication, close coordination is maintained through joint Service working groups, joint Service agreements and circulation of requirements documents of clothing and individual equipment item development. 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.

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604713A** Project Number: **#D668**
PE Title: **Combat Feeding, Clothing and Equipment** Budget Activity: **#4**

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

Project Title: Soldier Enhancement Program

Popular Name	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
SEP	14693	22187	3459	Cont	Cont

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The FY92 SEP program consists of 61 separate projects to identify, test and evaluate equipment for the individual soldier, focusing on non-developmental and commercially available items whenever possible, to expedite the research and development process. SEP projects are intended to improve lethality, survivability and general combat effectiveness of the soldier. The focus of SEP is in four general areas: weapons and munitions, combat clothing, communications and navigation aids and food/water and shelter.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:

- (U) Accelerated evaluation of several Army field feeding items which greatly improved the Meal, Ready to Eat (MRE)
- (U) Conducted test and evaluation of the lightweight helmet, alternative fabrics for cold weather clothing and improved fabrics and design for the Desert BDU
- (U) Completed evaluation and type classification of the improved soldier flashlight
- (U) Initiated evaluation of commercial digital compasses
- (U) Developed and fabricated prototype candidates for destruction/neutralization of anti-personnel mines
- (U) Completed test of the Five Soldier Crew Tent
- (U) Conducted market survey for alternate ration heaters and adopted the Flameless Ration Heater
- (U) Initiated soft mount project for use with M2 machine gun and MK19 Grenade Launcher

(U) FY 1992 Planned Program:

- (U) Type Classify Standard the Five Soldier Crew Tent
- (U) Initiate development of the Collective Support Package (CSP) based on lessons learned from Operation Desert Shield/Storm (ODS)
- (U) Continue efforts to expedite introduction of improved ration items and equipment and complete development of self-heating meal
- (U) Complete evaluation of small area camouflage covers and the digital handheld compass
- (U) Initiate evaluation of components for a launched grapnel hook to clear trip wires
- (U) Conduct market survey to identify a voice ducer system for hands-free operation of standard Army radios
- (U) Type classify the lightweight helmet; alternative fabrics for cold weather program; and improved fabric and design for the Desert BDU
- (U) Initiate test and evaluation for Clothing and Individual Equipment (CIE) such as the improved

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604713A** Project Number: **#D668**
PE Title: **Combat Feeding, Clothing and Equipment** Budget Activity: **#4**

ballistic protective combat vehicle crewman (CVC) helmet; lightweight rainsuit; gloves and boots improved ballistic helmet suspension system; and improved hot weather and desert boots

- (U) Conduct test and evaluation of individual canteen endothermic chiller and individual soldier shaving kit
- (U) Test, evaluate and adopt Army Field Feeding and Food Service equipment for items initiated in FY92 IAW test and evaluation plans
- (U) Test, evaluate and adopt the CIE items initiated in FY92 IAW T&E plans
- (U) Select required design and procure 750 soft mounts for test and evaluation

(U) FY 1993 Planned Program:

- (U) Complete design and testing of selected candidates for destruction/neutralization of anti-personnel mines and boobytraps
- (U) Award contracts to buy components of the Collective Support Package and prepare to test
- (U) Continue development and introduction of new rations, items and equipment to improve the nutrition, reduce logistic burden and cost, and improve quality of life of the soldier in the field
- (U) Continue development of several projects designed to improve the lethality of the individual soldier to include a soft mount for the M2 MG/MK19 GMG, 30mm Grenade Launcher and improved munitions

D. (U) WORK PERFORMED BY: In-house work performed by US Army Natick Research and Development Centers, Natick, MA; PM,Clothing and Individual Equipment, Woodbridge, VA; Project Office, Army Field Feeding, Ft. Belvoir, VA; Belvoir Research, Development and Engineering Center, Ft. Belvoir,VA; US Army Aviation Research Laboratory, Fort Rucker, AL; Ballistic Research Laboratory, Aberdeen Proving Ground (APG), MD; US Army Test and Evaluation Command, APG, MD; US Army Chemical Research, Development and Engineering Center, APG, MD; US Army Armament, Munitions and Chemical Command, Rock Island Arsenal, IL; US Army Communications and Electronics Command, Ft. 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; International Thermal Research; Teledyne; New Born Industries; Environmental Technologies Group. There is no unnecessary duplication of effort within the Army or DoD.

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** None
2. **(U SCHEDULE CHANGES:** 37 new start projects added
3. **(U) COST CHANGES:** Funding increased

F. (U) PROGRAM DOCUMENTATION: Each of the 61 separate projects within SEP have individual program documentation

G. (U) RELATED ACTIVITIES:

PE #0601102A (Defense Research Sciences) relates to basic research.
PE #0602786A (Logistics Technology) relates to exploratory development of clothing subjects, food
PE #0203751A (Force Enhancements/Active) relates to development of clothing and equipment items, food

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604713A** Project Number: **#D668**
PE Title: **Combat Feeding, Clothing and Equipment** Budget Activity: **#4**

and food service items.
PE #0603802A (Weapons and Munitions Advanced Development)

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands) Not applicable

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
Other Procurement, Army			
OPA 3 Line 137 Soldier Enhancement Program (MA6800)	- 0 -	12300	11500

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

J. (U) MILESTONE SCHEDULE: Each of the 61 separate projects within SEP has an individual milestone schedule

AMENDED FY 1992/1993 BIENNIAL RDTE 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 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D241	Non-System Training Devices Combined Arms				
	21148	28258	17930	Cont	Cont
D573	Project Manager for Training Devices and Naval Training Systems Center Support				
	8917	9179	9160	Cont	Cont
D574	Combined Arms Tactical Trainer				
	1400	23649	15461	Cont	Cont
PE TOTAL	31465	61086	42551		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This continuing program provides for 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/system. Modern weapon systems are being integrated into the force at unprecedented rates, and the Army is faced with increased constraints on people, dollars, time and real estate in a training environment where ammunition and fuel costs continue to rise. Training devices and training simulation provide force multipliers that can improve combat effectiveness by providing realistic training scenarios while helping to control rapidly escalating costs. Maintaining the combat effectiveness of Army personnel is the key to maintaining a ready force. This combat effectiveness can best be achieved by innovative, efficient and results oriented training. The major thrust in development of new training devices is to maximize the transfer of knowledge, skills and experience from the training situation to a combat situation. Improved training devices, available through modern technology, must continue to be developed to provide the training required to prepare US soldiers to fight and defeat a numerically superior adversary. Beginning in FY92 development of Combat Training Center (CTC) unique training devices, simulators, simulations and instrumentation was transferred into this program element from TRADOC PE 65603, Project M992. 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, W. 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 devices for Army-wide use, including the CTCs. Project D573, PM TRADE/NTSC Support, provides for in-house salaries and support of PM TRADE and Naval Training Systems Center (NTSC) personnel. Project D574, Combined Arms Tactical Trainer (CATT), projects 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 BOTH FY 1992 AND 1993:

(U) Project D573 - Project Manager for Training Devices and Naval Training Systems Center Support: This continuing project funds the support of Project Manager for Training Devices (PM TRADE) personnel and a proportionate Army share of the operating costs of the Naval Training Systems Center (NTSC) through an inter-service support agreement which is reviewed annually.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604715A**
PE Title: **Non-System Training Devices - Engineering Development** Budget Activity: **#4**

(U) FY 1991 Accomplishments:
- **(U)** Funded PM TRADE personnel and NTSC support

(U) FY 1992 Planned Program:
- **(U)** Continue funding PM TRADE personnel and NTSC support

(U) FY 1993 Planned Program:
- **(U)** Continue funding PM TRADE personnel and NTSC support

(U) Work Performed By: In-house activities are performed by personnel of the Project Manager for Training Devices (PM TRADE) and Navai Training System, Orlando, FL.

(U) Related Activities:
PE #0604321A (All Source Analysis System)
PE #0605603A (Army User Test Instrumentation and Threat Simulators)
PE #0607727A (Non-System Training Device Technology)
To preclude duplication of effort, this project is closely coordinated with other services through Training and Personnel Technology Conferences, a Joint Service Technical Coordinating Group, worldwide staffing of Training Device Requirements, and collocation of the Project Manager for Training Devices with the Naval Training Systems Center and the Defense Training and Performance Data 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) Not applicable.

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604715A** Project Number **# D241**
PE Title: **Non-System Training Devices - Engineering Development** Budget Activity: **#4**

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

Project Title: Non-System Training Devices Combined Arms

Popular Name	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
NSTD Combined Arms	11436	21148	17930	Cont	Cont

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This continuing 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 multisystem training within the Army, to include the Reserve Components. The purpose of this project is to improve the effectiveness and efficiency of Army training. This is done by developing training devices which transfer to trainees the knowledge, ability, and experience required to fight outnumbered and win on the modern battlefield; (e.g. the Corps Battle Simulation is a command and control system used to train corps commanders, major subordinate commanders, and major subordinate elements in the conduct of deep operations/air land battle operations; and Simulated Area Weapons Effects for Artillery, Munitions, Mortars, Mines and Nonpersistent Chemical Agents which provides tactical engagement interface with Multiple Integrated Laser Engagement Simulation (MILES) and individual and unit training in force-on-force exercises.) Additionally, this project provides for the development of maintenance simulators for many Army weapon systems. Beginning in FY92 Project M992 funding was transferred from TRADOC and now this project funds the development of training devices, simulators, simulations and instrumentation for the Combat Training Centers, including the Battle Command Training Program. Included are computer simulations, instrumentation upgrades, Simulation Enhancement supporting the Battle Command Training Program (BCTP). Devices developed under this project will enable the Army to train the collective unit to obtain the synergistic results which occur when a unit's weapons and support systems are employed in their respective battlefield roles. Utilizing modern technology, these devices and simulations will enhance training effectiveness while minimizing the requirements for scarce resources.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- **(U)** Completed development of the Guard Unit Armory Device for Full Crew Interactive Simulation-Armor (GUARDFIST I)
- **(U)** Completed development of the Simulated Area Weapons Effects for Indirect Fire - Global Positioning System at the Combat Training Centers.
- **(U)** Completed development of the interim Corps Battle System (CBS) Deep Battle Integration Training (1.3); initiated development of CBS versions 1.3R (Reforger) and CBS 1.4
- **(U)** Initiated development of AGES II for the AH-64B

(U) FY 1992 Planned Program:
- **(U)** Funding for the continued development of devices, simulators and simulations to support the

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604715A** Project Number **# D241**
PE Title: **Non-System Training Devices - Engineering Development** Budget Activity: **#4**

National Training Center, the Joint Readiness Training Center and the Combat Maneuver Training Complex transferred to Project D241 in FY 1992/1993 from PE 0605603/992 (NTC RDMS upgrade Range Data Management System, AH-64 Inst. System.

- (U) Complete development of the Air Ground Engagement System (AGES II) for the AH-64 and the Armed OH-58
- (U) Complete CBS 1.3R for Reforger 92
- (U) Continue development of CBS 1.4 (includes $2.9M Congressional plus-up)
- (U) Initiate development of the Combat Service Support Training Simulation System

(U) FY 1993 Planned Program:

- (U) Continue development of the Combat Service Support Training Simulation System
- (U) Complete development CBS 1.4; Initiate development of War SIMULATION (WARSIM) 2000. Next Generation Battle Simulation
- (U) Continue development of devices, simulators and simulations to support training at the National Training Center, Joint Readiness Training Center and the Combat Maneuver Training Complex
- (U) Initiate development of JRTC Obj Inst System

D. (U) WORK PERFORMED BY: In-house PM TRADE activities are performed by the Naval Training Systems Center, Orlando, FL. Contractors include Jet Propulsion Laboratories Pasadena, CA., Loral Electro Optics Pasadena, CA., Daedalean, Inc. Woodbine, MD. and numerous contractors throughout the country.

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** None
2. **(U) SCHEDULE CHANGES:** None
3. **(U) COST CHANGES:** None

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 the Project Manager for Training Devices with the Naval Training Systems Center (NTSC) and Defense Training and Performance Data Center (TPDC) in Orlando, FL. There is no unnecessary duplication of effort within the Army or the Department of Defense.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604715A** Project Number # **D241**
PE Title: **Non-System Training Devices - Engineering Development** Budget Activity: **#4**

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

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
Other Procurement, Army (NA0100)	99513	84926	90668

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

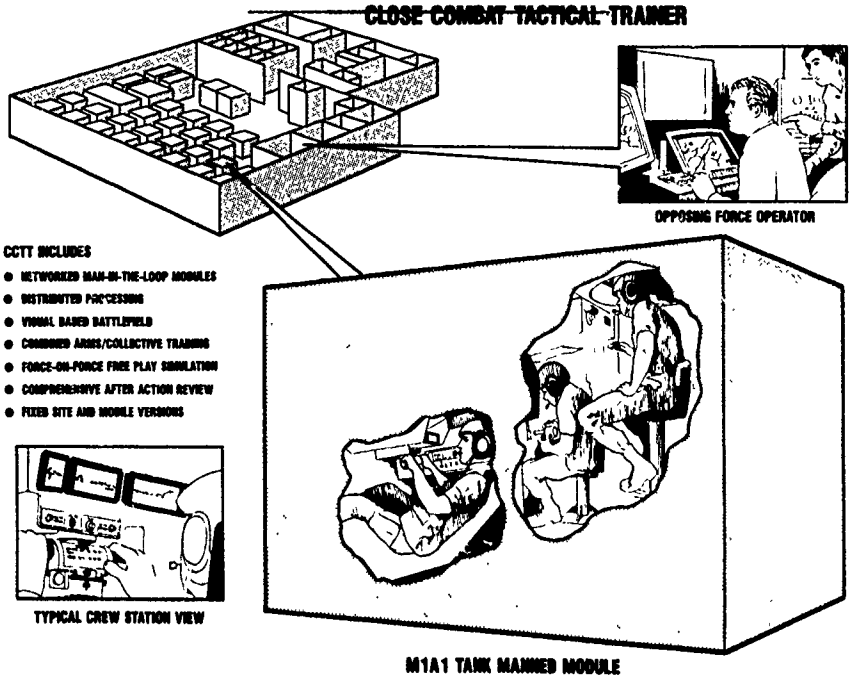
J. (U) MILESTONE SCHEDULE:

	Contract Award	Test Complete	Ready For Use
FY 1992:			
• (U) RDMS Upgrade	3Q92	1-2Q94	4Q94
• (U) CSSTSS	1Q92	1-2Q93	3Q93
FY 1993:			
• (U) JRTC Obj Inst System	1Q93	3Q95	3Q95

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604715A**
PE Title: **Non-System Training Devices - Engineering**

Project Number # **D574**
Budget Activity: **#4**



Popular Name CATT

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

SCHEDULE	FY 1991	FY 1992	FY 1993	To Complete
Program Milestones	AMSCI/II 6/91			AMSC III 1Q98
Engineering Milestones				
T&E Milestones		TEMP APP 10/91		DT 3Q95 ISTR 1Q97
Contract Milestones			Contract Award 10/92	PROD Options 1Q98
BUDGET ($000)	**FY 1991**	**FY 1992**	**FY 1993**	**Program Total (To Complete)**
Major Contract		22149	12331	99250
Support Contract	1020	780	1500	8500
In-House Support	7	537	1030	15100
GFE/ Other	373	183	600	5700
Total	1400	23649	15461	128550

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604715A** Project Number **# D574**
PE Title: **Non-System Training Devices - Engineering** Budget Activity: **#4**

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project provides for development of a series of trainers based on the Combined Arms Tactical Trainer (CATT) concept which envisions a training environment where all of the elements of the combined arms battlefield can be simulated and exercised at one time. The simulated environment selectively emulates equipment capabilities and establishes an environment which gives maneuver forces the opportunity to practice the art of synchronizing all applications of combat power without regard for peacetime restrictions of environment, economics or safety. It further envisions a training strategy in which units can conduct training at home station between field exercises. The Army will not procure a family of stand alone trainers based on proponent requirements. The common element will be interoperability on the network and database. Thus, helicopter modules at Fort Rucker will be able to operate, via long haul network, with tank and Bradley modules at Fort Knox or Grafenwoehr. These trainers will allow soldiers to practice, repetitively, techniques which if performed on real equipment, would be too hazardous, time consuming and expensive. These trainers enhance training realism and allow soldiers and units to learn tactical combat lessons on maneuver, command and control, and how to shoot without being killed, lessons heretofore learned only at the cost of soldiers' lives. The first two trainers in the CATT series are the Close Combat Tactical Trainer (CCTT) and the Aviation Combined Arms Tactical Trainer (AVCATT). Others will be added as proponents define their requirements.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- **(U)** Completed successful ASARC for MDR I/II

(U) FY 1992 Planned Program:
- **(U)** Award Engineering and Manufacturing Development contract for CCTT
- **(U)** Release RFP and conduct source selection activities

(U) FY 1993 Planned Program
- Continue development of CCTT

D. (U) WORK PERFORMED BY: In-house activities are performed by PM TRADE and the Naval Training Systems Center, Orlando, FL. Development contractor to be selected. Defense training and performance data center is providing assistance to project collection of data on performance characteristics of threat and friendly forces.

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** None
2. **(U) SCHEDULE CHANGES:** Contract award is deferred to 4QFY92.
3. **(U) COST CHANGES:** FY 92 funding includes $7.1 million Congressional addition. Due to delay in release of RFP some FY 92 funds will be obligated 4Q92 for major contract. The remainder will be carried over and obligated in 1Q FY93.

F. (U) PROGRAM DOCUMENTATION: Training device requirement (TDR) approved 4/91
Acquisition Decision Memorandum approved 10/91

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604715A** Project Number **# D574**
PE Title: **Non-System Training Devices - Engineering** Budget Activity: **#4**

G. (U) RELATED ACTIVITIES:

PE #0602727A (Non-System Training Devices Technology)
PE #0604801A (Aviation - Engineering Development)

To preclude duplication of effort, this project is closely coordinated with other services through Training and Personnel Technology Conferences, a Joint Service Technical Coordinating Group, worldwide staffing of Training Device requirements, and co-location of the Project Manager for Training Devices with the Naval Training Systems Center (NSTC) and Defense Training and Performance Data Center (TPDC) 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 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
PROCUREMENT			
Other Procurement, Army (NA0170-SIMNET)	- 0 -	- 0 -	- 0 -

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

J. (U) MILESTONE SCHEDULE:

Milestones	Milestones Dates
Milestone I/II Decision	3Q91
Contract Award	4Q92
PPQT and IOTE-Objective CCTT	4Q95-2Q97
Milestone III Decision	1Q98

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604716A (TIARA)** Project Number: **#D579**
PE Title: **Terrain Information - Engineering Development** Budget Activity: **#5**

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

Project Title: Field Army Mapping Systems - Engineering Development

Popular Name	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
DTSS/QRMP	10623	15062	12171	Cont	Cont

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This PE 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 battle field 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. The QRMP will provide rapid reproduction of up-to-date hard copy topographic documents.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- (U) Continued DTSS Engineering & Manufacturing Development (EMD) contract
- (U) Completed DTSS operational test
- (U) Continued DTSS P3I program
- (U) Conducted DTSS production decision inprocess review (IPR)
- (U) QRMP program restructured to insure affordability

(U) FY 1992 Planned Program:
- (U) Complete DTSS operational test and Milestone III
- (U) Award DTSS production contract
- (U) Award QRMP EMD contract

(U) FY 1993 Planned Program:
- (U) Accomplish DTSS First Unit Equipped (FUE)
- (U) Continue DTSS P3I program
- (U) Award QRMP EMD and complete critical designs

(U) Program Plan to Completion:
- (U) Accomplish DTSS Initial Operational Capability (IOC)
- (U) Continue DTSS P3I program & QRMP EMD
- (U) Accomplish QRMP Milestone III, FUE and IOC

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604716A (TIARA)** Project Number: **#D579**
PE Title: **Terrain Information - Engineering Development** Budget Activity: **#5**

D. (U) WORK PERFORMED BY: In-house work for the DTSS and the QRMP is accomplished at the U.S. Army Engineer Topographic Laboratories, Fort Belvoir,VA. The DTSS contractor is Loral Defense Systems Division, Akron, OH. The QRMP contractor is Xerox Corp., Pasadena CA.

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** DTSS/QRMP - Anticipates amended ROC to reflect an interim capability
2. **(U) SCHEDULE CHANGES:** DTSS/QRMP - Delay in awarding contract; other changes to be determined
3. **(U) COST CHANGES:** DTSS/QRMP - None, program restructure to fit available funding

F. (U) PROGRAM DOCUMENTATION:

Document	
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
Integrated Logistic Support Plan (ILSP)	05/87
Test & Evaluation Master Plan (TEMP)	04/88
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
Acquisition Strategy	09/87
Test & Evaluation Master Plan (TEMP)	09/87
Decision Coordinating Package (DCP)	09/87

G. (U) RELATED ACTIVITIES:
PE# 0604321A (Joint Tactical Fusion Program).
There is no unnecessary duplication of effort within DoD.

H. (U) OTHER APPROPRIATION FUNDS: ($in Thousands) Not applicable

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604716A (TIARA)**
PE Title: **Terrain Information - Engineering Development**

Project Number: **#D579**
Budget Activity: **#5**

J. (U) MILESTONE SCHEDULE:

Milestones	Milestones Dates
Digital Topographic Support System (DTSS): - System Delivery	12/90
Technical Test II	03/91
User Test II	03/92
Type Classification	09/92
Production Contract	10/92
First Article Test	06/93
First Unit Equipped	09/93
Quick Response Multicolor Printer (QRMP):	TBD

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604726A (TIARA)**
PE Title: **Integrated Meteorological Support System (IMETS)** Budget Activity: **#4**

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

Project Number Title	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
DD85 Integrated Meteorological System	- 0 -	4467	958		

B. (U) BRIEF DESCRIPTION OF ELEMENT: Project #D85, the Integrated Meteorological System (IMETS) is a shelter-contained operations and control system that includes the 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). The IMETS receives and processes weather and weather related inputs, provides an automated assist to the weather analysis and forecast functions, and disseminates weather effects tactical decision aids (TDAs) and forecast products. This is a new start in FY 1992.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND 1993:

(U) Project DD85 - Integrated Meteorological System

(U) FY 1991 Accomplishments: Project not funded.

(U) FY 1992 Planned Program:
- (U) Integrate three systems for development testing / operational testing
- (U) Integrate existing Army and Air Force software onto ATCCS common hardware processors/displays

(U) FY 1993 Planned Program:
- (U) Continue Army software integration
- (U) Transition to procurement
- (U) Complete testing
- (U) Field Block I systems to Echelons Above Corps (EAC)

(U) Work Performed By: In-house developing organizations are: Atmospheric Sciences Laboratory, White Sands Missile Range, NM (Software Development); the Army proponent is US Army Intelligence Center (preparation of requirements documents for development); US Army Communications Electronics Command (CECOM), Ft. Monmouth, NJ (development - Matrix Support); Program Executive Officer - Command & Control Systems (Systems Developer). The project manager for Electronic Warfare/Reconnaissance Surveillance Target Acquisition is assigned the responsibility for the Meteorological Data System (MDS). Atmospheric Sensor Work is performed by the US Army Atmospheric Sciences Laboratory and the Center for Electronic

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604726A (TIARA)**
PE Title: **Integrated Meteorological Support System (IMETS)** Budget Activity: **#4**

Warfare/Reconnaissance Surveillance Target Acquisition (EW/RSTA). Other involved organizations are: US Army Field Artillery School, US Army Atmospheric Sciences Laboratory, US Army Communications Command. US Army Test and Evaluation Command, US Army Logistics Evaluation Command, US Army Training and Doctrine Command.

(U) Related Activities:

- PE #0604321A - (ASAS Equipment)
- PE #0604716A - (Terrain Information - Engineering Development)
- PE #0603811A - (Meteorological Data System)
- Extensive coordination is conducted with other services and agencies to avoid duplication of effort. 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

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604740A (TIARA)** Project Number: **#D662**
PE Title: **Tactical Surveillance System-Engineering Development** Budget Activity: **#4**

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

Project Title: **Tactical Surveillance System-Engineering Development**

Popular Name	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
Tactical Surveillance System Engineering Development	6579	21666	20036	Cont	Cont

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 interface of the existing Imagery Exploitation Systems (IES) and engineering development and testing of the Tactical Radar Correlator (TRAC), which transfers from Tactical Surveillance System Advanced Development (PE #0603740 D560) in FY 1991. 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 (CJB), Volume VI, and the TENCAP Master Plan.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- (U) Initiated modernization program for XVIII Air Borne Corps (ABC) and USAREUR IES (MIES) to increase performance, downsize and guarantee maintainability
- (U) Deployed TRAC and USAREUR IES to SW Asia to support operation DESERT STORM. USAREUR IES was the imagery receiver for the theater command and TRAC supported over 311 TR-1 missions and processed 35,000 images.
- (U) Additional program detail requires special access and may be obtained per paragraph B above

(U) FY 1992 Planned Program:
- (U) Continue modernization program for IES
- (U) Initiate development of enhanced TRAC (ETRAC) system which is a downsized TRAC using a common synthetic aperture radar (SAR) processor and is capable of processing signals from multiple inputs

(U) FY 1993 Planned Program:
- (U) Field the modernized IES to XVIII Corps and continue development of MIES for USAREUR
- (U) Continue development of ETRAC and common SAR processor

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604740A (TIARA)** Project Number: **#D662**
PE Title: **Tactical Surveillance System-Engineering Development** Budget Activity: **#4**

D. (U) WORK PERFORMED BY: In-house efforts accomplished by US Army Topographic Engineering Center (TEC), Ft Belvoir, VA. Contractors: Aerospace Corp., El Segundo, CA; DBA, Inc., Melbourne, FL; and SAIC, Dayton, OH.

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** None
2. **(U) SCHEDULE CHANGES:** Initiated development of modernized IES and Enhanced TRAC (ETRAC)
3. **(U) COST CHANGES:** None

F. (U) PROGRAM DOCUMENTATION: Material Needs for Army Tactical Requirements for National Level Reconnaissance, May 73

G. (U) RELATED ACTIVITIES: PE #0603730A (Tactical Surveillance System-Advanced Development) provides the initial development efforts for timely and accurate 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.

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

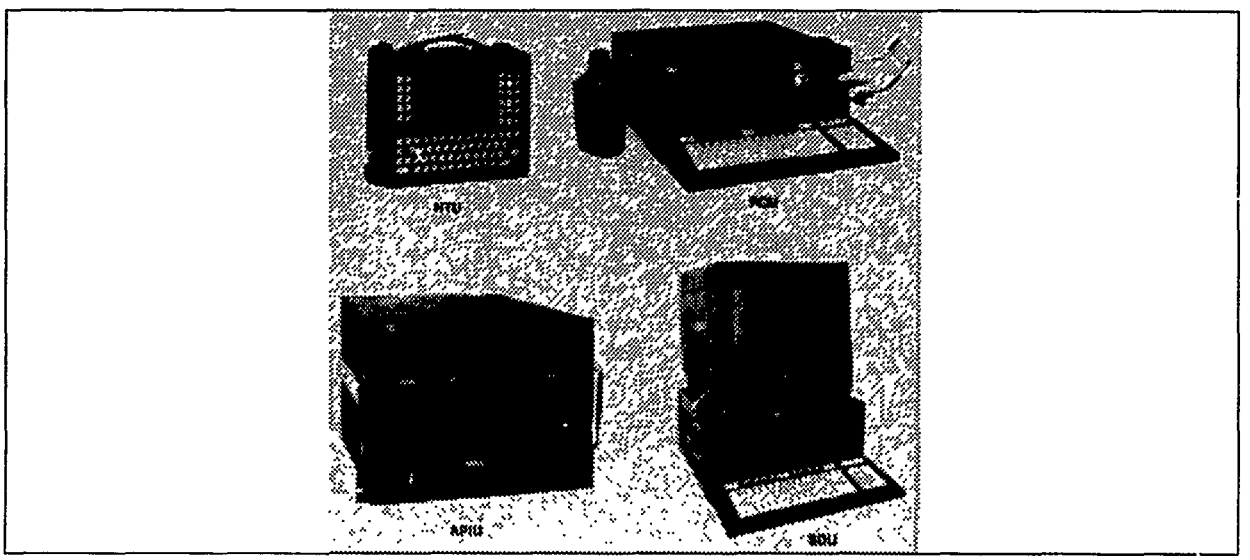
J. (U) MILESTONE SCHEDULE:

Milestones	Milestones Dates
Begin downsized TRAC development (ETRAC)	06/92
Complete ETRAC and field to XVIII ABC	06/95
Field MIES to XVIII ABC	11/92
Field MIES to XVIII ABC	11/93

AMENDED FY 1992/1993 BIENNIAL RDTE 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: **FAADC 2**

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

SCHEDULE	FY 1991	FY 1992	FY 1993	To Complete
Program Milestones	Lt Div Contr Awd 1/91		MDR III Aug Lt Div FUE 9/93	Hvy Div FUE 3/95
Engineering Milestones	CDR II V2 7/91	CDR V3 8/92	PCA CDR III 12/92	MDR III 1/95
T&E Milestones		TT Fire Unit 9/92	Lt Div IOTE 9/93	
Contract Milestones	Lt Division Contract Award	Heavy Division (V4) Contract award 12/91		
BUDGET ($000)	**FY 1991**	**FY 1992**	**FY 1993**	**Program Total (To Complete)**
Major Contract	28600	19696	20500	Cont
Support Contract	6200	3527	3705	Cont
In-House Support	7609	3491	7050	Cont
GFE/Other	13390	5096	9250	Cont
Total	55799	31810	40505	Cont

AMENDED FY 1992/1993 BIENNIAL RDTE 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**

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The Forward Area Air Defense (FAAD) Command and Control (C2) program addresses the need for automated command and control. Because of the improved capabilities of both the threat aircraft and FAAD weapons, the present Division Air Defense manual control capability does not support the force commander's need to manage air defense forces and use air defense weapons effectively. Incomplete and inaccurate engagement information to FAAD gunners by FAAD commanders and poor quality sensor data for the entire system cause deficiencies in air battle information. These deficiencies lead to missed opportunities to engage enemy aircraft and increased risk to friendly aircraft. A FAAD command and control system is necessary to improve the effectiveness of FAAD weapons and overcome present shortfalls by integrating weapons, sensors and aircraft identification systems through an automated command and control system. The FAAD C2 will consist of non-developmental computers, displays, and printers that are common to the Army Tactical Command and Control System (ATCCS), non-developmental ground sensors and required software. The system will be fully integrated with other FAAD elements and ATCCS and will use the Army Communications Systems for data transfer. The system will provide automation for exchange of Air Defense Artillery (ADA) force operations information, dissemination and acknowledgement of ADA engagement operations data, and air track data (alerting and cueing) from dedicated and remote sensor sources.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- (U) Continued hardware and software development
- (U) Awarded contract for light division early fielding
- (U) Conducted SW V2 laboratory demonstration
- (U) Continued FAAD integrated test support system
- (U) Conducted SW V3 critical design review (CDR)
- (U) Conducted Post-Deployment Realtime Interactive Simulator System (PRISS) SW V2 demo and V3 CDR

(U) FY 1992 Planned Program:
- (U) Continue hardware and software development
- (U) Complete light division integration, assembly and test and delivery of test system
- (U) Complete Light and Special Division Interim Sensor (LSDIS) integration
- (U) Conduct software V3 final qualification test
- (U) Accept delivery of validated technical manuals to support C2 test and instructor and key personnel training

(U) FY 1993 Planned Program:
- (U) Conduct force development test and experimentation
- (U) Conduct Physical Configuration Audit (PCA)
- (U) Conduct early user evaluation
- (U) Conduct Light Division initial operational test and evaluation (IOTE)

AMENDED FY 1992/1993 BIENNIAL RDTE 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**

- (U) Conduct Milestone Decision Review III (MDR)
- (U) First unit equipped (FUE) for Light Division

(U) Program Plan to Completion:
- (U) FUE for Heavy Division
- (U) Complete Heavy Division IOTE
- (U) Conduct Milestone Decision Review III for Heavy Division

D. (U) WORK PERFORMED BY: Program Management is performed by the Project Manager, Air Defense Command & Control Systems, assigned to the Program Executive Officer, Command & Control Systems Ft. Monmouth, N.J. FAADC 2 Systems Integration and Software Development Contractor is TRW, Redondo Beach, CA.

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:
1. **(U) TECHNICAL CHANGES:** None
2. **(U) SCHEDULE CHANGES:** None
3. **(U) COST CHANGES:** None

F. (U) PROGRAM DOCUMENTATION:

FAAD C2I Required Operational Capability (ROC)	7/86
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	5/90
FAAD C2I ROC Updated	11/90

G. (U) RELATED ACTIVITIES:
PE #0604820A (Radar Development)
PE #0603740A (Air Defense C2 I - Advanced Development)
PE #0603757A (FAAD System)
PE #0603706A (IFF - Advanced Development)
PE #0604709A (IFF - Engineering Development)
PE #0203739A (Air Defense C2 I Modifications)
PE #0604818A (Army Tactical Command and Control Hardware and 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) Not applicable.

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

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

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604746A**
PE Title: **Automatic Test Equipment Development** Budget Activity: **#4**

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

Project Number Title	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D537 Integrated Family of Test Equipment (IFTE)	902	1396	2114	Cont	Cont
DL10 Electro-Optic Test Equipment	2974	5973	2664	Cont	Cont
DL59 Diagnostics/Expert System Development	4343	10809	3683	Cont	Cont
PE TOTAL	8219	18178	8461		

B. (U) BRIEF DESCRIPTION OF ELEMENT: State-of-the-art weapon and support system electronic circuitry has rapidly outpaced the capability of the Army's present inventory of test, measurement and diagnostic equipment (TMDE) to adequately test weapon systems. To meet required operational readiness standards in sophisticated systems state-of-the-art, modular, reconfigurable automatic test equipment (ATE) that can satisfy the largest possible test requirements across each equipment commodity area. A requirement exists at unit level of maintenance for ATE capable of fault isolating to line replaceable units (LRU) in major weapon systems. ATE must be simple to operate and expandable across commodity lines. An urgent requirement exists for maintenance at Division and Echelons Above Corp (EACs) to support complex communications and electronics-intensive commodities such as missiles, aircraft and combat vehicles. This ATE must be capable of repairing LRUs as well as screening printed circuit boards (PCBs). In addition, maintenance units must be capable of dispatching contact teams to forward areas with portable ATE to perform this mission. The Integrated Family of Test Equipment (IFTE) project consisting of the Base Shop Test Facility (BSTF), Commercial Equivalent Equipment (CEE), Contact Test Set (CTS), Electro-Optics (E-O) test equipment, Army Test Program Set Support Environment (ATSE), and Diagnostic/Expert Systems Development will meet this mission need in the 1990-1999 timeframe. To meet the Army's requirement for general purpose testers at division level maintenance, non-developmental approaches are utilized to determine requirements, identify and evaluate candidate commercial items for acquisition. To conserve the Army's investment in Test Program Sets (TPS) and maintenance methods/procedures, state-of-the-art technologies in expert systems and artificial intelligence are being developed for application to paperless maintenance and trouble shooting manuals, as well as battlefield electronic displays.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND 1993:

(U) Project D537 - Integrated Family of Test Equipment (IFTE): This project supports the development of ATE that provides automated testing of electronic-intensive weapon systems at maintenance levels in Divisions and EACs. IFTE will automatically test and verify the operation of LRUs and screen shop replaceable units (SRUs). In FY 1989, Engineering and Manufacturing Development (EMD) was completed and a low-rate initial production contract awarded.

AMENDED FY 1992/' '93 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604746A**
PE Title: **Automatic Test Equipment Development** Budget Activity: **#4**

(U) FY 1991 Accomplishments:
- (U) Completed first article test
- (U) Completed Initial Operational Test and Evaluation (IOTE)
- (U) Awarded hardware option for FY 1991 requirements
- (U) Initiated subsystem level competition

(U) FY 1992 Planned Program:
- (U) Conduct Milestone IIIB In-Process Review (IPR)
- (U) Award full production contract
- (U) Develop high speed digital capability
- (U) First unit equipped
- (U) Support All Source Analysis System (ASAS) during their IOTE and verify incorporated changes from IFTE IOTE.

(U) FY 1993 Planned Program:
- (U) Conduct follow-on test and evaluation
- (U) Completion of EMD contract
- (U) Continue fielding of BSTFs

(U) Project DL10 Electro-Optics (E-O) Test Equipment: This project supports the EMD of the E-O test equipment which will be the standard, general purpose, automatic test equipment for Army E-O systems at all levels of maintenance. Electro-optics program (EOP) will provide the Army with a modern and enhanced replacement for the Land Combat Support System (LCSS), a technologically obsolete and difficult to maintain ATE. The EOP is structured in two parts. In FY 1992, the Part I EMD contract will be awarded to develop the on-system Contact Test Set-Electro-Optic Augmentation (CTS-EOA) with technology test/initial operational test and evaluation occurring in FY 1994. FY92 effort will include the development of the E-O requirement for the IFTE Commercial Equivalent Equipment (CEE). CTS-EOA for the Avenger and the Gunner's Primary Sight will be completed. No E-O efforts for the Army tank community (M1 Abrams, BFV or TOWII) will be completed. Part 2 EMD contract will be awarded in FY 1992 to integrate the off-system BSTF with the Navy Consolidated Automated Support System (CASS) Electro-Optic Bench (EOB).

(U) FY 1991 Accomplishments:
- (U) Completed proof-of-concept EOA for the M1 TPS
- (U) Issued request for proposal (RFP) and evaluate proposals
- (U) Conducted Milestone II In-Process Review (IPR).
- (U) Coordinated with Navy CASS program and procure one FOB for use with the BSTF and one for use with the CEE.

(U) FY 1992 Planned Program:
- (U) Award EOA Contract
- (U) Award EMD contract for BSTF-EOB to integrate the CASS EOB with the BSTF
- (U) Commence development of E-O TPS for Army Weapon Systems

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604746A**
PE Title: **Automatic Test Equipment Development** Budget Activity: **#4**

(U) FY 1993 Planned Program:

- **(U)** Complete E-O TPS for Army Weapon Systems
- **(U)** Complete integration of one EOB with the BSTF
- **(U)** Test the integrated BSTF-EOB with the E-O-TPS

(U) Work Performed By: In-house efforts will be accomplished by Communications-Electronics Command, Fort Monmouth, NJ. Major contractor is Grumman Aerospace Corporation, Bethpage, Long Island, NY.

(U) Related Activities:
PE #0603001A (Logistics Advanced Technology)
There is no unnecessary duplication of effort within the Army or Department of Defense.

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

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
OTHER PROCUREMENT, ARMY			
IFTE (KA4000)	33587	67089	72748

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604746A** Project Number: **DL59**
PE Title: **Automatic Test Equipment Development** Budget Activity: **#4**

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

Popular Name	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
Diagnostics/Expert System Development	4343	10809	3683	Cont	Cont

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project supports full-scale development and non-developmental items for expert/diagnostic systems and general purpose test equipment. Included in this program are market surveys of commercially available general purpose electronic test equipment (GPETE); evaluation/validation of test-equipment performance and requirements envelopes; development of diagnostic hardware and software with system-specific databases and tools; interface/host software on targeted hardware; and evaluation of Test Program Sets (TPSs) for conversion to new standard ATE. State-of-the-art technologies in expert systems and artificial intelligence use of paperless maintenance and troubleshooting manuals, battlefield use of electron-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.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- (U) Analyzed depot TPS workloads
- (U) Commenced prototype development of expert system software for APACHE.
- (U) Analyzed ability of the CTS to diagnose additional major weapon systems and initiate software development to support weapons at Direct Support (DS) level
- (U) Developed electronic manuals for the All Source Analysis System (ASAS)
- (U) Awarded CTS Instrumentation-On-A-Card (IAC) contract
- (U) Conducted First Article Test (FAT) for CTS IAC
- (U) Completed CTS [illegible]egration
- (U) Commenced development of the Bradley Fighting Vehicle System (BFVS), Expert System Troubleshooter (BEST)
- (U) Supported TEMOD acquisitions in the development of specifications and Bid Sample test procedures, conducted market surveys and testing of Bid Samples

(U) FY 1992 Planned Program:
- (U) Complete the Bradley Fighting Vehicle System (BFVS) Expert System Troubleshooter (BEST)
- (U) Complete expert system for sub-systems of the APACHE.
- (U) Commence development of expert systems for HAWK
- (U) Support TEMOD acquisitions in the development of specifications and Bid Sample Test procedures, conduct market surveys and test Bid Samples
- (U) Develop and test new Instrumentation-on-a-Card (IAC)
- (U) Field CTS III
- (U) Analyze current General Support (GS) maintenance workload

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604746A** Project Number: **DL59**
PE Title: **Automatic Test Equipment Development** Budget Activity: **#4**

- (U) Commence transition of GS Diagnostic software to standard automatic test equipment (ATE). Effort includes workload generated by 11 weapon systems (i.e. APACHE, SINCGARS, TACFIRE) to include approximately 100-140 diagnostic software programs for the Army. Other services will fund their individual TPS developments.

(U) FY 1993 Planned Program:

- (U) Test and field the BFVS Expert System Troubleshooter (BEST)
- (U) Test and field expert systems for sub-systems of the APACHE
- (U) Complete development of Expert System for HAWK
- (U) Develop and test additional IAC
- (U) Develop and test a "C" size VXI instrumentation chassis
- (U) Support test measurement and diagnostic (TEMOD) acquisitions
- (U) Complete transition of GS diagnostic software programs to standard automated test equipment (ATE).

D. (U) WORK PERFORMED BY: In-house efforts will be accomplished by US Army Test, Measurement and Diagnostic Activity, Redstone Arsenal, AL. Tobyhanna Army Depot, Tobyhanna, PA, Picatinny Arsenal (Armament Research, Development and Engineering Center) Picatinny, NJ. 8A competitive contracts to be awarded.

E. (U)COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: The Acquisition Executive determined that in order to provide GS maintenance support for systems currently supported by obsolete automatic test equipment (ATE), the GS maintenance workload be transitioned to the state-of-the-art standard ATE. This action resulted in budget increases to support the transitioned GS maintenance support for 11 weapon systems (such as APACHE, SINCGARS, TACFIRE).

2. (U) SCHEDULE CHANGES: There will be no schedule impact on the initial operational capability (IOC) of the standard ATE. The transitioned GS maintenance workload will result in higher utilization rates for the standard ATE.

3. (U) COST CHANGES: Congressional increase of $7.0M to FY92 program for to provide GS maintenance support for 11 weapon systems currently supported by obsolete ATE. This will fund the Army requirements for 100-140 diagnostic software programs. Weapon systems will include the SINCGARS, Apache, TACFIRE and others.

F. (U) PROGRAM DOCUMENTATION: Not applicable

G. (U) RELATED ACTIVITIES:
PE # 0603001A (Logistics Advanced Technology)
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: None

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604766A (TIARA)** Project Number: **#D909**
PE Title: **Tactical Electronic Surveillance System - Engineering Development** Budget Activity: **#4**

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

Project Title: **Tactical Electronic Surveillance System - Engineering Development**

Popular Name	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
Tactical Electronic Surveillance System	15803	20702	34136	Cont	Cont

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project supports the engineering development directed at meeting the tactical commanders intelligence mission requirements for contingency force deployment and deep battle — surveillance and targeting - as stated in Field Manual 100-5. Specific signals intelligence (SIGINT) and multi-spectral developments are managed within the Army's Tactical Exploitation of National Capabilities (TENCAP) program. The scope of the program is directed towards advanced techniques and capabilities to exploit National and selected theater capabilities that uniquely meet stated Army tactical intelligence and targeting needs and deficiencies, for near-real-time receipt, analysis, and dissemination into the appropriate tactical echelon. As a result of events during Desert Shield/Desert Storm, in FY 92 the Congress mandated that in the near-term Tactical Warning/Attack Assessment (TW/AA) capabilities be provided by direct data down link to the theater level tactical commander by means of a mobile tactical terminal. To support this congressional intent, the Office of the Secretary of Defense provided $15.0 Million for FY93 to the US Army for the required engineering development to exploit the US Army Strategic Defense Command's (USASDC) Tactical Surveillance Demonstration (TSD). 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) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:

- **(U)** Continued integration of Tactical Data Information Exchange System-B/Tactical Receive Equipment (TADIXS-B/TRE) capabilities into existing systems
- **(U)** Continued joint programs to exploit National capabilities for tactical force enhancements, to include Collection Management Support Tools (CMST) efforts with the Navy for CMST Upgrades.
- **(U)** Initiated engineering development, application software upgrade evaluation to support location of critical nodes, targeting and specific emitter identification and tracking
- **(U)** Continued refinements of the Electronic Processing Dissemination (EPDS) family of equipments to fully exploit the national capabilities; and the upgrade these systems to Defense Intelligence Agency directed National Imagery Transmission Format (NITF)
- **(U)** Began development of prototype Mobile Integrated Tactical Terminal (MITT), downsized Tactical High Mobility Terminal (THMT) for deployment with light and contingency forces
- **(U)** Continue to support field exercises and demonstrations for operational requirements and tactical utilization of TENCAP capabilities
- **(U)** Deployed 4 EPDS, 3 Enhanced Tactical User Terminals (ETUT), 5 THMT, and 7 Forward Area Secondary Imagery Dissemination Tactical Related Application (FAST) Prototyped TADIXS-B/TRE and imagery receive and display terminals to SW Asia in support of Desert Shield/Desert Storm

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604766A (TIARA)** Project Number: **#D909**
PE Title: **Tactical Electronic Surveillance System - Engineering Development** Budget Activity: **#4**

- (U) Integrated TADISX-B/TRE receive capability into 17 designated TENCAP Systems which supported targeting and provided early SCUD Missile and provided early SCUD Missile warning to maneuver CORPS and divisions.
- (U) Software support for the Prototype All Source Analysis System (ASAS) Work Station (PAWS) based Tactical High Mobility Terminal (THMT) was not funded after 1990 in the TENCAP program, and support had not yet been picked up by the ASAS Program. When the decision was made to deploy the PAWS-based THMT to Saudi Arabia, software upgrades were required. These included bringing the system to the current software level of other TENCAP THMTs that were baselined on Perkin-Elmer computers (vis-a-vis) the VAX-based PAWS, and to include the ability to accept the Tactical Event Reporting Scenario (TERS)-SCUD alert messages. These upgrades totaled approximately $650K which was reimbursed in the FY92 Desert Storm Supplemental.

(U) FY 1992 Planned Program:

- (U) Continue upgrades for the refinement of the Electronic Processing and Dissemination (EPDS) suite of equipments to fully exploit the national capabilities to meet the changing threat environment
- (U) Continue development of prototype MITT for deployment with light and contingency forces
- (U) Continue CMST improvements to include a new man-made interface on-line dynamic data base updates and a color printer.
- (U) Continue 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 equipments 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) Engineer and develop downsized system hardware, and install re-hosted software on new mobile TSD tactical terminal, and complete end-to-end hardware and software test.
- (U) Define and develop necessary operations and training requirements and manuals for the TSD terminals
- (U) Coordinate and accomplish integration of necessary communications suite for incorporation with the TSD hardware/software suite.
- (U) Develop necessary support requirements and package for TSD tactical terminal and related communications suite

D. (U) WORK PERFORMED BY: In-house development agencies: USASDC, Huntsville, AL, Fairfax, VA; CECOM, Ft. Monmouth, NJ; Contractor; Gen Corp AEROJET Space Systems Division, Azusa, CA.

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: In addition to previously described mission, in FY93, the engineering development of a mobile tactical terminal for enhanced stereo processing of infrared satellite data will be accomplished.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604766A (TIARA)** Project Number: **#D909**
PE Title: **Tactical Electronic Surveillance System - Engineering Development** Budget Activity: **#4**

2. (U) SCHEDULE CHANGES: In Dec 1993, the first TSD mobile tactical terminal and support vehicle and equipment will be completed.

3. (U) COST CHANGES: The $14.0 million increase in FY93 funding is to support engineering development for the TSD mobile tactical terminal.

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 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
OTHER PROCUREMENT, ARMY: BZ7315	8149	5556	5453

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

J. (U) MILESTONE SCHEDULE:

Milestones	Milestones Dates
Field and test second MITT	8/93

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604768A**
PE Title: **BAT**
Project Title: **BAT**

Project #: **D641**
Budget Activity: **#4**

POPULAR NAME: **BAT**

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

SCHEDULE	FY 1991	FY 1992	FY 1993	Program Total (To Complete)
PROGRAM MILESTONES	MSII - MAY 91			MS III 1ST QTR FY97
ENGINEERING MILESTONES		CDR- MAY 92	TDP-1 - OCT 93	
T&F MILESTONES				
CONTRACT MILESTONES	EMD CA - JUN 91		LLTI CA - JAN 94	LRIP I - 1 QTR FY 95 LRIP II - 1 QTR FY 96 FRP - 2 QTR FY 97
BUDGET ($000)	**FY 1991**	**FY 1992**	**FY 1993**	**To Complete**
MAJOR CONTRACT	22900	84715	93400	Cont Cont
SUPPORT CONTRACT	1376	4840	3817	Cont Cont
IN-HOUSE SUPPORT	2209	14926	13829	Cont Cont
GFE/OTHER	270	11253	10413	Cont Cont
TOTAL	26755	115734	121459	Cont Cont

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604768A**
PE Title: **BAT** Project #: **D641**
Project Title: **BAT** 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 designed for deep attack of operating armored vehicles. This submunition is capable of being delivered by a variety of missiles. The Army has postulated a Pre-Planned Product Improvement (P^3I) program in compliance with the Acquisition Decision Memorandum for MS II. The goal of the P^3I program is to increase submunition lethality, sensor(s) capability, countermeasure resistance, and the capability for selective target attacks. With regard to lethality, the warhead would be improved to defeat future, more robust armor. With regard to sensor(s) capability, countermeasure resistance, and selective target acquisition, an alternate sensor(s) will be selected and developed which would increase submunition effectiveness against "cold" and "dug-in" targets.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- (U) Program declassified
- (U) ASARC II - 22 Feb 91
- (U) DAB II - 13 May 91
- (U) Conducted Two End-To-End System Tests
- (U) Completed Extended Proof or Principle Program (EPOP)
- (U) Awarded Engineering and Manufacturing Development (EMD) Contract - 5 Jun 91

(U) FY 1992 Planned Program:
- (U) Continued EMD Program
- (U) Critical Design Review
- (U) Initiate Prototype Line
- (U) Perform Component Tests
- (U) Software, Hardware and Algorithm Development
- (U) Windtunnel Testing
- (U) Conduct Data Collection Campaigns
- (U) Army Tactical Missile System (TACMS) Integration Analysis and Test

(U) FY 1993 Planned Program:
- (U) Continue EMD Program
- (U) Produce Prototype Test Hardware
- (U) Conduct Design Verification Flight Tests
- (U) Qualify Major Subsystems
- (U) Initiate P^3I Program

(U) Program to Completion:
- (U) This is a continuing program.
- (U) Long Lead Program Review (CSC)
- (U) Award Long Lead Time Item (LLTI) Contract
- (U) Production Readiness Review
- (U) Internal Functional and Physical Configuration Audits
- (U) Complete Submunition Environmental Tests

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604768A**
PE Title: **BAT** Project #: **D641**
Project Title: **BAT** Budget Activity: **#4**

- (U) Final Contractor Developmental Test & Live Fire Test
- (U) Delivery Vehicle DT/OT Tests
- (U) Integration Tests with the Delivery Vehicle.
- (U) EMD completion early FY 95
- (U) Continue P^3I Program
- (U) Low Rate Initial Production (LRIP) Decision
- (U) Submunition Readiness Data (SRD)
- (U) MS III
- (U) Full Rate Production Decision.

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 IR system subcontractor.

E. (U) COMPARISON WITH PRIOR BIENNIAL RDTE DESCRIPTIVE SUMMARY: This is the first submission for this Program Element. BAT was a classified program prior to the start of EMD.

F. (U) PROGRAM DOCUMENTATION:

Test and Evaluation Master Plan (TEMP)	11/90
System Threat Assessment Report (STAR)	11/90
Required Operational Capability	03/91
Integrated Program Summary (IPS)	04/91

G. (U) RELATED ACTIVITIES: The BAT Submunition integrates with the following weapon systems:

- Program Element/Project #64767/637, Tri-Service Standoff Attack Missile (TSSAM)
- Program Element/Project #23802/050, Multiple Launch Rocket System
- Program Element/Project #23802/P26, Army Tactical Missile System

H. (U) OTHER APPROPRIATION FUNDS: None

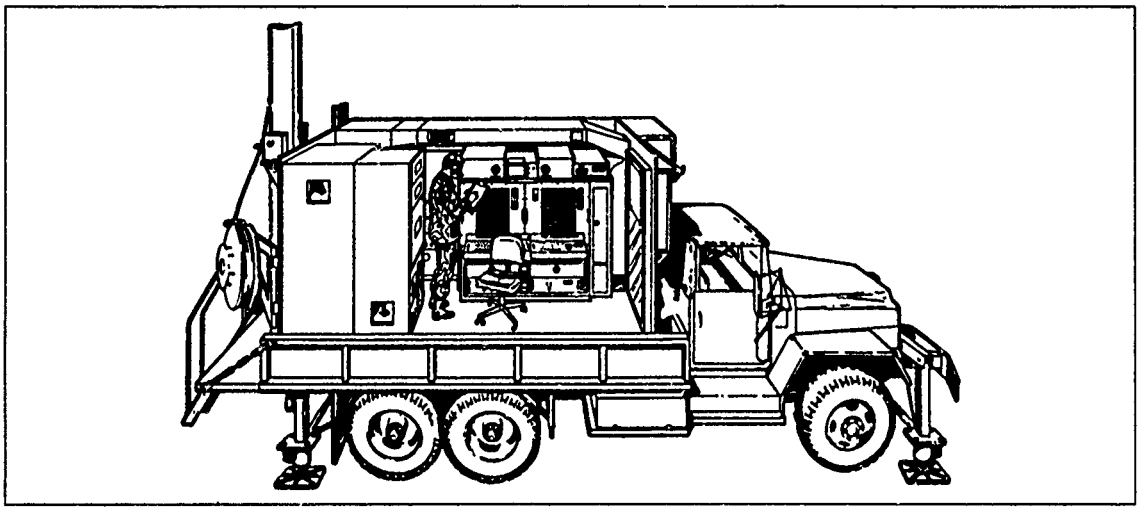
I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: None

J. (U) TEST AND EVALUATION DATA: Through Simulations and testing during 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 and Contractor Developmental Tests (CDT) in FY 94. Final System Development Test (DT) and Operational Test (OT) will be conducted in the later part of FY 94 and FY 95 with a final full-up OT in FY 96 prior to the BAT MS III decision.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604770A (TIARA)**
PE Title: **Joint Surveillance and Target Attack Radar System**
Project Title: **Army Joint STARS**

Project Number: **D202**
Budget Activity: **#4**



POPULAR NAME: **Army Joint STARS**

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

SCHEDULE	FY 1991	FY 1992	FY 1993	To Complete
Program Milestones			Block I Milestone IIIA 3/93	Block II GSM MS III Block IIA MSIII 11/94 Interim GSM FUE 8/94 Block IIA FUE 8/97 Block II GSM FUE 9/98
Engineering Milestones	Block I SW CDR 7/91		Block IIA CDR 3/93	Block II GSM CDR 2/94
T&E Milestones	Joint SLPE 9/91	Block I TT/UT 9/92	Block I LUT 12/92	Block II GSM TT/UT 4/94 Block I GSM FAT 3/95 Block IIA TT/UT 2/94 Block I MOTE 12/94 Block II TT/UT 7/95
Contract Milestones		Block IIA EMD 03/92	Block II GSM EMD Awd 1/93 Block I Prod 3/93	
BUDGET ($000)	**FY 1991**	**FY 1992**	**FY 1993**	**Program Total (To Complete)**
Major Contract	29886	51721	9286	Cont
Support Contract	7514	5575	4835	Cont
In-House Support	3483	6875	5052	Cont
GFE/Other	2217	5000	12750	Cont
Total	43100*	68635**	31213	Cont

* Includes $7.9 M FY 91 Desert Storm Supplemental
** Includes $20.0 M FY 92 Congressional increase

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604770A (TIARA)**
PE Title: **Joint Surveillance and Target Attack Radar System**
Project Title: **Army Joint STARS**

Project Number: **D202**
Budget Activity: **#4**

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This is a TIARA program. The US Army lacks the capability to detect, locate, track and attack targets beyond ground line of sight. The long-range, wide-area, near-real-time moving and fixed target surveillance and tracking capabilities of the Joint Surveillance and Target Attack Radar System (JSTARS) are critical to executing air land battle across the operational continuum, providing battle management and targeting of enemy units at critical times and places so that commanders can employ their organic forces and firepower. JSTARS supports commanders engaged in linear and non-linear battles, and provides enhanced indications and warning. The JSTARS program resulted from a merger of the Army's Stand-Off Target Acquisition System (SOTAS) and the Air Force's PAVE MOVER airborne radar programs. The joint program objective is to develop a radar, data link and E-8 (militarized Boeing 707) airframe that will provide the capability to locate, track, and classify tracked and wheeled vehicles beyond groundline of site during the day and night and under most weather conditions. The Army JSTARS program consists of the development and fielding of Ground Station Modules (GSM) to enhance corps, division and brigade commanders' battle management and targeting capabilities. The GSMs are tactical data processing and evaluation centers that receive sensor data from multiple sources such as radar data from the JSTARS E-8, OV-1D Mohawk and Unmanned Aerial Vehicle (UAV) platforms. The GSMs are co-located with Corps/Division Artillery Tactical Operations Centers, Multiple Launch Rocket System Tactical Operations Centers, and corps/division/brigade tactical operations centers. They distribute information to other users through the Army Tactical Command and Control System (ATCCS) which includes the All Source Analysis System (ASAS) and the Tactical Fire Direction System/Advanced Field Artillery Tactical Data System (TACFIRE/AFATDS). In FY 1988, the GSM program was restructured to capture all the user requirements, to synchronize GSM and E-8 fieldings, and to field GSMs in time to support other "targeting" programs. In order to achieve these objectives,the existing interim GSM (IGSM) will be enhanced in a phased effort with objective GSMs fielded in blocks I, II, IIA and III configurations. Block I in an S-280 shelter on a 5-ton truck; Block II in an Electronic Fighting Vehicle System (EFVS) on a Bradley chassis; Block IIA in a Standard Integrated Command Post System (SICPS) on a High Mobility Multi-Purpose Wheeled Vehicle (HMMWV); and Block III (to be determined) will be the Intelligence Electronic Warfare (IEW) Common Ground Station (CGS) JSTARS GSM system capabilities were very successfully demonstrated during their deployment to Saudi Arabia in support of Operation Desert Storm in January and February 1991. All six Engineering and Manufacturing Development (EMD) IGSMs (total Army GSM assets at that time) were deployed in direct support of combat forces and provided essential real-time targeting, battle management and intelligence data. JSTARS proved that it is a major force multiplier and has been assessed as the single most valuable targeting and intelligence system in Desert Storm.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:

- **(U)** Very successfully deployed and supported combat forces in Saudi Arabia during Operation Desert Storm
- **(U)** Initiated technical testing of Block I GSM
- **(U)** Required Operational Capability (ROC) updated to include Block II A (SICPS shelter on HMMWV)
- **(U)** US Army/US Air Force Four Star Summit revalidated operational requirements.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604770A (TIARA)** Project Number: **D202**
PE Title: **Joint Surveillance and Target Attack Radar System** Budget Activity: **#4**
Project Title: **Army Joint STARS**

(U) FY 1992 Planned Program:

- (U) Complete technical testing of the multi-sensor Block I GSM
- (U) Start Block II A GSM development per Congressional direction
- (U) Contract award for Block II GSM
- (U) Integrate Block I components into a Block II prototype (EFVS on Bradley chassis)
- (U) Continue incremental testing of the Joint STARS system
- (U) Complete Conventional Systems Committee (CSC) Review (emphasis on USAF long lead procurement)

(U) FY 1993 Planned Program:

- (U) Complete Block I Limited User Test (LUT)
- (U) Milestone IIIA on Block I GSM production
- (U) Award limited procurement contract for 12 Block I GSMs
- (U) Start EMD of the Block II GSM
- (U) Continue development of the Block IIA GSM

(U) Program Plan to Completion:

- (U) Completion of Block I detailed objective design
- (U) Integration of Block I components into Block II, IIA, III
- (U) Testing as required for Blocks I,II, IIA, III
- (U) Production awards for Blocks I, II, IIA, III
- (U) Complete First Unit Equipped (FUE) with Block I FY 95
- (U) Initial Operation Capability (IOC) (both Army (GSMs) and Air Force (E-8 aircraft)) FY 97
- (U) Complete production/fielding of Block I,II, IIAs to Force Package 1 by FY 99
- (U) Upgrade GSMs as required
- (U) Develop, produce and field Block III.(IEW Common Ground Station)

D. (U) WORK PERFORMED BY: The Army 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. The principle contractor 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, Norwalk, CT, and Cubic Corporation, San Diego, CA. The Air Force effort is directed by the Program Executive Officer for Tactical Strike, the Pentagon, and the Joint Program Director, Hanscom AFB, MA.

E. (U) COMPARISON WITH FY 1991 AMENDED RDTE DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: As a result of Operation Desert Storm experience and advancing technology, several technical changes are being incorporated to enhance GSM capabilities (primarily communication and data processing).

2. (U) SCHEDULE CHANGES: Operation Desert Storm deployment caused minor GSM schedule delays and Congressional direction has accelerated Block IIA development (HMMWV mounted).

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604770A (TIARA)** Project Number: **D202**
PE Title: **Joint Surveillance and Target Attack Radar System** Budget Activity: **#4**
Project Title: **Army Joint STARS**

3. (U) COST CHANGES: Average unit procurement cost remains unchanged. Total program cost has increased based on additional quantities required as result of decision to deploy GSMs to brigade level. Increased casts driven by technical enhancements and schedule changes (1 & 2 above) offset by reduction in unit cost as result of increased quantity requirement.

F. (U) PROGRAM DOCUMENTATION:

Under Secretary of Defense (USD) (RDT&E) Memo (Formed the Joint Program Office)		5/82
Air Force/Army Memorandum of Understanding (MOU)		4/85
Operational and Organizational (O&O)		9/88
Test and Evaluation Master Plan (TEMP)		12/88
Decision Coordinating Paper (DCP) Army Annex:		2/88
DA Interfaces Review		6/88
Block I GSM Integrated Logistic Support Plan (ILSP)		1/89
Joint Services Operationa. Requirement (JSOR)	Update	12/90
Required Operational Capability (ROC)	Update	3/91
Four Star Summit		11/91
Conventional System Committee Review		2/92

G. (U) RELATED ACTIVITIES:

- The Joint STARS program combined the Army's Stand Off Target Acquisition System (SOTAS) and the Air Force's PAVE MOVER airborne radar projects
- The Airborne Radar Demonstrator System, a NATO Cooperative R&D FY 1986 Nunn Amendment Legislative Program
- The Airborne hardware is funded in PE #0604770F (Joint Surveillance and Target Attack Radar System (Joint STARS))
- This merger ensures that there is no duplication of effort within either the Army, Air Force, or the Department of Defense
- The Program Director is appointed by the Air Force; the Deputy Program Director by the Army. The Deputy Director is dual hatted as the Army Project Manager for the GSM.
- The Program Office is manned jointly, ensuring that day-to-day Army/Air Force coordination is maintained

H. (U) OTHER APPROPRIATION FUNDS: OPA 2 BA 1080 FY93 36212

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Airborne Radar Demonstration System NATO Contract (Awarded Sept 87, completed Jun 91).

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604770A (TIARA)**
PE Title: **Joint Surveillance and Target Attack Radar System**
Project Title: **Army Joint STARS**

Project Number: **D202**
Budget Activity: **#4**

J. (U) TEST AND EVALUATION DATA:

1. Test and Evaluation Activity:
The Army test community including Army Material Systems Analysis Activity (AMSAA), Test and Evaluation, Command (TECOM), and the Operational Test Evaluation Command (OPTEC) will be involved in all test efforts. Test integration working group procedures are being utilized in coordinating the Army test community actions.

2. Test and Evaluation Schedule:

Test and Evaluation Activity

Event	Planned Date	Actual Date	Remarks
IGSM Technical Testing (TT)	3QFY90	Dec 90	Contractor qualification testing complete
Continuous test evaluation	Ongoing	Ongoing	Continuous evaluation being conducted on GSM's in CONUS and OCONUS
Block I Technical testing/(TT)	3QFY91-4QFY92		Block I GSM will undergo formal TT Mar- Sep 92
Block I Limited User Test (LUT)	Nov-Dec 92		Two phased User Test to support MS IIIA decision (sched Mar 93)
Multi-Service Op Test & Eval (MOTE)	Nov 94-Jul 95		Joint Army/Air Force system level operational test & eval.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604778A**
PE Title: Positioning Systems Development — Budget Activity: **#5**

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

Project Number Title	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D163 Modular Azimuth Positioning System Hybrid Product Improvement Program (MAPS Hybrid PIP)	- 0 -	3957	9873	4211	18041
D168 NAVSTAR Global Positioning System (NAVSTAR GPS) Equipment	6305	- 0 -	- 0 -	- 0 -	157262
PE TOTAL	6305	3957	9873	4211	175303

B. (U) BRIEF DESCRIPTION OF ELEMENT: Project #D163 provides for full scale engineering development of a hybrid Modular Azimuth Positioning System (MAPS) and integration engineering into one host system Howitzer Improvement Program (M109A6 HIP). 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 need of local survey control and limit inertial navigation system position errors. Project #D168 provides increased effectiveness on the battlefield, and improved navigation capabilities to determine weapons systems and fighting units positions under adverse weather conditions, day or night, in all environmental conditions, worldwide. The NAVSTAR GPS provides the Army this capability at a significant expected reduction in life cycle cost. GPS consists of 24 satellites, a satellite control segment, and user equipment sets for combat and combat support vehicles, aircraft (rotary/fixed wing), manpacks, and watercraft. The system provides global, highly accurate information which satisfies a significant portion of Army navigation and positioning missions. This is a joint program. The Air Force is developing and procuring the satellites and control segment, and the Services are jointly developing and procuring a family of user equipment to satisfy Joint Service needs.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND 1993:

(U) Project D163 - Modular Azimuth Positioning System Hybrid Product Improvement Program (MAPS Hybrid PIP) provides for full scale engineering development of a hybrid Modular Azimuth Position System (MAPS) and integration engineering into one host system Howitzer Improvement Program (M109A6 HIP). 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 need of local survey control and to limit inertial navigation system position errors. Survivability will be enhanced by eliminating the need to stop for position updates. The MAPS HYBRID will be a product improvement to the M109A6 HIP and to the Advanced FIREFINDER. It is also planned to use the MAPS HYBRID on the Fire Support Combat Observation Lasing Team. This is not a new start but a Hybrid Product Improvement of existing MAPS.

(U) FY 1991 Accomplishments: Project not funded

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604778A**
PE Title: Positioning Systems Development — Budget Activity: **#5**

(U) FY 1992 Planned Program:
- (U) Finalize system architecture
- (U) Design MAPS HYBRID
- (U) Define HIP modification (hardware and software)

(U) FY 1993 Planned Program:
- (U) Fabricate prototype MAPS HYBRID
- (U) Modify HIP
- (U) Initiate system integration

(U) Project D168 - NAVSTAR Global Positioning System provides increased effectiveness on the battlefield, and improved navigation capabilities to determine weapons systems and fighting units positions under adverse weather conditions, day or night, in all environmental conditions, worldwide. The NAVSTAR GPS provides the Army this capability at a significant expected reduction in life cycle cost. GPS consists of 24 satellites, a satellite control segment, and user equipment sets for combat and combat support vehicles, aircraft (rotary/fixed wing), manpacks, and watercraft. The system provides global, highly accurate information which satisfies a significant portion of Army navigation and positioning missions. This is a joint program.

(U) FY 1991 Accomplishments:
- (U) Finalized logistics support
- (U) Continued enhanced technology update implementation
- (U) Continued integration into various aircraft through Army Aviation Modernization Program
- (U) Current development program completed in FY 1991

(U) FY 1992 Planned Program: Project not funded

(U) FY 1993 Planned Program: Project not funded

(U) Work Performed By:
NAVSTAR GPS - Rockwell/Collins, Cedar Rapids, Iowa is the contractor for Joint Service user equipment. Texas Equipment, Plano, TX is contractor for non-developmental item (NDI) Manpack/Vehicle sets and Canadian Marconi and SCI of Huntsville, AL are contractors for aircraft sets. Internal Army program support and development is provided by the U.S. Army Communications - Electronic Command (CECOM), Ft. Monmouth, NJ.
MAPS HYBRID PIP - MAVD Division, Honeywell Inc. of Clearwater, FL is the production MAPS Dynamic Reference Unit (DRU) contractor. BMY at York, PA is the prime HIP contractor.

(U) Related Activities:
- (U) This is a joint program with participation by all the Armed Services
- (U) The revised Required Operational Capability (ROC) for the MK109A6 HIP and Advanced FIREFINDER include a requirement for initialization and update of the inertial positioning system and orientation system without the need of local survey control. The ROC for a new forward observer system, called the Fire Support Combat Observation Lasing Team will also incorporate the MAPS HYBRID. This effort will accomplish the development of the MAPS HYBRID; while application of the MAPS HYBRID to the production M109A6 Howitzer, as well as its application to Advanced FIREFINDER, will

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604778A**
PE Title: Positioning Systems Development — Budget Activity: **#5**

be accomplished via product improvement programs.

- **(U)** There is no unnecessary duplication of effort within the Army or DOD.

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

(U) International Cooperative Agreements:
NAVSTAR GPS -A Memorandum of Understanding with ten NATO nations was signed on 6 June 1984 amended on 14 April 1987. This memorandum provides for the exchange of information, coordination of developments and joint test and evaluation activities.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604801A**
PE Title: **Aviation - Engineering Development** Budget Activity: **#4**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D275	Synthetic Flight Training System				
	259	- 0 -	6701	Cont	Cont
DC45	Aviation Life Support System - Engineering Development				
	6500	11098	9528	Cont	Cont
DE70	Aviation Non-System Training Devices				
	9824	2889	- 0 -	Cont	Cont
PE TOTAL	16583	13987	16229		

B. (U) BRIEF DESCRIPTION OF ELEMENT: Funds engineering development of programs associated with 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. Aviation Non-System Training Devices (Project DE70) supports development of generic rotary wing aircraft (RWA) that are applicable to more than one aviation system. Aviation network (AIRNET), the DARPA proof-of-principle project has been succeeded by the aviation test bed (AVTB), a simulator system that supports realistic force-on-force combat training.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND 1993:

(U) Project D275 - Synthetic Flight Training System: This Project (SFTS) supports development of a family of high-fidelity flight, weapon, and mission helicopter simulators to support initial-entry helicopter pilot training, transition training, and combat operational training.

(U) FY 1991 Accomplishments:
- (U) Funds reprogrammed to support air-ground engagement system (AGES) II for AH-64.

(U) FY 1992 Planned Program: Project not funded.

(U) FY 1993 Planned Program:
- (U)Initiate development of Apache AH-64 integrated crew sustainment trainer (ICST), a transportable, reduced fidelity version of the AH-64 combat mission simulator (CMS).

(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 1991 Accomplishments:

- (U) Continue full-scale engineering development of AIRNET under Advance Distributed Simulator Training (ADST) for two reconfigurable rotary wing aircraft (RWA) devices.

(U) FY 1992 Planned Program:

- (U) Continue development of AIRNET/AVTB with reconfigurable modules.

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

(U) Work Performed By: The Project Manager for Training Devices (PM TRADE) is assigned responsibility for the development of flight simulators. In the past, the primary contractor has been CAE Link, Flight Simulator Division, Binghamton, NY. In-house activities are performed by the Project Manager for Training Devices and the Naval Training Systems Center, Orlando, FL. Full-scale engineering development work is performed by Loral Systems Corporation and various commercial subcontractors such as BBN Laboratories, Inc., Cambridge, MA, and BDM, McLean, VA, and others.

(U) Related Activities: 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 (PMs) in order to prevent duplication of effort and ensure proper priority of efforts. For coordination of training device technology 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 elements #0603003A (Aviation Advanced Technology) and #0602727A (Nonsystem Training Devices 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.

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

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
AIRCRAFT PROCUREMENT, ARMY			
SSN AZ3800	1000	- 0 -	- 0 -

(U) International Cooperative Agreements: Not applicable

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604801A**
PE Title: **Aviation - Engineering Development**
Project Number: **#DC45**
Budget Activity: **#4**

A. (U) RESOURCES: ($ in Thousands)
Project Title: Aviation Life Support System-Engineering Development

Popular Name	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
ALSE	6500	11098	9528	Cont	Cont

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project will provide engineering 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, integrated with 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; 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; improved effectiveness of decontamination; improved survival kit packaging with recent materials technology.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- (U) Completed Milestone III in-process review and type classification action for M43 Protective Mask Preplanned Product Improvement (P3I).
- (U) Initiated engineering development of and staffing action for Aircrew Integrated Helmet System (AIHS).
- (U) Initiated engineering development of laser protective devices in support of AIHS.
- (U) Initiated procurement staffing for engineering development of Aircrew Microclimatic Cooling System (AMCS).

(U) FY 1992 Planned Program:
- (U) Fabricate prototype aircrew integrated helmets, integrated with laser protective devices, improved crash protection and night vision sighting devices, and all other subsystems.
- (U) Fabricate and test prototype laser protective devices in support of Aircrew Integrated Helmet Program.
- (U) Initiate engineering development of AMCS, design and fabricate prototypes.

(U) FY 1993 Planned Program:
- (U) Continue engineering development of laser eye protection.
- (U) Complete engineering evaluation and operational testing of AIHS.
- (U) Test and evaluate AMCS prototypes and initiate engineering design of NBC Cockpit Filtration System.
- (U) Design and Fabricate Aircraft Module Survival Systems (AMSS). P3I Items not available during basic program MS III.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604801A** Project Number: **#DC45**
PE Title: **Aviation - Engineering Development** Budget Activity: **#4**

D. (U) WORK PERFORMED BY: Major contractors performing work for this project are: Gentex, Inc., Carbondale, PA; American Optical, Southbridge, MA; and Midwest Research Institute, Kansas City, MO. In-house work by CRDEC, APG, MD; LAIR, San Francisco, CA and USAARL, Ft. Rucker, AL.

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** None.
2. **(U) SCHEDULE CHANGES:** Helmet/Laser delayed 3 months from 12/93 to 3/94.
   NBC internal and external decon III changed from 12/94 to 12/96.
3. **(U) COST CHANGES:** None.

F. (U) PROGRAM DOCUMENTATION:

G. (U) RELATED ACTIVITIES:
PE #0602211A (Aviation Technology)
PE #0603801A (Aviation-Advanced Development)
There is no unnecessary duplication of effort within the Army or DoD.

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

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
AIRCRAFT PROCUREMENT, ARMY			
Aviation Life Support Equipment (SSN AZ3110)	4633	277	8197

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

J. (U) MILESTONE SCHEDULE:

Milestones	Milestones Dates
Laser Eye Protection, III	3/94
AIHS, III	3/94
AMCS, III	6/94
NBC I/E Decon, III	12/96
AMSS, P3I, III	10/95
NBC Contamination Avoidance, III	12/97

FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604802A**
PE Title: **Weapons and Munitions - Engineering Development** Budget Activity: **#4**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D031 25mm Ammunition Development	6420	- 0 -	- 0 -	- 0 -	65346
D286 Field Artillery Ammunition (NATO) Engineering Development	450	- 0 -	- 0 -	Cont*	Cont*
D531 105mm Howitzer Ammunition Improvement	- 0 -	997	5113	5018	11600
D613 120mm Mortar	4104	- 0 -	- 0 -	- 0 -	49500
PE TOTAL	10974	997	5113		

* Restructured to PE #0605805, D293 effective FY 1992.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program effort provides coordinated programs in direct-fire combat and indirect-fire support for airland battle operations. Specifically, the projects supported are: (1) Provide for the fielding of an extended range artillery projectile (2) Provide for improved 25mm ammunition for the Bradley Fighting Vehicle (3) Provide the engineering development of a multi-purpose munition for the individual soldier to defeat targets such as light-armored vehicles and personnel behind walls and in bunkers. (4) Develop a dual purpose improved conventional munition (DPICM) for the 105mm howitzer; (5) Complete non-developmental 120mm Mortar weapon system and development and technical test of a family of enhanced ammunition (6) Provide a new 105mm dual purpose improved conventional munition (ICM) for light forces.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND 1993:

(U) Project D031 - 25mm Ammunition Development: 25mm Cartridge Project supports increases in kill probability at effective ranges.

(U) **FY 1991 Accomplishments:**
- (U) Cartridge trace and dispersion anomalies corrected
- (U) LOVA propellent effort terminated
- (U) Barrel erosion study initiated for M919 and M791 cartridges

(U) **FY 1992 Planned Program:** Program not funded

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

(U) Project D286 - Field Artillery Ammunition (NATO) Engineering Development: Project supports US/ NATO howitzer and ammunition capability

FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604802A**
PE Title: **Weapons and Munitions - Engineering Development** Budget Activity: **#4**

(U) FY 1991 Accomplishments:
- **(U)** Continue NATO ammunition interchangeability firings under a NATO quadrilateral memorandum of understanding (MOU)

(U) FY 1992 Planned Program:
- **(U)** This project is restructured and transferred to PE #0605805A, Project D293

(U) Project D531 - 105mm Howitzer Ammunition Improvement: Develop a new 105mm dual purpose improved conventional munition (DPICM) for light forces for increased lethality and area coverage.

(U) FY 1991 Accomplishments: Project not funded

(U) FY 1992 Planned Program:
- **(U)** Initiate and complete development engineering phase I

(U) FY 1993 Planned Program:
- **(U)** Initiate development engineering phase II

(U) Project D613 - 120mm Mortar: Project supports qualification of nondevelopmental 120mm Mortar weapon and completes development of a family of enhanced ammo.

(U) FY 1991 Accomplishments:
- **(U)** Conducted qualification test on HE, illumination, and smoke cartridges
- **(U)** TC - LRP HE and illumination cartridge smoke cartridges

(U) FY 1992 Planned Program: Project not funded

(U) FY 1992 Planned Program: Project not funded

(U) Work Performed By: In-house efforts by the Armaments Research, Development and Engineering Center, Picatinny Arsenal, NJ; Harry Diamond Laboratories, Adelphi, MD; PM Advanced Field Artillery Systems, Picatinny Arsenal, NJ; PM Howitzer Improvement Program, Picatinny Arsenal, NJ; PM Mortars, Picatinny Arsenal, NJ; and the Advanced Antitank Weapon Systems Project Office, Program Executive Office for Fire Support, Huntsville, Al. Major contractors are Marquardt Corporation; McDonnell Douglas Corporation; Brunswick Corporation; Martin Marietta Corp., Bethesda, MD; Soltam Ltd., Israel; and Israeli Military Institute, Israel. Other contractors are to be determined.

(U) Related Activities:
PE #0603004A, (Weapons and Munitions - Advanced Technology)
PE #0602624A (Weapons and Munitions Technology
PE #0602120A (Electronic Survivability and Fuzing Technology)
PE #0602623A (Joint Service Small Arms Program)
PE #0603607A (Joint Service Small Arms Program)
PE #0602709A (Night Vision Technology)

FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604802A**
PE Title: **Weapons and Munitions - Engineering Development** Budget Activity: **#4**

PE #0603802A (Weapons and Munitions-Advanced Development)
PE #0604601A (Infantry Support Weapons)
There is no unnecessary duplication of effort within the Army or Department of Defense. Continuous coordination with other services/agencies and oversight is made by the OSD Conventional Systems Committee.

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

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
Weapons and Tracked Combat Vehicles, Army, G02100 (120mm mortar)	12326	27000	16000
Ammunition, Army, E76300, E08210, E25501, E25502, E25504, E61200	99925	155127	47000

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE 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 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D194 Engine Driven Generators Engineering Development	856	1650	1256	Cont	Cont
D279 Airdrop Equipment Engineering Development	5126	6143	4673	Cont	Cont
D429 Tactical Rigid Wall Shelters Engineering Development	4386	2483	3583	Cont	Cont
D461 Marine Oriented Logistical Equipment Engineering Development	2000	- 0 -	- 0 -	Cont	Cont
DH01 Combat Engineer Equipment Engineering Development	7657	4460 *	4646	Cont	Cont
DH14 Logistics Support Equipment Engineering Development	1	712	4793	Cont	Cont
DL39 General Support Equipment Engineering Development	1397	1171	1662	Cont	Cont
DL41 Fuels Handling Equipment Engineering Development	955	1489	1470	Cont	Cont
PE TOTAL	22378	18108	22083		

* Supplemental appropriation funds for Operation Desert Storm (ODS) in the amount of $2102K are included

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program supports engineering development (ED) of new and advanced general combat support and combat service support equipment. The tactical bridging provides dry and wet bridging for the Heavy Forces such as, the Heavy Assault Bridge (HAB), the MLC 70 version of the Armored Vehicle Launched Bridge (AVLB) and the Improved Ribbon Bridge (IRB) transporter. This program supports tactical rigid wall shelters that increase the efficiency and survivability of shelter systems and provide protection for personnel and equipment necessary to sustain operations in nuclear, biological, and chemical (NBC) environments. Development of materiels and container handling equipment, water and petroleum distribution systems, containers, and marine craft will provide efficient delivery of ammunition, water, food, medical supplies, and fuel from supply ships through existing ports and forward to combat forces. The Lighter, Amphibian, Heavy Lift (LAMP-H) was terminated. Improved water purification capabilities, including the ability to desalinate sea water, meet critical operational requirements in arid environments. This program funds engineering development of tactical electric power generation equipment and associated equipment. The Engine Driven Generator project will provide generators with reduced noise and thermal signatures, increased fuel efficiency, improved mobility, improved reliability, and will support the single fuel on the battlefield concept. This program also supports advanced development of airdrop equipment and techniques to reduce airdrop aircraft vulnerability to enemy air defenses, to improve operational capability to conduct airborne assault, including rapid deployment operations, and to provide improved airdrop resupply capability for both airborne and conventional forces of all services.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND 1993:

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604804A**
PE Title: **Logistics and Engineer Equipment - Engineering Development** Budget Activity: **#4**

(U) Project D194 - Engine Driven Generators Engineering Development: Develop and transition to procurement a series of diesel engine powered generators.

(U) FY 1991 Accomplishments:
- (U) Continued system technical performance assessments
- (U) Conducted IPR for Standard Integrated Command Post System Auxilliary Power Unit (SICPS APU) and complete testing of APU family
- (U) Initiated development and testing program of less than 3kW generator sets
- (U) Completed development and testing of lightweight 15kW power unit
- (U) Continued materiel change management for Tactical Quiet Generator (TQG) sets

(U) FY 1992 Planned Program:
- (U) Complete development and coordination of multiple power usage database
- (U) Continue system power and environmental control technical assessments
- (U) Type classify lightweight 15kW power unit
- (U) Continue development of tactical APU family
- (U) Continue development and testing of expanded TQG including less than 3kW (Light 3kW man portable set)
- (U) Initiate material change management for TQG
- (U) Adapt advanced infrared signature suppression techniques and lightweight material developments to improvements in the TQG family

(U) FY 1993 Planned Program:
- (U) Continue refinement of power usage databases
- (U) Complete development and testing of expanded TQG family including 100kW and above, and 2kW and below

(U) Project D279 - Airdrop Equipment Engineering Development: Develop and transition to procurement cargo parachutes, airdrop containers and associated equipment.

(U) FY 1991 Accomplishments:
- (U) Conducted test of 60k Low Velocity Airdrop System (60k LVADS) extraction system with modified end panel.
- (U) Finalized Technical Data Package (TDP) for STINGER Missile Jump Pack (SJMP)
- (U) Completed development of Parachutist Individual Equipment-Rapid Release (PIE/R2) and conducted technical testing (TT)
- (U) Completed design of All Purpose Weapons Equipment Container (AIRPAC) and conducted TT
- (U) Continued planning, execution and analytical support of USAF C-17 development program as part of C-17 Combined Test force

(U) FY 1992 Planned Program:
- (U) Complete TT/UT of AIRPAC
- (U) Type classify SJMP
- (U) Continue development of 60K LVADS and initiate TT for single platform 60K LVADS utilizing the C-5 aircraft

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0604804A
PE Title: **Logistics and Engineer Equipment - Engineering Development** Budget Activity: #4

- (U) Provide airdrop engineering support for USAF, C-17 aircraft

(U) **FY 1993 Planned Program:**
- (U) Type classify AIRPAC
- (U) Complete TT for single platform 60K LVADS and begin Initial Operational Test and Evaluation (IOT&E)
- (U) Initiate engineering development of Tactical Assault Personnel Parachute (TAPP)
- (U) Initiate engineering development of Low Altitude Container Delivery System for the C-17 aircraft

(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 1991 Accomplishments:**
- (U) Procured prototypes for Modular Expandable Rigid Wall Shelter (MERWS)
- (U) Type classified SICPS Limited Procurement Urgent (TC-LPU) to support the Army Tactical Command and Control System (ATCCS)
- (U) Initiated Engineering and Manufacturing Development (EMD) of Chemically and Biologically Protected Shelter (CBPS)
- (U) Procured prototypes for EMI Nonexpendable Rigid Wall Shelter

(U) **FY 1992 Planned Program:**
- (U) Conduct Production Proveout Testing (PPT) testing and initiate preparation of Technical Data Package (TDP) for the Lightweight Hardened S-280 Shelter
- (U) Procure CBPS prototypes and conduct PPT
- (U) Initiate PPT testing of MERWS
- (U) Initiate TT for type classification (TC) standard of SICPS shelter
- (U) Initiate fabrication of EMI Expandable Rigid Wall Shelter
- (U) Initiate PPT of EMI Hardened Non Expandable Rigid Wall Shelter
- (U) Initiate EMD of SICPS Tent P3I
- (U) Conduct Phase I Field Case test and procure Phase II Field Case prototypes for SICPS Tent P3I

(U) **FY 1993 Planned Program:**
- (U) Complete TDP preparation for the Lightweight Hardened S-280 Shelter
- (U) Type classify CBPS
- (U) Conduct PPT and initiate preparation of TDP for MERWS
- (U) Complete TT to TC-Standard for SICPS Shelter
- (U) Conduct PPT of Non Expandable and Expandable EMI Rigid Wall Shelter prototype

(U) Project D461 - Marine Oriented Logistical Equipment Engineering Development: The Lighter, Amphibian, Heavy-Lift (LAMP-H) was terminated.

(U) **FY 1991 Accomplishments:**
- (U) Completed solicitation and source selection process for the LAMP-H

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604804A**
PE Title: **Logistics and Engineer Equipment - Engineering Development** Budget Activity: **#4**

(U) FY 1992 Planned Program:
- **(U)** Not applicable

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

(U) Project DH01 - Combat Engineer Equipment Engineering Development: Develop and transition to procurement military bridging for dry and wet bridging requirements such as the Heavy Assault Bridge (HAB), Improved Ribbon Bridge (IRB) transporter, and the Light Assault Bridge (LAB).

(U) FY 1991 Accomplishments:
- **(U)** Initiated IRB technical testing (TT) and user testing (UT)
- **(U)** Continue preparation of IRB production technical data package (TDP)
- **(U)** HAB program restructured to identify affordable alternatives for HAB requirements
- **(U)** Initiated the Armored Vehicle Launched Bridge (AVLB) materiel change to upgrade to MLC 70 (AVLB 70)

(U) FY 1992 Planned Program:
- **(U)** Complete IRB transporter technical and user testing
- **(U)** Initiate HAB down select testing on prototype systems
- **(U)** Initiate fabrication and component testing on AVLB 70

(U) FY 1993 Planned Program:
- **(U)** HAB project transferred to PE 64649 (DG26) due to M1 tank chassis integration efforts
- **(U)** Continue limited support for HAB engineering development during transition year
- **(U)** Complete IRB transporter source selection
- **(U)** Complete upgraded AVLB 70 testing

(U) Project DH14 - Logistics Support Equipment Engineering Development: Develop and transition to procurement series of material handling equipment.

(U) FY 1991 Accomplishments:
- **(U)** Program not funded

(U) FY 1992 Planned Program:
- **(U)** Program requirements under review for the All Terrain Lifter Articulated System (ATLAS)

(U) FY 1993 Planned Program:
- **(U)** Issue solicitation and evaluate proposals for ATLAS ED prototypes

(U) Project DL39 - General Support Equipment Engineering Development: Develop and transition to procurement water purification and environmental control equipment.

(U) FY 1991 Accomplishments:

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604804A**
PE Title: **Logistics and Engineer Equipment - Engineering Development** Budget Activity: **#4**

- (U) Continued Extreme Environmental Water Supply (EEWS) effort on cold weather kit for storage and distribution equipment
- (U) Completed Technical Test (TT II) and operational test and evaluation of Water Quality Analysis Set- Purification (WQAU-P) and obtain Type Classification
- (U) Continued P3I evaluation of water supply equipment for ROWPU family
- (U) Initiated development of NBC, environmental water supply operations equipment
- (U) Conducted user assessment of 600 GPH ROWPU Cold Weather Kit in Alaska

(U) FY 1992 Planned Program:
- (U) Continue Extreme Environment Cold Weather Kit for the 600 GPH ROWPU
- (U) Continue design of Extreme Environment Cold Weather Kit for storage and distribution equipment
- (U) Continue high tech ROWPU pre-planned product improvement (P3I) of the family of water supply equipment to investigate NBC post treatment, lightweight composite pumps, long-term effects on reverse osmosis elements
- (U) Conduct evaluation of Collective Protective Ensemble for NBC resistance of 3000 GPH ROWPU

(U) FY 1993 Planned Program:
- (U) Perform testing of Extreme Environment Cold Weather Kit for storage and distribution equipment
- (U) Initiate Extreme Environment Hot Weather Kit for water supply equipment
- (U) Initiate development of individual water purification device
- (U) Develop NBC Resistant Storage and Distribution System
- (U) Conduct TT II and user testing for EEWS Cold Weather Kit for 600 ROWPU
- (U) Initiate development of Packaged Water System for the field
- (U) Continue ROWPU P3I to investigate NBC agent removal by RO. Complete longterm RO element study. Complete evaluation of lightweight composite pumps.

(U) Project DL41 - Fuels Handling Equipment Engineering Development: Develop and transition to procurement petroleum distribution systems.

(U) FY 1991 Accomplishments:
- (U) Initiated Engineering And Manufacturing Development (EMD) contract for the Lightweight Arctic Forward Area Refueling Equipment (LAFARE)
- (U) Held design reviews and selected major componenets for LAFARE
- (U) Conducted subsystem testing of fuel distribution equipment
- (U) Complete technical data package and type classication of Advanced Aviation Forward Area Refueling Subsystems (AAFARS)
- (U) Initiate long-term exposure tests for coated fabric materials and prototype model systems of collapsible fuel tanks to determine storage and service life

(U) FY 1992 Planned Program:
- (U) Finalize initial prototype design for LAFARE
- (U) Complete fabrication of first prototype and initiate system testing for LAFARE
- (U) Continue long-term exposure testing in desert environment for coated fabric materials for Tank

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604804A**
PE Title: **Logistics and Engineer Equipment - Engineering Development** Budget Activity: **#4**

Life Extension Program

(U) FY 1993 Planned Program:

- **(U)** Incorporate system test results into final prototype design for LAFARE
- **(U)** Fabricate prototypes, conduct burn-in tests and deliver hardware to CRTC for Government testing
- **(U)** Take delivery of first draft manuals and training package for LAFARE
- **(U)** Initiate the LAFARE final TDP
- **(U)** Continue exposure tests in desert environment to define seam joining, UV resistance and coated fabric materials for Tank Life Extension Program

(U) Work Performed By: In-house efforts will be accomplished by the U.S. Army Troop Support Command 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; Test and Evaluation Command, MD; Tank and Automotive Command, Warren, MI; Aberdeen Proving Ground, MD; White Sands Missile Range, NM; Harry Diamond Laboratory, 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. (with IMI as major subcontractor); 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 was managed by the Project Manager for Army Water Craft (PMAWC).

(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 Steer ing 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 1991 Actual	FY 1992 Estimate	FY 1993 Estimate

Other Procurement, Army:
Project DH14-

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604804A**
PE Title: **Logistics and Engineer Equipment - Engineering Development** Budget Activity: **#4**

M41300	14115	18152	
M48900	21321	20034	
M41500			9700

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE 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 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D098 Tactical Radio Accessories	- 0 -	- 0 -	2399	Cont	Cont
D282 SINCGARS-V Engineering Development	2703	- 0 -	- 0 -	- 0 -	63500
D488 Tactical Net Radio Communications	- 0 -	2991	5167	Cont	Cont
PE TOTAL	2703	2991	7566		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program funds Engineering and Manufacturing Development (EMD) and test evaluation of Army tactical communications equipment. Included are the very high frequency (VHF) Single Channel Ground and Airborne Radio System (SINCGARS), integrated communications security (ICOM) design for SINCGARS, the Battlefield Electronic Communications Electronic Operating Instruction (CEOI) System (BECS), and items associated with other tactical radios which are not a part of SINCGARS such as the frequency hopping multiplexer. Also included is engineering development of improved high frequency (IHF) radios, fiber optic transmission systems, telephone/data/record traffic terminals, data distribution systems, antenna configurations, multichannel radio/multiplexer/technical control assemblages and ancillary equipment that increase the reliability, extend the useful life, and/or improve interoperability of current inventory equipment.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND 1993:

(U) Project D098 - Tactical Radio Accessories: Develops the Frequency Hopping Multiplexer which allows multiple radios to operate on one antenna for reduced visual signature and rapid transportability and set-up. This is a new start On FY 1993.

(U) FY 1991 Accomplishments: Project not funded.

(U) FY 1992 Planned Program: Project not funded.

(U) FY 1993 Planned Program:
- (U) Initiate engineering development of Frequency Hopping Multiplexer

(U) Project D488 - Tactical Net Radio Communications: Develops the Frequency-agile Solid State High Frequency Power Amplifier and Coupler Program to provide needed range improvements for high frequency radios used for Special Forces operations.

(U) FY 1991 Accomplishments: Project not funded.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604805A**
PE Title: **Command, Control and Communications Systems - Engineering Development** Budget Activity: **#4**

(U) FY 1992 Planned Program:

- **(U)** Initiate development of the Frequency-Agile Solid State High Frequency Power Amplifier and Coupler program

(U) FY 1993 Planned Program:

- **(U)** Continue development of the Frequency-Agile Solid State High Frequency Power Amplifier and Coupler Program

(U) Work Performed By: Program management is provided by Project Manager, SINCGARS reporting to the Program Executive Officer for Communications at Fort Monmouth, New Jersey (NJ) with support from the U.S. Army Communications-Electronics Command. The contractor for the Frequency hopping Multiplexes, D098, and D488 is Xetron Corp, Cincinnati, OH. The contractor for the frequency agile solid state high frequency power amplifier, D488,is AEL Corp, Philadelphia, PA.

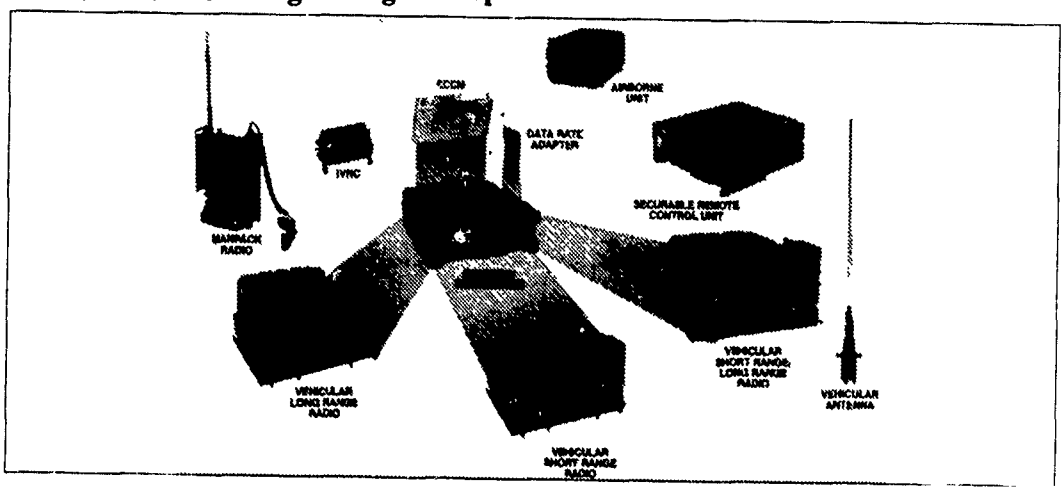
(U) Related Activities: There is no unnecessary duplication of effort within the Army or Department of Defense. No related activities.

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

(U) International Cooperative Agreements: Not applicable

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604805A** Project Number: **D282**
PE Title: **Command, Control and Communications Systems - Engineering Development** Budget Activity: **#4**
Project Title: **SINCGARS-V Engineering Development**



POPULAR NAME: **SINCGARS-V Engineering Development**

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

SCHEDULE	FY 1991	FY 1992	FY 1993	To Complete
Program Milestones		GD ICOM IIIB 7/92		
Engineering Milestones				
T&E Milestones	ICOM IOTE (GD)	ICOM IOTE(GD) 2/92		
Contract Milestones	ITT brnd/Opt 3 Cmpl/ITT Grnd/Opt 4 Awd 12/90 SRCU, cmpl. GD/Opt 1 Awd 3/91	ITT Abn/Opt 3 Del 3/92. GD/Opt 1 Del 8/92		
BUDGET ($000)	**FY 1991**	**FY 1992**	**FY 1993**	**Program Total (To Complete)**
Major Contract	945	-0-	-0-	50991 (0)
Support Contract	670	-0-	-0-	4183 (0)
In-House Support	1088	-0-	-0-	6180 (0)
GFE/ Other	-0-	-0-	-0-	2146 (0)
Total	2703	-0-	-0-	63500 (0)

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #060480?A
PE Title: **Command, Control and Communications Systems - Engineering Development**
Project Title: **SINCGARS-V Engineering Development**

Project Number: **D282**
Budget Activity: **#4**

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project provides engineering development support for the Single Channel Ground and Airborne System (SINCGARS) production radio. Tasks include the completion of efforts deferred during the advanced development phase such as vehicle installation kits, the SINCGARS Remote Control Unit (SRCU), and the design changes needed to integrate communications security (COMSEC) in the production radio and the initiation of pre-planned product improvement initiatives. The funding associated with this project is reported in the SINCGARS Selected Acquisition Report . Included as part of the SINCGARS program is the Battlefield Electronic Communication Electronic Operating Instruction (CEOI) System (BECS) development effort. It is a frequency management system designed to meet the critical requirement for a centralized and automated process to generate both single channel and frequency-hopping CEOI information. SINCGARS is a new family of electric counter-counter-measure capable very high frequency - frequency modulated (VHF-FM) combat net radios which provides the primary means of command and control for Infantry, Armor and Artillery Units.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- (U) Completed integrated COMSEC for airborne phase III
- (U) Completed P3I effort
- (U) Completed SRCU development efforts

(U) FY 1992 Planned Program: Project completed in FY 1991

D. (U) WORK PERFORMED BY: Production contracts for the ground and airborne radios were competitively awarded to the Aerospace and Optical Division of International Telephone & Telegraph (ITT) Corp., Fort Wayne, Indiana, in December 1983 and 1985, respectively. A second source production contract for the ground ICOM version was awarded competitively in July 1988, to General Dynamics (GD), San Diego California. SINCGARS is a major program managed by a Program Manager reporting to the Program Executive Officer for Communications at Fort Monmouth, NJ with support from the Communications-Electronics Command

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** None.
2. **(U) SCHEDULE CHANGES:** None.
3. **(U) COST CHANGES:** None.

F. (U) PROGRAM DOCUMENTATION:

Required Operational Capability (ROC)	12/74	10/86
Decision Coordinating Paper (DCP)	07/84	3/90
Test and Evaluation Master Plan (TEMP)	02/88	09/87

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604805A** Project Number: **D282**
PE Title: **Command, Control and Communications Systems - Engineering Development** Budget Activity: **#4**
Project Title: **SINCGARS-V Engineering Development**

G. (U) RELATED ACTIVITIES: This project was covered under Program Element #0604751A (Single Channel Ground and Airborne Radio System (SINCGARS) - Engineering Development) in FY 1987 and by Program Element #0603746A SINCGARS Advanced Development. No duplication of effort within the Department of the Army or other elements of the Department of Defense are known to exist.

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

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
OTHER PROCUREMENT, ARMY SINCGARS Family (SSN BW0006)	262863	287576	223190

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

J. (U) TEST AND EVALUATION DATA:

Test and Evaluation Activity (Past 12 Months)

Event	Dates	Remarks
Airborne non-Integrated Comsec (ICOM) Early User Test and Effectiveness Evaluation (EUTE)	Mar-May 88	Validated Operational
Ground non-Icom Follow-On Test and Eval (FOTE)	Mar-May 88	Validated Operational Effectivness and Suitability
Mutual Interference Test	May-Jun 88	Gathered field data
Federal Communications Commission Test	Jul 88	Gain approval of frequency hopping channel in US
Korean Government	Jun 88	Validated Hopset to prevent Interference Test TV interference
Ground non-ICOM 1000 hour Reliability Test	Jul-Sep 88	Validated Mean Time Between Failure
Airborne Non-ICOM First Article Test	Sep 88	Assured quality conformance of production equipment. (First production year buy).
Integrated COMSEC (ICOM) Early User Test and Experimentation	Oct-Nov 88	ICOM Operational Effectiveness
Integrated COMSEC Pilot Production	Apr-Oct 89	Validation of production process.
BECS Development Test	Oct-Dec 88	Validation of BECS hardware and software.
BECS Operational Test	Jan-Mar 89	Validation of Operational effectiveness and suitability.
Manpack Non-ICOM Reliability	Nov 89	To assess the ruggedization improvements to SINCGARS.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604805A** Project Number: **D282**
PE Title: **Command, Control and Communications Systems - Engineering Development** Budget Activity: **#4**
Project Title: **SINCGARS-V Engineering Development**

Natural Environmental Tests (Ground)	FY90-91	Natural environment test of tactical communications, RAM, use of manpack and MANPRINT.
ICOM IOTE	Jun 90	Validate Operational Effective-and Suitability of ICOM radio.
General Dynamics (GD) IOTE	Feb 92	To qualify the SINCGARS Second Source.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604806A**
PE Title: **Chemical/Biological Defense Equipment - Engineering Development** Budget Activity: **#4**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D017 Collective Protection Materiel	276	- 0 -	- 0 -	Cont	Cont
D019 Chemical/Biological Individual Protection Materiel	1730	1093	4048	Cont	Cont
D020 Chemical Detection and Warning Materiel	60695	40253	34074	Cont	Cont
D517 Radiac Equipment Engineering Development	1	3328	2100	Cont	Cont
DF97 Chemical/Biological Decontamination Materiel	1200	3851	1329	Cont	Cont
PE TOTAL	63902	48525	41551		

B. (U) BRIEF DESCRIPTION OF ELEMENT: Department of Defense Directive 5160.5 designates the Army as Executive Agent for the development of nuclear, biological and chemical (NBC) defensive equipment. This program element provides for the engineering development of radiological and chemical/biological/toxin agent detection and warning systems, individual and collective protection systems, and decontamination systems. It supports the urgent need to provide all Services with detection and warning systems to alert against the presence of radiological contamination and chemical/biological/toxin agents.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND 1993:

(U) Project D017 - Collective Protection Materiel: This development provides materiel which permits personnel to conduct vital operations inside contamination free protective enclosures while operating on a contaminated battlefield. Use of these protective enclosures ranges from rest facilities and command centers to complete operating field hospitals.

(U) FY 1991 Accomplishments:
- (U) Type classified limited production urgent the XM28 Collective Protevctive System
- (U) Fielded four prototype XM28 systems to Operation Desert Storm (ODS), 2QTR FY91.

(U) FY 1992 Planned Program:
- (U) Project not funded

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

(U) Project D019 - Chemical/Biological Individual Protection Materiel: This project completes the full-scale development of the Pre-Planned Product Improvement (P3I) of the M40 Protective Mask for ground

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0604806A
PE Title: Chemical/Biological Defense Equipment - Engineering Development
Budget Activity: #4

soldiers. The FY 1993 program supports development of the Aircrew Protective Mask (ACPM) .

(U) FY 1991 Accomplishments:
- (U) Continued engineering development (ED) for M40/42 mask communications, hood, laser/ballistic inserts, and vision correction Pre-planned Product Improvement (P3I)
- (U) Initiated technical test for laser/ballistic outserts and vision correction for M40 P3I
- (U) Type classified Limited Production Urgent, the laser/ballistic outserts and improved vision correction supporting Operation Desert Storm (ODS)

(U) FY 1992 Planned Program:
- (U) Complete technical and user tests for M40/42 Mask P3I
- (U) Incorporate all materiel changes into the M40E1 and M42E1 Mask technical data package to complete program
- (U) Type classify standard M40A1 and M42A1 Masks

(U) FY 1993 Planned Program:
- (U) Initiate engineering development of the Aircrew Protective Mask

(U) Project D517 - Radiac Equipment Engineering Development: Provides for engineering development of personal and vehicle-mounted radiation detection and warning systems.

(U) FY 1991 Accomplishments:
- (U) Due to requirements revisions, the Advanced Airborne Radiac System (AARS) was kept in 6.3b

(U) FY 1992 Planned Program:
- (U) Initiate engineering development and construct prototype test models of the Pocket Radiac
- (U) Initiate engineering development of Advanced Airborne Radiac System (AARS)

(U) FY 1993 Planned Program:
- (U) Continue engineering development of Advanced Airborne Radiac System
- (U) Initiate technical testing of the Pocket Radiac System

(U) Project DF97 - Chemical/Biological Decontamination Materiel: Conduct engineering development to increase capabilities for personal, vehicle and equipment decontamination of chemical, biological and radiological battlefield contamination.

(U) FY 1991 Accomplishments:
- (U) Awarded development contract for Decontamination Kit, Individual Equipment: XM295

(U) FY 1992 Planned Program:
- (U) Conduct technical tests/user test for the Decontamination Kit, Individual Equipment: XM 295
- (U) Conduct Milestone III in-process review for the Decontamination Kit, Individual Equipment: XM 295

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604806A**
PE Title: **Chemical/Biological Defense Equipment - Engineering Development** Budget Activity: **#4**

(U) FY 1993 Planned Program:

- **(U)** Conduct Milestone II IPR for Decontaminating Agent, Multipurpose and award development contract

(U) Work Performed By: For all services, the Project Manager for NBC Defense Systems, Aberdeen Proving Grounds (APG), Maryland, is responsible for development and fielding of chemical/radiological defense equipment. Major laboratories and developing centers include Chemical Research, Development and Engineering Center (CRDEC), Aberdeen Proving Ground (APG), MD; Test and Evaluation Command, APG, MD; Army Materials and Mechanics Research Center, Watertown, MA; Army Tank-Automotive Command, Warren, MI; Human Engineering Laboratory, APG, MD; and Electronic Warfare Laboratory, Ft Monmouth, NJ. Contractors include Brunswick Corporation, Deland, FL; All-Ban Enterprises, Anaheim, CA, Graseby Ionics, Ltd, United Kingdom; and Environmental Analytical Systems Inc. (EASI), Towson, MD. There is no unnecessary duplication of effort within the Army or Department of Defense.

(U) Related Activities:

PE #0602622A (Chemical, Smoke and Equipment Defeating Technology)
PE #0603806A (Chemical/Biological Defense Equipment - Advanced Development)
Department of Defense Directive 5160.5 assigns the Army responsibility for research and development in chemical-biological defense for joint requirements of the Army with the other Services in order to meet other Services' needs and to prevent unnecessary duplication of effort. Execution of this responsibility is coordinated through the Joint Chemical Warfare/ Chemical-Biological Defense Research, Development, and Acquisition Plan; Joint Services Radiac Working Group; and Joint periodic reviews of the Joint Chemical-Biological Research, Development, Test and Evaluation Program. Coordination and cooperation are maintained with allied countries via data exchange agreements and through meetings of the North Atlantic Treaty Organization (NATO) AC/225 (Panel VII).

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

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604806A**
PE Title: **Chemical/Biological Defense Equipment - Engineering Development**

Project Number **D020**
Budget Activity: **#4**

A. (U) RESOURCES: ($ in Thousands)
Project Title: **Chemical Detection and Warning Materiel**

Popular Name	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
NBC Reconnaissance, Detection and Identification (RDI)	60695	40253	34074	Cont	Cont

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project is vital to the full-scale development (FSD) of new manned and unmanned nuclear, biological and chemical (NBC) detectors and alarms that will greatly enhance the U.S. capability to detect, provide alarm, and identify threat agents on the battlefield. This project funds the System Improvement Program (SIP) for the XM93 Fox NBC Reconnaissance Vehicle (NBCRS). The SIP upgrades the NBCRS to meet full Army requirements by adding the first ever standoff chemical vapor detector, integrated sensor/data processing system that reduces the crew to three soldiers, jam-resistant communications, and an advanced navigation system. This project will also complete development of smaller, more dependable chemical and biological detection systems that will detect and identify contamination, as well as, evaluate the effectiveness of the decontamination of personnel and equipment. The completion of development of long range laser detectors for ground employment will greatly improve the U.S. capability to avoid contaminated areas and provide timely early warning of NBC attack. This project will complete the development of a new generation of point sampling detectors with increased sensitivity and expanded capabilities over current equipment.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- (U) Fielded XM21 development hardware to support Operation Desert Storm (ODS)
- (U) Completed XM21 RSCAAL development
- (U) Completed design of full capability NBCRS System Improvement Program (SIP) Vehicle
- (U) Initiated fabrication of TT/UT hardware for the XM22 ACADA

(U) FY 1992 Planned Program:
- (U) Type classify XM21 RSCAAL
- (U) Initiate fabrication of 8 full capability NBCRS SIP test systems and initiate technical testing
- (U) Complete fabrication of TT/UT hardware for the XM22 ACADA

(U) FY 1993 Planned Program:
- (U) Initiate full-scale development of the Multipurpose Integrated Chemical Agent Detector (MICAD) (complete design of FSD prototypes)
- (U) Complete NBCRS SIP
- (U) Initiate NBCRS SIP UT
- (U) Fabricate prototypes of the MICAD for use in TT/UT
- (U) Initiate TT/UT testing of the XM22 ACADA

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604806A** Project Number **D020**
PE Title: **Chemical/Biological Defense Equipment - Engineering Development** Budget Activity: **#4**

D. (U) WORK PERFORMED BY: Project Manager for NBC Defense Systems, Aberdeen Proving Ground (APG), MD; US Army Chemical, Research, Development, and Engineering Center (CRDEC), APG, MD; Test and Evaluation Command (TECOM), APG, MD; Night Vision Electro-Optics Lab (NVEOL), Fort Belvoir, VA; and Communications/Electronics Command (CECOM), Fort Monmouth, NJ. Current contractors include Brunswick Corp, Deland, FL; General Dynamics Land Systems (GDLS), Sterling Heights, MI.

E. (U) COMPARISON WITH FY 1991/1992 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** None.
2. **(U) SCHEDULE CHANGES:** XM22 ACADA delayed one year due to fabrication problems with TT/UT hardware; XM21 type classication delayed to resolve test issues; NBCRS SIP delayed by Operation Desert Storm (ODS)
3. **(U) COST CHANGES:** None.

F. (U) PROGRAM DOCUMENTATION: Not applicable.

G. (U) RELATED ACTIVITIES: Activities are coordinated through PE #0603806A, Chemical Detection and Warning Concepts, and PE #0602622, Chemical, Smoke, and Equipment Defeating Technology, A553 CB Defense Exploratory Development. No duplication of effort exists within the Army or Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands) None.

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

J. (U) MILESTONE SCHEDULE:

Milestones	Milestones Dates
XM22 ACADA	
MS III Type Classification (TC)	08/94
XM21 RSCAAL	
MS III TC	02/92
XM93 NBCRS	
MS III TC STD A	03/94
MICAD	
Type Classify	09/96

FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604807A**
PE Title: **Medical Material/Medical Biological Defense Equipment — Engineering Development** Budget Activity: **#4**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D812 Military Human Immunodeficiency Virus (HIV) Vaccine and Drug - Engineering Development	- 0 -	2978	- 0 -	Cont	Cont
D832 Combat Medical Materiel - Engineering Development	1010	3372	- 0 -	Cont	Cont
D834 Soldier System Protection - Engineering Development	- 0 -	112	- 0 -	Cont	Cont
D847 Medical Biological Defense - Development	7909	9508	- 0 -	Cont	Cont
D848 Medical Chemical Defense Life Support Materiel	2663	1819	- 0 -	Cont	Cont
D849 Infectious Diseases Drug and Vaccine - Engineering Development	4951	8364	- 0 -	Cont	Cont
PE TOTAL	16533	26153	- 0 -*		

* These Medical resources transferred to OSD, Health Affairs, effective FY 1993.

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 arthropod 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 protective devices against emerging laser threats, environmental health monitoring equipment, and medical water quality monitoring equipment. Project D812, Military HIV – ED, was created to accommodate a FY 92-97 redistribution of work across appropriate PEs. The establishment of Project D834, Soldier System Protection — ED, does not represent a new start but is a restructuring and realignment of existing resources within this PE. The restructuring was essential in order to realign new products with appropriate resources and is a zero sum transfer within the PE.

Program Element: **#0604807A**
PE Title: **Medical Materiel/Medical Biological Defense Equipment — Engineering Development** Budget Activity: **#4**

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND 1993:

(U) Project D812 - Military Human Immunodeficiency Virus (HIV) Vaccine and Drug - Engineering Development: This project was created to accommodate a FY92-97 redistribution of work and funds across appropriate PE's and does not represent a new start. (Transition from non-system Advanced Technology (PE #63105A) This project funds the full-scale development of vaccines, chemotherapy regimens and gene therapy for medical defense against, and treatment of human immunodeficiency virus (HIV) infection.

(U) FY 1991 Accomplishments: Not applicable

(U) FY 1992 Planned Program:

- (U) Expand clinical immunotherapeutic and vaccine field studies to evaluate the protective effect of test materials against HIV strains prevalent in militarily significant geographical regions (e.g. Southeast Asia, Africa).
- (U) Initiate a multidrug study of combination chemotherapy for patients with zidovudine (AZT) resistant HIV infection.

(U) FY 1993 Planned Program:

- (U) Continue large-scale Phase III trials of effective chemotherapeutic agents among the triservices.
- (U) Continue immunotherapeutic trials, with and without alternative immunotherapy strategies.

(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 improve the return to duty rate.

(U) FY 1991 Accomplishments:

- (U) Initiate engineering development of a hand-held dental x-ray system

(U) FY 1992 Planned Program:

- (U) Complete engineering development for Resuscitative Fluids Production System (REFLUPS) and the hand-held dental x-ray system
- (U) Continue testing of a Field Computer Tomography (CT) Scanner
- (U) Complete user testing of REFLUPS

(U) FY 1993 Planned Program:

- (U) Conduct user tests of a lightweight medical x-ray system
- (U) Complete development and testing of a Field CT Scanner
- (U) Initiate phase III studies of Hypertonic Saline Blood Expander
- (U) Initiate engineering development of a field medical filmless imaging system.

(U) Project D834 - Soldier System Protection - Engineering Development: Supports full scale development of medical materiel, including devices, pharmacologics and other tools, to protect the health and enhance the sustainment of soldiers' physiological and psychological capabilities affecting cognitive and physical performance imposed by military systems, combat operations, and hostile environments. This project was created to accommodate a FY92-97 redistribution of funds from Program Element 0604807A Project D832 and does not represent a new start.

(U) FY 1991 Accomplishments: (This Project was created to accommodate a FY92-97 redistribution of funds and does not represent a new start. FY91 accomplishments are therefore listed under Project D836).

Program Element: **#0604807A**
PE Title: **Medical Materiel/Medical Biological Defense Equipment — Engineering Development** Budget Activity: **#4**

(U) FY 1992 Planned Program: Project D834 was established from existing projects to support soldier system protection products commencing in FY93

(U) FY 1993 Planned Program:

- (U) Complete final testing of a new water sampling collection and submission kit to support field operations, and transition this kit for direct procurement and fielding
- (U) Initiate full scale development and operational testing of an environmental heat stress monitor to support work rest cycle and water consumption planning
- (U) Complete operational testing of a rapid "dip stick" water quality analysis set to assess key chemical and physical characteristics of field water to ensure potability
- (U) Initiate full scale development and testing of a rapid bacteriological test kit for determination of field water potability in reference to Army medical standards

(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 1991 Accomplishments:

- (U) Terminated the Antiviral Drug Development Program and redirected resources to higher priority programs.
- (U) Terminated advanced development of vaccines and drugs against aerosol-transmissible, vector- and rodent-borne viral diseases which do not appear on the Armed Forces Medical Intelligence Center (AFMIC) validated threat list. Vaccines and drugs against these viral diseases will henceforth be developed in the Infectious Disease Research Program.
- (U) Received permission from the FDA for use of pentavalent botulinal toxoid in Operation Desert Storm/Shield (ODS/S).
- (U) Maintained stocks of critical reagents (monoclonal and polyclonal antibodies, compete and subunit antigens) for immunoassays currently available or under investigation for viral, bacterial and toxin biological agents. Many of these reagents were used in support of ODS/S.
- (U) Conduct technical test of Rapid Identification System for diagnosis of biological agents in clinical specimens.
- (U) Conducted a short-term safety and immunogenicity study of the Argentine Hemorrhagic Fever vaccine and demonstrated its protective efficacy in a double-blind, placebo-controlled field study involving 6500 volunteers.
- (U) Reported favorable findings to the FDA from a double-blind trial of intravenous ribavirin against hemorrhagic fever with renal syndrome.
- (U) Completed certification of a new lot of Rift Valley Fever vaccine.

- (U) Continued support of the Salk Institute, Government Services Division (Swiftwater, PA) production facility for experimental vaccines, monoclonal antibodies, and other non-commercial research and diagnostic reagents that require specialized biocontainment facilities for their production.

Program Element: **#0604807A**
PE Title: **Medical Materiel/Medical Biological Defense Equipment — Engineering Development** Budget Activity: **#4**

(U) FY 1992 Planned Program:
- **(U)** Complete lot consistency clinical trials of Tularemia vaccine.
- **(U)** Conduct user test of Rapid Identification System.
- **(U)** Continue support of the production facility for experimental vaccines and other biological products requiring specialized containment.

(U) FY 1993 Planned Program:
- **(U)** Transition Q Fever vaccine to contingency stockpile.
- **(U)** Submit product license application for Tularemia vaccine.
- **(U)** Continue support of the production facility for experimental vaccines and other biological products requiring specialized containment.

(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 1991 Accomplishments:
- **(U)** Completed Full Scale Development (FSD) of the Field Medical Oxygen Generation and Distribution System (FMOGDS)
- **(U)** Transitioned oral nerve agent pretreatment pyridostigmine to production
- **(U)** Completed FSD of the Powered Ventilator

(U) FY 1992 Planned Program:
- **(U)** Initiate FSD of the Life Detector
- **(U)** Transition the Field Medical Oxygen Generation and Distribution System (FMOGDS) to production

(U) FY 1993 Planned Program:
- **(U)** Award a full scale development contract for the Multichaml ered Autoinjector
- **(U)** Complete FSD of the Life Detector

(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 readiness posture of U.S. forces and provide medical defense against naturally occurring infectious diseases of military significance.

(U) FY 1991 Accomplishments:
- **(U)** Initiated field efficacy study of inactivated Hepatitis A vaccine to prevent adverse infections with hepatitis A, which is endemic in many areas of potential deployment.
- **(U)** Transitioned antimalarial drug Halofantrine to production.
- **(U)** Continued field trials of Klebsiella/Pseudomonas Globulins for therapy of bacterial sepsis and shock.
- **(U)** Initiated Phase II/III clinical studies of Schistosome Topical Antipenetrant (1200 volunteers in Eqypt and Brazil) to prevent infections with the schistosome parasite endemic in many tropical areas of the world.
- **(U)** Completed lot consistency clinical trials of Japanese encephalitis vaccine, a candidate medical countermeasure for this militarily relevant disease.

(U) FY 1992 Planned Program:
- **(U)** Conduct expanded falciparum malaria vaccine field studies in OCONUS areas.

Program Element: **#0604807A**
PE Title: **Medical Materiel/Medical Biological Defense Equipment -- Engineering Development** Budget Activity: **#4**

- (U) Submit New Drug Application (NDA) for halofantrine as a therapy for severe malarial infections.
- (U) Continue field trials of hepatitis vaccines and shigella (diarrheal disease) vaccines.
- (U) Continue trials to determine dose regimens of Argentine Hemorrhagic fever vaccine, to prevent severe Junin virus infections in U.S. Forces deployed to endemic areas.

(U) FY 1993 Planned Program:
- (U) Initiate Phase III trials of antimalarial drug WR238605.
- (U) Complete Phase II/III trials and submit New Drug Application (NDA) for Schistosome Topical Antipenetrant.
- (U) Initiate Vivax malaria and meningitis B vaccine Phase III trials.
- (U) Initiate Phase III trials of cholera vaccine, a medical countermeasure against diarrheal disease.

(U) Work Performed By:

D812 - Work is performed in-house by the following organizations: U.S. Army Medical Materiel Development Activity, Fort Detrick, MD; Walter Reed Army Institute of Research, Washington, DC. Research facilities of the Navy and the Air Force collaborate in this effort. The top three extramural contractors are the Henry M. Jackson Foundation for the Advancement of Military Studies, Bethesda, MD; SRA Technologies, Inc., Alexandria, VA; and the National Institutes of Health, Bethesda, MD.

D832 - Work is performed in-house by US Army Medical Materiel Development Activity, Fort Detrick, MD; US Army Bioengineering Research and Development Laboratory, Fort Detrick, MD; and US Army Institute of Dental Research, Washington, DC. Primary contractors: Sterimatics Corp., New Bedford, MA, and American Optical Corporation, Southbridge, MA.

D834 - Work is performed by the following organizations: U.S. Army Medical Materiel Development Activity and U.S. Army Biomedical Research and Development Laboratory, Fort Detrick, MD; U.S. Army Aeromedical Research Laboratory, Fort Rucker, AL; and the U.S. Army Institute of Environmental Medicine, Natick, MA. Civilian contractors are to be determined.

D847 - Work is performed in-house by the following organizations: U.S. Army Medical Materiel Development Activity, and the U.S. Army Medical Research Institute of Infectious Disease, Fort Detrick, MD; Walter Reed Army Institute of Research, Washington, D.C. Major Contractors include: Salk Institute, San Diego, CA; and Centers for Disease Control, Atlanta, GA.

D848 - Work is conducted in-house at US Army Biomedical Research and Development Laboratory and US Army Medical Materiel Development Activity, Fort Detrick, MD. The primary contractors are Guild Corp, Dayton, OH; and Duphar, Marietta, GA.

D849 - Work is performed in-house by US Army Medical Materiel Development Activity, Fort Detrick, MD; US Navy Medical Research and Development Command, Bethesda, MD; Walter Reed Army Institute of Research, Washington, DC; and its field activities in Thailand, Korea, Kenya, and Brazil; Letterman Army Institute of Research, San Francisco, CA. Primary contractor: University of Maryland School of Medicine, Baltimore, MD.

(U) Related Activities:

PE #0601102A (Defense Research Sciences, Projects BS12, BS13, BS14, BS15, and BS16).
PE #0602787A (Medical Technology, Projects A825, A871, A874, and A878).
PE #0603002A (Medical Advanced Technology, Projects D807, D810, D819, and D840).
PE #0603105A (Acquired Immune Deficiency Syndrome (AIDS) Research).
PE #0603807A (Medical Systems - Advanced Development).

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 Deputy

Program Element: **#0604807A**
PE Title: **Medical Materiel/Medical Biological Defense Equipment — Engineering Development** Budget Activity: **#4**

Director, Defense Research and Engineering (Research and Advanced 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; Pan American Health Organization.

(U) Other Appropriation Funds: ($ in Thousands) Procurement of transitioned products is provided for in Other Procurement, Army (OPA), Operation and Maintenance, Army (OMA), or passed to other procuring agencies as appropriate.

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604808A**
PE Title: **Landmine Warfare/Barrier-Engineering Development** Budget Activity: **#4**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D016 Mine Systems Engineering Development	2135	4765	2947	Cont	Cont
D021 Explosive Demolitions	2750	- 0 -	- 0 -	- 0 -	Cont
D415 Mine Neutralization/Detection	2680	7526	- 0 -	Cont	Cont
PF TOTAL	7565	12291	2947		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program element provides for the effective use of mines and demolition systems to complement natural obstacles such as defiles, woods, rivers, and built-up areas to slow, attrite, and canalize attacking forces, thus enhancing the performance of direct and indirect fire weapons. It also provides effective countermine equipment which serves to maintain mobility on the modern battlefield. The program provides for full-scale development of the Vehicle Magnetic Signature Duplication (VEMASID) System which projects a field to counter magnetically fuzed mines. Engineering development coordination for the Antipersonnel Obstacle Breaching System (APOBS) being developed by the USMC will be provided. It also provides for completion of the Multi-Sensor Electronic Package (MSEP), initiation of Minefield Command and Control, and termination of the Tactical Explosive System (TEXS). Improved explosive demolition systems are required for increased effectiveness and reduced emplacement time and logistics as compared with existing systems. Modern conventional explosive technologies can provide an alternative to nuclear demolition systems.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND 1993:

(U) Project D016 - Mine Systems Engineering Development: Provides for engineering development of the Family of Scatterable Mines (FASCAM) and new smart mines

(U) FY 1991 Accomplishments:
- (U) Continued development and test of improved multi-sensor fuzing for fielded systems
- (U) Type classified the Volcano Air System and M548 System

(U) FY 1992 Planned Program:
- (U) Continue full-scale development MSEP for Volcano mines

(U) FY 1993 Planned Program:
- (U) Type classify MSEP for Volcano mines

(U) Project D021 - Explosive Demolitions: Provides for engineering development of the Tactical Explosive System (TEXS)

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604808A**
PE Title: **Landmine Warfare/Barrier-Engineering Development** Budget Activity: **#4**

(U) FY 1991 Accomplishments:
- **(U)** TEXS program was terminated

(U) FY 1992 Planned Program:
- **(U)** Program not funded

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

(U) Project D415 - Mine Neutralization/Detection: Provides for engineering development of U.S. countermine systems.

(U) FY 1991 Accomplishments:
- **(U)** Type classified and initiated production of VEMASID and classification of M109 family of vehicles attachment

(U) FY 1992 Planned Program:
- **(U)** Complete technical data package
- **(U)** Complete coil redesign
- **(U)** Terminate VEMASID program
- **(U)** Continue engineering development coordination for Anti-Personnel Obstacle Breaching System (APOBS).

(U) FY 1993 Planned Program: 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, Dover, NJ; and the Belvoir Research, Development and Engineering Center, Ft. Belvoir, VA. The major countermine contractor employed at this time is Alliant Tech Systems, Inc. Edina, MN; Major mine contractors are Motorola Inc, Scottsdale, AZ; and Alliant Tech Systems, Inc., Edina, MN. The major demolitions contractor is Atlas Powder Company, Dallas, TX.

(U) Related Activities: Component work and exploratory development for this program are conducted in program elements #0602624 (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 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 with 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.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604808A**
PE Title: **Landmine Warfare/Barrier-Engineering Development** Budget Activity: **#4**

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

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
Ammunition Procurement, Army E72190, E72194, E72195	73640	3012	2953
Other Procurement, Army, R21000	395	1432	- 0 -

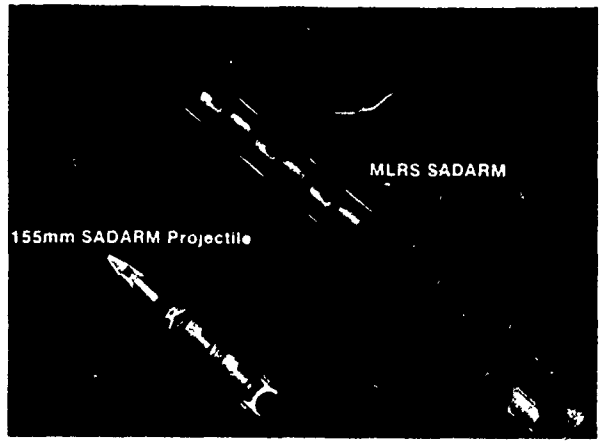
(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE 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**

~~The SADARM System~~



POPULAR NAME **SADARM**

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

SCHEDULE	FY 1991	FY 1992	FY 1993	To Complete
Program Milestones			155MM IIIA 3/93	155MM MS III 6/94 MLRS MS III 6/94
Engineering Milestones		Critical Des Rev 2Q92		FUE 155MM FY94 (4Q94) FUE MLRS FY96 (1Q96)
T&E Milestones	155MM Tech Test 4Q91-1Q93	MLRS Tech Test 4Q92-2Q93	IOTE - 155MM & MLRS 4Q93-1Q94	
Contract Milestones			155MM LRP 3Q93	FSP 155MM & MLRS 3Q94
BUDGET ($000)	**FY 1991**	**FY 1992**	**FY 1993**	**Program Total (To Complete)**
Major Contract	85900	117613	43717	605983
Support Contract	2355	4856	1300	32879
In-House Support	11640	10800	9000	87088
GFE/ Other	7968	16759	8428	120434
Total	107863	150028	63037	846384

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604814A**
PE Title: **Sense and Destroy Armor (SADARM)-Engineering Development**
Project Number **D644**
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. This development responds to the primary fire support deficiency of insufficient lethality identified by the Fire Support Mission Area Analysis. SADARM will be capable for use in inclement weather, degraded battlefield conditions and nuclear, biological and chemical (NBC) environments, both day and night. 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 combination of 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 1991 Accomplishments:
- **(U)** Completed sensor algorithm verification (captive flight tests)
- **(U)** Completed MLRS-SADARM component design and testing except for lethal mechanism
- **(U)** Completed 155mm SADARM component design & testing
- **(U)** Began 155mm-SADARM projectile technical tests (firing tables)
- **(U)** Down selected to a single design (Aerojet)

(U) FY 1992 Planned Program:
- **(U)** Continue 155mm SADARM technical testing
- **(U)** Begin MLRS-SADARM technical testing

(U) FY 1993 Planned Program:
- **(U)** Complete SADARM technical testing
- **(U)** Conduct 155mm-SADARM user testing
- **(U)** 155mm SADARM low-rate production decision

(U) Program Plan to Completion:
- **(U)** Complete MLRS SADARM engineering and manufacturing development
- **(U)** MLRS and 155mm SADARM type classification (TC) standard
- **(U)** Full-scale production decision-FY 94
- **(U)** First unit equipped (FUE) - 155mm SADARM-FY94
- **(U)** FUE - MLRS SADARM-FY96

D. (U) WORK PERFORMED BY: Major Contractors are Aerojet Electronic Systems Division Azusa, CA; LTV Corp., Dallas, TX. and Alliant Tech Systems (formerly Honeywell, Inc), Minneapolis, MN (sub to Aerojet); Inhouse efforts accomplished by: Program Executive Officer, Armaments, Picatinny Arse-

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0604814A
PE Title: **Sense and Destroy Armor (SADARM)-Engineering Development** Project Number **D644**
Budget Activity: **#4**
Project Title: **Generic SADARM Engineering Development**

nal, NJ; Project Manager, Sense And Destroy Armor (SADARM), Picatinny Arsenal, NJ; Product Manager, Multiple Launch Rocket System-SADARM (MLRS-SADARM), Redstone Arsenal, AL.

E. (U) COMPARISON WITH FY 1991/1992 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** None
2. **(U) SCHEDULE CHANGES:** Defense Acquisition Executive approved 12-month extension to 155mm-SADARM FUE and a 19 month extension to MLRS-SADARM FUE.
3. **(U) COST CHANGES:** None

F. (U) PROGRAM DOCUMENTATION:

Required Operational Capability (ROC)	6/87
Decision Coordinating Paper (DCP)	5/88
Acquisition Plan/Acquisition Strategy	2/91
System Threat Assessment Report (STAR)	11/91
Operational and Organizational (O&O) Plan	1/87
Integrated Logistics Support Plan (ILSP)	7/91
Test and Evaluation Master Plan (TEMP)	12/89

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

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

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
AMMUNITION PROCUREMENT, ARMY			
SADARM (SSN E66300)	- 0 -	- 0 -	35486

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

J. (U) TEST AND EVALUATION DATA: Firings of modified advanced development hardware (8-inch Howitzer), as required by FY 1986 Joint Appropriations Conference report language, were completed during July 1989. Proof-of-principle was successfully demonstrated in a complete firing, dispense, acquisition, and target engagement sequence. Captive flight testing has been conducted with over 112,000 target encounters in winter, summer, and desert environments. To date, effectiveness exceeds requirements in all clean target scenarios and most countermeasure modes. The smaller size lethal mechanism is baselined and has demonstrated the desired perforation repeatedly. The 155mm SADARM projectile has demonstrated maximum range, ballistic similitude, and is proceeding into integration testing. The MLRS-SADARM warhead has demonstrated expulsion of the submunitions during both ground and flight tests. Technical testing has begun with completion of the firing tables test to date.

AMENDED FY 1993 AMENDED BUDGET REVIEW RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604816A**
PE Title: **LONGBOW** Budget Activity: **#4**

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

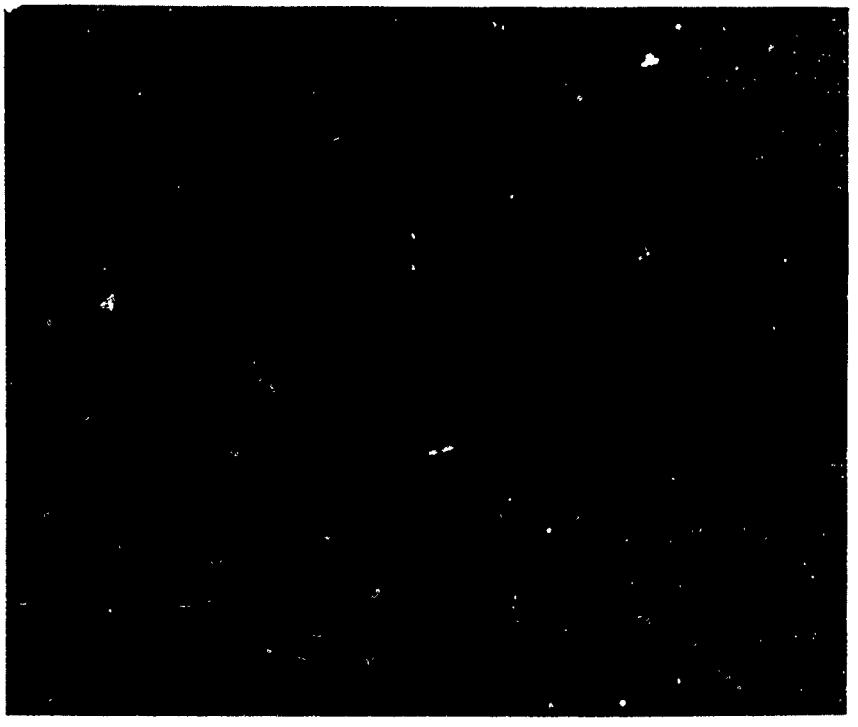
Project Number / Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
DC27 Longbow - Engineering Development	196969	179287	212088	175560	Cont
DC31 Longbow - Apache	- 0-	52880	69714	92306	Cont
PE TOTAL	196969	232167	281802	267866	

B. (U) BRIEF DESCRIPTION OF ELEMENT: Longbow (Project DC27) consists of a mast mounted Fire Control Radar (FCR), which will be integrated into the AH-64 airframe with future application to the RAH-66 Comanche and a radio frequency (RF) autonomous seeker in a HELLFIRE missile. Longbow will provide the AH-64 and the Comanche (RAH-66) 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 obscurants. HELLFIRE must effectively engage and destroy advanced threat armor on the airland battlefield of the late 1990's and into the next century. Project DC31 encompasses modifications to the AH-64 necessary to effectively and efficiently integrate the Longbow system into the AH-64 APACHE.

AMENDED FY 1993 AMENDED BUDGET REVIEW RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604816A**
PE Title: **LONGBOW**
Project Title: **LONGBOW - ED**

Project Number: **#DC27**
Budget Activity: **#4**



POPULAR NAME: **LONGBOW**

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

SCHEDULE	FY 1991	FY 1992	FY 1993	To Complete
Program Milestones	MSII (DAB) 1QFY91			MDR IIIA 2QFY95 MDR IIIB 1QFY97
Engineering Milestones		Critical Design Review 1QFY92		
T&E Milestones				Develop Test 4QFY94 IOTE 2QFY95
Contract Milestones				LRIP Award (FCR & Seeker) 3QFY95 Full Rate Prod Awd (FCR & SKR) 1QFY97
BUDGET ($000)	**FY 1991**	**FY 1992**	**FY 1993**	**Program Total (To Complete)**
Major Contract	179000	162200	189700	Cont
Support Contract	- 0 -	- 0 -	- 0 -	- 0 -
In-House Support	17969	17087	22388	Cont
GFE/Other	- 0 -	- 0 -	- 0 -	- 0 -
Total	196969	179287	212088	Cont

AMENDED FY 1993 AMENDED BUDGET REVIEW RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604816A**
PE Title: **LONGBOW**
Project Title: **LONGBOW - ED**

Project Number: **#DC27**
Budget Activity: **#4**

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: LONGBOW consists of a mast mounted Fire Control Radar (FCR), which will be integrated into the AH-64 airframe, and a radar frequency (RF) autonomous seeker in a HELLFIRE missile. LONGBOW will provide the AH-64 and subsequently the Comanche (RAH-66) 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 obscurants. HELLFIRE must effectively engage and destroy advanced threat armor on the airland battlefield of the late 1990s and into the next century. To be effective and survive on this future battlefield, the attack helicopter team must rapidly engage multiple targets with minimum exposure time, and deploy a system that is inherently resistant to threat countermeasures.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- (U) Conducted DAB II for Longbow gaining approval to proceed into Engineering and Manufacturing Development (EMD)

(U) FY 1992 Planned Program:
- (U) Continue development
- (U) Conduct hardware and software critical design reviews for both the Fire Control Radar (FCR and Radio Frequency (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) Program Plan to Completion:
- (U) Complete delivery of FCR prototypes; continue missile deliveries
- (U) Conduct qualification tests
- (U) Complete aircraft integration
- (U) Conduct force development test and evaluation
- (U) Conduct initial operational test and evaluation

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 1992/1993 AMENDED RDTE DESCRIPTIVE SUMMARY:

1. (U) **TECHNICAL CHANGES:** None
2. (U) **SCHEDULE CHANGES:** EMD program stretched by 5 months due to DAB direction.
3. (U) **COST CHANGES:** Cost increases due to schedule stretch and implementation of aggressive risk management program. FY 1991 funding includes airframe integration costs formerly included under PE #0203744A.

AMENDED FY 1993 AMENDED BUDGET REVIEW RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604816A**
PE Title: **LONGBOW**
Project Title: **LONGBOW - ED**

Project Number: **#DC27**
Budget Activity: **#4**

F. (U) PROGRAM DOCUMENTATION:

Organization and Operational (O&O) Plan	8/85
System Concept Paper dated	10/85
TRADOC Letter of Agreement (LOA)	1/86
Required Operational Capability (ROC)	8/90
Decision Coordinating Paper(DCP)	12/90
Acquisition Decision memorandum (ADM)	12/90

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

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands) None.

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

J. (U) TEST AND EVALUATION DATA:

LRU Integration Test	1QFY93
FCR Qualification Test	4QFY93
Technical Test	4QFY94
Adverse Weather Test	4QFY94
Force Development Test & Experimentation (FDTE)	1QFY95
Initial Operational Test & Evaluation (IOT&E)	2QFY95

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604816A**
PE Title: **Apache Longbow**
Project Number: **#DC31**
Budget Activity: **#4**

A. (U) RESOURCES: ($ in Thousands)
Project Title: **Apache Longbow**

Popular Name	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
Apache Longbow	- 0 -	52880	69714	Cont	Cont

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. It provides an all-weather fire and forget missile capability which increased the AH-64 lethality and survivability. The Longbow Apache 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 1991 Accomplishments: Program funded in Project DC27 this PE

(U) FY 1992 Planned Program:
- (U) Conduct critical design review
- (U) Continue EMD
- (U) Conduct force development test and experimentation phase 1
- (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) Program Plan to Completion:
- (U) Complete EMD
- (U) Conduct Initial Operational Test & Experimentation (IOTE)

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604816A** Project Number: **#DC31**
PE Title: **Apache Longbow** Budget Activity: **#4**

D. (U) WORK PERFORMED BY: McDonnell Douglas Helicopter Company, Mesa, Arizona

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. (U) TECHNICAL CHANGES: Project was restructured from PE #0203744A, Project D423.
2. (U) SCHEDULE CHANGES: Program extended from 51-month EMD to 70-month EMD at December 1990 DAB Direction. Milestone IIIA decision slipped from June 1994 to March 1995.
3. (U) COST CHANGES: DOD FY 1992 Appropriations Act added $21 Million to C3I to begin development work on an AH64C prototype. OSD added the $21 Million to the rescission list since it was not requested by the Army in the Amended Budget Submission. FY 1993 RDTE,A funding was increased to accommodate extending EMD, adding risk reduction, changes in the airframe integration, producibility engineering and adjusted labor and overhead rates.

F. (U) PROGRAM DOCUMENTATION:

Program Documentation:	
AAH-MN	9/90
Decision Coordinating Paper	9/90
Test & Evaluation Master Plan	6/91
Acquisition Decision Memorandum	12/90

G. (U) RELATED ACTIVITIES: Related efforts accomplished in PE #0604223A (Comanche Longbow). No unnecessary duplication of effort exists within the Army or DoD.

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands) Not applicable.

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

J. (U) MILESTONE SCHEDULE:

Milestones	Milestones Dates
Low Rate Initial Production	1/94
Contract Award	4/95
Milestone IIIA	3/95
Milestone IIIB	10/96

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604817A**
PE Title: **Non-Cooperative Target Recognition - Engineering Development** Budget Activity: **#4**

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

Project Number Title	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D356 Non-Cooperative Target Recognition Electronic Support Measures (NCTR-ESM)	10497	11912	18502	Cont	Cont
A434 Non-Cooperative Target Recognition - VSX (NCTR-VSX)	494	- 0 -	- 0 -	Cont	Cont
D482 Ground Combat Identification	- 0 -	- 0 -	6813	Cont	Cont
D494 Non-Cooperative Target Recognition - Hostile Aircraft Identification Device Equipment (NCTR-HAIDE)	- 0 -	11613	619	Cont	Cont
D495 Non-Cooperative Target Recognition-Non-Imaging Sensors (NCTR-NIS)	494	9216	1636	Cont	Cont
PE TOTAL	11485	32741	27570		

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 D356 was moved to this PE from PE #0604709A. Funding for D494 is broken out from Project D356 starting in FY 1992. Project D482 for Ground Combat Identification is a new start and 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.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND 1993:

(U) Project A434-NCTR-VSX. This project was previously classified/special access.

(U) **FY 1991 Accomplishments:**
- (U) Program returned to Tech Base for further investigation

(U) **FY 1992 Planned Program:** Project not funded

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

Program Element: **#0604807A**
PE Title: **Medical Materiel/Medical Biological Defense Equipment — Engineering Development** Budget Activity: **#4**

Director, Defense Research and Engineering (Research and Advanced 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; Pan American Health Organization.

(U) Other Appropriation Funds: ($ in Thousands) Procurement of transitioned products is provided for in Other Procurement, Army (OPA), Operation and Maintenance, Army (OMA), or passed to other procuring agencies as appropriate.

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0604817A
PE Title: Non-Cooperative Target Recognition - Engineering Development Budget Activity: **#4**

(U) Work Performed by:
NCTR-VSX: The prime contractor for NCTR-VSX is Texas Instruments. In-house effort is performed by Product Manager NCTR under Project Manager, RADAR and Combat Identification at Ft. Monmouth, NJ, and Program Executive Officer, Intelligence and Electronic Warfare, Vint Hill Farms Station, Warrenton, VA. Technical assistance is also provided by the US Army Communications Electronic Command (CECOM), Ft. Monmouth, NJ.

NCTR-NIS: Phase I contractors are General Dynamics, Ontario, CA; Hazeltine Corp., Greenlawn, NY; and Sanders Lockheed, Nashua, NH. Phase II prime contractor has not yet been selected. In-house effort is performed by Product Manager, NCTR, Ft. Monmouth, NJ. Program oversight is through Project Manager, RADAR at Ft. Monmouth, NJ and Program Executive Office, Intelligence and Electronic Warfare (PEO-IEW) at Vint Hill Farms Station, Warrenton, VA.

Ground Combat ID: Contractor to be selected, under open competition, during 1st QTR FY93. In-house effort is performed by a coordinated effort of Laboratory Command (LABCOM) personnel and Combat Identification Office personnel. The Combat ID personnel are located at Wright Patterson AFB, Dayton, OH, under Project Manager, Radar and Combat Identification, Ft. Monmouth, NJ, and Program Executive Officer, Intelligence and Electronic Warfare, Vint Hill Farms Station, Warrenton, VA.

(U) Related Activities:
PE #0603710A - Night Vision Advanced Technology
PE #0603757A - Forward Area Air Defense (FAAD) System
PE #0604709A - Identification Friend or FOE (IFF) Engineering Development
PE #0604810A - Fiber Optic Guided Missile - Engineering Development
PE #0604820A - Radar Development
There is no unnecessary duplication of effort within the Army or the Department of Defense.

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

(U) International Cooperative Agreements: Not applicable

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0604817A
PE Title: Non-Cooperative Target Recognition - Engineering Development

Project Number # 356
Budget Activity: #4

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

Project Title: Non-Cooperative Target Recognition - Electronic Support Measures (NCTR-ESM)

Popular Name	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
NCTR-ESM	10497	11912	18502	Cont	Cont

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The dynamic nature of Airland Battle requires that Army forces capitalize on the beyond visual range capabilities of air defense weapons yet maintain freedom of maneuver by friendly aviation and air forces. Positive Hostile Identification devices developed by this project will identify foes and preclude engagement of friendly aircraft (fratricide). Emphasis is placed on technologies for Non-Cooperative Target Recognition (NCTR) that exploit the inherent and unique signatures of air platforms. NCTR Electronics Support Measures (ESM) passively identifies aircraft by recognizing their electron 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. This project was moved to this program element (PE) from PE #0604709A beginning FY 1992. PE #0604817A Project #D494 shared funding in FY 1991 and prior with this project.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- (U) Completed Milestone II in-process review (IPR)
- (U) Award Engineering & Manufacturing Development Contract for NCTR-ESM (Model 1)
- (U) Initiated integration effort with Model 1 weapon platform managers (Avenger & ADATS)
- (U) Initiated efforts for NCTR-ESM (Model 2) option.

(U) FY 1992 Planned Program:
- (U) Continue development of NCTR-ESM (Model 1)
- (U) Exercise option for development of NCTR-ESM (Model 2)
- (U) Continue integration effort with NCTR-ESM (Model 1) weapon platform managers (AVENGER & ADATS)
- (U) Initiate integration effort with NCTR-ESM (Model 2) weapon platform manager Ground Based Sensor (GBS)

(U) FY 1993 Planned Program:
- (U) Complete NCTR-ESM Model 1 Pre-Production Qualification Tests/Limited User Test (PPQT/UT)
- (U) Continue development of NCTR-ESM (Model 2)
- (U) Release LRIP Request for Proposal (RFP) for NCTR-ESM (Model 1)
- (U) Complete integration of NCTR-ESM (Model 1) units with host platforms (AVENGER & ADATS)

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604817A** Project Number **# 356**
PE Title: **Non-Cooperative Target Recognition - Engineering Development** Budget Activity: **#4**

(U) Program Plan to Completion:

- (U) Conduct PPQT/LUT for NCTR-ESM (Model 2)
- (U) Complete integration of NCTR-ESM (Model 2) units with host platform user (GBS)
- (U) Conduct LRIP Program Review for NCTR-ESM (Model 1 & 2)
- (U) Award LRIP Contract for NCTR-ESM (Model 1 & 2)

D. (U) WORK PERFORMED BY: In-house work is managed by Product Manager, PM NCTR at Ft. Monmouth, NJ. Integration with air defense weapons and radars is coordinated with the Program Executive Officer (PEO), Air Defense and Redstone Arsenal, AL. Program oversight is through Project Manager, RADAR and Combat Identification at Ft. Monmouth, NJ, and PEO, Intelligence and Electronic Warfare at Vint Hill Farms Station, Warrenton, VA. Technical assistance is provided by CECOM's Center for Electronic Warfare/Reconnaissance, Surveillance and Target Acquisition at Ft. Monmouth, NJ and Missile Command's (MICOM) 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 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** None
2. **(U) SCHEDULE CHANGES:** Contract award for NCTR-ESM (Model 2) has been accelerated to 2QFY92
3. **(U) COST CHANGES:** Change reflects zero-sum adjustments within the NCTR Program (RDTE & OPA), in order to exercise option for NCTR-ESM (Model 2).

F. (U) PROGRAM DOCUMENTATION: Forward Area Air Defense System Capstone Required Operational Capability (ROC), 02/88

G. (U) RELATED ACTIVITIES: 0603757A - Forward Area Air Defense (FAAD) System.
PE #0604709A - Identification Friend or Foe - Engineering Development
PE #0604820A - Radar Development
There is no unnecessary duplication of effort within the Army or the Department of Defense. All combat identification related development is overseen by a tri-service General Officer steering committee to synchronize service identification development and signature collection and to avoid duplication of effort.

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands) Not applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604817A**
PE Title: **Non-Cooperative Target Recognition - Engineering Development**

Project Number **# 356**
Budget Activity: **#4**

J. (U) MILESTONE SCHEDULE:

Milestones	Milestones Dates
Acquisition Plan Approved	03/88
Required Operational Capability Revalidated	10/90
Model I EMD Contract Award	03/91
PPQT/LUT (Model 1)	01/93 - 09/93
LRIP Program Review (Model 1)	04/94
PPQT/LUT (Model 2)	01/94 - 11/94
First Unit Equipped (Model 1)	05/96
First Unit Equipped (Model II)	08/97

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604817A** Project Number **D494**

PE Title: **Non-Cooperative Target Recognition - Engineering Development** Budget Activity: **#4**

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

Project Title: Non-Cooperative Target Recognition - Hostile Aircraft Identification Device Equipment (NCTR-HAIDE)

Popular Name	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
NCTR-HAIDE	- 0 -	11613	619	Cont	Cont

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: This project is funded to develop Model 1, the Hostile Aircraft Identification Device Equipment II (HAIDE), Non-Cooperative Target Recognition (NCTR) devices. The dynamic nature of Airland Battle requires that Army forces capitalize on the beyond visual range capabilities of air defense weapons yet maintain freedom of maneuver by friendly aviation and air forces. Positive Hostile Identification devices developed by this project will identify foes and preclude engagement of friendly aircraft (fratricide). HAIDE II essentially collects, processes, and analyzes the data in comparison to a signature library to positively identify the aircraft. NCTR devices are physically and electronically integrated into air defense weapons and/or radars. The identification data is then added to radar track messages and/or displayed directly on the fire control display of an air defense weapon. This program shared funding in FY 1991 & prior with PE #0604709A, Project #D356.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- (U) Awarded contract modification to integrate NCTR with the HAWK display
- (U) Continued Engineering and Manufacturing Development (EMD) prototype design efforts
- (U) Continued HAWK platform integration effort
- (U) Completed Preliminary Design Review

(U) FY 1992 Planned Program:
- (U) Complete Critical Design Review
- (U) Complete HAIDE EMD design and prototype fabrication
- (U) Approve EMD test plans

(U) FY 1993 Planned Program:
- (U) Conduct Pre-Production Qualification Test/Limited User Test (PPQT/LUT)
- (U) Complete final test report
- (U) Prepare Limited Rate Initial Production (LRIP) Request for Proposals (RFP)
- (U) Prepare LRIP Program Review documentation

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604817A** Project Number D494

PE Title: **Non-Cooperative Target Recognition - Engineering Development** Budget Activity: **#4**

D. (U) WORK PERFORMED BY: In-house work is managed by Product Manager, PM-NCTR at Ft Monmouth, NJ. Integration with air defense weapons and radars is coordinated with the Program Executive Officer (PEO), Air Defense at Redstone Arsenal, AL. Program oversight is through Project Manager, RADAR and Combat Identification at Ft. Monmouth, NJ, and PEO, Intelligence and Electronic Warfare at Vint Hill Farms Station, Warrenton, VA. Technical assistance is provided by CECOM's Center for Electronic Warfare/Reconnaissance, Surveillance and Target Acquisition at Ft. Monmouth, NJ, and MICOM's Research and Development Engineering Center at Huntsville, AL. Contractor for HAIDE II is Scope Electronics of Reston, VA.

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** None
2. **(U) SCHEDULE CHANGES:** Model 2 is indefinitely postponed due to affordability.
3. **(U) COST CHANGES:** None

F. (U) PROGRAM DOCUMENTATION: Forward Area Air Defense System CAPSTONE ROC 01/88

G. (U) RELATED ACTIVITIES:
PE # 0603757A - Forward Area Air Defense (FAAD) System
PE #0604709A - Identification Friend-or-Foe (IFF) Engineering Development
PE #0604820A - Radar Development
There is no unnecessary duplication of effort within the Army or the Department of Defense. All combat identification related development is overseen by a tri-service General Officer steering committee to synchronize service identification development and signature collection and to avoid duplication of effort.

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

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
OPA II - AD5051		11970	

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

J. (U) MILESTONE SCHEDULE:

Milestones	Milestones Dates
ROC revalidated	03/90
Model I EMD Contract Award	03/90
Model I PPQT/LUT	10/92 - 06/93
Model I LRIP Program Review	10/93
Model I Milestone III IPR	02/95
Model I First Unit Equipped	02/96

AMENDED FY 1992/1993 BIENNIAL RDTE 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 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D323 Common Hardware Software (CHS)	6367	11554	10655	Cont	Cont
DC34 Army Tactical C2 Systems (ATCCS) Engineering	11747	12332	9920	Cont	Cont
DC36 C3 I Interoperability Test Suite	6658	- 0 -	- 0 -	- 0 -	9645
PE TOTAL	24772	23886	20575		

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 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 Systems 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 C3 I interoperability test bed provides each system developer the capability to conduct laboratory tests of its system's compatibility and interoperability with other systems without requiring the interfacing systems to be relocated. Each ATCCS system's life-cycle software engineering center throughout the country is connected via commercial leased 'ines 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 BOTH FY 1992 AND 1993:

(U) Project DC36 - The C3 I Interoperability Test Suite: Components of which are the Army Interoperability Network (AIN) and the support through use of the AIN of interoperability testing. AIN is a centrally controlled, nationally distributed network of test instrumentation and communications that is being implemented in blocks to conform to the block development approach of ATCCS. AIN interconnects the Communications-Electronics Command (CECOM) Life Cycle Software Engineering (LCSE) Centers and provides its users with access to not only Army but also joint tactical automation systems and their supporting communications systems. AIN allows distributed developmental testing of interfaces as the first phase of the complex process of assuring: (1) nodal interoperability (between battlefield automated systems and operational facilities within a battlefield functional area (BFA); (2) Army interoperability (among BFA control systems and between BFA subordinate systems of different BFAs); and (3) joint and combined interoperability.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604818A**
PE Title: **Army Tactical Command and Control (C2) Hardware and Software** Budget Activity: **#4**

(U) FY 1991 Accomplishments:

- **(U)** Completed Block 1 preliminary design review (PDR)
- **(U)** Initiated purchase of hardware, implement, and install Army Interoperability Test Center (AITC), tactical communications interfaces, and Ft. Leavenworth remote site
- **(U)** Integrate and test AIN block 1 in preparation for Maneuver Control System S.11 and Initial Force Level Control System interoperability testing
- **(U)** Participate in Army test requirements and test planning
- **(U)** Coordinate with ATCCS functional area project managers to develop schedules for developmental certification test

(U) Work Performed By: Contractor: MILTOPE Corporation, Melville, NY; UNISYS Eatontown, NJ; R&D Associates, Marine Del Ray, CA; Teledyne Brown Engr., Huntsville, AL; COMCON, Delran, NJ; Applications Experiment Corporation, West Long Beach, NJ; Computer Science Corporation, Falls Church, VA; Compass, Vienna, VA; Columbia Research Corporation, Arlington, VA; SAIC, San Diego, CA; Ventronnix, Roslyn Heights, NY; Wang, Lowell, MA; TRW, Rendo Beach, CA; GE, Philidelphia, PA; TELOS, Santa Monica, CA and Institute of Defense Analysis, Alexandria, VA. In-house organizations: US Army Communications-Electronics Command (CECOM), Fort Monmouth, NJ; US Army Test and Evaluation Command (TECOM), Fort Huachuca, AZ; Communications-Electronics Board (CEB), Fort Gordon, GA.

(U) Related Activities:

PE #0203740A (Maneuver Control System)
PE #0203726A (Advanced Field Artillery Tactical Data System)
PE #0603805A (Combat Service Support Control System Evaluation & Analysis)
PE #0604741A (Air Defense C 2I-Engineering Development)
PE #0604321A (Joint Tactical Fusion Program)
PE #0205604N (Tactical Information System)
PE #0203740A (Maneuver Control System)

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

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604818A** Project Number # **D323**
PE Title: **Army Tactical Command and Control (C2) Hardware and Software** Budget Activity: **#4**
Project Title: **Common Hardware/Software (CHS)**

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

Popular Name	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
Common Hardware/Software (CHS)	6367	11554	10655	Cont	Cont

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: Common Hardware and Software (CHS) is the Army's program to equip all 5 battlefield functional areas (BFA), from corps to foxhole, with common hardware and software. The overall goal is to improve interoperability by standardizing battlefield C2 automation through centralized buys of non-developmental item standard protocols, and Ada software. Four hardware versions are available to meet the specific needs of each BFA, i.e. hand-held, portable, transportable, and light weight computer unit.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- (U) Assured commonality of tactical C3I systems
- (U) Continued delivery CHS
- (U) Continued to manage the integration of CHS into Standardized Integrated Command Post System (SICPS)
- (U) Initiated actions leading to award of second generation CHS
- (U) Continued to manage Common ATCCS Support Software (CASS)
- (U) Awarded Light Weight Computer Unit Contract
- (U) Developed standard nodal system operational facilities configuration using CHS
- (U) Delivered initial Light Weight Computer Unit (LCU) (U1/U2)

(U) FY 1992 Planned Program:
- (U) Continue to provide support to CHS users to develop and field battlefield automated system
- (U) Continue to manage CASS
- (U) Funding increases as actions are initiated to award a contract for the second generation of CHS
- (U) First unit equipped (FUE) - Maneuver Control System (MCS) CHS
- (U) Conduct test on LCU equipment
- (U) Conduct initial operational test and evaluation (IOT&E) on Common Hardware and Software in conjunction with Maneuver Control System (MCS)

(U) FY 1993 Planned Program:
- (U) Continue to manage CASS
- (U) Deliver CHS to support MCS
- (U) Testing will be conducted on CHSII
- (U) Continue to provide support to CHS users

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604818A** Project Number **# D323**
PE Title: **Army Tactical Command and Control (C2) Hardware and Software** Budget Activity: **#4**
Project Title: **Common Hardware/Software (CHS)**

- (U) Continue to deliver CHS/LCU
- (U) The CHS contract will be recompeted for CHSII

(U) Program Plan to Completion:

- (U) Continue to provide CHS support to users
- (U) Continue to deliver CHS/LCU for the remaining BFA
- (U) Continue to manage CASS

D. (U) WORK PERFORMED BY: A firm fixed-priced contract with basic and 5 years of options was awarded to MILTOPE Corp., Melville, NY for buying common hardware/software. Orders for the basic year quantities and option years 1 through 3 have been awarded. Currently ordering from option year 4 prices which expire 18 Aug 92. The in-house developing agency is Program Manager (PM) Common Hardware and Software, Program Executive Office (PEO) Command and Control Systems, Ft. Monmouth, NJ. MITRE Corp., UNISYS, Teledyne Brown Engineering, R&D Associates, Concon Inc., and Compass provide PM Support.

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** None
2. **(U) SCHEDULE CHANGES:** None
3. **(U) COST CHANGES:** None

F. (U) PROGRAM DOCUMENTATION:

Program Initiated	12/85
CHS Required Operational Capability (ROC)	12/86
Acquisition Plan	6/88
Baseline Approved	3/89
CHS Test Plan (currently being staffed) (Annex 9 to ATCCS TEMP)	TBD

G. (U) RELATED ACTIVITIES:
PE #0203726A (Advanced Field Artillery Tactical Data System)
PE #0203740A (Maneuver Control System)
PE #0604321A (Joint Tactical Fusion Program)
PE #0604741A (Air Defense Command, Control and Intelligence (C2I)-Engineering Development)
PE #0603805A (Combat Service Support Control System (CSSCS) Evaluation and Analysis)

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands) Not applicable

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604818A** Project Number **# D323**
PE Title: **Army Tactical Command and Control (C2) Hardware and Software** Budget Activity: **#4**
Project Title: **Common Hardware/Software (CHS)**

J. (U) MILESTONE SCHEDULE:

Milestones	Milestones Dates
Program Initiated	1Q85
Army Tactical Command and Control System (ATCCS)	1Q86
Common Hardware Software (CHS) Required Operational Capability (ROC)	
CHS Contract Award to MILTOPE	4Q88
ROC update with LCU	4Q90
Deliver CHS to each Battlefield Functional Area (BFA)	
developer for test and evaluation	1Q88-4Q90
LCU Contract Awarded to SAIL	3Q91
Initial Operational Test and Evaluation	FY92
BFA CHS Production Decision	
Maneuver Control System (MCS)	FY92
Combat Service Support Control System (CSSCS)	
Advanced Field Artillery Tactical Data System	
(AFATDS) (Training Base)	FY93
Fire Support	FY94
Forward Area Air Defense System	
Command and Control (FAADC2)	FY93
Re-compete CHS contract	FY93

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604818A** Project Number **# DC34**
PE Title: **Army Tactical Command and Control (C2) Hardware and Software** Budget Activity: **#4**

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

Popular Name	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
Army Tactical C2 Systems Engineering	11747	12332	9920	Cont	Cont

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The AirLand Battle doctrine requires military leaders to make sound and timely command and control decisions to direct the activities of assigned and supporting units. The umbrella program to exploit automation technology in support of this mission is the Army Tactical Command and Control System (ATCCS) Program. The effort to achieve horizontal integration of the ATCCS battlefield functional areas (BFA), although going on independently in each BFA, was not disciplined enough to address all connections and needs within the entire spectra of communications and control. Therefore, to ensure this horizontal integration effort is complete and automated, a significant management, systems engineering and integration effort is required. This project provides the technical and programmatic disciplines required for systems engineering and integration, experimentation acquisition management, testing, Ada software development, interoperability, fielding, and sustainment to assure an interoperable, as well as affordable ATCCS. The Program Executive Officer Command and Control Systems (PEO C2S) has planned an evolutionary approach to fielding the ATCCS as soon as possible. The approach entails analysis of the current (manual) battlefield architecture to establish the baseline to transition to a target ATCCS with partially automated capabilities. The target ATCCS will provide automated exchange of force level control (FLC) commander and staff information throughout the ATCCS network by FY-93. Through the use of technology insertion we will incrementally upgrade the BFA control systems with new Common Hardware and Software (CHS). Evolving from the target ATCCS, the Objective ATCCS will be fielded incrementally beginning in FY-97. The objective ATCCS will provide fully automated capabilities (information flows at the commander and functional staff levels) and will provide enhanced automation-supported planning and analysis functions.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- **(U)** Completed communication loading analysis
- **(U)** Finalized ATCCS shortfall analysis and technology insertion plans
- **(U)** Completed ATCCS specification
- **(U)** Provided configuration audit of ATCCS interoperability per user requirements
- **(U)** Updated ATCCS system development master plan
- **(U)** Continued configuration updates & management of overall ATCCS development
- **(U)** Continued program management support to PEO

(U) FY 1992 Planned Program:
- **(U)** Conduct/support preliminary target ATCCS configuration technical interface compatibility demonstrations.
- **(U)** Conduct/support preliminary target system configuration operational confidence demonstration and

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604818A** Project Number # **DC34**
PE Title: **Army Tactical Command and Control (C2) Hardware and Software** Budget Activity: **#4**

early user test and experimentation (EUTE) of partially automated ATCCS at Ft. Hood, TX (III Corps).

- (U) Update ATCCS System specification and ATCCS cross functional interface specification
- (U) Integrate ATCCS BFA systems into CHS in Standardized Integrated Command Post System (SICPS) shelters. Perform command post analysis to finalize, EUTE command post/hardware layouts, refine functional analysis to determine functions and workloads to be performed at each workstation for EUTE Command Post
- (U) Initiate fielding Common ATCCS Support Software (CASS) to strengthen commonality among the BFA systems to realize potential dollar savings through multiple user and application of common software at all BFAs. Continue to support common software development and specific applications software that has utility in more than one BFA

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

- (U) Conduct/support target system configuration technical interface compatibility demonstrations.
- (U) Conduct/support the target system configuration developmental/operational confidence demonstrations in conjunction with the follow-on operational tests and evaluations (FOT&E) at III Corps
- (U) Update ATCCS System Specification and ATCCS cross functional interface specification. Continue fielding CASS. Additional upgrades with common hardware and software will add to the automated capabilities previously fielded and in development
- (U) Update the Command Post Analysis to finalize FOTE I command post/hardware layouts = workstation functions
- (U) Implement new competitive contract for second generation of CHS equipment and upgrade training diagnostics and system manuals

(U) **Program Plan to Completion:**

- (U) Conduct/support FOTE II of complete target ATCCS configuration at III Corps. Design, develop, test and field objective ATCCS (FY94-97)
- (U) Update ATCCS System specification and ATCCS cross functional interface specifications. Develop advanced program (high technology), specifications, testing and fielding/support for follow-on ATCCS
- (U) Update the Command Post Analysis to finalize FOTE II Command Post/Hardware layouts and workstation functions.
- (U) Ensure logistics support structure keeps pace with hardware and software upgrades. Provide updated training, systems manuals, support plans, diagnostics, spares, and hot mockups

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 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. (U) **TECHNICAL CHANGES:** None
2. (U) **SCHEDULE CHANGES:** None
3. (U) **COST CHANGES:** None

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604818A** Project Number # **DC34**
PE Title: **Army Tactical Command and Control (C2) Hardware and Software** Budget Activity: **#4**

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 (REV 4, chg 5)	9/91
Force Level Control System	

G. (U) RELATED ACTIVITIES:

PE #0203726A (Advanced Field Artillery Tactical Data System)
PE # 203740A (Maneuver Control System)
PE #0604321A (All Source Analysis System)
PE #0604741A (Air Defense C2I-Engineering Development)
PE #0603805A (Combat Service Support Control System Evaluation and Analysis)

PEO CCS Mission is to assure that no unnecessary duplication of effort exists within the Army or DoD. A central feature of all ATCCS programs is to ensure interoperability with all other battlefield functional areas.

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands) Not applicable.

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

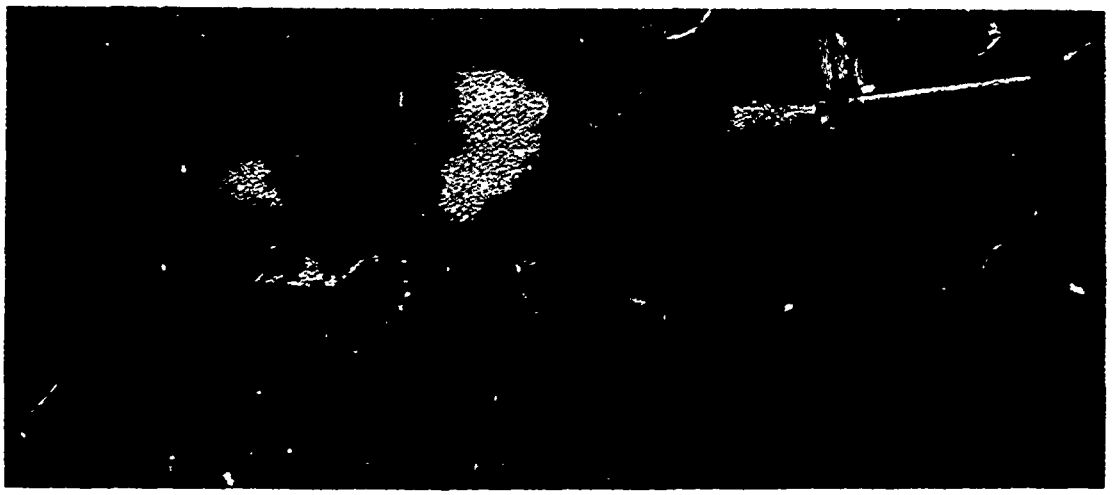
J. (U) MILESTONE SCHEDULE:

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 Follow-on Operational Test & Evaluation (FOT&E) I	04/93
Finalize Objective ATCCS Specification	09/93
ATCCS System Confidence Demonstration	10/93
ATCCS FOTE II System Field Test at III Corps	01/94
Finalize design, development, test and fielding of Objective ATCCS	10/94-9/97
Develop follow-on advanced ATCCS program	09/97

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0604819A
PE Title: Line-of-Sight Antitank
Project Title: Line-of-Sight Antitank

Project Number: #DE07
Budget Activity: #4



POPULAR NAME: LOSAT

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

SCHEDULE	FY 1991	FY 1992	FY 1993	To Complete
Program Milestones		ASARC 9/92	MS II 11/92	LRIP PRG REV 1QFY98
Engineering Milestones			PDR 6/93	CDR 1QFY94 MANRATE SYS 3QFY95
T&E Milestones				EMD TEST BEGINS 2QFY95 IOTE 3QFY97
Contract Milestones			EMD Award 11/92	LRIP I AWARD 2QFY98
BUDGET ($000)	**FY 1991**	**FY 1992**	**FY 1993**	**Program Total (To Complete)**
Major Contract			77398	Cont
Support Contract			8414	Cont
In-House Support		3000	22630	Cont
GFE/ Other			14406	Cont
Total	-0-	3000	122848	Cont

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0604819A
PE Title: Line-of-Sight Antitank
Project Title: Line-of-Sight Antitank

Project Number: #DE07
Budget Activity: #4

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The current and projected armor threat and operational concept envisioned for fighting the antiarmor battle requires an effective, extended range, vehicular mounted, heavy anti-tank capability for the infantry. The Line-of-Sight Antitank (LOSAT) will be capable of operating out to the maximum range of direct fire combat engagements and will perform under day/night adverse weather conditions, and in the presence of obscurants. The LOSAT program will develop a replacement system(s) for the Improved Tube-Launched, Optically-Tracked, Wire-Guided (TOW) Missile Vehicle (ITV) platforms. The Infantry's dedicated heavy antitank system, LOSAT, will be counter-measures hardened to perform effectively in a dirty battlefield environment. LOSAT will incorporate kinetic energy capabilities to defeat the evolving armor threat. This effort will transition from Program Element #0603612A/D096 in FY 1993 for Engineering and Manufacturing Development (EMD).

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments: Project not funded.

(U) FY 1992 Planned Program:
- (U) Evaluate EMD contractor's proposal
- (U) Prepare MSII documentation

(U) FY 1993 Planned Program:
- (U) Award EMD contract
- (U) Begin component/subsystem testing
- (U) Conduct motor preliminary flight rating test (PFRT)

(U) Program Plan to Completion:
- (U) Conduct production proveout tests
- (U) Conduct preliminary production qualification testing
- (U) Manrate system
- (U) Conduct system qualification
- (U) Conduct operational testing

D. (U) WORK PERFORMED BY: In-house efforts performed by the Armored Systems Modernization (ASM) Program Executive Office (PEO), Line-of-Sight Antitank Weapon Systems Project Office, U.S. Army Missile Command (MICOM) Redstone Arsenal, AL, and the U.S. Army Tank-Automotive Command (TACOM), Warren, MI. Sole source contract award for EMD will be made to LTV of Dallas, TX, in 1QFY93. LTV will subcontract to Texas Instruments of Dallas, TX, and FMC of San Jose, CA.

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** None

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0604819A
PE Title: Line-of-Sight Antitank
Project Title: Line-of-Sight Antitank

Project Number: #DE07
Budget Activity: #4

2. (U) SCHEDULE CHANGES: The Milestone II EMD decision slipped from Jun 91 to Nov 92 due in part to funding delays and test failures which impacted the DEM/VAL flight test program schedule and in part due to the addition of risk reduction efforts in response to an Army decision for a more robust DEM/VAL LOSAT program.

3. (U) COST CHANGES: The total project cost increase of $204,393K is the result of estimating changes reflecting the increased escalation associated with a slide in the schedule period of performance and a better defined Engineering and Manufacturing Development program plan including an increase in required tests and test hours and a commensurate increase in prototype hardware and schedule duration.

F. (U) PROGRAM DOCUMENTATION:

Letter of Agreement	10/86
Advanced Anti-Tank Weapon System-Heavy Program Decision Memorandum	8/86
Special In-Process Review	12/87
AAWS-H HQDA Program Review	8/88
Organization and Operational Plan	3/89
Acquisition Plan	2/91
Required Operational Capabilities	5/91
Critical Resource Life Cycle Management Plan	7/91
Test and Evaluation Master Plan	11/91

G. (U) RELATED ACTIVITIES:

PE #0603612A (Advanced Anti-Tank Weapon System)
PE #0603313A (Missile and Rocket Advanced Technology)
PE #0602709A (Night Vision Technology)
PE #0603710A (Night Vision Advanced Technology)
There is no unnecessary duplication of effort within the Army or other services/agencies within the Department of Defense. This is assured by continuous coordination with other services and agencies and oversight of the program by the OSD-level Conventional Systems Committee.

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands) Not applicable.

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

J. (U) TEST AND EVALUATION DATA: The LOSAT EMD test program will begin Technical Validation Tests in 1QFY95 with seven systems. The Technical Qualification Tests will begin 2QFY96 with seven systems

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604819A** Project Number: **#DE07**
PE Title: **Line-of-Sight Antitank** Budget Activity: **#4**
Project Title: **Line-of-Sight Antitank**

from validation tests and three new systems. The EMD test program will end with a four-month Force Development Test and Experimentation from 4QFY96 to 1QFY97 and an Initial Operational Test and Evaluation in 3QFY97 using two refurbished EMD test systems and four new systems.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604820A**
PE Title: **Radar Development**

Project Number: **#DE10**
Budget Activity: **#4**

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

Project Title: FAAD Ground Based Sensor

Popular Name	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
FAAD Ground Based Sensor	- 0 -	39870	18656	25100	139626

B. (U) BRIEF DESCRIPTION OF MISSION REQUIREMENT AND SYSTEM CAPABILITIES: The Mission of the Forward Area Air Defense Ground Base Sensor (FAAD GBS) is to provide continuous, acquisition and tracking of friendly and hostile aircraft over the division area of influence, provide cueing data to the AVENGER Pedestal Mounted STINGER, protect friendly aircraft from fratricide, and secondarily provide target information to the FAAD Line of Sight-Forward-Heavy (LOS-F-H). FAAD GBS performs this mission by providing its air picture data to the FAAD Command, Control and Intelligence (C2I) system, or in continuity of operations (CONOPS), directly to support fire units. The FAAD GBS System consists of a radar based sensor with Integrated Identification Friend or Foe (IFF) and Non-Cooperative Target Recognition (NCTR) identification devices, prime mover/power, communications equipment, an operator's remote control unit and FAAD C2 interfaces. The GBS target set includes both fix and rotary wing aircraft with growth to Cruise Missiles and unmanned aerial vehicle (UAVs). GBS target information includes track location, classification, and identification. Highly mobile and reliable, FAAD GBS's Electronic Counter Measures (ECM) and Anti-Radiation Missile (ARM) resistant performance will support both heavy and light forces in contingency and mature theaters. FAAD GBS is an essential component of the Army's FAAD System of Systems - it puts the "I" into the FAAD C2I to allow pro-active air defense by providing near real-time air picture and targeting data to the air defender. The FAAD GBS best value non-developmental item (NDI) acquisition strategy combines the best features of an event (exit criteria) based milestone schedule and a streamlined acquisition approach. FAAD GBS meets yesterday's and tomorrow's Army needs today in support of light and heavy forces throughout the spectrum of battlefield intensities and contingencies.

C. (U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) FY 1991 Accomplishments:
- (U) Completed Source Selection Evaluation Test (SSET) of candidate GBS in March 1991
- (U) Completed Production Readiness Assessment of candidate GBS in June 1991.

(U) FY 1992 Planned Program:
- (U) Completed Source Selection Evaluation Board December 1991
- (U) Award pre-production GBS contract options
- (U) Refine integrated logistics support (ILS) through a tailored Logistics Support Analyst process
- (U) Begin fabrication of six (6) P.DTE Preproduction Sensors.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0604820A** Project Number: **#DE10**
PE Title: **Radar Development** Budget Activity: **#4**

(U) FY 1993 Planned Program:

- **(U)** Continue fabrication, assembly, and checkout of Pre-production GBS
- **(U)** Begin pre-production qualification and technical tests
- **(U)** Initiate logistics demonstration and road tests
- **(U)** Complete development of system support packages, and for test preparations.

D. (U) WORK PERFORMED BY: Prime contractor to be determined from seven proposals by 2Q FY 92. In-house effort performed by FAAD Sensor Product Office ; and the Program Executive Officer, Intelligence and Electronic Warfare (PEO-IEW), Vint Hill Farms Station, Warrenton, VA; PEO Air Defense and US Army Missile Command's Research, Development and Engineering Center (RDEC) at Redstone Arsenal, AL, assisted by US Army Communications - Electronics Command's Electronic Warfare - Reconnaissance Surveillance and Target Acquisition (EW/RSTA) Center, Ft. Monmouth, NJ.

E. (U) COMPARISON WITH FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY:

1. **(U) TECHNICAL CHANGES:** None
2. **(U) SCHEDULE CHANGES:** None
3. **(U) COST CHANGES:** None

F. (U) PROGRAM DOCUMENTATION: Required Operational Capability (ROC) Revised 11/89; Test and Evaluation Master Plan (TEMP): Acquisition Strategy; Organization and Operation Plan (O&O).

G. (U) RELATED ACTIVITIES:
PE #0604741A (Air Defense Command, Control and Intelligence)
PE #0603757A (FAAD Systems)
PE #0604709A (IFF-Engineering Development)
PE #0604817A (Non-Cooperative Target Recognition-Engineering Development)
There is no unnecessary duplication of effort within the Army or the Department of Defense.

H. (U) OTHER APPROPRIATION FUNDS: ($ in Thousands) Not applicable

I. (U) INTERNATIONAL COOPERATIVE AGREEMENTS: Not applicable

J. (U) MILESTONE SCHEDULE:

Milestones	Milestones Dates
Milestone II/IIIA Review	07/86
Request for Proposal (RFP) Issued	05/90
Proposals Received	09/90
Evaluation Complete	12/91
Pre-Production Contract Award	01/92
Pre-Production Tests Complete	09/94
Milestone IIIB DAB-Full Scale Production (FSP)	01/95
First Unit Equipped (Pre-Prod)	11/94
First Unit Equipped (Prod)	08/96

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605103A**
PE Title: **RAND Arroyo Center** Budget Activity: **#6**

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

Project Number Title		FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D732	Arroyo Center Support	22564	16949	20164	Cont	Cont
PE TOTAL		22564	16949	20164		

B. (U) BRIEF DESCRIPTION OF ELEMENT: Through FY 1990, this effort was funded by the Operations and Maintenance, Army (OMA) Appropriation; in FY 1991, it was transferred to the RDTE, Army Appropriation. 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. The RAND Arroyo Center research agenda is primarily focused on mid- and long-term concerns. Results and analytical findings directly impact senior management deliberations on major issues. Arroyo Center research is sponsored by the Secretary of the Army, the Assistant Secretaries, the Chief of Staff and Vice Chief of Staff 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 multidiciplinary 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 1991 Accomplishments:

- (U) Major contributions included research that showed how the Army could save significantly in support costs for the AH-64 helicopter and the MlAl tank. Another study found that close support for ground troops in combat could be improved significantly - and at reasonable cost - by enhancing existing weapons systems, such as aviation electronics and munitions for aircraft and helicopters. A series of analytical efforts shed light on issues of airlift and sealift, logistics, active and reserve component force mix, and command and control from the recent Gulf War. The Arroyo Center also quantified the substantial return the Army gets on the investment required to recruit high-quality enlistees. The results provided crucial input for the Congressionally mandated

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0605103A
PE Title: **RAND Arroyo Center** Budget Activity: **#6**

Enlistment Bonus Test. Other research provided the Army with a process for incorporating uncertainty into its long-/mid-range planning for weapons systems procurement and military personnel management.

(U) FY 1992 Planned Program:

- (U) Effective FY 1992, the Arroyo Center reorganized and trimmed its focus from five to four major research areas, eliminating force development and employment as a separate area. In addition, the Arroyo Center cut the number of projects on its research agenda by more than one-third. Current Arroyo Center research is focused on three fundamental questions: 1) what should be the future role of military forces, and how should the U.S. respond to a world where the main U.S. military threat has disappeared but threats to peace have not? 2) how should the Army be structured for its new role in future contingencies? and 3) what can be done to rationalize the Army's peacetime and wartime support requirements?

(U) FY 1993 Planned Program

- (U) While specific topics will naturally evolve, research will continue in those major areas where RAND Arroyo Center can make unique contributions to the Army. Research will focus on future technology thrusts and weapon systems, new acquisition and investment strategies, and support structures for new environments. This work is integrated with the future force development work and the Army's strategy.

(U) Work Performed By: The RAND Corporation Arroyo Center or their contractors.

(U) Related Activities:

- (U) RAND Arroyo Center efforts span functional and organizational boundaries. As a result, the research conducted relates to a wide spectrum of Army activities
- (U) Research results are deposited with the Defense Technical Information Center for appropriate dissemination to other qualified recipients
- (U) 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.
- (U) There is no duplication of effort within the Army or the Department of Defense

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

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605301A**
PE Title: **Army Kwajalein Atoll** Budget Activity: **#6**

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

Project Number Title		FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D614	Army Kwajalein Atoll	175672	180700	184454	Cont	Cont
PE TOTAL		175672	180700	184454		

B. (U) BRIEF DESCRIPTION OF ELEMENT: U.S. Army Kwajalein Atoll (USAKA) is a remote, 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 DoD systems, space surveillance and object identification, and NASA scientific and space programs. Programs supported include Strategic Defense Initiative Organization (SDIO) functional, integrated technology, and Global Protection Against Limited Strikes 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 analysts 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. This element also provides funds for the contractors to accomplish range instrumentation modernization and improvement; and installation maintenance, repair and operation.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project D614 - Army Kwajalein Atoll. The Army, Air Force, Navy and Strategic Defense Initiative (SDI) Organization 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.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605301A**
PE Title: **Army Kwajalein Atoll** Budget Activity: **#6**

(U) FY 1991 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 first ERIS Flight Test Vehicle which successfully maneuvered to intercept a Minuteman I intercontinental ballistic missile reentry vehicle launched from Vandenberg AFB, CA.
- (U) Continued improvement and modernization of range instrumentation to ensure continued supportability. Included were upgrades to Communications, Command and Control, Safety, Telemetry, and Radar Systems.
- (U) Completed second year of the Threat Assessment and Countermeasure program to enhance USAKA Security Fix-It Plan, a seven year, $67 million program to identify and counter USAKA's security and intelligence vulnerabilities. Signed a $25.6 million contract to replace the existing Digital Microwave System (DMS) with a Submarine Fiber-Optic Telecommunications System (SFOTS). Completed encryption of DMS.
- (U) Continued USAKA environmental mitigation actions to insure compliance with environmental statutes. Included were collection and disposal of polychlorinated biphenyl (PCBs); construction of temporary hazardous materials storage facility; removal of waste oil/hazardous waste; cleaning of waste oil pits; completion of an asbestos inventory in facilities posing a health risk to humans; completion of fresh water recirculation system and improvements to landfill procedures and solid waste recycling..
- (U) Initiated contractual action to compete the KREMS contracts.

(U) FY 1992 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 (GBI) and AST programs; NASA's STS program; the Air Force Ballistic Missile Organization's associated operations; and SDIO's Lightweight Exoatmospheric Projection (LEAP) and Brilliant Pebbles (BP) programs.
- (U) Continue improvement and modernization of range facilities for more cost-effective testing and to support the continuous update of range requirement and facilities. Complete development of new Kwajalein Missile Range (KMR) control center; bring new systems on-line.
- (U) Continue contractual effort on KREMS competition.
- (U) Begin planning to support Global Protection against Limited Strike (GPALS) initial deployment and Theater Missile Defense (TMD) testing.
- (U) Execute the third 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 engineering study for command destruct encryption, airborne sensor platform, Meaconing, Intrusion, Jamming and Interference (MIJI), and upgrading KMR to Top Secret.
- (U) Tropical Storm Zelda struck Kwajalein Atoll 28 Nov 91 causing extensive damage to the island and facilities. A Congressional reprogramming action, estimated at $17 million, will be submitted for emergency construction/repair at USAKA.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605301A**
PE Title: **Army Kwajalein Atoll** Budget Activity: **#6**

(U) FY 1993 Planned Program:

- (U) Continue to support strategic operational and developmental testing for all services as indicated
- (U) Continue improvement and modernization of range instrumentation and facilities.
- (U) Award new contracts for USAKA technical support to include the range engineering and data acquisition effort.
- (U) Continue planning to GPALS initial deployment and theater missile defense operational testing.
- (U) Execute the fourth year of the Security Fix-It Plan. Initiate installation of a new USAKA electronic security system. Implement development of a digital command destruct system. Initiate an engineering study of an underwater threat acquisition and tracking system. Complete the USAKA SFOTS project. Begin design of facility changes for upgrading KMR to Top Secret.

(U) Work Performed By: USAKA is a subordinate command of the US Army Strategic Defense Command (USASDC). 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 and support for operational and development testing of deployed strategic systems such as Minuteman and Peacekeeper. Effective FY 1992, environmental mitigation is accomplished in PE #0605856A, Environmental Compliance. There is no unnecessary duplication of effort within the Army or the DoD.

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

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
Military Construction, Army	- 0 -	47400	52800
Military Construction, Defense	980	- 0 -	22000

(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 by the test activities are of a community service nature and are reimbursable by the host nation. Funding associated with the SOFA and MUORA are provided directly to the RMI government by U.S. Department of the Interior.

AMENDED FY 1992/1993 BIENNIAL 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 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D066 Aviation Engineering Flight Activity (Transfers to D618)	1147	- 0 -	- 0 -		
D452 Cold Regions Test Center	4173	2743	2736	Cont	Cont
D618 Aviation Development Test Activity	14323	15085	16426	Cont	Cont
D630 TECOM Test Design and Evaluation	3118	2927	2750	Cont	Cont
DE90 Yuma Proving Ground	21979	18892	15905	Cont	Cont
DE91 Combat Systems Test Activity	42405	36264	31097	Cont	Cont
DE92 Dugway Proving Ground	14561	14646	12644	Cont	Cont
DE93 White Sands Missile Range	74258	73135	67079	Cont	Cont
DE94 Army Electronic Proving Ground	11222	12054	11606	Cont	Cont
PE TOTAL	187186	175746	160243		

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 Ground, Ft. Huachuca, AZ); Cold Regions Test Center, Ft. Greely, 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. Implementation of defense management review initiatives coupled with DoD test workload adjustments have and will continue to result in mission realignment and productivity savings.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605601A**
PE Title: **Army Test Ranges and Facilities** Budget Activity: **#6**

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project D066 - Aviation Engineering Flight Activity (AEFA), Edwards Air Force Base, California: This program insures flight capability Army aviation through the conduct of engineering flight and reliability testing of aircraft and major aircraft components. This includes evaluation of aircraft incorporating advanced concepts with potential military applications; evaluation of foreign science and technologies through flight test of foreign air vehicles; technology flight evaluations of non-military aircraft and aircraft systems and technologies for potential Army applications; and tests to determine airworthiness of prototypes, initial production Army aircraft, and proposed engineering change proposals or modifications to existing aircraft systems. Under Defense Management Review initiatives, the management of testing and resources of this project was transferred to project D618, Aviation Development Test Activity effective FY 1992.

(U) FY 1991 Accomplishments:
- (U) Air worthiness qualification testing for the improved UH60, AH64 and the Army Helicopter Improvement Program (AHIP) and other Army aviation systems.
- (U) Technology evaluation of domestic and foreign aircraft.
- (U) Upgraded specially designed data acquisition packages.
- (U) Facilities improvement program.

(U) FY 1992 Planned Program: Program transferred to Project D618 - ADTA

(U) FY 1993 Planned Program: Not applicable.

(U) Project D452 - Cold Regions Test Center (CRTC), Fort Greely, Alaska: CRTC is the only cold region environmental test center within DoD. This program includes developmental and production testing to determine the effects of extreme cold weather, 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 the DoD Test and Evaluation Project Reliance. Approximately 27 civilians and 52 military are employed in support of this program.

(U) FY 1991 Accomplishments:
- (U) Systems tested include:
  - Bradley Infantry Fighting Vehicle
  - Penetration Augmented Munition
  - Small Unit Support Vehicle (SUSV)
  - Cold Weather Boots
  - Howitzer Improvement Program
  - Integrated Aircrew Helmet System HGU-56
- (U) A total of 24 tests were completed.

(U) FY 1992 Planned Program:
- (U) Through FY 1991, testing was fully funded by this program. Effective FY 1992, users of the facility will pay direct costs in accordance with DoD funding policies.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0605601A
PE Title: Army Test Ranges and Facilities **Budget Activity: #6**

- (U) Systems to be tested include:
  - Bradley Infantry Fighting Vehicle
  - Extended Cold Weather Clothing System
  - Sense and Destroy Armor Projectile
  - Palletized Loading System
  - Family of Medium Tactical Vehicles

(U) FY 1993 Planned Program:

- (U) Systems to be tested include:
  - Advanced Field Artillery System
  - Ration Heating System
  - Family of Training Smokes
  - Sense and Destroy Armor Projectile

(U) Project D618 - Aviation Development Test Activity (ADTA), Fort Rucker, Alabama (with a directorate at Edwards AFB, California): Provides a capability for developmental product verification and materiel change testing of Army aircraft, 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 rate flight test programs in order to identify problems affecting fleet availability, flight safety and verity attendant solutions. Operates DoD's only helicopter icing spray capability and low speed, fixed wing cloud physics instrumented aircraft which provides for qualification of helicopters for flight under icing conditions. Defense Management Review Decisions combined project D066 mission and resources with D618 and resulted in zero sum realignment effective FY92. Approximately 114 civilians, 61 military, and 17 contractor personnel are employed in support of this project.

(U) FY 1991 Accomplishments:

- (U) Systems tested include:
  - Integration of AH-1 Cobra and MK-66 Rocket Firing
  - Preliminary Airworthiness Evaluations (PAE) of MH-47E helicopter and MK-60K aircraft
  - Lead-the-Fleet (LTF) AH-64 APACHE, UH-60 A/L BLACKHAWK, CH-47D CHINOOK, AH-1 COBRA, UH-1 HUEY, OH-58 A/C KIOWA
  - CH-47D Engine air separator (Operation DESERT STORM Support)
  - AH-64/UH-60 vulnerability assessment
  - AN/APR-39A radar warning set
  - COMANCHE demonstration/validation and down select
- (U) A total of 110 tests were completed.

(U) FY 1992 Planned Program:

- (U) Systems to be tested include:
  - Aerial refueling tests of MH-60K aircraft
  - Icing test for AH64 helicopter and MK66 rocket
  - Air to Air Stinger
  - LONGBOW

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0605601A
PE Title: Army Test Ranges and Facilities **Budget Activity: #6**

- PAE of OH-58D Armed Scout
- RAH-66 COMANCHE evaluation

- (U) Quick response and safety testing of fielded systems.
- (U) Manage technical and air worthiness qualification mission of all Army aircraft.

(U) FY 1993 Planned Program:

- (U) Systems to be tested include:
  - RAH-66 COMANCHE PAE
  - Threat helicopter simulator
  - Lead-the-Fleet Programs for AH-64A, CH-47D, UH-60, OH-58D
  - Air-to-Air Stinger
  - Night vision equipment
  - Icing test for V-22, COMANCHE, Osprey, AH-1, Helicopters & MK66 Rocket
  - AH1/64 Flight/Weapons Simulator
  - COMANCHE Family
- (U) Quick response and safety testing of fielded systems.
- (U) Manage technical and air worthiness qualification mission of all Army aircraft.

(U) Project D630 - TECOM Test Design and Evaluation: Provides for independent assessment of over 400 non-major systems. Includes design of developmental and initial production tests and for subsequent independent analysis and assessments to include recommendations for type classification and materiel release of all non-major systems. Approximately 45 civilians and 1 military are employed in support of this project.

(U) FY 1991 Accomplishments:

- (U) Test design and assessment program incorporated new systems and provided continuous assessment of all non-major systems:
  - Over 100 technical independent assessments for non-major acquisition programs
  - Trackwolf (OSD Designated Half-Track) for Operation DESERT STORM
  - Interfaced with materiel acquisition process

(U) FY 1992 Planned Program:

- (U) Test design and assessment program to incorporate new systems and continuous assessment of all non-major systems:
  - Technical assessments for non-major acquisition programs ie. Lightweight (LGWT) Chemical, Biological Protective Outfit
  - Interface with materiel acquisition process
  - Increased use of artificial intelligence to improve efficiency

(U) FY 1993 Planned Program:

- (U) Test design and assessment program to incorporate new systems and continuous assessment of all non-major systems.
- (U) Technical assessments for non-major acquisition programs ie. LGWT Chemical, Biological Protective Outfit; Trackwolf.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0605601A
PE Title: Army Test Ranges and Facilities **Budget Activity: #6**

(U) Project DE90 - Yuma Proving Ground (YPG), Arizona: YPG is the DoD's premier artillery, air delivery and desert test range. Vast tracts of varied desert terrain provide testers with desert 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; DoD's only tracking air-to-ground and ground-to-ground aircraft armament range with precision real-time instrumentation; 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 a primary site for conduct of indirect fire gun munitions and land vehicle testing. YPG is scheduled to assume the munitions production testing mission from Jefferson Proving Ground by FY95 under the Base Realignment and Closure Act. Approximately 184 civilians, 46 military, and 57 contractor personnel are employed in support of this project.

(U) **FY 1991 Accomplishments:**
- (U) Systems tested include:
  - Mine Rake/Plow (Operation DESERT STORM Support)
  - Armament Enhancement Initiative Programs
  - 60K Capacity Air Drop System
  - Family of Medium Tactical Vehicles
  - Sense and Destroy Armor Projectile
  - NAVSTAR Global Positioning System user equipment
- (U) Completed range improvements include Drone operations facility; Hawk generators; and mobile automotive testing fixtures.
- (U) A total of 210 tests were completed.

(U) **FY 1992 Planned Program:**
- (U) Systems to be tested include:
  - Armament Enhancement Initiative Programs
  - Small Capacity Parachute Release
  - Family of Medium Tactical Vehicles
  - Family of Heavy Tactical Vehicles
  - Experiments with electromagnetic/electrothermal guns
  - LONGBOW
- (U) Range improvements are targeted to support known technological advances in specific Army mission areas; ie Fire Support, Close Combat Heavy, etc.
- (U) Planned improvements include gun positions, safety bunker, and air drop staging facility.

(U) **FY 1993 Planned Program:**
- (U) Systems to be tested or continued include:
  - Experiments with electromagnetic/electrothermal guns
  - Air delivery techniques - Patriot Pods
  - 155mm Self-Propelled Howitzer Improvement Program
  - Armament Enhancement Initiative Programs
  - Advanced Field Artillery System

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605601A**
PE Title: **Army Test Ranges and Facilities** Budget Activity: **#6**

- **(U) Range improvements are targeted to support known technological advances in specific Army mission areas; i.e. Fire Support, Engineer and Mine Warfare etc.**

(U) Project DE91 - Combat Systems Test Activity (CSTA), Aberdeen Proving Ground, Maryland: CSTA is DoD's designated lead agency for land vehicle testing. Under Project Reliance, CSTA is designated a 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 output of a nuclear weapon using a fast-burst nuclear reactor, and conducts nuclear radiation evaluations. Major facilities include the Munson automotive test course, a variety of firing ranges, cross-terrain automotive test sites, a radar tracking site facility, a unique robotic vehicle test facility, moving target simulation facility, live fire evasive targ :, 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. Approximately 455 civilians, 68 military, and 47 contractor personnel are employed in support of this project.

(U) FY 1991 Accomplishments:

- **(U)** Systems tested include:
  - M1A2 Tank System
  - Armored Systems Modernization
  - Anti-Fratricide Feasibility Testing (Operation DESERT STORM Support)
  - Tactical Quiet Generators
  - Magazine Protection Enhancement Program (Navy)
  - 120mm gun mount to M1A1 modifications
  - Bradley Fighting Vehicle system modifications
  - Family of Medium Tactical Vehicles
- **(U)** Improvement projects include tilt table; boat dock pilings; range building renovations; welding equipment; enclosed range - Michaelsville and Briar Point upgrade.
- **(U)** A total of 376 tests were completed.

(U) FY 1992 Planned Program:

- **(U)** Systems to be tested or continued include:
  - M1A2 Tank System
  - Advanced Field Artillery System
  - Tactical Quiet Generators
  - Experiments with Robotic Vehicles
  - Armor/Anti-Armor technologies
  - Armored Gun System/Anti-Armor Support Platform
  - Experiments with Defense Advanced Research Projects Agency's High Altitude Research Program (HARP) Gun in horizontal launch mode
  - Magazine Protection Enhancement Loading System (Navy)
  - Palletized Loading System

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605601A**
PE Title: **Army Test Ranges and Facilities** Budget Activity: **#6**

- (U) Planned improvements include: safety and operational upgrades to ammunition plants, automotive courses, main front target and sabot recovery area, and power upgrade to Mulberry Point Loop area.

(U) FY 1993 Planned Program:

- (U) Systems to be tested or continued include:
  - Experiments with HARP Gun in horizontal launch mode
  - Counter Mobility Vehicle
  - Advanced Field Artillery System
  - M1A2 Tank System
  - Armor/Anti-Armor technologies
  - Family of Medium Tactical Vehicles
  - Experiments with Robotic Vehicles
  - 140mm Tank Gun
  - Magazine Protection Enhancement Program (Navy)
- (U) Range improvements are targeted to support known technological advances in specific Army mission areas, i.e. Close Combat Heavy, Combat Service Support, Fire Support, etc.

(U) Project DE92 - Dugway Proving Ground (DPG), Utah: DPG is the DoD central point for chemical and biological defense testing. It 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. Approximately 132 civilians, 14 military, and 14 contractor personnel are employed in support of this project.

(U) FY 1991 Accomplishments:

- (U) A total of 114 tests were completed
- (U) Range improvements included real time x-ray system; support testing facility improvements; and upgrade, refurbishment, recertification of bio-defense systems test chambers.
- (U) Systems tested or continued include:
  - Aerial Reconnaissance System
  - German NBC Fuchs Vehicle (Operation DESERT STORM Support)
  - Chemical Agent Detection Network
  - Simplified Collective Protection System
  - Joint CB Contact Point & Test Project
  - 40mm High Velocity Smoke Grenade
  - Support Nuclear/Biological/Chemical (NBC) testing for Operation DESERT SHIELD

(U) FY 1992 Planned Program:

- (U) Systems to be tested:
  - Chemical Agent Detection Network
  - Combat Vehicle Defensive Obscurant System (CV-DOS)

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0605601A
PE Title: Army Test Ranges and Facilities **Budget Activity: #6**

- Self-contained toxicological environmental protective outfit
- Field Medical Oxygen Generating Distribution system
- Improved Lightweight Decontamination System
- NBC Reconnaissance System
- Aerial Reconnaissance System

- (U) Range improvements are targeted to support known technological advances in specific Army mission areas, i.e., Nuclear, Biological, Chemical; Fire Support; Combat Service Support.

(U) FY 1993 Planned Program:

- (U) Systems to be tested or continued:
  - NBC Reconnaissance System
  - Field Medical Oxygen Generating Distribution System
  - Aerial Reconnaissance System
  - Combat Vehicle Defensive Obscurant System (CV-DOS)
  - Chemical Agent Detection Network
  - XM86 Automatic Liquid Agent Detector Unit
  - Family of Training Smokes
- (U) Range improvements are targeted to support known technological advances in specific Army mission areas, i.e. Nuclear, Biological, Chemical; Fire Support, Combat Service Support.

(U) Project DE93 - White Sands Missile Range (WSMR), New Mexico: WSMR is the largest, all-purpose, overland test range within DoD and the free world. 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 guided 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 DoD's premier ground-to-air test facility, optical and calibration laboratories, inertial guidance test facilities, full spectrum nuclear effects facilities, 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 include temperature, shock, vibration, and electromagnetic effects. WSMR facilities and services are extensively utilized by the Tri-Services, National Aeronautics and Space Administration, other government agencies, etc. Approximately 449 civilians, 60 military, and 95 contractor personnel are employed in support of this project.

(U) FY 1991 Accomplishments:

- (U) Systems tested or continued include:
  - Nuclear hardening of DoD equipment at various test facilities (i.e. solar furnace, nuclear reactor, DNA Simulated Large Blast)
  - Army Tactical Missile (production qualification and acceptance testing)
  - PATRIOT/HAWK/STINGER/MLRS production testing
  - Smart munitions and missile warheads
  - Direct support to DESERT SHIELD/STORM - test/certification of PATRIOT upgrade
  - First firing of hypervelocity missile

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605601A**
PE Title: **Army Test Ranges and Facilities** Budget Activity: **#6**

- Testing in support of Strategic Defense Initiative

- (U) A total of 155 tests were completed.

(U) FY 1992 Planned Program:

- (U) Systems to be tested include:
  - Hypervelocity weapons
  - Start support for Advanced Air Defense Electro-Optical System (AADEOS)
  - Multiple Launch Rocket System (MLRS)
  - Start support for New Passive Identification Friend or Foe (IFF) System
  - PATRIOT/HAWK/STINGER production testing
  - Start support of Special Artillery Effects (SAE) testing
  - FAADS Command, Control and Intelligence
  - Advanced Medium Range Air-to-Air Missile (AMRAAM) follow-on test and evaluation
  - Nuclear hardening of DoD Equipment and various test facilities
  - Developmental experiments on artillery and air defense weapon systems and missiles

(U) FY 1993 Planned Program:

- (U) Systems to be tested or continued include:
  - Multiple Launch Rocket System
  - Continue support to AADEOS, SAE, and FAAD C3I
  - Hypervelocity weapons
  - PATRIOT Air Defense Missile System product improvement
  - HAWK/STINGER production testing
  - Nuclear Hardening of DoD Equipment at various test facilities (i.e., solar furnace, nuclear reactor, DNA Simulated Large Blast)
  - Acceptance testing on new facilities (Aerial Cable and Large Blast Thermal Simulator)
  - Continued testing of modern artillery and air defense missile systems

(U) Project DE94 - Army Electronic Proving Ground (EPG), Fort Huachuca, Arizona: EPG is unique within DoD because of it's electromagnetically "clean" environment, expansive 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, EM1/E MC/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 facil' . Effective FY92, funding for the Battlefield Electromagnetic Environmental Office was transferred from OMA to RDT&E. The mission of creating, developing, and maintaining data bases for standard tactical deployment scenarios for electromagnetic capability and vulnerability analysis will be continued. Approximately 113 civilians, 142 military, and 95 contractor personnel are employed in support of this project.

(U) FY 1991 Accomplishments:

- (U) Enhanced capability with the addition of Compact Range Antenna Test Facility for far field measurement.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605601A**
PE Title: **Army Test Ranges and Facilities** Budget Activity: **#6**

- (U) Systems tested or continued include:
  - Global Positioning System
  - Joint Surveillance Target Acquisition Radar System
  - AN/USD-9 Airborne Collection System (GUARDRAIL)
  - All Source Analysis System (ASAS)
  - Position Locating and Reporting System
  - Identification Friend-or-Foe kit for UH-60 (Operation DESERT STORM Support)
- (U) A total of 119 tests were completed.

(U) FY 1992 Planned Program:

- (U) Systems to be tested include:
  - Unmanned Aerial Vehicle Test IIB (short range)
  - Joint Surveillance Target Acquisition Radar System
  - Ground Base Common Sensor
  - Mobile Subscriber Equipment improvement

(U) FY 1993 Planned Program:

- (U) Systems to be tested or continued include:
  - Global Positioning System (GPS)
  - Unmanned Aerial Vehicle Block I/II Short Range/Close Range
  - Tests of Army Intelligence Electronic Warfare Systems

(U) Work Performed By: In-house testing is performed by personnel assigned to facilities augmented by temporarily assigned military personnel from Forces Command and the Reserve Component. Support functions are performed by: Sikorsky Support Services, Inc., Stratford, CT; COBRO, Wheaton, MD. Other contractors include: Dynamic Science, Phoenix, AZ; Dyna Corp, 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, Management and Services Company, Houston, TX; Westar, Albuquerque, NM; and Boeing Corporation, Philadelphia, PA.

(U) Related Activities: The five US Army Test and Evaluation Command activities plus Kwajalein Atoll comprise the Army's contribution to the DoD Major Range and Test Facility Base. This base also includes designated Air Force and Navy test facilities, all of which operate under a DoD uniform reimbursement policy. Users of these facilities pay directly identifiable testing costs, and the host activity finances all other costs associated with maintaining a testing capability. The Office of the Deputy Director of Defense Research and Engineering (Test and Evaluation) reviews management of all DoD test facilities to avoid unnecessary duplication of capabilities, to insure that highest priority capabilities are established expeditiously and suitably maintained, and to insure integration of testing by the services. The Jefferson Proving Ground, IN, production acceptance testing mission is reimbursed from the Procurement, Army appropriation. In addition to the foregoing, 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

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605601A**
PE Title: **Army Test Ranges and Facilities** Budget Activity: **#6**

Command. Extensive coordination is conducted with other services to ensure no unnecessary duplication of effort.
Related programs include:

PE #0605602A (Army Technical Test Instrumentation and Targets - RDT&E)
PE #0605702A (Meteorological Support to RDT&E Activities)
PE #0605876A (Minor Construction - RPM)
PE #0605878A (Maintenance & Repair - RPM)
PE #0605856A (Environmental Compliance - RDT&E)
PE #0605896A (Base Operations - RDT&E)

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

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
MILITARY CONSTRUCTION Army:			
Dugway Proving Ground	500	- 0 -	- 0 -
Yuma Proving Ground	- 0 -	- 0 -	- 0 -
Combat Systems Test Activity	10400	- 0 -	- 0 -
White Sands Missile Range	- 0 -	13800	- 0 -

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605602A**
PE Title: **Army Technical Test Instrumentation and Targets** Budget Activity: **#6**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D238 Aerial Targets	10014	9093	9753	Cont	Cont
D453 Major Test Instrumentation	51036	47831	35406	Cont	Cont
D459 Ground Targets	738	683	683	Cont	Cont
D628 Test Technology & Sustaining Instrumentation	12272	31203	30657	Cont	Cont
PE TOTAL	74060	88810	76499		

B. (U) BRIEF DESCRIPTION OF ELEMENT: Funds development, acquisition and sustainment of technical test instrumentation for the Army at the major ranges and test facility bases (Yuma Proving Ground, AZ; Dugway Proving Ground, UT; White Sands Missile Range, NM; Electronic Proving Ground, AZ; and Combat Systems Test Activity, MD; as well as the Aviation Technical Test Center, AL; Redstone Technical Test Center, AL; and Cold Regions Test Activity, AK to support testing of advanced, high technology systems and weapons developments. Program also funds aerial and ground target development, maintenance and upgrade. Included are efforts to identify advanced test technology long-range requirements and their integration into DoD efforts; test methodology improvements, standardization, and international test procedures and methods; the development of specifications and prototype instrumentation not available on-the-shelf. Funding realignments between projects within program have been accomplished to finance the Army's highest priority requirements. All projects within program element are managed by Program Manager for Instrumentation Targets and Threat Simulators (PM ITTS) except D628 which is managed by the U.S. Army Test and Evaluation Command (TECOM).

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project D238 - Aerial Targets: Provides for development, acquisition 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 equivalent to 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 substitute targets adequately replicate the threat, development and acquisition of surrogate and acquired targets, and continuing maintenance of the developed and acquired threat targets to ensure target availability for the test and evaluation customer.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605602A**
PE Title: **Army Technical Test Instrumentation and Targets** Budget Activity: **#6**

(U) FY 1991 Accomplishments:
- (U) Began development of Large Scale Rotary Wing Target (HAVOC)
- (U) Defined program options for Large Scale Rotary Wing Target (HOKUM) and Air Force Development of QF-4 Full-Scale Target
- (U) Continued enhancement of subscale targets and augmentation devices
- (U) Improved operations and infra-red signature of Large Scale Rotary Wing Target (HIND)
- (U) Completed feasibility demonstration of advanced helicopter control system
- (U) Began studies of Aerial Cable Facility targets

(U) FY 1992 Planned Program:
- (U) Continue development of Large Scale Rotary Wing Target (HAVOC)
- (U) Participate in Air Force led joint development of Full Scale Fixed Wing Target (QF4)
- (U) Refine requirements for Large Scale Rotary Wing Target (HOKUM)
- (U) Continue enhancement of subscale targets and augmentation devices
- (U) Initiate development of Universal Drone Control Kit
- (U) Continue studies of Aerial Cable Facility targets

(U) FY 1993 Planned Program:
- (U) Continue Large Scale Rotary Wing Target (HAVOC) development
- (U) Continue enhancement of subscale targets and augmentation devices
- (U) Continue development of Universal Drone Control Kit

(U) Project D453 - Major Test Instrumentation: This project is an investment account which provides for the development and acquisition of major technology required to perform technical testing of materiel, weapons, and weapon systems at seven TECOM activities (five of which are elements of the DoD major ranges and test facility base). Acquires instrumentation to capture data required to evaluate new technology weapons systems. New control and data capture equipment will keep pace with the faster processing, more complex weapon control systems, with remote sensor technology required to precisely quantify events where traditional measurement would alter or fail to capture the process being measured, and with high dynamics time and space positioning data for hypersonic projectiles. This project responds to the rapid advances in weapons systems technology and diversity of systems being developed to assure adequate testing. The Project Manager for Instrumentation, Targets and Threat Simulators (PM ITTS) began managing this project in FY 91. Major instrumentation is defined as that instrumentation with one or more of the following attributes: joint service requirements, used by multiple commands, high visibility, large dollar value or produces a new capability.

(U) FY 1991 Accomplishments:
- (U) Acquired fiber-optic network for key firing ranges at the Combat Systems Test Activity (CSTA).
- (U) Continued the development, acquisition, and installation of the Combat Vehicle Performance and Combat Vehicle Measurement System Projects to assess the performance of combat vehicles and vehicle based weapon systems.
- (U) Continued on-going advanced acquisition and analysis through the Year 2000 (A3-2000) which provides for fast and compatible data acquisition computers that are required because of sophisticated weapon system technology and customer demand for more data.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605602A**
PE Title: **Army Technical Test Instrumentation and Targets** Budget Activity: **#6**

- (U) Acquired the expanded Artillery and Mortar System Test Capability, Lower Atmospheric Tracking system, and the Computer Test System at Dugway Proving Ground.
- (U) Acquired Munitions Tracking System at White Sands Missile Range (WSMR).
- (U) Continued replacement of Electromagnetic Radiation effects transmitters at WSMR. Replaces obsolete transmitters, antennas and adds a centralized computer for control.
- (U) Initiated development and acquisition of instrumentation for tests of command and control systems under the Army Tactical Command and Control System Common Instrumentation Suite.
- (U) Continued Airspace Surveillance Radar Project. Project replaces three obsolete AN/TPS-48 radars with the ASR-9 radars and display.
- (U) Replaced WSMR's Command Control/Flight Termination System (CC/FTS) which controls missile flights and terminates missiles and drones from four fixed sites and three mobile units.
- (U) Completed upgrade of Hydraulic Vibration System at Yuma Proving Ground (YPG), AZ. The upgrade enhances current vibration testing capability by increasing vibration displacement from 1" to 2" to meet new wheeled-vehicle testing requirements.
- (U) Implemented simulation and modeling capability using DMA 3-D terrain data integrated with test range real-time space positioning data at YPG.

(U) FY 1992 Planned Program:

- (U) Continue the development, acquisition, and installation of Combat Vehicle Performance and Measurement Systems to assess the performance of combat vehicles/vehicle based weapon systems.
- (U) Continue Range Signal Security initiatives at various major test ranges. Provides for encrypted message traffic at test centers.
- (U) Complete integration effort of the Airspace Surveillance Radar Project. Funds the replacement of three obsolete AN/TPS-48 radars with new ASR-9 radars and replacement of display systems with a new Airspace Display and Control (ASDCS).
- (U) Continue development/acquisition of instrumentation for tests of tactical command and control systems under the Army Tactical Command and Control System Common Instrumentation Suite.
- (U) Continue replacement of Electromagnetic (EM) Radiation Effects Transmitters at WSMR. Replaces obsolete transmitters, antennas and adds a centralized computer for control.
- (U) Initiate the Direct Fire Productivity Improvement Program which provides instrumentation for more efficient and accurate testing of direct fire weapon systems.
- (U) Continue Frequency Surveillance/Analysis System which allows for the modernization and enhancement of the radio frequency monitoring requirement at WSMR.
- (U) Initiate Army follow on to the OSD Global Positioning System which was funded under Central Test and Evaluation Investment Program (CTEIP). This program provides Range Applications Joint Program Office developed hardware and support to TECOM test centers.
- (U) Initiate the development and purchase of radar simulation equipment at RTTC for the Radar Electromagnetic Simulator (RES) Project. The RES simulates high peak pulse radar EM environments present when missiles come in close proximity to radar emitters.
- (U) Continue to acquire Mobile Conditioning Chambers at Dugway Proving Ground (DPG) to allow the environmental conditioning of items under test.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605602A**
PE Title: **Army Technical Test Instrumentation and Targets** Budget Activity: **#6**

(U) FY 1993 Planned Program:

- (U) Continue all on-going projects from FY 1992.
- (U) Initiate and complete the Broad Coverage Communications Project at CSTA.
- (U) Initiate Advanced Armor Instrumentation Project at CSTA. This program will provide the instrumentation required to test active armor and advanced materials used in armor.
- (U) Initiate Communications Trunking Program at WSMR. This project will upgrade the communications system with fiber optics in order to handle the increased data rates of modern high technology testing.

(U) Project D459 - Ground Targets: This program funds Army efforts to support testing of advanced weapon systems by developing, and/or acquiring and maintaining surrogate and acquired threat armor 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. This includes management of the target research development, test and evaluation process, execution of the validation and accreditation process to ensure that substitute targets adequately replicate the threat, development, and acquisition of surrogate and acquired targets, and continuing maintenance of the developed and acquired threat targets to ensure target availability for the test and evaluation customer.

(U) FY 1991 Accomplishments:

- (U) Developed T80 Main Battle Tank (MBT) target
- (U) Built two prototypes, MBT targets
- (U) Initiated U.S. Army validation process on MBT
- (U) Supported threat signature measurements
- (U) Consolidated ground target requirements and formalized effort under Targets Management Office, U.S. Army Missile Command (MICOM)
- (U) Studied foreign target assets for application
- (U) Initiated a program to utilize acquired foreign vehicles as targets

(U) FY 1992 Planned Program:

- (U) Continue planning for surrogate development of light, medium, and heavy armor targets
- (U) Complete validation of MBT target
- (U) Provide validation support for Smart Weapons targets requirements
- (U) Initiate action for procurement of MBT target
- (U) Manage use of MBT surrogate targets for test
- (U) Continue consolidation of target requirements
- (U) Establish management process for foreign equipment to be used as ground targets
- (U) Establish and maintain an inventory of 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) Develop surrogate targets
- (U) Manage use of consolidated target assets

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605602A**
PE Title: **Army Technical Test Instrumentation and Targets** Budget Activity: **#6**

- (U) Continue planning of target development and consolidation
- (U) Continue the management and maintenance of acquired foreign targets

(U) Project D628 - Test Technology and Sustained Instrumentation: Test Technology provides critical front-end efforts for development of new test methodologies and test standards, development and formulation of advance test technology concepts for future test capabilities and development of advanced technology instrumentation prototypes and test capabilities. Sustaining instrumentation provides for modification and replacement of worn out or obsolete instrumentation with new or state-of-the-art instrumentation to support test execution at Army test facilities. Test technology and sustaining instrumentation are linked to the acquisition process as a concurrent engineering effort to align test center core capabilities with future test requirements, thus providing the necessary capabilities required to support testing with technical adequacy and cost effectiveness. Funding also sustains technical test instrumentation to maintain required existing test capability.

(U) **FY 1991 Accomplishments:**

- (U) Advanced test technologies in the areas of Army space testing, low observable systems and sensor systems, chemical testing and other critical areas. Space testing capabilities, although still under development, support the TERRA SCOUT mission.
- (U) Developed new methodologies for chemical-biological testing - a critical requirement emphasized by Desert Storm.
- (U) Developed high pressure, more linear dynamic strain measurement techniques for high explosive environments generated by advance warheads
- (U) Advances in Electric Gun test technologies led to Army designation as Project Reliance lead for testing these advanced weapons.
- (U) Completed concept development for a High Powered Microwave Test Capability
- (U) Sustainment of basic instrumentation for Gun Systems, Nuclear Effects and Automotive Vehicle testing
- (U) Sustainment of basic instrumentation in support of chemical testing - acquired new test chambers for toxic chemical agent testing and additional state-of-the-art chemical analysis equipment (MINICAMS).
- (U) Upgraded Micro-TIS and Simulation Hardware Capability. Developed high data rate communication board for next generation Micro-TIS to meet upcoming test requirements eliminating dependence upon proprietary hardware. Replaced obsolete CYBER computer with state-of-the-art computer workstations, improved performance, reduced operational costs.
- (U) Completed Compact Antenna Range at Electronic Proving Ground permitting antenna bandwidth measurement capabilities to 40 GHz (from 6 GHz).

(U) **FY 1992 Planned Program:**

- (U) Expand capabilities for Sensor Fusion System testing into additional spectrums and bandwidths consistent with new weapon system developments; complete Artificial Intelligence projects for range scheduling, environmental assessment and security planning; initiate system design of a High Powered Microwave Test Capability.
- (U) Establish firing facilities and continue test technology developments in support of electric gun development.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605602A**
PE Title: **Army Technical Test Instrumentation and Targets** Budget Activity: **#6**

- (U) Develop new and improved test methodologies for Live Fire Vulnerability, Nuclear Effects and Smoke and Obscurants.
- (U) Maintain existing capability for replacement of worn-out equipment/instrumentation at Army ranges, e.g. refurbishment of AN/MPS-25 instrumentation radar at YPG.
- (U) Acquire ruggedized, high-speed, high reliability transducers, on-board digital data acquisition systems and subminiature telemetry systems to provide/enhance capability for Congressionally mandated live fire vulnerability testing of combat vehicles and lethality testing of munitions.

(U) FY 1993 Planned Program:

- (U) Maintain existing capability for replacement of worn-out, inadequate equipment/instrumentation at Army test facilities, e.g., upgrade computer hardware for threat radio frequency stimulation, simulation and modeling at Electronic Proving Ground, AZ
- (U) Continue with development of the Test and Evaluation Range Internetting System and initiate implementation of the Data-Net Integration phase which will initially link up to six Major Range and Test Facility Base from the Army, Navy and Air Force, and ultimately expand to 20 or more test facilities. Expand methodologies and test instrumentation development in support of hypervelocity projectiles from electric gun; focus on application of simulation to testing such as Virtual Reality; strengthen linkage to Technology Base emerging technologies and next generation /future systems; and initiate supporting advance test technologies to include expanded electromagnetic environmental effects, robotics, directed energy testing methods and capabilities.
- (U) Procure instrumentation/equipment for security, safety and efficient operation of test ranges and computer upgrades to include data recording and reduction instrumentation at ATTC, computer workstations for chemical data acquisition at DPG, fiber optic communications systems at CSTA, proliferation of test data acquisition requirements.
- (U) Acquire photo-optics, high speed video camera and portable X-Ray which will enhance ballistic testing of munitions.

(U) Work Performed By: Major contractors are: GE Corp, Morristown, NJ; Westinghouse, Baltimore, MD; JET Propulsion Lab, Palo Alto, CA; Sperry Corporation, Reston, VA; Physical Sciences Lab, New Mexico State Univ, Las Cruces, NM; Lockheed, Los Angeles, CA; TVI Corporation, Beltsville, MD; KAMAN Science, Colorado Springs, CO; Science and Technology Corp, Hampton, VA; Environmental Research Institute of Michigan, Detroit, MI; National Institute of Standard and Technology, Boulder, CO; Bell Technical Operations, Inc., Ft. Walton Beach, FL; Dynaspan, Las Cruces, NM; Raytheon Corp., Manchester, NJ; Honeywell, Inc., Defense Avionics Systems Division, Albuquerque, NM; Beach Aircraft, Wichita, KS; and Native American Services, Huntsville, AL. Study contracts are now in place with SRS Technologies, Huntsville, AL; Illinois Institute of Technology Research Center, Chicago, IL; and Physical Science Lab, New Mexico State University, Las Cruces, NM; Georgia Tech Research Institute, Atlanta, GA; AAI Corp, Baltimore, MD; Colea Inc., Huntsville, AL. In-house organizations include: Army Test and Evaluation Command, APG, MD; Army Missile Command, Redstone Arsenal, AL; Army Combat Systems Test Activity, APG, MD; Army Yuma Proving Ground, AZ; Army Dugway Proving Ground, UT; Army White Sands Missile Range (WSMR), NM; Army Vulnerability Assessment Lab, WSMR, NM; Army Electronic Proving Ground, Ft. Huachuca, AZ; Army Cold Regions Test Center, Ft. Greeley, AK; Army Aviation Development Test Activity, Ft. Rucker, AL; Army Redstone Technical Test Activity, Huntsville, AL; Ballistics Research Laboratory, APG, MD; and Foreign Science and Technology Center, Charlottesville, VA.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605602A**
PE Title: **Army Technical Test Instrumentation and Targets** Budget Activity: **#6**

(U) Related Activities: Tri-services requirements are coordinated and duplication of effort is precluded through Multi Service Test Investment Review Committee. Under Project Reliance, the Army is the 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 #0605603A (Army User Test Instrumentation & Threat Simulators); 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)

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
PROCUREMENT			
Missile Procurement, Army Air Defense Targets (C93000)	12503	11210	13589

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605603A**
PE Title: **Army User Test Instrumentation and Threat Simulators** Budget Activity: **#6**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D976 Army Threat Simulator Program (ATSP)	29650	27223	28318	Cont	Cont
D986 Major User Test Support Instrumentation	10980	18544	18000	Cont	Cont
M992 National Training Center Support	4069	- 0 -	- 0 -	*	*
PE TOTAL	44699	45767	46318		

*Transferred to PE #0604715A, Project D241

B. (U) BRIEF DESCRIPTION OF ELEMENT: This element finances development of field instrumentation for U.S. Army Operational Test and Evaluation Command (OPTEC) test organizations, and provides funds to develop realistic mobile simulators. It provides the capabilities to create simulated tactical environments during conduct of user testing of new weapon systems and provides development and upgrade of other range instrumentation in support of training. This program, as realigned under the Defense Management Review T&E reorganization, is managed and executed by Project Manager, Instrumentation, Targets, and Threat Simulators.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project D976 - Army Threat Simulator Program (ATSP) is a continuing project which finances development of realistic enemy threat simulators for Army operational test organizations. These battlefield simulators represent foreign systems (e.g. missile systems, command & control, communications, electronic warfare systems, helicopters, etc.) that are used to portray a realistic threat environment during operational testing of U.S. weapon systems. Simulator development is responsive to Office of the Secretary of Defense and General Accounting Office concern that the Army conduct operational testing in a realistic threat environment.

(U) FY 1991 Accomplishments:

- (U) Significant testing of the following U.S. development programs was supported:
  - Advanced Antitank Weapon System Medium (AAWS-M)
  - Special Electronics Missions Aircraft (SEMA)
  - Army Helicopter Improvement Program (HIP)
  - Sense and Destroy Armor Projectile (SADARM)
  - Army Tactical Missile System (ATACMS)
  - Advanced Field Artillery Tactical Data System (AFATDS)
  - M1 Tank BLK II
  - LONGBOW
  - Single Channel Ground/Air Radio Systems (SINCGARS)

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605603A**
PE Title: **Army User Test Instrumentation and Threat Simulators** Budget Activity: **#6**

- FIREFINDER II (AN/TPQ 36/37)
- Support to Desert Shield Training

- (U) Threat simulator systems completed:
  - XM11S (SAM) one system
  - XM13S (SAM) two systems
  - XM13A (SAM) two systems
  - XMP12S (C3 System) one system
  - Publication of the U.S. Army Validation and Accreditation Plan for Threat Simulators and Targets

(U) FY 1992 Planned Program:

- (U) One XM06A SAM system
- (U) One XMHKS jammer
- (U) One XMTSA radar system will be instrumented
- (U) One XMLTA radar system will be instrumented
- (U) Four XMP12A C3 systems will be instrumented
- (U) Planned user tests requiring threat simulator support:
  - U.S. Army Aviation Tactics, Doctrine & Aircraft Survivability Equipment, Part 2 FDTE
  - Single Channel Ground & Airborne Radio System/Integrated COMSEC IOTE
  - Unmanned Aerial Vehicle/Short Range LUTE
  - Tactical Unmanned Ground Vehicle EUTE
  - Army Tactical Command & Control System EUTE

(U) FY 1993 Planned Program:

- (U) Ten XM14/16S SAM systems
- (U) One XMHOKS Helo
- (U) One Aircraft survivability Equipment Trainer ASET IV
- (U) Planned user tests requiring threat simulator support:
  - Forward Area Air Defense Command, Control & Intelligence (Light) FDTE
  - Mobile Subscriber Equipment FOE (CORPS) FOTE
  - Joint Tactical Information Distribution System IOTE
  - 155mm Sense and Destroy Armor IOTE
  - Multiple Launch Rocket System SADARM IOTE
  - Avenger Non-Cooperative Target Recognition ESM Weapons Version LUTE

(U) Project D986 - Major User Test Support Instrumentation: Project finances the development of field instrumentation for Operational Testing (OT) and Force Development Testing and Experimentation (FDTE). The Mobile Automated Instrumentation Suite (MAIS) will provide users the capability to measure the performance of hardware and personnel under realistic tactical conditions for large scale operations (up to 1830 players). The MAIS will instrument combat systems in the operational forces to provide Real Time Casualty Assessment and Time Space Position Information data. This data will provide objective assessment for new materiel acquisition, force structuring, doctrine and tactics modification, and, through the Defense Advanced Research Projects Agency (DARPA) protocol data unit (PDU) format, provide data with which to validate the future DoD warfighting models and simulations. The MAIS, a non-major system acquisition, achieved Milestone I/II in FY 90 and is managed by the Project Manager for Instrumentation, Targets and Threat Simulators (PM ITTS).

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605603A**
PE Title: **Army User Test Instrumentation and Threat Simulators** Budget Activity: **#6**

(U) FY 1991 Accomplishments:
- **(U)** MAIS development contract was awarded for 250 player units and one command, control and communications (C3) complex (LOT I) to Loral Systems Company, Akron, OH.
- **(U)** Purchased six encryption chips through the National Security Agency (NSA) for system integration development of the C3 center and 250 player units.
- **(U)** Conducted the MAIS System Design Review (SDR)

(U) FY 1992 Planned Program:
- **(U)** Continue MAIS development contract by conducting the MAIS Software Specification Review (SSR), Preliminary Design Review (PDR) and the Critical Design Review (CDR).
- **(U)** Based upon experience gained while integrating the initial purchase of NSA encryption chips, place an order for the LOT I requirement of 481 chips.
- **(U)** Initiate engineering change proposal for MAIS to develop the capability to reformat the data generated into PDU format so MAIS data can be used in existing and future simulation tools relying on this data format.

(U) FY 1993 Planned Program:
- **(U)** Continue MAIS development contract hardware and software systems integration and network simulation for C3 center and player units.
- **(U)** Commence in-plant contractor testing of MAIS components.

(U) Project M992 - National Training Center Support: Provides for development of upgrade of the instrumentation at the Combat Training Centers which includes the National Training Center (NTC), Ft Irwin, CA, Joint Readiness Training Center, Ft Chaffee, AR, and Combat Maneuvers Training Center (CMTC), Hohenfels, Germany. The system will enable participating units, commanders, and staffs to measure their performance in a simulated combat environment and thereby increase their training for combat readiness. Effective FY 1992, program is funded in PE #0604715A/241, Non-Systems Training Devices Combined Arms.

(U) FY 1991 Accomplishments:
- **(U)** Continuation of development capability.
- **(U)** Development of interfacing instrumentation requirements to accommodate future utilization of Global Positioning System at training centers.

(U) Work Performed by: In-house work: elements of the Army Research Institute at Fort Monroe and Fort Eustis, VA; Ballistics Research Laboratory, Aberdeen Proving Ground, MD; the Armament R&D Center, Picatinny Arsenal, NJ; the Defense Intelligence Agency; PM TRADE, Orlando, Fl; and Vulnerability Lab, Albuquerque, NM. Contractors include: International Laser System, Orlando, FL; General Electric, Syracuse, NY; Bell Technical Operations, Inc., Sierra Vista, AZ; AC Corp, Oakridge, TN; Loral Data Communication Corp, Anaheim, CA; Loral Space and Range Systems, Sunnyvale, CA; Loral Electro-Optical Systems, Pasadena, CA; Loral Conic, San Diego, CA: ULTRA Defense and Space System, Inc, Sierra Vista, AZ; Chrysler Pentastor, Huntsville, AL; University of Texas, Austin, TX; Georgia Tech, Atlanta, GA; Georgia Tech Research Institute, Marietta, GA; Ford Aerospace, Newport Beach, CA; and LTV, Buffalo, NY; Some contractor arrangements are classified.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605603A**
PE Title: **Army User Test Instrumentation and Threat Simulators** Budget Activity: **#6**

(U) Related Activities: The program is coordinated within the Department of Defense (DoD) through the Central Test and Evaluation Investment Program (CTEIP), PE #0604940D to preclude duplication. A joint service committee oversees 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.

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

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
Procurement (OPA)	12690	14592	12893

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605604A**
PE Title: **Technology and Vulnerability Assessment** Budget Activity: **#6**

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

Project Number / Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D067 Airworthiness Qualification Support	4108	3642	3660	Cont	Cont
D181 Antiradiation Missile Counter/Countermeasures	- 0 -	- 0 -	1502	Cont	Cont
D190 System Vulnerability Assessment Technology	6849	6828	6741	Cont	Cont
D234 Ground Combat System Vulnerability	5548	5704	5539	Cont	Cont
D235 Missile Counter/Countermeasures Technology	1029	991	984	Cont	Cont
D267 Air Defense and Space System Vulnerability	6922	7211	6991	Cont	Cont
D462 Technical Vulnerability Reduction	2995	3102	2980	Cont	Cont
D626 C4I Systems Vulnerability/Susceptibility	6018	6126	5916	Cont	Cont
DC10 Technology Assessment	3603	10941	6038	Cont	Cont
DC55 Distributed Developmental Simulation Technology	- 0 -	4005	3934	- 0 -	8027
PE TOTAL	39072	48550	44285		

B. (U) BRIEF DESCRIPTION OF ELEMENT: The effectiveness and survival of weapon, communication, aviation, air defense and electronic systems can be severely degraded or neutralized by enemy all-arms attacks that integrate radio electronic combat techniques and anti-radiation missiles (ARMs) with strike force operations unless adequate counter-countermeasures (CCM) and survivability measures are incorporated during system design. The objectives of this program are to: (1) develop & maintain necessary technology, facilities, and expertise to assess performance of Army systems against current and future threats; (2) conduct theoretical analyses, simulations, and field experiments to provide a vulnerability data base; (3) perform actual vulnerability assessments to quantify system effectiveness in a realistic environment; (4) develop supporting Required Operational Capability documentation, counter-countermeasure/survivability (CCM/SURV) annexes, to quantify threat countermeasure performance and specify the level of CCM/SURV required to perform when encountering threat countermeasures (CM) and lethal weapons; and (5) provide supporting technology for electronic counter/countermeasure (ECCM) hardening efforts. This program provides technology support and management oversight for ECCM, antiradiation missile countermeasures (ARM CM), signature measurements, sensor/signal processing vulnerability/survivability assessments and Battlefield Distributed Simulation-Developmental (BDS-D). Activities in progress include assessment of the effects of lasers, high-power microwave, electro-optic/radio

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frequency (EO/RF) jammers, and decoys on STINGER, PATRIOT, BAT, HAWK, Forward Area Air Defense System (FAADS), Joint Surveillance and Target Attack Radar System (JSTARS), FIREFINDER, Enhanced Position Location and Reporting System (EPLRS), Mobile Subscriber Equipment (MSE), LONGBOW, Sense and Destroy Armor Projectile (SADARM), JAVELIN, Army Tactical Missile System, HELLFIRE, Fuzes, Bradley Fighting Vehicle, M1A2, Armored System Modernization, SINCGARS, Army Tactical Command and Control System (ATCCS) and classified programs. Other activities include special electronic warfare on BLACKHAWK, APACHE and M1A2, electronic warfare vulnerability assessment of foreign missile systems, and developing improved vulnerability assessment capabilities. The technology and resource bases developed within the projects in this program provide technology, instrumentation and facilities to conduct vulnerability assessments and man-in-the-loop simulations of the combined arms battlefield for the purpose of combat development, materiel development and assessment. Funding for actual conduct of the assessments is supported by the system developer. Performs engineering functions necessary for certifying the airworthiness of all Army aircraft. Also manages and executes the aeronautical design standards program and new vendor qualification/testing on fielded aircraft systems.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project D067 - Airworthiness Qualification Support: Performs engineering functions necessary for certifying the airworthiness of all Army aircraft. Performs safety-of-flight investigations/assessments, determines the probability of occurrence and issues messages to field; thereby allowing quick reaction for safety-of-flight and airworthiness qualification testing. Insures Army aircraft are safe to fly within the complete mission envelope.

(U) FY 1991 Accomplishments:

- (U) Performed airworthiness qualification, engineering, and test and evaluation support for RAH-66, LONGBOW APACHE, AH-64, CH-47, UH-60, OH-58D, MH-47E, MH-60K, AH-1, UH-1, and associated integrated aircraft systems
- (U) Performed safety-of-flight investigations/assessments on LONGBOW APACHE, AH-64, CH-47E, MH-60, AH-1, UH-1, UH-60, and fixed wing aircraft
- (U) Performed test and evaluation management on COMANCHE, LONGBOW APACHE, Kiowa Warrior, MH-47E, MH-60K, aircraft systems and other emerging technologies used on U.S. Army aviation systems in support of OPERATION DESERT STORM

(U) FY 1992 Planned Program:

- (U) Continue to manage/execute technical and airworthiness qualification mission for all Army aircraft systems
- (U) Continue to ensure safety-of-flight of all Army aircraft as well as engineering cognizance during aircraft systems development
- (U) Continue to manage/execute the aeronautical design standards program
- (U) Provide developmental engineering support to COMANCHE, Special Operations Aircraft, LONGBOW APACHE and other engineering support for emerging technology upgrades for all Army aviation aircraft systems

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(U) FY 1993 Planned Program:
- **(U)** Continue to manage/execute technical and airworthiness qualification mission for all Army aircraft systems
- **(U)** Continue to ensure safety-of-flight of all Army aircraft as well as engineering cognizance during aircraft systems' development
- **(U)** Continue to manage/execute the aeronautical design standards program
- **(U)** Continue to develop test management capability for Program Executive Officer/Project Manager (PEO/PMs) and other engineering support for emerging technology upgrades for all Army aircraft systems
- **(U)** Continue development of the Flight Data Recorder program and of the Integrated Helmet Display Sight System

(U) Project D181 - Antiradiation Missile Counter/Countermeasures (ARM-CCM): This program will provide various ARM emulators and ARM-CCM simulation test tools; investigate the vulnerability of US emitters, such as PATRIOT and FIREFINDER, to anti-radiation missile threats, and analyze the effectiveness of countermeasures. This is not a new start in FY 1993. Work was funded in FY 1989 under this project. In FY 1990, FY 1991 and FY 1992 funding was provided to complete the emulator, conduct an ongoing NATO DART test, and perform a joint U.S./Israeli test. Project will provide a future ARM-CCM verification capability for the Army.

(U) FY 1991 Accomplishments: Effort funded from other sources to support NATO DART program

(U) FY 1992 Planned Program: Effort funded from other sources to support NATO DART program

(U) FY 1993 Planned Program:
- **(U)** Complete fabrication and check out of S-band emulator head, and complete design on a C-band emulator head. The feasibility and approach for designing a wideband emulator will be studied
- **(U)** Complete multi-path and ARM threat modeling and simulation
- **(U)** Conduct multi-static radar ARM-CCM tests and analyze results

(U) Project D190 - System Vulnerability Assessment Technology: This project supports development of the Army initiative to reduce systems' susceptibility to EM environmental effects, e.g. critical Army aviation special EM interference (SEMI) investigations of BLACKHAWK for flight safety concerns. This project also includes the Army's EW signature measurement program and the assessment of laser CM effects on Army optical/electro-optical (O/EO) systems. This project provides supporting technology and data for the Army's EW vulnerability assessment (EWVA) program. Inherent in this program is the use of extensive assessment facilities and threat emulators to quantify susceptibilities early in system development cycles, and to preclude the need for costly retrofits. This project supports investigations of new technologies for assessment techniques and makes recommendations for hardening alternatives if system susceptibilities or vulnerabilities are discovered. Also funds salaries, travel, equipment, and general management/administrative support.

(U) FY 1991 Accomplishments:
- **(U)** Conducted SEMI investigations of three Army weapon/communication-electronic systems and platforms

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- (U) Began high-power microwave (HPM) evaluation of shielding techniques for computers and communications systems, and missile hardening techniques for millimeter wave weapon systems
- (U) Performed HPM assessments of three foreign missile systems, one U.S. Army system and low power microwave (LPM) characterization of three foreign missiles
- (U) Performed infrared (IR), ultraviolet (UV), and radio frequency (rf) signature measurements to support FAADS, STINGER, Line-of-Sight Anti-Tank (LOSAT), other Army development programs, foreign materiel exploitation programs, and EW technology development
- (U) Continued exploring and developing EW technology to support current and future vulnerability assessments of weapon/communications, command, control, computers and intelligence systems
- (U) Performed ultra wideband rf (UWBRF) susceptibility investigations of three foreign systems
- (U) Supported Desert Shield/Storm through signature characterizations or developmental missile CM devices, missile guidance beacons and consultations concerning CM/CCM aspects for the combat Identification Friend or Foe (IFF) effort
- (U) Reported results of laser CM investigations of the OH-58D mast-mounted sight and AH-64 Target Designation System (TADS)
- (U) Reported laboratory measurements in support of STINGRAY development program

(U) FY 1992 Planned Program:

- (U) Conduct SEMI investigation of U.S. Army fuzes and two advanced anti-tank weapon systems
- (U) Conduct HPM phenomenon investigation of generic missiles
- (U) Provide laser vulnerability assessments to support EW CCM hardening of smart munitions, FAADS, LOSAT, and M22 binoculars
- (U) Perform EW investigations of combat identification technology program through analyses and field experiments of candidate systems
- (U) Perform UWBRF susceptibility investigations of four foreign systems, one U.S. Air Force system and to U.S. Army helicopters
- (U) Complete development of basic innovative radiometric imaging system
- (U) Provide EW support to US Army programs
- (U) Continue EO, IR, UV and rf signature measurements to support Army weapon system and ECM/ECCM technology development activities and foreign materiel exploitation

(U) FY 1993 Planned Program:

- (U) Provide EW support to US Army programs
- (U) Conduct SEMI susceptibility investigation of LOSAT, SADARM and TOW Sight Improvement Program (TSIP)
- (U) Continue HPM evaluation of selected systems and rf shielding technology for advanced systems
- (U) Continue vulnerability assessment of selected systems to new/advanced CM/CCM technologies
- (U) Conduct UWBRF 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 LOSAT and air defense systems such as Non-Line-of-Sight (NLOS) and individual and crew-served weapons
- (U) Continue EO, IR, UV, and RF signature measurements to support Army development activities and foreign materiel exploitation

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Program Element: **#0605604A**
PE Title: **Technology and Vulnerability Assessment** Budget Activity: **#6**

(U) Project D234 - Ground Combat System Vulnerability: Project investigates the vulnerability of Army smart weapons to electronic warfare (EW). Weapons developed under the mission areas of close combat, fire support, aviation, fuzes, and mines/countermines are assessed for susceptibilities/vulnerabilities. Recommend CCMs and evaluate effectiveness of implemented hardening. Assessments support weapon requirements, test evaluation master plans, cost/operational effectiveness analyses, and major decision milestones. Also funds salaries, travel, equipment, and general management/administrative support.

(U) FY 1991 Accomplishments:

- (U) Continued EWVAs of proximity fuzes and smart weapon systems for neckdown decisions
- (U) Continued vulnerability assessments of TOW-2B, SADARM, Multiple Launched Rocket System - Terminally Guided Warhead (MLRS-TGW), and STAFF
- (U) Support full-scale development of JAVELIN, LOSAT, and LONGBOW
- (U) Continued seismic/acoustic EW investigations of smart mines/countermines
- (U) Continued EWVA of JAVELIN, STAFF, Armored Munition System - Heavy (AMS-H), LOSAT and LONGBOW
- (U) Initiated EWVA of Armored Systems Modernization (ASM)
- (U) Supported Desert Shield/Storm by providing evaluations of missile countermeasures devices

(U) FY 1992 Planned Program:

- (U) Continue EWVAs of Army close combat, aviation, and fire support weapons systems
- (U) Continue EWVAs of Army smart mine and countermine systems
- (U) Conduct laboratory/captive-carry EW investigations on MLRS-Binary Chemical Warhead (BCW) and multi-option fuze artillery (MOFA) fuzes
- (U) Support field CM investigations of TSIP passive/active EW environments
- (U) Continue upgrades of MMW, acoustic, seismic, EO and IR capabilities
- (U) Initiate EWVA of COMANCHE
- (U) Complete EWVA of LOSAT
- (U) Initiate EWVA of Advanced Field Artillery Systems (AFAS)
- (U) Initiate EWVA of Wide Area Mine (WAM)
- (U) Initiate EWVA of Standoff Minefield Detections System (STAMIDS)

(U) FY 1993 Planned Program:

- (U) Continue EWVAs of Army systems in close combat, fire support, and engineer and mine warfare mission areas
- (U) Complete EWVAs on SADARM, BAT and MLRS-TGW
- (U) Complete EWVAs on MLRS-TGW and MOFA fuzes
- (U) Continue upgrades of MMW, acoustic, seismic, EO and IR capabilities
- (U) Complete EWVA of LOSAT
- (U) Complete EWVA of STAMIDS
- (U) Complete EWVA of WAM
- (U) Complete EWVA of AFAS

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Program Element: **#0605604A**
PE Title: **Technology and Vulnerability Assessment** Budget Activity: **#6**

(U) Project D235 - Missile Counter/Countermeasures Technology: Project supports development of CCM to harden missile systems against laser and radio frequency (rf) directed energy threats. Supports modeling to investigate vulnerabilities of systems to threat air defense systems. Supports investigations of missile signatures and exploitability. Investigates technology to harden optical windows against rf energy. Also funds salaries, travel, equipment, and general management/administrative su t.

(U) FY 1991 Accomplishments:
- **(U)** Used improved model to evaluate battlefield effects on Fiber Optic Guided-Munition (FOG-M) and other missile systems
- **(U)** Continued to develop non-linear materials to protect O/EO sensors from frequency agile directed energy weapons threat
- **(U)** Continued signature measurement and reduction program, conducted field tests to determine effectiveness of techniques, and developed generic missile system CCM technology

(U) FY 1992 Planned Program:
- **(U)** Use improved model to assess EW battlefield effects on smart missile systems
- **(U)** Through coordination with the Vulnerability Assessment Laboratory (VAL), continue to develop techniques and devices to protect missile system sensors from laser/rf threats
- **(U)** Perform proof-of-principle demonstrations of techniques to harden EO sensors against frequency agile laser threat
- **(U)** Continue to develop signature reduction and generic missile systems CCM technology

(U) FY 1993 Planned Program:
- **(U)** Update simulation module to assess evolving rf and laser threats on smart missile systems
- **(U)** In coordination with VAL, continue development of techniques and devices to protect deployed and developmental missile systems from updated battlefield threats
- **(U)** Perform missile signature measurements and continue to develop signature reduction and generic missile system CCM technology
- **(U)** Conduct missile system performance analysis in CM/CCM environments
- **(U)** Assess missile system CM/CCM requirements for current and future systems in the face of emerging independent republics and countries

(U) Project D267 - Air Defense and Space System Vulnerability: Provide the independent EW vulnerability assessment of U.S. Army air defense and space systems, and recommend ECCM fixes to improve their battlefield survivability. The results of the vulnerability assessment investigations are used by each Project Manager (PM) and the Program Executive Office (PEO) to direct the weapon system development efforts and to structure product improvement programs; by the user to develop doctrine and tactics; and by the Defense Acquisition Board (DAB) in formulating production decisions. Also funds salaries, travel, equipment, and management/administrative support.

(U) FY 1991 Accomplishments:
- **(U)** Supported Desert Shield/Storm with special quick reaction investigations to enhance PATRIOT Anti-Tactical Missile (ATM) capabilities

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PE Title: Technology and Vulnerability Assessment Budget Activity: #6

- (U) Completed EW vulnerability assessment of PATRIOT and HAWK to specific ECM threat techniques and provided improvement recommendations
- (U) Initiated EW vulnerability assessment program for Theater High Altitude Area Defense (THAADS) and PATRIOT Quick Reaction Program, and performed EW susceptibility studies of strategic defense
- (U) Validated simulation models/performance assessment for STINGER RMP Mod IV
- (U) Actively participated in the Ground Based Sensor (GBS) source selection evaluation tests, and conducted EW susceptibility studies of the Multiple Role Survivable Radar and the FAADS components

(U) **FY 1992 Planned Program:**

- (U) Update the radio electronic combat and penetration aid threats for EWVA investigations of U.S. Army air defense and strategic defense systems
- (U) Initiate EW vulnerability assessment of corps SAM and HAWK Hostile Aircraft Identification Equipment (HAIDE)
- (U) Conduct missile firing experiments to assess ECM hardness of PATRIOT fuze
- (U) Perform EW susceptibility studies and threat characterization for the THAAD and PATRIOT QRP programs
- (U) Complete performance assessment report for STINGER RMP Mod IV
- (U) Conduct EW field experiments in support of the FAAD Line-of-Sight-Forward-Heavy (LOS-F-H) milestone III DAB decision and EW investigations of GBS and Multiple Role Survivable Radar (MRSR)
- (U) Research and study advanced CM techniques and develop next generation CM devices and simulation capabilities

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

- (U) Update STINGER EWVA for advanced threats
- (U) Perform EWVA assessment of Corps SAM system concept and ECCM analysis of HAWK HAIDE
- (U) Conduct EW investigation of PATRIOT extended range and remote launch upgrades
- (U) Identify EW susceptibilities and ECCM recommendations of Theater Missile Defense (TMD) and Global Protection Against Limited Strikes technologies, and of THAAD design
- (U) Provide EW vulnerability assessment conclusions and recommendations for FAAD LOS-F-H DAB consideration
- (U) Provide EW susceptibility findings on GBS and MRSR
- (U) Develop new and modernize existing specialized EW instrumentation/equipment, and simulation facilities

(U) Project D462 - Technical Vulnerability Reduction: This project funds the Army Survivability Management Office, the Army Materiel Command's survivability specialist, spokesman for survivability policy, and manager of survivability enhancement programs involving multiple organizations or systems. An objective of project activities is to determine the best means for coping with countermeasures and lethal weapons effects. The relative severity of all threats is gauged, and experimental information from every organization performing

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PE Title: **Technology and Vulnerability Assessment** Budget Activity: **#6**

vulnerability assessment is integrated to form a comprehensive prescription for a robust system. Results are used to predict quantitative requirements for system performance under combat conditions, to help Project Managers translate requirements into system technical features, to develop technology investment plans with substantial survivability payoff, and to ensure that survivability performance issues are developed for testing.

(U) **FY 1991 Accomplishments:**
- (U) Laser protection and thermal image support for Desert Shield/Storm
- (U) Developed balanced survivability examples for combat vehicles against post Desert Storm threats
- (U) Supported Training and Doctrine Command (TRADOC) and PEO/Pms in LOSAT, NLOS,LONGBOW, MLRS-TGW, JAVELIN, and WAM Operational Requirement Document appendices and value added analysis for AH-1 Cobra C-Nite
- (U) Developed vulnerability reduction guide for fielded Guardrail IPFs
- (U) Managed the Army Optical Improvement (OIP) and Advanced Laser Protection Programs (ALPP)

(U) **FY 1992 Planned Program:**
- (U) Continue development of CCM/SURV requirement annexes
- (U) Continue technical support in survivability and topical assessments for PM's
- (U) Management of Army laser protection programs, OIP and ALPP
- (U) Coordination of international laser hardening technology

(U) **FY 1993 Planned Program:**
- (U) Management of the ALPP demonstrators and down-select for system applications
- (U) Continue PM support by developing survivability options/tradeoff analyses for balanced survivability and lethality
- (U) Continue examination of survivability upgrades needed by U.S. combat systems to protect against "gray" threats and proliferation of smart munitions
- (U) Continue support of Army Research Office and Independent Research and Development (IR&D) programs by in-depth technical reviews
- (U) Support PEO COMM and PEO CCS by technical analyses of EW, ballistic, chemical, and nuclear synergistic hardening needs

(U) Project D626 - Command, Control, Communications and Computer Intelligence (C4I) Systems Vulnerability/Susceptibility: Supports vulnerability assessments of Army communications and electronic equipment against friendly and threat electro magnetic radiation. Provides field threat environment support for EWVA. Assesses foreign threat weapons' and C4 information systems' ECM vulnerabilities to Blue EW systems; provides threat weapon design data to jammer developers and technical capability information to the intelligence community. Supports Army initiative in EM effects vulnerability reduction of C4 systems. Also funds salaries, travel, equipment, and general management/administrative support.

(U) **FY 1991 Accomplishments:**
- (U) Continued support to operation DESERT SHIELD/STORM
- (U) Began developing DoD's first real time, hardware-in-the-loop simulation of a new foreign surface-to-air missile

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PE Title: **Technology and Vulnerability Assessment** Budget Activity: **#6**

- (U) Completed EWVAs of four foreign surface-to-air missiles, one foreign anti-tank guided missile, and one foreign air-to-surface missile
- (U) Participated in international cooperative program with Canadian and UK Ministries of Defense
- (U) Significantly upgraded existing software ECM simulation modules
- (U) Completed EW field investigations and provided initial EWVA results in support of FAADS GBS source selection
- (U) Initiated JSTARS block I phase I EW laboratory assessment
- (U) Completed relay deployment aids predictive model to support further testing and fielding of MSE and EPLRS
- (U) Initiated EWVA on Joint Advanced Special Operations Radio System (JASORS), Global Positioning System (GPS), and Wide Area Mines Remote Control Unit (RCU)
- (U) Continued development of EWVA methodology and simulations in support of ATCCS demonstration
- (U) Provided EWVA results to support SINCGAR's Second Source Production Decision and completed EWVA of two foreign C3I systems

(U) FY 1992 Planned Program:

- (U) Initiate construction of two new foreign missile ECM hardware simulations and significantly upgrade two foreign missile ECM hardware simulators
- (U) Complete EWVAs of two foreign surface-to-air missiles, two foreign anti-tank guided missiles, one foreign air-to-surface missile, and three foreign C3I systems
- (U) Participate in four international cooperative programs
- (U) Complete EWVA of MSE Packet Switch Overlay and the JSTARS interceptibility and accessibility field tests
- (U) Provide initial EWVA results and ECCM recommendations on JASOR, WAM RCU, FAADS GBS and GPS
- (U) Complete development of EWVA methodology and initiate support for ATCCS demonstrations (i.e., MSE FOTE ASAS IOTE, MCS IOTE, ATCCS EUTE)
- (U) Initiate information vulnerability assessment of ATCCS to malicious electronic attack (including computer virus)

(U) FY 1993 Planned Program:

- (U) Initiate construction of one new foreign missile ECM hardware simulation and significantly upgrade one foreign missile ECM hardware simulator
- (U) Complete EWVAs of two foreign surface-to-air missiles, one foreign anti-tank guided missiles, one foreign air-to-surface missile, and three foreign C3I systems
- (U) Participate in four international cooperative programs
- (U) Construct new software models for preliminary ECM susceptibility investigations
- (U) Initiate JSTARS block II EW field investigations and complete block I lab tests
- (U) Complete JASORS investigation and provide EWVA conclusions to support JASORS' Milestone IIIa In-Process Review (IPR)
- (U) Complete EPLRS EWVA in support of Milestone IIIb, FAADS GBS pre-production ECCM verification, and JSTARS EWVA in support of DAB-IIIa

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PE Title: Technology and Vulnerability Assessment Budget Activity: #6

- (U) Support ATCCS demonstration program and provide EWVA recommendations
- (U) Complete information vulnerability assessment of ATCCS of malicious electronic attack, including computer virus
- (U) Initiate tactical satellite EWVAs in support of overall communication requirements in AirLand Operation concepts
- (U) Provide final EWVA findings in support of MSE product improvement program decision

(U) Project DC10 - Technology Assessment: Project provides management, policy, and guidance for the preparation, conduct and validation of vulnerability/lethality (V/L) assessments and oversight coordination in signatures, sensors and signal processing. Funds V/L Assessment Management Office (VLAMO) and the Signatures, Sensors and Signal Processing Technology Organization (S3TO). VLAMO serves as the Army proponent for a total materiel life cycle V/L assessment program. Supports the development & maintenance of V/L assessment techniques & supporting databases. Conducts independent evaluation of all assessment results and provides independent assessment to system milestone reviews. Coordinates use of signatures, vulnerability assessments in modeling efforts in conjunction with the Army Materiel Systems Analysis Activity (AMSAA). S3TO develops and maintains cognizance of signature data and sensor/signal processing technological efforts throughout the DoD community. Maintains a capability, including development and use of war games, models, simulations, signature and environmental measurements, equipment prototype field tests and analysis tools necessary to support technology assessment. Identifies and recommends appropriate balance to minimize redundancy and maximize technological return. Coordinates Army acoustic reconnaissance, surveillance and target acquisition (RSTA) technology with special emphasis on signal processing.

(U) FY 1991 Accomplishments:

- (U) Developed full-spectrum signature model and distributed to industry and other services
- (U) Reviewed applicability of multi-mission area sensor concept at division-level for RSTA missions
- (U) Prepared the Army wide Automatic Target Recognition (ATR) technology development plan
- (U) Supported DoD Tri-Service ATR steering committee plan development
- (U) Initiated EW vulnerability assessment support to the Armored Systems Modernization Program and Acoustic/Seismic Program
- (U) Initiated Computer Vulnerability Methodology Program
- (U) Developed/directed Army rf Threat to Fuzes Program
- (U) Continued to support development of EW and conventional ballistic V/L assessment techniques
- (U) Established investment strategy and multi-year program plan for V/L assessments
- (U) Conducted V/L reviews on NLOS, LOS-F-H, LOSAT, Stingray, LONGBOW, and UAV (Close) systems for major milestone reviews

(U) FY 1992 Planned Program:

- (U) Analysis and validation of Balanced Technology Initiative (BTI) Battalion Targeting System (BTS) model and evaluation of contractor developed BTS concepts
- (U) Completion of acoustic signature database, continuing development of acoustic propagation models to include turbulence and multi-path, and continued development of target detection/ identification algorithms for acoustics
- (U) Complete multi-spectrum "white world" signatures and models directory

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PE Title: **Technology and Vulnerability Assessment** Budget Activity: #6

- (U) Develop a multiple hypothesis generating algorithm for multi-sensor correlation processing
- (U) Conduct V/L reviews on MCS, CSSCS, CHS, MSE, SINCGARS, ADDS, ASAS, FAADS and COMANCHE systems
- (U) Complete rf Threat to Mortar/Artillery Fuzes Program
- (U) Complete Degraded States Vulnerability Methodology for Paladin, Bradley Fighting Vehicle, and foreign battle tank
- (U) Continue to support the development of Acoustic/Seismic, ASM, and Computer Vulnerability EWVA capabilities
- (U) Update multi-year program plan for V/L assessments
- (U) Support development of V/L assessment techniques to address the total threat spectrum
- (U) Continue to update V/L assessment policies

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

- (U) Analyze contractor developed BTS concepts and hardware implementations vis-a-vis realistic battlefield scenarios; prepare for BTS field testing
- (U) Complete acoustic propagation models and acoustic detection/identification algorithms
- (U) Initiate new sensor/signal processing data correlation efforts in response to TRADOC requirements
- (U) Assess ATR performance limits using multi-sensor feature fusion vis-a-vis requirements
- (U) Conduct V/L reviews on TGW, SADARM, Armored Gun System (AGS), JSTARS, JAVELIN and HIP
- (U) Initiate/direct Army rf Threat to Missile Proximity Fuze Program
- (U) Initiate (and complete) Degraded States Vulnerability Methodology for U.S. Army helicopters and a foreign howitzer
- (U) Update multi-year program plan for V/L assessments
- (U) Continue to support the development of Acoustic/Seismic, ASM, and Computer Vulnerability EWVA capabilities identify
- (U) Update investment strategy and prioritization process for V/L assessments

(U) Project DC55 - Distributed Developmental Simulation Technology. SIMulator NETworking (SIMNET) was a proof of principle developed by the Defense Advanced Research Projects Agency (DARPA) to show the feasibility of simulator networking of weapon simulators. The Battlefield Distributed Simulation - Developmental (BDS-D) is the Army's program which will expand the capability provided with the SIMNET technology to create an expanded virtual battlefield environment. The Army is under contract to conduct the Advanced Distributed Simulation Technology (ADST) contract which is the vehicle used by the Army to execute the BDS-D program. It provides a laboratory environment in which air and ground simulators can be used by developmental activities in combat development, material development, and testing. The simulation network links manual weapon system simulators with computer controlled semi-automated forces (SAFOR) at geographically different sites. Funding supports the Laboratory Sustaining Effort (LSE) to operate and maintain the current and forecasted BDS-D sites. funds are required to operate the laboratory for future developmental work through FY 2000.

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(U) FY 1991 Accomplishments: (DARPA Funds Plus $2.5M Army Year of Execution Funding)
- (U) Sustained BDS-D operations at Ft. Rucker, AL in support of Counter Target Acquisition System (CTAS) II, Scout/Attack Mix, and NLOS missile systems
- (U) Sustained BDS-D operations at Ft. Knox, KY in support of Combat Vehicle Command and Control (CVCC), 3 versus 4 Tank Study, and Speech Intelligibility Study
- (U) Sustained BDS-D Program Office

(U) FY 1992 Planned Program:
- (U) Sustain BDS-D operations and perform customer tests at Ft. Rucker, AL including Air to Air Combat (ATAC) - II, and (CTAS) III
- (U) Sustain BDS-D operations and perform customer tests at Ft. Knox, KY including LOSAT, WAM, Experimental Round (XRod), CVCC, and Speech intelligibility Study
- (U) Sustain BDS-D Program Office

(U) FY 1993 Planned Program:
- (U) Sustain BDS-D operations and perform customer tests at Ft. Rucker, AL including continuation of Air to Air Combat (ATAC) - II, and (CTAS) III
- (U) Sustain BDS-D operations and perform customer tests at Ft. Knox, KY including IFF, Vehicle integrated Defense System (VIDS), WAM, (XRod), and CVCC
- (U) Sustain BDS-D Program Office

(U) Work Performed By: In-house work performed by: Harry Diamond Laboratories, Adelphi, MD; Signatures, Sensors, and Signal Processing Technology Organization, Adelphi, MD; Survivability Management Office, Adelphi, MD; U.S. Army Missile Command, Countermeasures/Counter-Countermeasures Center, Huntsville, AL; Vulnerability/Lethality Assessment Management Office, Aberdeen Proving Ground, MD; and Vulnerability Assessment Laboratory, White Sands, NM; Supporting efforts are provided by: Air Force Avionics Laboratory, Wright-Patterson Air Force Base, OH; Atmospheric Sciences Laboratory, White Sands Missile Range, NM; Ballistic Research Laboratory, Aberdeen Proving Ground, MD; Chemical Research Development and Engineering Command, Aberdeen Proving Ground, MD; Defense Advanced Research Projects Agency, Arlington, VA; Department of Energy, Albuquerque, NM; Electronics Technology and Devices Laboratory, Fort Monmouth, NJ; 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; 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; Optimetrics, Inc., Las Cruces, NM; Optometrics, Ann Arbor, MI; Orlon,

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605604A**
PE Title: **Technology and Vulnerability Assessment** Budget Activity: **#6**

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; and Wackenhut Advanced Technologies Corporation, Fairfax, VA.

(U) Related Activities:

PE #0601102A (Defense Research Sciences)
PE #0602105A (Materials Technology)
PE #0602112F (Materials)
PE #0602120A (Electronic Survivability and Fuzing Technology)
PE #0602131M (Marine Corps Landing Force 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 #0602786A (Logistics 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)
PE #0604270A (Electronic Warfare Development)

- (U) DL: 08EO (DARPA, Sensor & Eye Protection)
- (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 Munition Effectiveness (JTCG/ME)
- (U) JTCG/AS Topical Cooperation
- (U) NATO Directed Energy Working Group
- (U) Laser Hardened Materiels-structures Group (OSD)
- (U) Battlefield Laser Management Panel (JCG-C-E)
- (U) Tri-Service Joint Working Group on Anti-radiation Missile Countermeasures (ARM-CM)
- (U) There is no unnecessary duplication of effort within the Army or the Department of Defense.

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

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605605A**
PE Title: **DoD High Energy Laser System Test Facility (HELSTF)** Budget Activity: **#6**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
DE97 DoD High Energy Laser System Test Facility (HELSTF)					
	30807	28355	17852	Cont	Cont
PE TOTAL	30807	28355	17852		

B. (U) BRIEF DESCRIPTION OF ELEMENT: Operates and maintains a broad-based high energy laser test capability at White Sands Missile Range. As the only multi-megawatt high energy laser test system in the U.S., this facility provides unique DoD capabilities for assessing damage, susceptibility/vulnerability and lethality of various systems and materials to lasers. Primary emphasis of the facility supports Army tactical damage and vulnerability assessments and Army test and evaluation of anti-missile technologies and systems. This funding provides for facility operations and maintenance as well as acquisition and characterization of facility equipment, including optics and diagnostic instrumentation common to all ongoing programs supported by the facility. This funding also supports adaptation of single purpose, user installed equipment to support the broad range of test requirements, ensuring efficient expenditure of DoD investments. Current upgrades include adaptation of additional laser systems to support Army damage and vulnerability testing, smoke and obscurant research, and tactical laser weapons research. Program element restructured from PE #0605601 - Army Test Ranges/Facilities based on transfer of facility from the U.S. Army Materiel Command to the U.S. Army Strategic Defense Command. With the completion of the full Aperture Upgrade in FY91, HELSTF has the only potential U.S. Anti-Satellite capability in the near term.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project DE97 - DoD High Energy Laser System Test Facility (HELSTF)

(U) FY 1991 Accomplishments:

- (U) Continued to operate and maintain HELSTF test capability
- (U) Reorganized HELSTF to increase efficiency and tailor facility support to funded programs
- (U) Completed flux/fluence upgrade for the Vacuum Test System
- (U) Completed Full Aperture Upgrade Program.
- (U) Successfully executed atmospheric anti-satellite tests
- (U) Successfully executed satellite lethality tests in the vacuum chamber
- (U) Successfully executed two pre-launch calibrations for NASA X-Ray telescopes
- (U) Initiated installation of tactically-scaled lasers for damage and vulnerability experiments
- (U) Initiated Army damage and vulnerability experiments
- (U) Supported other DoD sponsored testing, including: Air Force ground calibration, Strategic Defense Initiative, Air Force Foreign Technology Division

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605605A**
PE Title: **DoD High Energy Laser System Test Facility (HELSTF)** Budget Activity: **#6**

(U) FY 1992 Planned Program:

- (U) Continue to operate and maintain HELSTF test capability
- (U) Complete installation of Pulsed Laser Vulnerability Test System
- (U) Complete installation of Laser Development Device
- (U) Continue to support test programs, to include:
  - Army C02 tactical laser damage and vulnerability testing
  - Multiple Integrated Laser Engagement System (MILES) Characterization
  - Army tactical smoke and obscurant testing
  - Air Force ground calibration
  - Strategic Defense Initiative Theater Missile Defense testing
  - Support for Air Force Foreign Technology Division
  - Support for classified program testing

(U) FY 1993 Planned Program:

- (U) Continue to operate and maintain HELSTF test capability
- (U) Continue to support test programs, to include:
  - Army C02 tactical laser damage and vulnerability testing
  - Initial multi-wavelength Army tactical damage and vulnerability testing
  - Army tactical smoke and obscurant testing
  - Army anti-missile experiments
  - Air Force Ground Calibration
  - Strategic Defense Initiative testing
  - Support for Air Force Foreign Technology Division

(U) Work Performed By: In-house work is performed at the High Energy Laser Test Facility, White Sands Missile Range, NM. Contractors are: Lockheed; Rockwell Power Systems; TRW; Hughes; Los Alamos National Laboratory; and Massachusetts Institute of Technology/Lincoln Laboratory

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

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

(U) International Cooperative Agreements: Initial coordination underway with the United Kingdom and France for possible testing of UK, French and German developed military lasers.

AMENDED FY 1992/1993 BIENNIAL 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 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D127	Meteorological Support to LABCOM Activities				
	22699	10013	9902	Cont	Cont
D128	Meteorological Support to TECOM Activities				
	- 0 -	11140	8930	Cont	Cont
PE TOTAL	22699	21153	18832		

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. Realignments and reductions in FY92 and FY93 reflect Army implementation of Defense Management Review decisions. Project D128 was established in FY92 to effect the division of funding required with the change of command. The funding split (with D127) causes a zero change in funding of this program element.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project D127 - Meteorological Support to LABCOM Activities: Provide atmospheric measurements and analyses critical to the testing of high priority Army weapon systems and materiel. Provide assessment of system design performance parameters operating in realistic environments. Provide highly specialized instrumentation required for characterizing the natural atmosphere and battlefield smokes/obscurants to support test and evaluation of Army smart munitions. Conduct measurements, maintain databases, and provide computational capabilities necessary for: system designers and testers; simulation models; and electro-optical propagation codes. Support live fire tests of Army systems in real-world environments. Approximately 68 civilians are employed in support of this project.

(U) FY 1991 Accomplishments:

- (U) Meteorological support to U.S. Army Laboratory Command (LABCOM), U.S. Army Test and Evaluation Command (TECOM) and numerous other Army agencies engaged in RDTE
- (U) Implemented Noise Abatement and Prediction System (NAPS) in US Army Europe (USAREUR) in support of training in noise abatement
- (U) Provided smoke dynamics, transmittance and met measurements to Chemical Research, Development, and Engineering Center (CRDEC), Smoke Week XIII, Forward Area Air Defense (FAADS) Line-of-Sight Forward-Heavy (LOS-F-H), Advance Missile System-Heavy (AMS-H) and Anti-Armor Weapons System-Medium (AAWS-M)
- (U) Provided specialized environmental measurements for Directed Energy Weapon (DEW) countermeasure tactical systems
- (U) Conducted specialized atmospheric measurements in support to DEW threat-related tests

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605702A**
PE Title: **Meteorological Support to RDT&E Activities** Budget Activity: **#6**

- (U) Provided atmospheric sampling, analysis, consultation weather forecasts, severe weather advisories, staff meteorological services and atmospheric measurements to support Army/DoD tests and projects at 14 permanent ranges
- (U) Modernized operational support equipment to meet range/customer requirements:
  - Evaluated Small Portable Transmissometer (multi-spectral sensor) prototypes for further development and fielding
  - Designed a prototype Mobile Operational Meteorological Measurement System
  - Evaluated a prototype rocket-launched dropsonde
  - Upgraded radiosonde receivers with LORAN C (position locating system)
  - Examined the potential of Global Positioning (GPS) radiosondes
- (U) Negotiated a contract to replace or refurbish to Army standards three 300 ft meteorological towers at Yuma Proving Ground, AZ. Work began in FY91 and will be completed in FY92.
- (U) Designed a Wide-Area Network for interconnection of meteorological teams automated data processing resources

(U) FY 1992 Planned Program:

- (U) Effective FY92 this project supports LABCOM only. Support to TECOM is transferred to Project D128 as a net zero budget adjustment
- (U) Develop millimeter transmission and imaging capability
- (U) Provide smoke dynamics, transmittance and met measurements to CRDEC, Smoke Week XIV, and other tests as required
- (U) Integrate profiler measurement capabilities and develop a continuous, surface to 20-Km, wind and optical turbulence profile updated every three to six minutes
- (U) Support 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 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
- (U) Initiate development of program to provide atmospheric slant path transmission measurements from airborne platforms
- (U) Extend capacity to measure transmission through obscure atmospheres using imaging techniques

(U) Project D128 - Meteorological Support to TECOM Activities - This function was previously funded in project D127. Resources and functions were realigned to this project in accordance with the Defense Management Review, test & evaluation consolidation, which transferred meteorological teams from the Atmospheric Sciences Laboratory to the Test and Evaluation Command (TECOM). Provides atmospheric sampling, analysis, consultation forecasting, advisory and warning products and test reports to satisfy Army/DoD RDTE support requirements. Provide technical support to Army Program Executive Officers (PEOs), Project Managers (PMs) and the Meteorological Teams. Develop methodologies and acquire instrumentation/systems that allow

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605702A**
PE Title: **Meteorological Support to RDT&E Activities** Budget Activity: **#6**

meteorological teams to support Army/DoD RDTE requirements. Approximately 149 civilians are employed in support of this project.

(U) FY 1991 Accomplishments: Project effort funded under Project D127.

(U) FY 1992 Planned Program:

- (U) Integrate LABCOM profiler measurement capabilities for operational application by White Sands Meteorological Team.
- (U) Provide weather forecasts, severe weather advisories, staff meteorological services, and atmospheric measurements in support of Army/DoD tests and projects at 14 permanent ranges
- (U) Modernize operational support equipment at the meteorological teams to meet customer requirements:
  - Evaluate the Small Portable Transmissometers for application at Ft. Belvoir, VA and Aberdeen Proving Ground, MD
  - Upgrade Vaisala upper air systems with LORAN-C which has the potential to increase spatial resolution.
  - Install Vaisala MARWIN-12s' at selected Meteorological Teams (up to five).
  - Upgrade radio theodolites to employ digital sondes
  - Install field mills for lightning detection
  - Install particle volume monitors at the meteorological teams
  - Evaluate Mobile Operational Meteorological Measurement Systems at selected sites for test support applications.

(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 permanent ranges
- (U) Modernize operational support equipment at the meteorological teams to meet customer requirements:
  - Install Small Portable Transmissometers at Alaska, Redstone Arsenal, AL and Ft. Hunter-Liggett, CA sites
  - Replace/upgrade meteorological teams Surface Atmospheric Meteorological Systems to provide increased sampling rate to satisfy evolving test 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
  - Field the Mobile Operational Meteorological Measurement System, subject to satisfactory FY 1992 evaluation and full funding in FY 1993

(U) Work Performed By: Approximately 91% is performed in-house by the Atmospheric Sciences Division. Primary contractors; the Management Assistance Corp., El Paso, TX; New Mexico State University, Physical Science Laboratory, Las Cruces, NM; and W.J. Shafer, Inc., El Paso, TX.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605702A**
PE Title: **Meteorological Support to RDT&E Activities** Budget Activity: **#6**

(U) Related Activities: There is no unnecessary duplication of effort within the Army or the Department of Defense. Related program elements include:
PE #0605601A (Army Test Ranges & Facilities)
PE #0605602A (Army Technical Test Instrumentation and Targets)

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

(U) International Cooperative Agreements: The Atmospheric Science Laboratory supports NATO and World Meteorological Organization testing.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605706A**
PE Title: **Materiel Systems Analysis** Budget Activity: **#6**

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

Project Number / Title		FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D026	Test Design and Evaluation	7253	7170	7035	Cont	Cont
M541	Materiel Systems Analysis	16295	16585	15823	Cont	Cont
PE TOTAL		23548	23755	22858		

B. (U) BRIEF DESCRIPTION OF ELEMENT: The U.S. Army Materiel Systems Analysis Activity (AMSAA), as the Army's major analytical agency for technical analyses and evaluations of materiel, provides the independent technical capability in the Army Materiel Command (AMC) for the conduct of materiel systems analysis. AMSAA evaluates the performance 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 analysis, 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 models, simulations, and data bases for use in Army studies and analyses. AMSAA is the Army's independent technical evaluator of developmental 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 the technical independent evaluations for the major milestone decisions, materiel changes, 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 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 are performed independent of the PEO/PM, materiel development command and the testing agencies to complement operational test and evaluation results for the Army acquisition decision process. It is a project separate from the AMSAA institutional, fixed and recurring account, because of its significance and the desire for management visibility. It funds the salaries of civilian employees assigned to the test design and evaluation mission and associated contractor support and other in-house operations such as data processing and reports publication.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605706A**
PE Title: **Materiel Systems Analysis** Budget Activity: **#6**

(U) FY 1991 Accomplishments:

- (U) Evaluations performed in support of AAE decisions for: Special Operations Aircraft, APACHE LONGBOW Product Improvement Program, Guardrail/Common Sensor, Combat Service Support System, Family of Medium Tactical Vehicles, TOW-2B, Pursuit Deterrent Munition, Air Crew Member Protective Mask, Improved HELLFIRE Live Fire, Forward Area Air Defense Systems - Ground Based Sensor Competitive tests, and Advanced Air Defense Electro-optical sensor proof-of-principle.
- (U) Test and Evaluation planning efforts in support of evaluations projected for FY 1992 and beyond
- (U) Developed live fire test plans and designs; and evaluated the Army live fire or joint live fire test results to determine the wartime performance and survivability of Army materiel systems.

(U) FY 1992 Planned Program:

- (U) Evaluation in support of AAE decisions for: M1A2 Abrams, Joint Unmanned Aerial Vehicle-Short Range, All Source Analysis System, APACHE Product Improvement (AH-64B), Light Firefinder, Light TACFIRE, Single Source Processor - SIGINT, Commander's Tactical Terminal Forward Area Air Defense Family, Single Channel Grd - Airborne Radio System, and Nuclear Biological and Chemical Reconnaissance System.
- (U) Develop test and evaluation design plans for technical tests to be evaluated in FY93 and FY94
- (U) Develop live fire test plans and designs; and evaluate the Army live fire or joint live fire test results to determine the wartime performance and survivability of Army materiel systems

(U) FY 1993 Planned Program:

- (U) Evaluation in support of AAE decisions for: Joint Surveillance and Target Acquisition System - Block I and Improved Ground Station Module, Army Tactical Command and Control System, Special Operations Aircraft, Improved Remote Battlefield Sensor System, Howitzer Improvement Program, Advanced Field Artillery Tactical Data System, Light Armored Vehicle 105, Combat Service Support Control System, and Enhanced Position Location and Reporting System
- (U) Develop test and evaluation design plans for technical tests to be evaluated in FY94 thru FY99
- (U) Develop live fire test plans and designs; and evaluate live fire test results to determine wartime performance and survivability of Army materiel systems

(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 (Testing 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, required operational capabilities, 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.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605706A**
PE Title: **Materiel Systems Analysis** Budget Activity: **#6**

(U) FY 1991 Accomplishments:

- (U) Continued to support Army studies with U.S. and foreign systems performance estimates to include TRADOC COEAs and Force Structure Studies at FY 1990 level to include: Line-of-Sight Anti-Tank and Infantry Anti-Armor COEA, Indirect Fire Anti-Armor Submunition Study, Future Infantry Fighting Vehicle COEA, Wide Area Mines COEA, and Forward Area Air Defense Systems Command Control, Communications and Intelligence Analysis
- (U) Provided support to recurring Army Theater Level Studies to include performance estimates for: TAA #2 (FIA & DA), OMNIBUS FY 1993, Armed Forces Planning Data and Assumptions, MCAF FY 1991 and Mid Range Force Study FY 1991.
- (U) Provided materiel systems analysis in support of HQDA, PEOs/PMs/R&D Centers including Armored Systems Modernization Campaign Analysis, COMANCHE Campaign Analysis, All Source Analysis System, Theater High Altitude Air Defense Systems Risk Analysis, LONGBOW Sensitivity Analysis, and the Radio Frequency Countermeasures Study.

(U) FY 1992 Planned Program:

- (U) Support 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) Provide materiel systems analyses of performance effectiveness and survivability in support of HQDA, AMC and PEOs/PMs/R&D Centers including campaign analyses, risk analyses, and trade-off analyses.
- (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 acquisition-heavy programs to research and development of oriented programs and from focus on a single, Soviet-block threat to a broad, world-wide-scoped 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.
- (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 acquisition-heavy programs to research and development of oriented programs, and from focus on a single, Soviet-block threat to a broad, world-wide-scoped set of scenarios and types of threat (and equipment)

AMENDED FY 1992/1993 BIENNIAL 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: ($ in Thousands) Not applicable.

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605709A (TIARA)**
PE Title: **Exploitation of Foreign Items** Budget Activity: **#6**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D650	Exploitation of Foreign Items				
	2824	4303	3615	Cont	Cont
DC28	Acquisition/Exploitation of Threat Items				
	14630	24833	16035	Cont	Cont
PE TOTAL	17454	29136	19650		

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 D650 - Exploitation of Foreign Items: Acquisition and exploitation of leading-edge technology, worldwide, on a sole source basis, from friendly cooperative nations which can not be acquired under other programs, in order to prevent technological surprise and shorten the research and development cycle, thereby saving time and funds.

(U) FY 1991 Accomplishments:
- (U) Continued/completed exploitation of items already acquired.
- (U) Prioritized and initiated acquisition of new items.
- (U) Published reports on completed exploitations.

(U) FY 1992 Planned Program:
- (U) Continue/complete exploitation of items already acquired.
- (U) Prioritize and initiate acquisition of new items.
- (U) Publish reports on completed exploitations.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605709A (TIARA)**
PE Title: **Exploitation of Foreign Items** Budget Activity: **#6**

(U) FY 1993 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) 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 1991 Accomplishments:
- **(U)** Acquired and initiated exploitation of threat systems identified in the FMP Five Year Plan.
- **(U)** Continued exploitation of threat systems acquired in FY 1990.

(U) FY 1992 Planned Program:
- **(U)** Acquire and initiate exploitation of threat systems identified and prioritized in the Army Foreign Materiel Program FY 1992 Five Year Plan update.
- **(U)** Support developmental testing, operational testing, and other Army and DoD requirements for threat systems on hand.
- **(U)** Acquire and exploit rest of world (non-Soviet) threat equipment to prevent technological surprise.

(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.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605709A (TIARA)**
PE Title: **Exploitation of Foreign Items** Budget Activity: **#6**

(U) Work Performed By: The Army Deputy Chief of Staff for Intelligence, with the advice of the Army Foreign Materiel Review Board, has Army staff oversight responsibility and sets general policy for the Army Foreign Materiel Program. The Commander, Army Intelligence Agency is responsible for executing the exploitation program with coordination and support from Army Materiel Command. Where the Army acts as the Executive Agent, the Army Intelligence Agency is responsible for executing the exploitation program to ensure that the objectives and requirements of all services and agencies are satisfied. The Army Materiel Command manages exploitations for the D650 project.

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

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605710A**
PE Title: **Joint Chemical/Biological Point of Contact, Test and Assessment** Budget Activity: **#4**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D049	Joint Chemical/Biological Contact Point and Test				
	2692	2338	2286	Cont	Cont
D204	Field Smoke Assessment				
	3557	3523	3416	Cont	Cont
PE TOTAL	6249	5861	5702		

B. (U) BRIEF DESCRIPTION OF ELEMENT: Supports the direct costs of the joint service project which provides input to the services 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 data source books), and to respond to unified and specified commands and all services for CB information. Dugway Proving Ground is the Executive Agent for the effort. Also supports the conduct of field tests to observe and measure effects on performance of battlefield obscurants on electro-optical/smart weapon systems. Data gathered by such tests is analyzed, catalogued, and disseminated in support of continued development on these systems. An annual smoke symposium is conducted as the primary mechanism for information exchange between industry, government, academia, and international organizations to discuss smoke and obscurants and resulting effects on weapon systems and operations. The Munitions Directorate, U.S. Army Chemical Research, Development and Engineering Center sponsors the symposium.

C. (U) JUSTIFICATION FOR PROJECTS LESS THAN $10.0 MILLION IN BOTH FY 1992 AND 1993:

(U) Project D049 - Joint CB Contact Point and Test: Conducts CB tests and maintains repository of CB information for multiple users.

(U) FY 1991 Accomplishments:

- (U) Completed five field trials:
  - Effects of extended flight on aircraft contamination
  - Improved Military Oriented Protective Posture (MOPP) exchange procedures evaluation
  - DS-2 decontamination procedures evaluation
  - Improved entry/exit procedures for litter patients
  - Evaluation of aircrew chemical protective garment exchange procedures
- (U) Completed three laboratory tests:
  - Purge of chemical vapor from vehicle compartments
  - Effects of decontamination on selected aircraft and vehicle materials
  - Agent penetration of remains pouch
- (U) Continued update of CB source book
- (U) Completed six technical analyses:
  - Concentration fluctuation modeling for chemical hazard prediction
  - Amphibious operations logistics

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605710A**
PE Title: **Joint Chemical/Biological Point of Contact, Test and Assessment** Budget Activity: **#4**

- Acclimation and adoption of troops in MOPP
- Chemical hazard and Air Force ground support personnel
- Impact of chemical attack on aerial and sea ports of debarkation operations
- Vehicle mounting locations for chemical detectors

(U) FY 1992 Planned Program:
- (U) Complete ongoing FY91 field trials, laboratory tests and studies
- (U) Continue to update CB source book
- (U) Initiate 23 studies, field trials and laboratory trials evaluating performance and procedures in a chemical environment

(U) FY 1993 Planned Program:
- (U) Complete FY92 carryover programs
- (U) Continue to update CB source book
- (U) Initiate 22 studies, field trials and laboratory tests evaluating performance and procedures in a chemical environment

(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 1991 Accomplishments:
- (U) Provided field test support for the Army Missile System-Heavy (AMS-H), the Line-of-Sight Anti-Tank System (LOSAT), and the HELLFIRE Optical Missile System (HOMS)
- (U) Conducted Smoke Symposium 15 at Laurel, MD
- (U) Conducted Smoke Week 13 at Eglin AFB, FL
- (U) Field tested a third generation obscuration-producing capability
- (U) Continued evaluation of Javelin

(U) FY 1992 Planned Program:
- (U) Provide field test support for HOMS and continue evaluation of Javelin and LOSAT
- (U) Conduct Smoke Week 14 at Eglin AFB, FL
- (U) Conduct Smoke Symposium 16 at Laurel, MD
- (U) Field test a third generation obscuration-producing capability

(U) FY 1993 Planned Program:
- (U) Provide field test support and evaluations for Javelin and other major weapon systems
- (U) Conduct Smoke Week 15 at Dugway Proving Ground, UT
- (U) Conduct Smoke Symposium 17 at Laurel, MD

(U) Work Performed By: In-house efforts accomplished by U.S. Army Chemical, Research Development and Engineering Center, Aberdeen Proving Ground, MD; U.S. Army Atmospheric Sciences 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 Corporation, Hampton VA.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605710A**
PE Title: **Joint Chemical/Biological Point of Contact, Test and Assessment** Budget Activity: **#4**

(U) Related Activities: Not applicable.

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

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605712A**
PE Title: **Support of Operational Testing** Budget Activity: **#6**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D001	OPTEC (IOTE)				
	31430	39501	36466	Cont	Cont
D985	Concepts Evaluation of Materiel				
	1110	2503	1517	Cont	Cont
DV02	Test Directorates				
	23722	22419	20555	Cont	Cont
DV03	TRADOC P2NBC2				
	2234	2100	1837	Cont	Cont
PE TOTAL	58496	66523	60375		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program finances the operational testing of developmental materiel systems. Project D001 provides for the direct operational test costs incurred by the Operational Test and Evaluation Command (OPTEC). Project DV02 provides for the recurring costs of operating the test activities of OPTEC. Funding for each test project varies based on the number of personnel involved and test duration. Project D985 provides quick reaction testing of equipment having military potential for readily solving materiel requirement deficiencies. DV03 is a joint effort of the operational, medical, and laboratory communities to address the physiological, psychological, and performance factors which effect individuals and crews under nuclear, biological, and chemical environments.

C. (U) JUSTIFICATION FOR PROJECTS:

(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 and IOTE on major and nonmajor materiel systems. Operational testing conducted under conditions, as close as possible, to those encountered in actual combat conditions 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 1991 Accomplishments:

- (U) Tests conducted for the following systems:
  - Single Channel Ground and Airborne Radio System/Integrated COMSEC (SINCGARS ICOM)
  - C-17 Aircraft IOTE
  - AN/APR-39A (XE-2) Advance Threat Radar Warning IOTE (APR-39A (XE-2))
  - Integrated Family of Test Equipment OA (IFTE OA)
  - NAVSTAR HELIBORNE
  - NAVSTAR Global Positioning System (GPS)
  - Heavy Equipment Transporter System (Tractor) (HETS XM1070) IOTE
  - Advanced Field Artillery Tactical Data Systems (AFATDS)

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605712A**
PE Title: **Support of Operational Testing** Budget Activity: **#6**

- Unmanned Aerial Vehicle/Short Range (UAV-SR) EUTE
- Palatized Loading System (PLS)
- Heavy Equipment Transporter System (Trailer) (HETS XM1000) IOTE
- MIAZ Block II Abrams Tank System (M1 Block II)
- Family of Medium Tactical Vehicles (FMTV) EUTE
- Tactical Quiet Generators (TQG)
- HF Intercept and Direction Finding System (AN/TSQ-152) IOTE (TRACKWOLF)
- Resuscitation Fluids Production and Reconstitution System (REFLUPS)
- Single Channel Objective Tactical Terminal (SCOTT) AN/TCS-124 IOTE
- 155MM Sense and Destroy Armor (155MM SADARM)
- Forward Area Air Defense Non-Line-of-Sight (FAAD NLOS) System
- All Source Analysis System (ASAS)
- Line-of-Sight - Forward-Heavy (LOS-F-H)
- Special Operations Improved Cryptographic System (SOICS)
- Joint Stars-Block I Ground Station Module (GSM Block I)
- Air-to-Air Stinger (ATAS)
- Forward Area Air Defense Ground Based Sensor (FAAD GBS)
- Maneuver Communications System (MCS)

(U) FY 1992 Planned Program:

- (U) Significant tests planned subject to impending decisions:
  - MIA2 Block II Abrams Tank System (M1 Block II) Early User Test and Evaluation (EUTE)
  - Unmanned Aerial Vehicle (UAV)
  - 155MM Sense and Destroy Armor (155MM SADARM)
  - Heavy Equipment Transporter System (Tractor & Trailer) IOTE
  - Army Tactical Command and Control System (ATCCS) EUTE
  - Resuscitation Fluids Production and Reconstitution System (REFLUPS)
  - Palletized Loading System (PLS) IOTE
  - Single Channel Ground and Airborne Radio System (SINCGARS)
  - All Source Analysis System (ASAS) IOTE
  - Joint Stars - Block I Ground Station Module
  - C17 Aircraft
  - Family of Electronic Deception Devices - Communication Deception System (FEDD-CDS)
  - Improved Ribbon Bridge/Folding Float Bridge 2000 (IRB/FFB 2000)
  - Joint Tactical Information Distribution System (JTIDS)
  - Family of Medium Tactical Vehicles-A (FMTV) IOTE
  - Advanced Field Artillery Tactical Data System (AFATDS)
  - Patriot Navigation Emplacement Enhancement System (NAVES)

(U) FY 1993 Planned Program:

- (U) Significant tests planned:
  - Ground Station Module (GSM) Block I IOTE
  - C-17 Aircraft
  - Army Tactical Command and Control System (ATCCS)

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605712A**
PE Title: **Support of Operational Testing** Budget Activity: **#6**

- All Source Analysis System (ASAS)
- 155 Sense and Destroy Armor (SADARM) IOTE
- Family of Medium Tactical Vehicles (FMTV)
- Multiple Launch Rocket System - Sense and Destroy Armor (MLRS - SADARM)
- Joint Tactical Information Distribution System (JTIDS)
- Avenger (PMS NCTR)
- X-Ray System-Dental-Miniature (XRSDM)
- Line-of-Sight - Forward-Heavy Noncooperative Target Recognition (LOS-F-H-NCTR)
- Line-of-Sight - Forward-Heavy Noncooperative Non-Imaging Sensor (LOS-F-H-NNIS)
- Multispectral Close Combat Decoy (MCCD)
- Army Field Artillery Tactical Data System (AFATDS) IOTE
- Advanced Anti-Armor Weapon System - Medium (AAWS-M) IOTE B
- M1A2 Unit Conduct of Fire Trainer (U-COFT)

(U) Project D985 - Concepts Evaluation of Materiel: This project provides for acquiring or leasing of commercially available equipment, other services and foreign items to permit conduct of innovative tests of limited scope and duration. This provides insights into the feasibility of a materiel concept or system for which a potential requirement can be clarified or initiated. Items selected for such testing have high potential for increasing combat effectiveness and have military potential for readily solving materiel requirements deficiencies. These are quick-reaction tests that also support the Army combat developer in validating up front, early system training, tactics, and organizational concepts. The program is designed to facilitate rapid testing efforts in order to take advantage of windows of opportunity. It is also intended to provide quick assessments of newly discovered products and to answer unanticipated questions in support of other major efforts. Although it is managed on a year to year basis, the program historically has supported 50-60 projects per year.

(U) FY 1991 Accomplishments:

- (U) Tests completed for the following systems:
  - Contact Maintenance Truck
  - Combat Service Support Automation Assisted Office
  - Conduct of Fire Trainer/Precision Gunnery System
  - Nuclear, Biological, Chemical (NBC) Mechanical Smoke Generator
  - Unmanned Aerial Vehicle (UAV) Ducted Fan Platform
  - Intelligence and Electronic Warfare (IEW) Command and Control

(U) FY 1992 Planned Program:

- (U) Tests are planned for the following systems:
  - Unmanned Aerial Vehicle (UAV)
  - Theater Construction Management System
  - Reduced Tank Crew
  - Battle Damage and Repair Kits
  - Royal Ordnance Lightweight Howitzer
  - C2 On The Move
  - Small Hawk

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605712A**
PE Title: **Support of Operational Testing** Budget Activity: **#6**

- Conduct of Fire Trainer/Precision Gunnery System
- NBC Mechanical Smoke Generator

(U) FY 1993 Planned Program:

- (U) Planned tests for FY 1993 include: Anti-Armor Weapon System-Medium, Non-Line-of-Sight Combined Arms, Air Defense Anti Tank System, Improved TOW Acquisition System.

(U) Project DV02 - Test Directorates: This project finances the recurring costs (civilian salaries, equipment, 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. Primary mission of these test directorates is to conduct operational testing of developmental materiel, joint testing, and force development test and experimentation (FDTE).

(U) FY 1991 Accomplishments:

- (U) This project financed the operational costs for test directorates, including civilian pay, support contracts, TDY, supplies and equipment. FY 1991 was the transition year to implement the Defense Management Review (DMR) Directive to consolidate test and evaluation activities. The overall objective to improve effectiveness and reduce costs resulted in the realignment of the operational test and evaluation community to create the Operational Test and Evaluation Command (OPTEC). Systems tested listed under Project D001 accomplishments.

(U) FY 1992 Planned Program:

- (U) Program continues to finance the operational costs for test directorates, including civilian pay, support contracts, TDY, supplies, and equipment. Systems to be tested listed under Project D001.

(U) FY 1993 Planned Program:

- (U) Program will continue to finance the operational costs for test directorates, including civilian pay, support contracts, TDY, supplies, and equipment. Systems to be tested listed under Project D001.

(U) Project DV03 - TRADOC Physiological and Psychological Effects on Nuclear, Biological and Chemical Combat (P2NBC2): 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 associated laboratory research, is oriented toward understanding the effects of this environment on soldiers. The program is chartered to quantify the degradation of the soldier, develop measures to mitigate the effects and have these measures instituted into the Army. Results support program management development of major systems and doctrine and training development objectives.

(U) FY 1991 Accomplishments:

- (U) Test completed for the following systems:
  - Forward Area Air Defense System soldier performance

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605712A**
PE Title: **Support of Operational Testing** Budget Activity: **#6**

- Mobile Subscriber Equipment
- Corps hospital
- Detailed equipment decontamination
- Heat strain modeling - ongoing
- Micro climate cooling in UH-60 simulator
- Micro climate backpacks
- Medical monitor (ongoing) support
- AVN thermal modeling
- Stress performance study
- Field validation study
- Heat tolerance in Mission Oriented Protective Posture 4 (MOPP4) (ongoing)
- Soldier extended eyepiece
- Metabolic taxonomy

(U) FY 1992 Planned Program:

- **(U)** Significant tests planned:
  - Smoke generator platoon test
  - Forward Area Air Defense System team test
  - Light division decontamination operations
  - Heat tolerance prediction in MOPP4
  - Female soldier performance in MOPP4
  - Towed artillery test
  - Ordnance maintenance team test
  - Light forces battalion aid station/ambulance team

(U) FY 1993 Planned Program:

- **(U)** Significant tests planned:
  - Air defense team test (continued)
  - Combat engineer float bridge teams
  - Chemical dual purpose teams
  - Forward area rearm and refuel team
  - At this time, non-specific Concept Evaluation Program and research projects in the areas of combat, combat support and combat service support systems

(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: PRC/ORI Joint Venture, McLean, VA; BDM International Inc., McLean, VA; Computer Sciences Corporation (CSC), Fort Hunter-Liggett, CA; Madentech, Inc., Arlington, VA; Dyncorp, Fort Huachuca, AZ; United International Engineering, Fort Bliss, TX; 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., Fort Huachuca, AZ; and PRC, Inc., Fort Hood, TX. P2NBC2 program is managed by the U.S. Army Chemical School. A majority of the work is performed by the

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605712A**
PE Title: **Support of Operational Testing** Budget Activity: **#6**

U.S. Army Research Institute for Environmental Medicine; Walter Reed Army Institute of Research; Chemical Research, Development and Experiment Center; Army Research Institute; HQ TRADOC; integrating centers and proponent schools; and the Human Engineering Laboratory.

(U) Related Activities: The Army staff monitors all tests for materiel development and activities to avoid duplication of effort. The Deputy Director of Defense Research and Engineering (Test and Evaluation), and Director of Operational Test and Evaluation, Office of the Secretary of Defense (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.

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

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#63605801A**
PE Title: **Programwide Activities** Budget Activity: **#6**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
M881	RDTE Command/Center/General Administrative Support				
	89131	95880	86420*	Cont	Cont
PE TOTAL	89131	95880	86420*		

* RDTE,Army funds in this program supporting the U.S. Army Medical Research and Development Command, Ft Detrick, MD were transferred to the Office of the Assistant Secretary of Defense (Health Affairs) effective FY 1993.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program funds the 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. Requested resources finance salaries and related costs for civilian personnel assigned to other than Army Management Headquarters Activities (AMHA). This program is central to efficient management of the total Army RDT&E program.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project M881 - RDTE Command/Center/General Administrative Support

(U) FY 1991 Accomplishments:
- (U) Provided continued operation of management and administrative functions at a level consistent with mission requirements and support needs at Army non-AMHA RDT&E commands, centers and activities
- (U) Provided continued operation of the five Standardization Groups and Army Material Command (AMC) representative in France
- (U) Funded travel of Army Science Board
- (U) Provided continued contract and acquisition management and administrative functions performed by the U.S. Army Medical Research Acquisition Activity (USAMRAA) in support of 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 1992 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

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605801A**
PE Title: **Programwide Activities** Budget Activity: **#6**

- (U) Fund quick reaction capability for accident investigations at Aviation Systems Command and unique costs related to tenant support
- (U) Provide 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 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) Funds to support management and administrative functions of USAMRDC transferred to the Office of the Assistant Secretary of Defense (Health Affairs) effective FY 1993

(U) Work Performed By: U.S. Army Medical Research Acquisition Activity, Ft. Detrick, MD; U.S. Army Research Institute for the Behavioral and Social Sciences, Alexandria, VA; U.S. Army Armament RDE Center, Picatinny Arsenal, NJ; U.S. Army Aviation RDE Center, St. Louis, MO; U.S. Army Laboratory Command, 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 RDE Center, 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: Research and Development Commands/Centers perform staff management functions related to work performed by RDTE laboratories and test facilities. There is no unnecessary duplication of effort within the Army or the Department of Defense.

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

AMENDED FY 1992/1993 BIENNIAL 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 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
M798	International Cooperative Research and Development - Army Research Institute				
	1881	1504	1925	Cont	Cont
PE TOTAL	1881	1504	1925		

B. (U) BRIEF DESCRIPTION OF ELEMENT: The goal of this program is to expand worldwide allied standardization and interoperability through cooperative R&D projects and technology sharing. This program funds the travel costs and administrative support (studies, analysis, interpretation, translation and equipment) required to participate in international fora, such as the NATO Army Armaments Group (NAAG), and to pursue 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); the Four Power Senior National Representatives (SNR); 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 1991 Accomplishments:
- (U) Continued 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) Continued funding of the entire United States' share of the NIAG budget
- (U) Continued program supporting regular attendance at meetings of eleven NATO panels; nineteen ABCA working groups; annual meetings of SNR, staff talks and numerous sub-panels and working group meetings
- (U) Continued funding travel to support the cooperative R&D initiatives
- (U) Funded travel to support U.S. Army in Canadian Air Show
- (U) Funded travel to support U.S. Army participation in Paris Air Show

(U) FY 1992 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 (900K) of the NIAG budget
- (U) Continue program supporting regular attendance at meetings of eleven NATO panels; nineteen ABCA working groups; annual meetings of SNR, staff talks, and numerous sub-panels and working group meetings
- (U) Continue funding travel to support cooperative R&D initiatives

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605802A**
PE Title: **International Cooperative Research and Development** Budget Activity: **#6**

(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 of the NIAG budget
- **(U)** Continue program supporting regular attendance at meetings of eleven NATO panels; nineteen ABCA working groups; annual meetings of SNR, staff talks, and numerous sub-panels and working group meetings
- **(U)** Continue funding travel to support cooperative R&D initiatives

(U) Work Performed By: US Army Research Institute, US Army Materiel Command, and the US Army Training and Doctrine Command are principally involved.

(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 to improve combat and logistical effectiveness of the Army during wartime. The project defrays, on behalf of all services, the US support for the NATO Industrial Advisory Group to produce prefeasibility studies in suppc of NATO Cooperative materiel development projects. There is no unnecessary duplication of effort within th Army or DoD.

(U) Other Appropriation Funds: ($ in Thousands) 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 the required administrative support. See paragraph B.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605803A**
PE Title: **Technical Information Activities** Budget Activity: **#6**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D730	Personnel and Training Analysis Activities				
	- 0 -	2746	3403	Cont	Cont
DC16	Field Assistance in Science and Technology (FAST)				
	2419	2593	3061	Cont	Cont
DC18	Board on Army Science Technology (BAST)				
	460	205	322	Cont	Cont
M720	Technical Information Functional Activities				
	947	1009	1265	Cont	Cont
M727	Technical Information Activities				
	2149	1563	1873	Cont	Cont
M728	Information Technology				
	2	- 0 -	- 0 -	- 0 -	9837
M729	Youth Science Activities				
	1693	1616	2074	Cont	Cont
M731	Government/Industry Data Exchange Program/Advisory Group on Electronic Devices (GIDEP/AGED)				
	406	444	556	Cont	Cont
MZ85	DBOF - Information Analysis Centers (IAC)				
	- 0 -	3195	3919		
MZ86	DBOF - Defense Technical Information Center (DTIC)				
	- 0 -	7289	6956		
PE TOTAL	8076	20660	23429		

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. The effort in Project D730 was previously funded in PE #0603007A, Human Factors, Personnel and Training Advanced Technology and has been restructured to this PE at the request of the Office of the Secretary of Defense, Comptroller.

C. (U) JUSTIFICATION FOR PROJECTS:

(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

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as the effects of training an individual and unit readiness, the personnel costs of alternative force structures and the effects of "downsizing" on retention and readiness of quality soldiers. Related efforts were previously funded in PE #0603007A.

(U) FY 1991 Accomplishments: See PE #0603007A - Human Factors/Personnel/Training AT

(U) FY 1992 Planned Program:

- **(U)** Research-based training analyses: Conduct collective (unit) training analyses using the ARI/Combat Training Center (CTC) Training Data Archive. Analyses will include: determining the relative effects of Battle Operating Systems (e.g. direct fire/indirect fire (artillery)) performance on battle outcomes and determining the adequacy of doctrine, force structure, materiel and training for close combat (light) missions.
- **(U)** Research-based manpower and personnel analyses: Conduct manpower cost and compensation analyses, using the research-based Army Manpower Cost System model, to determine the relative costs of different "downsizing"/force structure alternatives
- **(U)** Conduct preliminary examination of impact of "down-sizing" on officer career intentions

(U) FY 1993 Planned Program:

- **(U)** Research-based training analyses: Continue collective training analyses using the ARI/CTC Data Archive. Analyses will include: quantification of the relationship of unit performance at CTCs (e.g., the National Training Center, the Joint Readiness Training Center and the Combat Maneuver Training Center) to home station training resource expenditure; determination of unit performance degradation as a function of continuous operations; and the determination of organizational and leadership changes required for Special Operations Forces/Low Intensity Conflict operations.
- **(U)** Research-based manpower and personnel analyses: Use the ARI-developed Longitudinal Research Database (including data on all Army enlistees over the last nine years) to conduct policy analyses to determine the influence of entry standards on soldier performance and on soldier retention for critical military occupational specialties (MOS).

(U) Project DC16 - Field Assistance in Science and Technology (FAST): Composed of a Director's office staff of four (4) with nineteen (19) 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. All science adviser salaries are funded by AMC labs/centers who supply the science advisors for two year tours. Project costs have required significant below-threshold reprogramming actions at AMC HQ because of the high priority and Army wide visibility of FAST projects. FAST is a level of effort type project with most projects recouping many times their cost in O&S cost savings.

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(U) FY 1991 Accomplishments:

- (U) Continued support of CINCs and major field commanders with eighteen science advisers and a director's office staff of four, dedicated to reducing O&S cost and improving readiness, safety and training
- (U) Nineteenth science advisor position authorized for Southern Command (SOCOM)
- (U) Provided continuous activity on over 120 projects, completing about 40 and starting approximately 60 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 documents for the ten highest priority programs for submission to the Department of Army, Army Commanders Initiative Program (ARCIP) Board of Directors
- (U) Provided quick reaction and on-site support to Operation Desert Shield/Storm
- (U) As a result of the first ARCIP Board of Director's meeting, PEO was directed to procure and field the 2kw Auxiliary Power Unit (APU) for the MI Abrams.
- (U) AMC-FAST developed sleep support system was procured by the Human Engineering Laboratory to support Operation Desert Storm requirements

(U) FY 1992 Planned Program:

- (U) Provide continuous activity on over 140 projects, completing 50 and starting 70 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 approximately 12 highest priority programs for submission to the ARCIP Board of Directors
- (U) Provided science advisor to SOCOM
- (U) Provide AMC-FAST science advisors 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 documentations.

(U) FY 1993 Planned Program:

- (U) Provide continuous activity on over 150 projects, completing 60 and starting 70 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 approximately 12 highest priority programs for submission to the Department of Army ARCIP Board of Directors

(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 the 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. In addition, this project will support the Army Science Board activities in FY92.

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(U) FY 1991 Accomplishments:
- (U) Expended technical and scientific advice to longer periods into the future with more generic emphasis.
- (U) Provided responsive scientific and technical advice in areas of Army interest
- (U) Provided special panel for annual In-house Laboratory Independent Research (ILIR) review.

(U) FY 1992 Planned Program:
- (U) Provide support for forecast of Army science and technology needs and opportunities over next twenty years
- (U) Respond to immediate science and technology requirements
- (U) Provide special panel for annual ILIR review

(U) FY 1993 Planned Program:
- (U) Provide support for forecast of Army science and technology needs and opportunities over next twenty years
- (U) Respond to immediate science and technology requirements
- (U) Provide special panel for annual ILIR review

(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) data base, (2) Army support for the Federal Laboratory Consortium (FLC), (3) Data collection and publication of the annual "Department of Defense In-House RDT&E Activities" report. 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, 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.

(U) FY 1991 Accomplishments:
- (U) Continued management and support of Army data input to DTIC WUIS data base. Provided training, training materials, and support for all Army organizations that input data to the DTIC WUIS data base authorized by the Army Executive Agent
- (U) Provided Army funding support for FLC as required by Public Law 99-502
- (U) Continued annual data collection/publication of the "DoD In-House RDT&E Activities" report

(U) FY 1992 Planned Program:
- (U) Continue enhancement for WUIS Input System
- (U) Provide 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) Continue the annual data collection and printing of the DoD Tri-Service annual "DoD In-House RDT&E Facilities Report"
- (U) Provide Army funding support for FLC as required by Public Law 99-502

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PE Title: **Technical Information Activities** Budget Activity: **#6**

(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) Continue the annual data collection and printing of the DoD Tri-Service annual "DoD In-House RDT&E Facilities Report"
- (U) Provide Army funding support for FLC as required by Public Law 99-502

(U) Project M727 - Technical Information Activities: This project supports development of decision aids and automation 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 and hardware/software tools to support technical and budgetary decisions at the Army Materiel Command (AMC), Department of the Army (DA) and Office, Secretary of Defense (OSD) levels.

(U) FY 1991 Accomplishments:

- (U) Awarded a new small business AMC technology base engineering support contract
- (U) Updated the Army repository for technology base data at the workpackage level
- (U) Continued to support updates to the Army Technology Base Master Plan
- (U) Continued computer engineering support to both AMC and HQDA
- (U) Defined the requirements for an international Technology Base database
- (U) Provided technical information support to the Technology Base Exposition and Show of new technologies by the Army laboratories/centers

(U) FY 1992 Planned Program:

- (U) Continue the technology base engineering support contract
- (U) Provide AMC support/input, as required, to Army level consolidation efforts
- (U) Continue automation support for the internatic ıal program. Expand efforts to include other cooperative efforts
- (U) Provide updates to the Army Tech Base Master Plan (TBMP)
- (U) Provide Army wide input to the Science and Technology thrusts
- (U) Provide contract support for the AMC O&S cost savings initiative
- (U) Continue computer engineering support to AMC and HQDA
- (U) Provide technical/contractor support for Long Range Research Development Acquisition Plan (LRRDAP)/Plans, Program, Budget, Execution System (PPBES) actions
- (U) Maintain/update Army technology base data at the workpackage level
- (U) Provide easier access to technology base data by the Army community
- (U) Provide technical staff support for the Acquisition Management System Review Committee

(U) FY 1993 Planned Program:

- (U) Continue the technology base engineering support contract
- (U) Provide technical/contractor support for LRRDAP/PPBES actions

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PE Title: **Technical Information Activities** Budget Activity: **#6**

- (U) Provide computer engineering support to AMC and HQDA
- (U) Provide updates/support to the Army TBMP
- (U) Continue development/improvements to the technology base databases
- (U) Provide technical staff support for the Acquisition Management System Review
- (U) Maintain/update Army technology base data at the workpackage level
- (U) Improve the quality and accessibility of technology base data to the Army community
- (U) Provide contract support for the AMC O&S cost savings initiative

(U) Project M728 - Information Technology: This project supports efforts in R&D to improve information access, display, interpretation, transmission, and storage and enables access to additional databases through a secure communications network.

(U) FY 1991 Accomplishments:
- (U) Funds reprogrammed to support the Board on Army Science Technology (BAST) Program

(U) FY 1992 Planned Program: Project completed in FY 1991.

(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 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. In 1992, ten additional Army laboratories have expressed interest in participating in this program.

(U) FY 1991 Accomplishments:
- (U) Integration of US Army Training and Doctrine Command (TRADOC) and the 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 R&D laboratories/centers in youth focused science and technology activities
- (U) Continued the Joint Army/Navy Washington Regional Area Summer Apprenticeship Program

(U) FY 1992 Planned Program:
- (U) Continue to foster high school student interest in science, mathematics, engineering and computer science, nationally, through: International Science and Engineering Fair, Junior Science and Humanities Symposia, Research Engineering Apprenticeship Program, Computer Related Engineering Science Studies, and the International Mathematics Olympaid
- (U) Continue the Joint Army/Navy Washington Regional Area Summer Apprenticeship Program

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PE Title: **Technical Information Activities** Budget Activity: **#6**

- (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) FY 1993 Planned Program:
- (U) Continue to foster high school student interest in science, mathematics, engineering and computer science, nationally, through: International Science and Engineering Fair, Junior Science and Humanities Symposia, Research Engineering Apprenticeship Program, Computer Related Engineering Science Studies and the International Mathematics Olympiad
- (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) 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 1991 Accomplishments:
- (U) Continued information exchange data for Non-Developmental Items (NDI) programs

(U) FY 1992 Planned Program:
- (U) Continue information exchange data for NDI programs
- (U) Compile technical information for engineering design handbooks

(U) FY 1993 Planned Program:
- (U) Continue information exchange data for NDI programs
- (U) Compile technical information for engineering design handbooks

(U) Project MZ85 - Information Analysis Centers (IAC): This program funds technology transfer activities designed to improve the access to and usage of acquisition-funded Scientific and Technical Information (STI). Established at the Office of the Deputy Director of Defense, Research and Engineering (ODDR&E) direction 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

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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 1991 Accomplishments:

- (U) Funded by the RDTE,Defense Agencies Appropriation, efforts included:
  - Published over 120 technical reference documents
  - Maintained 25 DoD Numeric and Modeling databases
  - Supported 18 Joint Service committees, conferences and symposia
  - Answered 4,400 technical inquiries
  - Provided technology awareness services to 50,000 users

(U) FY 1992 Planned Program:

- (U) Maintain goal level of IAC services
- (U) Invest in IAC capability to leverage technology base
- (U) Develop DoD-required test result databases
- (U) Create Defense management support resources
- (U) Network technical information sources for Defense needs
- (U) Assist 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
- (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) 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 Under Secretary of Defense (Acquisition), Deputy Director of Management Systems, Acquisition Policy and Program Integration.

(U) FY 1991 Accomplishments:

- (U) Funded by the RDTE,Defense Agencies Appropriation, efforts included:
  - Implemented multimedia acquisition program (floppy disk, video tape, magnetic tape)
  - Implemented virus checking and scanning for multimedia acquisitions
  - Completed Low-cost Encryption Authentication Device (LEAD) beta test for National Security Agency.

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- Implemented secure telephone access to Defense RDT&E Online System (DROLS)
- Provided DROLS access for foreign disclosure offices
- Redesign of the Independent Research and Development database system
- Supported Defense Modeling and Simulation Community
- Implemented a Document Tracking System
- Implemented CDRom for the Technical Reports Database

(U) FY 1992 Planned Program:

- (U) Maintain goal level of DTIC services in support of Defense Acquisition community information needs
- (U) Provide DoD information services to leverage technology base
- (U) Create Defense management support resources
- (U) Network technical information sources for Defense needs
- (U) Enhancements to Work Unit Information System (WUIS)
- (U) Implement a Cost Allocation Information System (CAIS)
- (U) Begin implementation of Electronic Document System (EDS)

(U) FY 1993 Planned Program:

- (U) Maintain goal level of DTIC services in support of Defense Acquisition community information needs
- (U) Replacement of Defense Gateway Information System (DGIS) and development minicomputers
- (U) Acquire and 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) Work Performed By: In-house efforts: Army Materiel Command, Alexandria, VA; Army Laboratory Command, Adelphi, MD; Army Information Systems Command, Ft Huachuca, AZ; 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; 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.

(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.

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Program Element: **#0605805A**
PE Title: **Munitions Standardization, Effectiveness and Safety** Budget Activity: **#6**

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

Project Number Title	FY 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D293	Field Artillery Ammunition (NATO) Engineering Development*				
	- 0 -	24	295	Cont	Cont
D620	DOD Munitions Effectiveness				
	6624	7520	8513	Cont	Cont
DC38	CHICKEN LITTLE Follow-On				
	5050	3496	4819	Cont	Cont
DF21	NATO Small Arms Evaluation				
	253	253	329	Cont	Cont
DF24	Conventional Ammunition Demilitarization				
	- 0 -	1001	1964	Cont	Cont
M857	Explosive Safety Standards				
	703	690	863	Cont	Cont
PE TOTAL	12630	12984	16783		

* Restructured from PE #0604802 - Weapons and Munitions ED, Project D286.

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; operation of the North American Regional Test Center (NARTC); evaluation of demilitarization methods for existing conventional ammunition, safety and hazard evaluation and quantification of DoD munitions via the DoD Explosives Safety Board.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project D293 - Field Artillery Ammunition (NATO) Engineering Development: Project supports US/NATO howitzer and ammunition compatibility and interoperability.

(U) FY 1991 Planned Program:
- (U) Funded in PE #0604802, Project D286

(U) FY 1992 Planned Program:
- (U) Continue NATO ammunition interchangeability firings under a NATO quadrilateral memorandum of understanding (MOU)

(U) FY 1993 Planned Program:
- (U) Continue NATO ammunition interchangeability firings under a NATO quadrilateral MOU

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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 weapon systems. Promotes the establishment of standardized procedures for effectiveness parameters associated with munitions effectiveness. Conducts special studies to determine the effectiveness of non-nuclear munitions systems as directed by the Joint Logistics Commanders. 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. Conducts various other related ad-hoc tasks.

(U) FY 1991 Accomplishments:
- (U) Supported DESERT STORM near-realtime Battlefield Damage Assessment
- (U) Provided munitions effectiveness estimates against ship targets
- (U) Supported Army Southwest Asia (SWA) Weapons System Performance data collection and analysis effort
- (U) Provided target descriptions/vulnerability analyses for surface and air targets
- (U) Provided aircraft gunnery JMEMs for Air Force and Navy systems
- (U) Prepared computer-aided JMEMs for air-to-air missiles
- (U) Conducted vulnerability analysis of communications/jamming targets
- (U) Published air-to-surface weapons systems delivery accuracy parameters
- (U) Supported joint live fire tests and databasing
- (U) Prepared target descriptions/vulnerability analyses for surface and air targets
- (U) Continued methodology development for smart munitions effectiveness
- (U) Performed target vulnerability and weaponeering analyses for Special Forces
- (U) Upgraded air-to-surface, surface-to-surface and anti-air JMEMs
- (U) Performed effectiveness analyses for red-on-blue munitions

(U) FY 1992 Planned Program:
- (U) Continue near-zero Concept Evaluation Program (CEP) methodology development
- (U) Upgrade air strike planning advisor program
- (U) Upgrade Naval gun systems effectiveness
- (U) Support the ammunition reliability program
- (U) Support Naval anti-ship missile accuracy program
- (U) Continue smoke/obscurant effectiveness modeling
- (U) Complete surface-to-air missile JMFMs
- (U) Continue target descriptions/vulnerability of Soviet aircraft
- (U) Provide non-Soviet "gray world" weapons effects on blue targets
- (U) Continue smart munitions effectiveness methodology development
- (U) Provide target descriptions/vulnerability analysis of Soviet surface targets
- (U) Revise air-to-surface, surface-to-surface and anti-air JMEMs

(U) FY 1993 Planned Program:
- (U) Continue efforts to computerize Joint Technical Coordinating Group (JTCG) manuals and reports
- (U) Support the Special Operations Forces

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Program Element: **#0605805A**
PE Title: **Munitions Standardization, Effectiveness and Safety** Budget Activity: **#6**

- (U) Update smart munition/seeker handbooks
- (U) Add new targets/weapons combinations for vulnerability analyses
- (U) Support the Joint Live Fire/Live Fire (JLF/LF) databasing effort and continue to incorporate JLF/LF test results in JMEMs
- (U) Continue to incorporate DESERT STORM data into JMEMs and JTCG models
- (U) Expand support to the DoD non-nuclear Strategic Capability Program
- (U) Support Ammunition Reliability Program

(U) Project DC38 - CHICKEN LITTLE Follow-On: This project is a joint munitions test and evaluation program executed by the Army and the Air Force. Evaluates developmental smart munitions and components against mobile ground vehicles and strategic relocatable targets using actual threat vehicles and realistic countermeasures. The project serves as a center for target signature data collection/exploitation and assists in the testing and evaluation of U.S. vehicle system countermeasures.

(U) **FY 1991 Accomplishments:**
- (U) Conducted captive flight tests to support Army Project Managers (PMs) and Air Force Special Project Officers (SPOs) development effort
- (U) Performed target signature exploitation to collect data on newly acquired targets
- (U) Conducted vulnerability and lethality testing of developmental warhead and armor protection material
- (U) Conducted crude oil smoke obscuration data collection and provided technical information to OPERATION DESERT STORM to modify rules of engagement
- (U) Conducted predeployment DESERT STORM training for Army maneuver forces to acquire and track threat armored combat vehicles

(U) **FY 1992 Planned Program:**
- (U) Conduct captive flight test at Grayling, MI to refine seeker/sensor autonomous acquisition algorithms under development for smart munitions
- (U) Participate in cooperative test activity with U.S. Army Chemical Research, Development and Engineering Center (CRDEC) to evaluate sensor performance in obscurant environment
- (U) Develop test facility to test and evaluate new armor materials against threat warheads
- (U) Initiate DoD signature measurement center and database
- (U) Develop test warhead simulants to evaluate the effectiveness of dual shape charge warheads
- (U) Design test methodology to assess blue smart munitions against blue ground vehicles using active countermeasures
- (U) Perform analysis of blue countermeasure data to support precision strike and advanced combat vehicles (survivability) thrust areas

(U) **FY 1993 Planned Program:**
- (U) Conduct signature exploitation of selected target vehicles and assist in the validation process for target simulators
- (U) Complete development of DoD Signature Measurement Center and Database
- (U) Plan and conduct captive flight tests to verify seeker/sensor performance for advanced munitions and target acquisition systems
- (U) Expand and upgrade target set to include strategic targets and threat missile systems for the

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Program Element: **#0605805A**
PE Title: **Munitions Standardization, Effectiveness and Safety** Budget Activity: **#6**

benefit of the development community
- (U) Support the Army Armored System Modernization developments by testing of U.S. countermeasures against threat smart munitions

(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 1991 Accomplishments:**
- (U) Completed Manual of Proof and Inspection for 12.7mm ammunition
- (U) Completed STANAG 4383 for 12.7mm NATO ammunition
- (U) Accomplished control testing of 9mm, 5.56mm, 7.62mm & 25mm ammunition
- (U) Initiated ratification action for STANAG 4383
- (U) Initiated draft STANAG for 35mm ammunition

(U) **FY 1992 Planned Program:**
- (U) Complete ratification of STANAG 4383, 12.7mm ammunition
- (U) Complete qualification testing of 12.7mm ammunition
- (U) Initiate ratification actions for 40mm ammunition
- (U) Continue development of 35mm STANAG
- (U) Accomplish controlled testing of 9mm, 5.56mm, 7.62mm, and 25mm ammunition
- (U) Complete STANAGs and Manual of Proof and Inspection for 40mm ammunition

(U) **FY 1993 Planned Program:**
- (U) Complete ratification of 40mm STANAGs
- (U) Accomplish controlled testing of 9mm, 5.56mm, 7.62mm, and 25mm ammunition
- (U) Complete STANAGs and Manual of Proof and Inspection for 35mm ammunition
- (U) Initiate qualification testing of 40mm ammunition designs
- (U) Initiate and develop other standards for ammunition, as required

(U) Project DF24 - Conventional Ammunition Demilitarization: Evaluate applicability of existing technologies to the demilitarization of conventional ammunition.

(U) **FY 1991 Accomplishments:** Project not funded.

(U) **FY 1992 Planned Program:**
- (U) Begin examination of applicability of existing technologies to demilitarization of ammunition in service inventories

(U) **FY 1993 Planned Program:**
- (U) Continue examination of existing technologies

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605805A**
PE Title: **Munitions Standardization, Effectiveness and Safety** Budget Activity: **#6**

(U) Project M857 - Explosive Safety Standards: Supports explosives effects research and testing to quantify hazards and to develop techniques to mitigate these hazards in all DoD manufacturing, testing, maintenance, storage, and disposal of ammunition and explosives 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 1991 Accomplishments:**
- (U) Completed tri-Service implementation of FRAGHAZ computer program for United Nations (UN) class/division 1.1 ammunition
- (U) Continued development of automated data base for DoD Explosives Safety Board accident files and Board minutes
- (U) Conducted full-scale underground tunnel tests
- (U) Developed/improved tri-Service approved design procedures for explosion-resistant structures
- (U) Developed revised quantity-distance criteria for underground storage
- (U) Conducted 1/4 scale hardened aircraft shelter explosion test to improve and verify modeling techniques

(U) **FY 1992 Planned Program:**
- (U) Develop improved lightning protection systems/test procedures
- (U) Improved methods for assessing radiant flux hazards for UN class/division 1.3 ammunition

(U) **FY 1993 Planned Program:**
- (U) Complete verification of UN class/division 1.6 article testing protocol
- (U) Complete tri-service implementation of FRAGHAZ computer program for UN class/distance 1.2 ammunition

(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, Eglin AFB, FL and 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.

AMENDED FY 1992/1993 BIENNIAL 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 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D125	NDI Market Investigation	976	1009	1003	Cont	Cont
DE65	NDI Testing	7405	5331	5089	Cont	Cont
PE TOTAL		8381	6340	6092		

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 dollars and time delays to field a system developed through the normal RDTE route. 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. This testing and evaluation typically includes major engineering modifications of an item leading to the development of performance specifications used for the procurement of those modified commercial items.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project D125 - NDI Market Investigation: The market investigation portion 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 to mention a few. Examples of tasks are identified below.

(U) FY 1991 Accomplishments:

- (U) Water Borne Paintings and Coatings - Conducted market investigations to identify the appropriate water borne chemical agent resistant coating (CARC) paints and on-going informal testing of CARC requirements. These efforts will ultimately qualify water based paints for live agent resistance and decontamination procedures.
- (U) Army Watercraft Program - Conducted market investigation for 100 ton floating crane and started market survey for 250 ton floating crane.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605810A**
PE Title: **RDT&E Support for Non-Developmental Items (NDI)** Budget Activity: **#6**

- (U) Active Suspension - Conducted market investigation on active suspensions for use in light tactical vehicles and high mobility multi-purpose wheeled vehicle (HMMWV) variants. Active suspensions substantially increase cross country mobility, high speed stability, and safe handling of these vehicles. Benefits include: improved combat effectiveness, reduced crew fatigue, enhanced vehicle component life, and improved running gear life.

(U) FY 1992 Planned Program:

- (U) Army Watercraft Program - Prepare questionnaire, conduct market investigation and prepare technical reports for the liquid cargo barge, deck cargo barge and selected commercial marine components.
- (U) Heavy Dry Support Bridge - Conduct a market investigation to identify CONUS and OCONUS dry support bridge developments that could meet draft operational and organizational (O&O) plan requirements.
- (U) Containerized Kitchen Systems - Conduct a market investigation of system and component level hardware which will 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) 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 1991 Accomplishments:

- (U) Analysis of Environmental Control Units - An improved 24K BTUH air conditioner was designed; necessary components were procured; unit was fabricated and operational testing initiated.
- (U) Improved Chelators and Sequestrants - Completed pilot scale analysis and issued interim report. Issued final report.
- (U) Family Of Rock Processing Equipment (FORPE) - Coordinated draft hydraulic track mounted rock drill purchase description.
- (U) Low-Profile Tubeless Radial Tires - Purchased tires and tread depth indicators; testing on US postal trucks has been initiated.
- (U) Ultra Lightweight Camouflage Net System (ULCANS) - Procured prototype ULCANS and performed operational testing to determine suitability for use in replacing heavier camouflage systems.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605810A**
PE Title: **RDT&E Support for Non-Developmental Items (NDI)** Budget Activity: **#6**

(U) FY 1992 Planned Program:

- **(U)** Army Watercraft Program - Conduct operational testing and finalize program management documents and Milestone I for the crane barge and the mechanized landing craft.
- **(U)** Chip Resistant CARC Undercoating - Preliminary live agent testing on several materials.
- **(U)** Ultra Lightweight Camouflage Net System (ULCANS) - Continue and finalize support of operational testing performed in FY 1991. Finalize technical data package for production of the ULCANS, support 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. 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 - Conduct North Atlantic Treaty Organization durability test evaluation on the medium integrated propulsion systems, i.e., engines, transmissions, axles, that will be used in medium combat vehicles.

(U) Work Performed By: These projects provide for performance of technical tasks and acquisition of related materiel by contract utilizing both private and Government agency contractors. The following Army Material Command Major Subordinate Commands are actively involved in the program: Belvoir Research Development and Engineering Center, Ft. Belvoir, VA; Tank-Automotive Command, Warren, MI; Communications-Electronics Command, Ft. Monmouth, NJ; Missile Command, Redstone Arsenal, AL; and Aviation Systems 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 Department of Defense.

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

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605856A**
PE Title: **Environmental Compliance - RDT&E** Budget Activity: **#6**

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

Project Number / Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
MAB9	Environmental Compliance - AMC Test Ranges				
	- 0 -	25287	23598	Cont	Cont
MAC1	Environmental Compliance - AMC Major Subordinate Commands/Laboratories				
	- 0 -	22095	14021	Cont	Cont
MAC2	Environmental Compliance - U.S. Army Kwajalein Atoll (USAKA)				
	- 0 -	5016	4888	Cont	Cont
PE TOTAL	- 0 -	52398	42507		

B. (U) BRIEF DESCRIPTION OF ELEMENT: Resources in this program were transferred from PE #0605894A - Real Property Maintenance Activities (RPMA-RDTE), and PE #0605301A - U.S. Army Kwajalein Atoll (USAKA), to this program effective FY 1992. This program restructure 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 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 - 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 for this program were transferred from PE #0605894A, RPMA (RDTE), as part of a restructure to align all RDTE environmental compliance resources into a single program element. This restructure was implemented in FY 1992 to 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.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605856A**
PE Title: **Environmental Compliance - RDT&E** Budget Activity: **#6**

(U) FY 1991 Accomplishments:
- (U) Environmental compliance efforts in FY 1991 were funded in PE #0605894 - RPMA (RDTE)

(U) FY 1992 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, consent orders/interagency agreements, and environmental permit requirements; funds a portion of the Environmental Class II projects expected to become Class I during current budget cycle; does not fund any Class III projects. 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 tanks requirements, solid waste management units studies and remediation, and hazardous waste disposal; funds a portion of previous year Class II projects expected to become Class I by start of FY93, and emerging Class II that could become Class I before funding could be requested again; does not fund any Class III projects. Major project examples are: asbestos abatement and underground storage tank removal/remediation at APG; solid waste management units, closure and waste-water 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) Project MAC1 - Environmental Compliance - Army Materiel Command (AMC) Major Subordinate Commands/Laboratories: Resources for this program were transferred from PE #0605894A, RPMA (RDTE), as part of a restructure to align all RDTE environmental compliance resources into a single program element. This restructure was implemented in FY 1992 to ensure an adequate level of funding for environmental compliance requirements at Army Research Laboratory, Adelphi, MD; Armament Research, Development and Engineering Center (ARDEC), Dover, NJ; Natick Research, Development and Engineering Center (NRDEC), Natick, MA; and Army Materials Technology Laboratory, Watertown, MA.

(U) FY 1991 Accomplishments:
- (U) Environmental compliance efforts in FY 1991 were funded in PE #0605894 - RPMA (RDTE)

(U) FY 1992 Planned Program:
- (U) Funds legally mandated environmental compliance activities/functions discussed in paragraph B

(U) FY 1993 Planned Program:
- (U) Funds legally mandated environmental compliance activities/functions discussed in paragraph B

(U) Project MAC2 - Environmental Compliance - U.S. Army Kwajalein Atoll (USAKA): Resources for this program were transferred from PE #0605301A, USAKA, as part of a restructure to align all RDTE environmental

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0605856A
PE Title: **Environmental Compliance - RDT&E** Budget Activity: #6

compliance resources into a single program element. This restructure was implemented effective FY 1992 to ensure an adequate level of funding for installation compliance with U.S. and Republic of the Marshall Islands environmental laws and regulations at USAKA.

(U) FY 1991 Accomplishments:
- (U) Environmental compliance efforts in FY 1991 were funded in PE #0605301 - USAKA

(U) FY 1992 Planned Program:
- (U) Funds cost of installation compliance with U.S. and Republic of the Marshall Islands environmental laws and regulations
- (U) Environmental mitigation issues include: collection and disposal of polychlorinated biphenyls (PCB), and asbestos; decontamination of Building 1045 (abandoned radar facility), and establishing a permit for hazardous waste staging

(U) FY 1993 Planned Program:
- (U) Funds the Class I environmental compliance activities/functions discussed in paragraph B
- (U) Environmental mitigation issues at USAKA include: collection and disposal of polychlorinated biphenyls (PCB), removal of contaminated soil from waste oil pits and erection of hazardous materiel dispensing areas

(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; Materials Technology Laboratory, Watertown, MA and U.S. Army Kwajalein Atoll, Marshall Islands.

(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; and PE #0605301A - U.S. Army Kwajalein Atoll.

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

	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate
DERA: APG, MD	22515	44703	
DERA: DPG, UT	380	5700	
DERA: ARDEC, NJ	5509	12229	
DERA: NRDEC, MA	181	1000	
DERA: WSMR, NM	1485	305	

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element #0605872
PE Title: **Productivity Investments** Budget Activity #6

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

Project Number Title		FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
D851	QRIP & PECIP - OCE	1137	1225	835	- 0 -	7343
DE13	OSD PIF - OCE	152	3931	- 0 -	- 0 -	4978
DE89	QRIP & PECIP - AMC	7771	8365	5340	- 0 -	57684
DE98	OSD PIF - AMC	6375	5304	- 0 -	- 0 -	118309
DW02	QRIP & PECIP - SDC	3485	3668	1372	- 0 -	18626
PE TOTAL		18920	22493	7547		

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 D851 - Quick Return on Investment Program and Productivity Enhancing Capital Investment Programs - Office of Chief of Engineers (QRIP & PECIP - OCE). Program finances Army research and development of productivity improvement through investment in productivity-enhancing capital equipment and management initiatives at OCE. 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 1991 Accomplishments:

- (U) Example: Mobile Radar Backscatter Measurement Platform ($120,000), to support smart munitions developments, multi-sensor fusion studies, and other areas of Army research and model development that involve millimeter wave active radar sensors. Backscatter measurements of natural terrain features that form potential target backgrounds must be conducted on-site. A mobile platform is required to make these measurements, and will consist of a 16-18 meter telescoping boom mounted on a stabilized truck. The radar front end(s) will be pointed by an antenna positioner fitted to the end of the boom and directed from within a climate-controlled instrumentation cabin also positioned on the truck bed. The entire platform will be powered by a 10kw generator towed behind the truck at the test site. Annual savings are estimated at $98 thousand.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element #0605872
PE Title: **Productivity Investments** Budget Activity #6

(U) FY 1992 Planned Program:

- (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) Project DE13 - Office, Secretary of Defense, Productivity Investment Funding (OSD PIF) - Office of the Corps of Engineers (OCE): This program finances Army research and development support of productivity improvement through investment in productivity-enhancing capital equipment and productivity-enhancing management initiatives at OCE. 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 1991 Accomplishments:

- (U) Example: A Real-Time Sea State Forecasting System to more accurately and efficiently develop, test, demonstrate, and implement sea state forecasts. The system will be used to support the Joint-Logistics-Over-the-Shore (JLOTS) operation in which the successful integration of wind data, water levels, currents, and waves are crucial for a successful JLOTS exercise. At a cost of $138 thousand the estimated annual savings to the Army is over $250 thousand per year.

(U) FY 1992 Planned Program:

- (U) Example: The proposed project requests funds to replace the explosive test data recording analog equipment with a digital system at the Waterways Experiment Station. The present analog system requires 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.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element #0605872
PE Title: **Productivity Investments** Budget Activity #6

(U) FY 1993 Planned Program: Program terminated in FY 1993.

(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 1991 Accomplishments:

- (U) Acquired a Molecular Beam Epitaxy System to be located at the Electronics Technology and Devices Laboratory, which will upgrade the present system to a 3 inch non-bonded capacity and will be used for the growth of millimetric sources and monolithic integrated circuits (IC) devices which impact radar, smart munitions, and communication systems. The investment of $125 thousand is expected to produce annual benefits of $102 thousand for 6 years.

(U) FY 1992 Planned Program:

- (U) Example: Planned acquisitions for FY 1992 include 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 US Army Chemical Research, Development and Engineering Center at Aberdeen Proving Ground expects the cost of $538 thousand to amortize in 7 months.

(U) FY 1993 Planned Program:

- (U) In FY93, 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) Project DE98 - Office, Secretary of Defense, Productivity Investment Funding (OSD PIF) - Army Materiel Command (AMC): This program 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. The Office of the Secretary of Defense 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 1991 Accomplishments:

- (U) An example of the type of project planned is the Multi-Source Deposition System for dielectric and phosphor thin films to be used in conjunction with the existing in-house, thin film

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element #0605872
PE Title: Productivity Investments — Budget Activity #6

electroluminescent (TFEL) characterization facility. The Electronics Technology and Devices Laboratory is involved in the development of TFEL technology and has resulted in the design and application of TFEL panel monochrome displays into numerous Army systems. Requirements for color displays and rapid assimilation of high density information in tactical situations demands even greater involvement of ETDL in this development. Without this equipment, experimental samples will continue to be obtained through expensive contracts resulting in reduced experimental control and higher costs. Investment cost of $1 million is expected to produce annual savings of $1.1 million for 5 years.

(U) FY 1992 Planned Program:

- (U) Planned acquisitions for FY 1992 include the purchase of a Combined Environmental Reliability Test/Environmental Stress Screening/Productivity Recovery Chamber. By using this chamber to simultaneously test for vibration, temperature and humidity, the U.S. Army Communications-Electronics Command at Fort Monmouth, NJ expects the cost of $832 thousand to amortize in 6 months.

(U) FY 1993 Planned Program: Program terminated in 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 1991 Accomplishments:

- (U) One project planned for FY91 funding is the procurement and installation of a municipal waste incinerator which will meet environmental requirements for disposal of municipal solid waste, waste oil, and other flammable materials at US Army Kwajalein Atoll. Legally, all solid waste must be disposed of in a conforming landfill and waste oil be packaged and shipped to an authorized disposal site. The tremendous expense involved in these undertakings will be eliminated by the installation of the incinerator. An investment of $2.8 million will realize a projected annual savings of $980 thousand for 10 years.

(U) FY 1992 Planned Program:

- (U) An example of one of the many efforts to be undertaken in FY 1992 is the procurement and installation of the UNICOS Operating System in the USASDC Simulation Center. The Simulation Center was established to provide large scale computing resources to the scientific and engineering community engaged in research and development of future strategic defense applications and technologies. The increased reliance on the center by USASDC has resulted in a system which runs at near capacity 24 hours a day, 7 days a week and reflects a fully utilized resource with demand for continuing growth. UNICOS, a new operating system for computers, offers significant improvements in the productive use of high-end computing resources. The

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element **#0605872**
PE Title: **Productivity Investments** Budget Activity **#6**

availability of additional hardware/software with equal or better performance of the current system will effect the productivity gains in the most advantageous manner. An investment of $2.4 million will realize a projected annual savings of $1.3 million for eight years.

(U) FY 1993 Planned Program:

- **(U)** A planned project for FY 1993 funding is Ion Chromatography in the High Energy Laser Systems Test Facility (HELSTF) Analytical Chemistry Laboratory. This project will allow a great number of ion measurements to be made with only one sample preparation and in only a few minutes time per sample. This project will replace the old and inefficient Ion Selective Electrodes (ISE) technology with the much more powerful Ion Chromatography. The continuing requirement for the chemlab to do ion qualitative and quantitative analyses will be greatly aided by the addition of this powerful technology. An investment of $31.5 thousand will realize a projected annual savings of $42 thousand for 15 years.

(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 the Department of Defense.

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

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0605876A
PE Title: Minor Construction - RPM
Budget Activity: #6

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

Project Number / Title		FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
M6XX	Minor Construction - AMC					
		- 0 -	2046	2692	Cont	Cont
M6YY	Minor Construction - AMC Major Subordinate Commands and Laboratories					
		- 0 -	638	541	Cont	Cont
M6ZZ	Minor Construction - Corps of Engineers					
		- 0 -	1369	667	Cont	Cont
PE TOTAL		- 0 -	4053	3900		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This was not a new start. Resources were transferred from PE 0605894A - Real Property Maintenance Activities - RDTE. This program element finances activities and functions necessary to provide 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. Excludes cost of minor construction and repair projects costing over $15,000. Effective FY 1993, DoD policy change realigns RDTE funded major repair of real property (over $15,000) and minor construction of real property (not to exceed $300,000 per project), to the Military Construction Appropriations. These projects substantially prolong the useful life of the facility, and are all actually facility investments. This realignment will place all related facility investments into the construction investment accounts.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project M6XX - Minor Construction - Army Materiel Command (AMC) Test Ranges: Finances RDTE minor construction projects (as described in paragraph B) for Army's 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, project provides common service host support for over 100 tenants and satellites located on these four TECOM ranges: e.g., Chemical Research Development and Engineering Center, Ballistics Research Laboratory; Human Engineering Laboratory; and Vulnerability Assessment 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 1991 Accomplishments:

- (U) FY 1991 minor construction projects were funded in PE 0605894A - Real Property Maintenance Activities - RDTE.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605876A**
PE Title: **Minor Construction - RPM** Budget Activity: **#6**

(U) FY 1992 Planned Program:
- **(U)** Funds 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 with no growth to program

(U) Project M6YY - Minor Construction - Army Materiel Command Major Subordinate Commands and Laboratories: This project finances those minor construction projects (described in paragraph B) for AMC Major Subordinate Command RDT&E installations and laboratories, i.e., Harry Diamond Laboratories, 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.

(U) FY 1991 Accomplishments:
- **(U)** FY 1991 minor construction projects were funded in PE 0605894A - Real Property Maintenance Activities - RDTE.

(U) FY 1992 Planned Program:
- **(U)** Funds essential minor construction projects.

(U) FY 1993 Planned Program:
- **(U)** Continue to minimally fund minor construction projects at U.S. Army Materiel Command 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 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 1991 Accomplishments:
- **(U)** FY 1991 minor construction projects were funded in PE 0605894A -Real Property Maintenance Activities - RDTE.

(U) FY 1992 Planned Program:
- **(U)** Funds essential minor construction projects.

(U) FY 1993 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.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605876A**
PE Title: **Minor Construction - RPM** Budget Activity: **#6**

(U) Related Activities: There is no duplication of effort within the Army or the Department of Defense. 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: ($ in Thousands) Not applicable.

(U) International Cooperative Agreements: Not applicable

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605878A**
PE Title: **Maintenance and Repair - RPM** Budget Activity: **#6**

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

Project Number Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
M5XX Maintenance and Repair - U.S. Army Materiel Command Test Ranges	- 0 -	56401	51366	Cont	Cont
M5YY Maintenance and Repair - U.S. Army Materiel Command MSC/LABS	- 0 -	17593	10314	Cont	Cont
M5ZZ Maintenance and Repair - U.S. Army Corps of Engineers	- 0 -	1891	2113	Cont	Cont
PE TOTAL	- 0 -	75885	63793		

B. (U) BRIEF DESCRIPTION OF ELEMENT: This was not a new start. Resources were transferred from PE 0605894 - Real Property Maintenance Activities - RDTE. 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, machine shops, quarries and construction equipment units. Includes design costs directly associated with accomplishing a designated project undertaking. Excludes cost of minor construction and repair projects costing over $15,000. Effective FY 1993, DoD policy change realigns RDTE funded major repair of real property (over $15,000) and minor construction of real property (not to exceed $300,000 per project), to the Military Construction Appropriations. These projects substantially prolong the useful life of the facility, and are all actually facility investments. This realignment will place all related facility investments into the construction investment accounts.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project M5XX - Maintenance and Repair - Army Materiel Command (AMC) Test Ranges: Finances functions for maintaining and repairing infrastructure (see paragraph B) for Army's 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, e.g., Chemical Research Development and Engineering Center, Ballistics Research Laboratory; Human Engineering Laboratory; and Vulnerability Assessment 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 resulted in deterioration of facility assets.

(U) FY 1991 Accomplishments:

- (U) FY 1991 maintenance and repair projects were funded in PE 0605894A - Real Property Maintenance Activities - RDTE.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605878A**
PE Title: **Maintenance and Repair - RPM** Budget Activity: **#6**

(U) FY 1992 Planned Program:
- (U) Funds essential maintenance and repair projects to meet test ranges infrastructure requirements.
- (U) BMAR increases to $218 million

(U) FY 1993 Planned Program:
- (U) Continue to fund 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 $288 million

(U) Project M5YY - Maintenance and Repair - RPM Army Materiel Command Major Subordinate Commands and 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 RDT&E installations and laboratories, i.e., Harry Diamond Laboratories, 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. Because of funding shortfalls and emphasis on environmental compliance in recent years, BMAR has increased to a level which has resulted in deterioration of facility assets.

(U) FY 1991 Accomplishments:
- (U) FY 1991 maintenance and repair projects were funded in PE 0605894 - Real Property Maintenance Activities - RDTE.

(U) FY 1992 Planned Program:
- (U) Funds essential maintenance and repair projects to meet infrastructure requirements.
- (U) BMAR increases to $58 million

(U) FY 1993 Planned Program:
- (U) Continue to minimally fund maintenance and repair activities and functions at U.S. Army Materiel Command major subordinate commands and laboratories
- (U) BMAR increases to $65 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 1991 Accomplishments:
- (U) FY 1991 maintenance and repair projects were funded in PE 0605894A - Real Property Maintenance Activities - RDTE.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605878A**
PE Title: **Maintenance and Repair - RPM** Budget Activity: **#6**

(U) FY 1992 Planned Program:

- **(U)** Funds essential maintenance and repair projects to meet infrastructure requirements. BMAR continues 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.

(U) Work Performed By: Subordinate commands and other activities of the US Army Materiel Command and the Corps of Engineers R&D activities.

(U) Related Activities: There is no duplication of effort within the Army of the Department of Defense. Related program elements include:

PE #0605896A (Base Operations-RDT&E)
PE #0605856A (Environmental Compliance RDT&E)
PE #0605301A (Army Kwajalein Atoll)
PE #0605876A (Minor Construction - RPM)

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

(U) International Cooperative Agreements: Not applicable

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605896A**
PE Title: **Base Operations - RDT&E** Budget Activity: **#6**

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

Project Number / Title	FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
M0ZZ	Base Operations - Army Materiel Command (AMC) Test Ranges				
	134329	194207	194307	Cont	Cont
M1ZZ	Base Operations - AMC Major Subordinate Commands and Laboratories				
	61709	101352	95578	Cont	Cont
M4ZZ	Base Operations - Corps of Engineers				
	12001	16563	18682	Cont	Cont
PE TOTAL	208039	312122	308567		

B. (U) BRIEF DESCRIPTION OF ELEMENT: The increase from FY 1991 to FY 1992 is the result of the transfer of the operation of utilities and other engineering support function from PE #0605894A - Real Property Maintenance Activities, RDT&E to Base Operations - RDT&E. This is a zero sum transfer, effective FY 1992. The Base Operations (BASEOPS) program finances those activities and functions necessary for operating and maintaining U.S. Army RDT&E installations, laboratories, and test ranges within Army Materiel Command (AMC) and Corps of Engineers (COE). 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. Provides salaries and related personnel benefits for authorized civilian personnel and associated administrative support functions outlined above. This program element is a labor intensive account.

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, 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: Army Chemical Research Development and Engineering Center, Ballistics Research Laboratory, Ordnance Center and School, Army Material Systems Analysis Activity, Human Engineering Laboratory and Vulnerability Assessment Laboratory. This project supports a combined population of nearly 40,000 military, civilians, contractors, and military dependents.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605896A**
PE Title: **Base Operations - RDT&E** Budget Activity: **#6**

(U) FY 1991 Accomplishments:
- (U) This project continued to fund BASEOPS activities and functions for the AMC Test Ranges
- (U) Funded civilian benefits associated with the conversion of non-appropriated fund positions to appropriated fund per FY 1989 Congressional language; funds the FY 1991 annualization of the civilian pay raise.
- (U) Funded specific security projects on AMC/TECOM RDT&E installations
- (U) $4.5 million for range security was provided in the FY 1991 Appropriation Act.

(U) FY 1992 Planned Program:
- (U) This project funds BASEOPS activities and functions for AMC/TECOM Test Ranges and tenant/satellite activities
- (U) Funds specific security projects on AMC/TECOM 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) Effective FY 1992, the operation of utilities and other engineering support, including fire prevention, refuse collection, and custodial services are transferred from PE 0605894A, Real Property Maintenance Activities to this program. These were zero sum transfers within RDTE.
- (U) GSA conversion of non-tactical vehicles is scheduled 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 AMC/TECOM Test Ranges and tenant/satellite activities as described in paragraph B.
- (U) Funds specific security projects on AMC/TECOM RDT&E installations

(U) Project M1ZZ - Base Operations - AMC Major Subordinate Commands and Laboratories: Funds those BASEOPS activities and functions (described in paragraph B) necessary for operating and maintaining U.S. Army Materiel Command RDT&E installations and laboratories, i.e., Harry Diamond Laboratories, Adelphi, MD, Picatinny Arsenal, NJ, and Natick Research Development and Engineering Center, MA.

(U) FY 1991 Accomplishments:
- (U) This project continued to fund the BASEOPS activities and functions for the AMC Major Subordinate RDT&E Commands and Laboratories.

(U) FY 1992 Planned Program:
- (U) This project continues to fund the BASEOPS activities and functions for AMC Major Subordinate RDT&E Commands and 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) Effective FY 1992, the operation of utilities and other engineering support, including fire prevention, refuse collection, and custodial services are transferred from PE 0605894A, Real Property Maintenance Activities - RDT&E to this program. These were zero sum transfers within RDTE,Army.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605896A**
PE Title: **Base Operations - RDT&E** Budget Activity: **#6**

(U) FY 1993 Planned Program:

- (U) This project continues to fund the BASEOPS activities and functions for the AMC Major Subordinate RDT&E Commands and Laboratories and tenant/satellite activities as described in paragraph B.

(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 RDT&E laboratories; i.e., Waterways Experiment Station, Vicksburg, MS; Cold Regions Research and Engineering Laboratories, Hanover, NH; Construction Engineering Research Laboratory, Champaign, IL; and Engineer Topographic Laboratories, Ft. Belvoir, VA.

(U) FY 1991 Accomplishments:

- (U) This project continued to fund the BASEOPS activities and functions for the Corps of Engineers RDTE,A Laboratories

(U) FY 1992 Planned Program:

- (U) This project funds the BASEOPS activities and functions for the U.S. Army Corps of Engineers RDTE,A Laboratories
- (U) Effective FY 1992, BASEOPS activities at Construction Engineering Research Laboratory, Champaign, Illinois, will be funded in RDTE,A. BASEOPS resources were transferred from the OMA appropriation to RDTE,A (zero sum). This action aligns BASEOPS funding of all COE Laboratories in RDTE,Army appropriation
- (U) Effective FY 1992, the operation of utilities and other engineering support, including fire prevention, refuse collection, and custodial services are transferred from PE 0605894A, Real Property Maintenance Activities, to this program. These are zero sum transfers within the Army.

(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) 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: ($ in Thousands) Not applicable

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL 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 1991 Estimate	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
HH02 Army Management Headquarters Activities (AMHA)					
	15154	14721	8661*	Cont	Cont
PE TOTAL	15154	14721	8661*		

* RDTE,Army funds in this program supporting the U.S. Army Medical Research and Development Command, Ft Detrick, MD were transferred to the Office of the Assistant Secretary of Defense (Health Affairs) effective FY 1993.

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program funds the management headquarters activities at the U.S. Army Medical Research and Development Command (USAMRDC), Ft Detrick, MD, and the U.S. Army Laboratory Command (LABCOM), Adelphi, MD, that (1) develop policy and guidance; (2) perform long-range planning, programming and budgeting; (3) provide the management and distribution of resources; and (4) conduct program performance review and evaluation for the Research, Development, Test and Evaluation (RDTE), Army appropriation. Provides salaries and related personnel benefits for authorized civilian personnel and the associated administrative support (temporary duty travel, operating supplies and equipment). The program is heavily dependent on civilian salaries and associated support contractor operations.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project HH02 - Army Management Headquarters Activities (AMHA):

(U) FY 1991 Accomplishments:
- (U) Funded the operation of the RDTE management headquarters activities at USAMRDC and LABCOM.

(U) FY 1992 Planned Program:
- (U) Fund the operation of the RDTE management headquarters activities at USAMRDC and LABCOM.
- (U) Perform long-range planning, programming and budgeting
- (U) Provide for the management and distribution of resources

(U) FY 1993 Planned Program:
- (U) Fund the operation of the RDTE management headquarters activities at LABCOM.
- (U) Perform long-range planning, programming and budgeting
- (U) Provide for the management and distribution of resources
- (U) Funds to support operation of the RDTE management headquarters activities at USAMRDC transferred to the Office of the Assistant Secretary of Defense (Health Affairs) effective FY 1993.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0605898A**
PE Title: **Management Headquarters (Research and Development)** Budget Activity: **#6**

(U) Work Performed By: The U.S. Army Medical Research and Development Command, Ft. Detrick, Maryland and the U.S. Army Laboratory Command, Adelphi, Maryland.

(U) Related Activities: This program funds RDTE headquarters administrative and management activities only. There is no duplication of effort within the Army or the Department of Defense

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

(U) International Cooperative Agreements: Not applicable.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0708011A**
PE Title: **Industrial Preparedness** Budget Activity: **#6**

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

Project Number / Title		FY 1991 Actual	FY 1992 Estimate	FY 1993 Estimate	To Completion	Total Program
DE50	Communications & Electronics	6596	- 0 -	- 0 -	- 0 -	
DE51	Other Procurement	11250	- 0 -	- 0 -	- 0 -	
DE60	Aircraft	2020	- 0 -	- 0 -	- 0 -	
DE61	Missiles	2296	- 0 -	- 0 -	- 0 -	
DE62	Weapons & Tracked Combat Vehicles	6370	- 0 -	- 0 -	- 0 -	
DE63	Ammunition	2159	- 0 -	- 0 -	- 0 -	
DE64	Tactical Support Vehicles	150	- 0 -	- 0 -	- 0 -	
DE71	Single Issue Tasks	- 0 -	1243	2844	Cont	Cont
DE74	Chemical Processes	- 0 -	954	3065	Cont	Cont
DE77	Electronics Manufacturing	- 0 -	1780	2799	Cont	Cont
DE87	Manufacturing Process Control	- 0 -	- 0 -	1132	Cont	Cont
DE99	Environmentally Acceptable Processes	- 0 -	- 0 -	1132	Cont	Cont
DF03	Optics/Electro-Optics	- 0 -	7035	4931	Cont	Cont
DF04	Non-Metallic Materials	- 0 -	1006	2973	Cont	Cont
DF05	Metals	- 0 -	- 0 -	827	Cont	Cont
PE TOTAL		30841	12018	19703		

B. (U) BRIEF DESCRIPTION OF ELEMENT: The Army's Manufacturing Technology (MANTECH) is an on-going program that provides improvements to manufacturing processes, procedures and equipment to bring advanced technology into manufacturing, enhance quality and reduce the cost of production and support critical defense manufacturing processes in the industrial base. As such it is one of the key elements of the Army Total Quality Management Program in the production phase of the acquisition cycle. Beginning in FY 1992, the program is restructured to focus resources on a fewer number of technology thrust areas and leverage Army resources with private and other government efforts. The technologies selected have the potential for high payoff in terms of improved quality and cost across a spectrum of Army weapon systems as well as having potential for

making a significant impact on national manufacturing goals and the U.S. industrial base. The restructured program eliminated projects DE50; DE51; DE60; DE61; DE62; DE63; and DE64 and, no FY 1992 planned program will be identified for them. The new projects implemented in FY 1992 are: DE71: Single Issues; DE74: Chemical Processes; DE77: Electronic Manufacturing; DE87: Manufacturing Process Control; DE99: Environmentally Acceptable Processes; DF03: Optics/Electro-Optics; DF04: Non-Metallic Materials; DF05: Metals.

C. (U) JUSTIFICATION FOR PROJECTS:

(U) Project DE50 - Communications and Electronics: Electronics manufacturing is characterized by rapidly evolving technical performance of end products and intense competition from foreign sources. Implementation of advanced technology into the manufacture and remanufacture processes reduces the costs of ownership and allows the Army to take maximum benefit of end item technology. Thrust areas on soldering and microelectronics manufacturing and night vision-electro optics have been formed to coordinate Army efforts and focus resources. Tasks being pursued emphasize the exploitation of technology to improve test and diagnostic capabilities, process control of plating, soldering and assembly operations, the manufacturing processes for infra-red focal plane arrays and large scale integrated circuits for Army applications.

(U) FY 1991 Accomplishments:

- (U) Completed wiring harness test with industry-DOD demonstrations for technology transfer
- (U) Continued efforts in automated test equipment for monolithic microwave integrated circuits, and ultra-violet curable conformal coating system to repair Army printed wiring assemblies
- (U) Continued effort to improve crystal growth and manufacturing capability for basic integrated circuit materials such as galium arsenide and barium strontium titanate
- (U) Continued exploration of advanced techniques to improve the yield of materials and processes used to manufacture high performance seekers and sensors for missiles and target acquisition systems
- (U) Continued microelectronics manufacturing thrust area to coordinate enhancement of manufacturing processes essential to the quality production of electronic circuits and equipment
- (U) Continued soldering thrust area work in critical soldering standards, solderability testing, composite solders and fluxless solder. Provided demonstration and technology transfer to industry through cooperative agreements with nine universities. Applied for five patents and two licensing agreements with products developed.

(U) FY 1992 Planned Program:

- (U) Effective FY 1992, the MANTECH projects have been restructured within this program element to reflect the technology thrust areas. FY 1992 is the transition year from an end item/weapon category orientation for MANTECH projects and tasks to a major manufacturing thrust area orientation, therefore, no planned program is identified for DE50.

(U) FY 1993 Planned Program:

- (U) FY 1993 follows FY 1992 transition to a manufacturing thrust area orientation, therefore, no planned program is identified for DE50.

(U) Project DE51 - Other Procurement: This project supports technology thrust areas in chemical defense, environmentally acceptable treatment process and nondestructive evaluation. Other technologies being advanced by this project include the processes of material and weapons systems testing which support a wide variety of weapons systems; basic combat support and individual soldier support materials.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0708011A
PE Title: Industrial Preparedness **Budget Activity: #6**

(U) FY 1991 Accomplishments:
- **(U) Continued efforts in the chemical defense material thrust area**
- **(U) Continued to develop production methods for heat stable enzymes used in detection devices for chemical/biological agents and toxins, and technology for advanced sorbents**
- **(U) Initiated efforts for manufacturing detector receptor proteins**
- **(U) Continued environmentally acceptable treatment process thrust area to examine alternative production processes and material formulation to limit the use, collection and environmental protection required from volatile organic compounds (paints, solvents, coatings, etc.) used in the treatment, coating and rebuild of equipment**
- **(U) Continued non-destructive evaluation thrust area completing tasks impacting the quality of adhesive bonded joints, printed wiring boards and continuing advanced image processing techniques**
- **(U) Continued to enhance testing technology to respond to emerging Army inspection requirements for material properties and suitability for use/verification of materials in weapon systems production**
- **(U) Expanded effort to enhance current production methods for medium duty landing mats**
- **(U) Continued development of advanced manufacturing processes for support to the individual soldier such as stitchless seams for garments, and meal packets**

(U) FY 1992 Planned Program:
- **(U)** Effective FY 1992, the MANTECH projects have been restructured within this program element to reflect the technology thrust areas. FY 1992 is the transition year from an end-item/weapon category orientation for MANTECH projects and tasks to a major manufacturing thrust area orientation, therefore, no planned program is identified for DE51.

(U) FY 1993 Planned Program:
- **(U)** FY 1993 follows FY 1992 transition to a manufacturing thrust area orientation, therefore, no planned program is identified for DE51.

(U) Project DE60 - Aircraft: Manufacturing technology advances are expected to produce significant benefits to the Army aircraft programs and US aerospace industry. High performance helicopters utilize advanced composite materials, precision engine parts and high technology mission equipment packages. Technology crosses several thrust areas.

(U) FY 1991 Accomplishments:
- **(U)** Continued efforts to develop advanced processes for manufacture of complex aircraft parts using composites as part of the composites/adhesive bonding thrust area
- **(U)** Completed solution to wet riveting and frayed surface sealing

(U) FY 1992 Planned Program:
- **(U)** Effective FY 1992, the MANTECH projects have been restructured within this program element to reflect the technology thrust areas. FY 1992 is the transition year from an end-item/weapon category orientation for MANTECH projects and tasks to a major manufacturing thrust area orientation, therefore, no planned program is identified for DE60.

(U) FY 1993 Planned Program:
- **(U)** FY 1993 follows FY 1992 transition to a manufacturing thrust area orientation, therefore, no planned program is identified for DE60.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0708011A
PE Title: Industrial Preparedness **Budget Activity: #6**

(U) Project DE61 - Missiles: State-of-the-art technology associated with missile power, flight, target acquisition, control and lethality requires parallel advances in manufacturing technology to facilitate the transition from hand made development prototypes to full quantity production. Dramatic improvement in cost and product quality are attributable to these investments. This project expanded in FY 1990 to encompass technology used cooperatively between the Army and industry with resources focused on missile seeker technology thrust areas.

(U) FY 1991 Accomplishments:
- (U) Continued advances in pilot production line and high volume test equipment in hybrid/monolithic millimeter transceivers (94 GHz)
- (U) Completed the process description of advanced manufacturing techniques to reduce the cost of fiber optically controlled missiles
- (U) Continued improvement of manufacturing processes to integrate focal plane array technology into advanced missile seekers and sensor production

(U) FY 1992 Planned Program:
- (U) Effective FY 1992, the MANTECH projects have been restructured within this program element to reflect the technology thrust areas. FY 1992 is the transition year from an end-item/weapon category orientation for MANTECH projects and tasks to a major manufacturing thrust area orientation, therefore, no planned program is identified for DE61.

(U) FY 1993 Planned Program:
- (U) FY 1993 follows FY 1992 transition to a manufacturing thrust area orientation, therefore, no planned program is identified for DE61.

(U) Project DE62 - Weapons and Tracked Combat Vehicles: This project provides manufacturing improvements in the areas of heavy materials forming, assembly and remanufacturing technology. It covers a wide spectrum of areas such as gun tubes, machining, metallurgy, welding, casting, and computer controls of balancing and plating processes. These tasks were integrated by proposed thrust areas such as optics, welding and composites commencing in FY 1990.

(U) FY 1991 Accomplishments:
- (U) Continued optics thrust area to enhance US manufacturing base capabilities to produce precision optics. Establish methods for processing optic quality glass and lens making operations
- (U) Completed efforts to reduce cost and increase quality in the rebuild/overhaul of combat vehicle power trains and assemblies in advanced laser balancing and transmission test stands.

(U) FY 1992 Planned Program:
- (U) Effective FY 1992, the MANTECH projects have been restructured within this program element to reflect the technology thrust areas. FY 1992 is the transition year from an end-item/weapon category orientation for MANTECH projects and tasks to a major manufacturing thrust area orientation, therefore, no planned program is identified for DE62.

(U) FY 1993 Planned Program:
- (U) FY 1993 follows FY 1992 transition to a manufacturing thrust area orientation, therefore, no planned program is identified for DE62.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0708011A**
PE Title: **Industrial Preparedness** Budget Activity: **#6**

(U) Project DE63 - Ammunition: This project provides improvement in processes, inspection systems, handling, and manufacturing of ammunition. It also heavily involves the processes and methods to increase safety and better meet environmental procedures that are required by law. In so doing, the quality of the end items is increased and the overall process costs are reduced.

(U) **FY 1991 Accomplishments:**
- (U) Continued the evolution of process control, handling, packaging and inspection technologies at Army ammunition plants
- (U) Continued efforts for advanced processing techniques for energetic materials
- (U) Continued efforts to reduce cost and environmental impact of producing explosive substances

(U) **FY 1992 Planned Program:**
- (U) FY 1992 is the transition year from an end-item/weapons category orientation for MANTECH projects and tasks to a major manufacturing thrust area orientation, therefore, no planned program is identified for DE63.

(U) **FY 1993 Planned Program:**
- (U) FY 1993 follows FY 1992 transition to a manufacturing thrust area orientation,therefore, no planned program is identified for DE63.

(U) Project DE64 - Tactical Support Vehicles: This project provides improvements in many depot areas such as inspection of engines and engine components. It also involves use of modern technology to repair and regrind steel components. It will further adapt tools such as computer analysis and laser inspections to rebuild operations. In so doing, the end items will be returned to the user at lowest cost. Some of these efforts will fit into thrust areas such as welding of metallics and composites/adhesive bonding.

(U) **FY 1991 Accomplishments:**
- (U) Continued to enhance production/rebuild of tactical vehicle engines, transmissions and major structures by applying technology for automation of tasks, inspection and process control

(U) **FY 1992 Planned Program:**
- (U) FY 1992 is the transition year from an end-item/weapon category orientation for MANTECH projects and tasks to a major manufacturing thrust area orientation, therefore, no planned program is identified for DE64.

(U) **FY 1993 Planned Program:**
- (U) FY 1993 follows FY 1992 transition to a manufacturing thrust area orientation, therefore, no planned program is identified for project DE64

(U) Project DE71 - Single Issue Tasks: Supports the technology tasks that are not part of established thrust areas but offer opportunity for significant advances in manufacturing. These technologies cover such areas as manufacturing fabrics for individual soldier use, materiel plating facilities, advanced testing technologies, tools for analyzing the manufacturing constraints of an item in design or start-up tasks for proposed new thrust areas.

(U) **FY 1992 Planned Program:**
- (U) Continue advanced testing technologies to reduce inspector cost and improve quality

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0708011A
PE Title: Industrial Preparedness
Budget Activity: #6

- (U) Remaining tasks were suspended due to restrictive language in the FY92 Appropriation which reduced the funds available for the Army by 40%

(U) FY 1993 Planned Program:
- (U) Restart efforts in stitchless seam technology required for troop uniform manufacture/advanced food processing
- (U) Continue efforts in area of materials testing required for manufacture of different weapon and support systems
- (U) Restart development of design tools to enhance manufacturability of new equipment parts

(U) Project DE74 - Chemical Processes: This project involves application of emerging technologies in energetics and chemical defense, and, the transfer of these technologies from the laboratory environment to the industrial production/manufacturing arena. The goal for this project is to apply technological advances to more effectively meet the known military requirement of the services in the energetic/chemical/biological areas.

(U) FY 1992 Planned Program:
- (U) All chemical defense tasks were suspended due to restrictive language in the FY92 Appropriation which reduced the funds available to the Army by 40%
- (U) Continue advanced process development for nitramine propellents and examine technological opportunities to reduce costs and enhance worker safety in ammunition production

(U) FY 1993 Planned Program:
- (U) Finalize development of non-organic and non-polluting processing bids for extruded and molded energetic materials
- (U) Restart development of processes for protective and detection systems against chemical weapons. Initiate development of non-proprietary carbon filter materials.

(U) Project DE77 - Electronics Manufacturing: This project involves the development of processes requiring high quality, reliable electronic devices for the manufacture of electronic devices, in mass production; and also, to improve the surface mount, through-hole mount and mechanical processes used in such areas as printed wiring assemblies on boards

(U) FY 1992 Planned Program:
- (U) Complete efforts in the automated testing of monolithic microwave integrated circuit processes which result in reduction of costly defects found in the end items
- (U) Continue development of composite solders which have better performance characteristics but lower lead content than conventional solders
- (U) Complete software programs for automated test equipment for advanced circuit cards in electronics equipment.

(U) FY 1993 Planned Program:
- (U) Continue efforts in the introduction of intermetallic powders into solder pastes as fillers resulting in composite solder
- (U) Restart development of processes for making barium strontium titanate used in advanced radars and sensors systems

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: #0708011A
PE Title: Industrial Preparedness Budget Activity: #6

- (U) Continue efforts in the detection and gaging of intermetallic compounds to reduce/eliminate blow holes in the manufacture of circuit boards
- (U) Complete task on growth of 20 Kg Galium Arsenide Boules and incorporate the necessary process to implement these into various circuit boards
- (U) Initiate efforts on fluxless solder and advanced electronics bonding techniques to reduce cost and improve performance of high volume production electronics systems

(U) Project DE87 - Manufacturing Process Control: This project develops advance manufacturing process controls in technologies involving non-destructive evaluation and feedback, machine tool control, computer integrated manufacturing, advance machine sensors and assembly processes and process controls. The objective is to use these technologies in identifying defective parts early in the manufacturing cycle and in the control of process variability of manufacturing operations.

(U) FY 1992 Planned Program:
- (U) These tasks have been suspended due to restrictive language in the FY92 Appropriation which reduced the funds available for the Army by 40%

(U) FY 1993 Planned Program:
- (U) Restart development of dimensional gauging of engine components leading to the automation of in-process manual inspection of physical features
- (U) Restart development of automated inspection/part recognition with generic applications in automotive, aircraft, and machine tools, leading to digitizing of optical images for reverse engineering and inspection

(U) Project DE99 - Environmentally Acceptable Processes: This project will provide the means to validate or ensure environmental regulatory compliance, and increase worker safety while maintaining current industrial capability.

(U) FY 1992 Planned Program:
- (U) Project not funded.

(U) FY 1993 Planned Program:
- (U) Restart efforts with the Army Materiel Command Materials Technology Laboratory for ion implantation into various welding and soldering joints
- (U) Restart efforts in the planning for volatile organic compounds compliant coatings application processes
- (U) Restart efforts to determine alternatives to paint stripping processes

(U) Project DF03 - Optics/Electro Optics: These projects support 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 and a thrust area in electro-optics manufacturing process for night vision and passive sensor systems.

(U) FY 1992 Planned Program:
- (U) Continue manufacturing process development for missile seekers (94 6Hz transceiver)
- (U) Continue development of an optical machine for the manufacture of spherical lens

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0708011A**
PE Title: **Industrial Preparedness** Budget Activity: **#6**

- (U) Initiate industry/academia partnering in advance photonics processes
- (U) Continue development of an optical machine for the finish polishing of optical lens
- (U) Continue efforts to improve the manufacturing processes of the Infrared Focal Plane Array Dewar Assembly
- (U) Develop processes for thermal electric cooler manufacture and assembly
- (U) Continue efforts in the magneto-optical mapper for the manufacture of semi-conductor wafers for high performance missile sensors

(U) FY 1993 Planned Program:

- (U) Complete manufacturing processes for missile seeker electronics (94 6Hz transceiver) - implement into production documentation
- (U) Continue efforts in the development of a computer aided manufacturing machine for the manufacture of prisms
- (U) Complete efforts in the development of the spherical optic lens blocking to incorporate composite tooling for large lenses
- (U) Complete the assembly processes for second generation Focal Plane Array Detectors
- (U) Continue efforts in the development of the manufacturing processes for the Thermal Weapons System Focal Plane Array

(U) Project DF04 - Non-Metallic Materials: This project involves the development for advanced bonding technologies for joining organic, ceramic, and metallic materials for prolonged use under several environmental conditions; to improve process control parameters for adhesive-bonded structures; and to develop plastics and composite materials processing capability for weapons systems.

(U) FY 1992 Planned Program:

- (U) Efforts to develop manufacturing processes for lay-up of composites into rotor blade technology for helicopters have been suspended
- (U) Efforts to develop composites for the armor plating used on the M1A1 tank and Bradley Fighting Vehicle System have been suspended
- (U) Efforts to develop processes for the molding of composite polymeric sabots have been suspended
- (U) Continue 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) Restart development for automated tool fabrication used in machine tool environment
- (U) Restart development of processes to incorporate composites into gun barrel manufacturing
- (U) Restart development of manufacturing processes for advanced composite structures used in aircraft

(U) Project DF05 - Metrology: This project develops welding technologies dealing with materials, processes, process control, weldment design, and automation of welding equipments having wide applications in the electronics, aerospace, and automotive industries. This project will draw inputs from NASA Marshall Space Flight Center, Department of Energy, academia, national laboratories and DoD.

AMENDED FY 1992/1993 BIENNIAL RDTE DESCRIPTIVE SUMMARY

Program Element: **#0708011A**
PE Title: **Industrial Preparedness** Budget Activity: **#6**

(U) FY 1992 Planned Program:

- **(U)** All Army tasks have been suspended

(U) FY 1993 Planned Program:

- **(U)** Initiate development of high temperature metal processes, advanced processes for metal part joining, assembly and fabrication and processes for combat vehicle manufacture.

(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)** The Air Force, Navy, and Defense Logistics Agencies have PE# 0708011 MANTECH programs that are coordinated with this program. There is no duplication of effort among these components
- **(U)** All manufacturing technology tasks are coordinated through the DoD subcommittees of the Manufacturing Technology Advisory Group (MTAG) which includes industry representatives. This organization precludes duplication of effort in the Army and within other services
- **(U)** Individual weapons systems program executive officers do manufacturing research specifically related to their weapons systems
- **(U)** Other government agencies like NASA, the Defense Advanced Research Projects Agency, the Strategic Defense Initiative, and the National Institute of Standards and Technologies pursue manufacturing technology development
- **(U)** The Army carries out other industrial preparedness and productivity activities like Production Base Support, and the Industrial Modernization Incentives Program that are funded with procurement appropriations. All are coordinated under the Industrial Base Resource Allocation Council
- **(U)** AMC has the responsibility for the performance of the Manufacturing Technology Program and all of the thrust areas under this program

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

(U) International Cooperative Agreements: Not applicable.

DEPARTMENT OF THE ARMY
RESEARCH, DEVELOPMENT, TEST AND EVALUATION, ARMY
MAJOR IMPROVEMENTS TO AND CONSTRUCTION OF GOVERNMENT-OWNED FACILITIES FUNDED BY RDT&E, ARMY APPROPRIATION

PART 1. UTILIZATION OF SECTION 2353, TITLE 10 AUTHORITY

Specialized R&D facilities and/or equipment determined to be necessary for the performance of a contract for a Military Department for research and development may be constructed by or furnished to the contractor and funded from appropriations available for research, development, test and evaluation. The Congress enacted this legislation, now 10 USC 2353, in 1956. This policy is executed through DoD Directive 4275.5. Under this policy, the Secretaries of the Military Departments or their designees, and the Directors of Defense Agencies may approve facilities projects up to $3,000,000; the Under Secretary of Defense for Acquisition approves projects exceeding $3,000,000. The Congress is notified in advance of starting any project involving construction, regardless of the dollar amount. The table below provides a summary listing of all such projects accomplished in FY 1991 and planned in FY 1992 and FY 1993.

Facility/Equipment	RDTE PE Number	Contractor/ Location	Total Obligational Authority (Thousands of Dollars) FY 1991	FY 1992	FY 1993
SECTION I					
Projects Accomplished or Underway					
Negative					
SECTION II					
Projects Planned or Projected					
Negative					

MAJOR IMPROVEMENTS TO AND CONSTRUCTION OF GOVERNMENT-OWNED FACILITIES FUNDED BY RDT&E, ARMY APPROPRIATION

PART 2. UTILIZATION OF RDT&E APPROPRIATION FOR FACILITIES AT GOVERNMENT-OWNED/GOVERNMENT-OPERATED INSTALLATIONS

The RDT&E appropriation may finance the development, design, purchase, and installation (including directly related foundations, shielding, environmental control, weather protection, structural adjustments, utilities and access) of equipment or instrumentation required for research, development, test and evaluation activities. The table below provides a summary listing of all such projects for the installation of equipment, where the cost of installation is $200,000 or more, accomplished in FY 1991 and planned in FY 1992 and FY 1993.

Facility/Equipment	RDTE PE Number	Contractor/ Location	Total Obligational Authority (Thousands of Dollars) FY 1991	FY 1992	FY 1993
SECTION I					
Projects Accomplished or Underway					
Weapons Firing Chamber	0605601A	Yuma Proving Ground, AZ	281		
SECTION II					
Projects Planned or Projected					
Aviation Training Simulation Testbed Facility *	0602785A	Ft Rucker, AL		1,767	

*Initial Listing

PART 2. SUPPORTING NARRATIVE STATEMENT:

WEAPONS FIRING CHAMBER, YUMA PROVING GROUND, AZ:

a. DESCRIPTION: The Weapons Firing Chamber (WFC), an environmental chamber capable of accepting a complete weapons system, will be a state-of-the-art environmentally safe system for effective testing of artillery and tank weapons systems for effects of exposure to extreme climatic conditions. The proposed location of this system is the Gun Position 5 KOFA Firing Range area of the U.S. Army Yuma Proving Ground, AZ.

b. MAJOR ITEMS INCLUDED IN PROJECT: The WFC consists of a chamber, which is a insulated long-span corrugated metal pipe arch (30' long, 30' wide and 18" high) connected to a 15' radius insulated dome-shaped blast wall. The dome wall will contain a four foot wide slot which permits firing a test weapon at various elevations. During periods of temperature conditioning the slot will be covered. Access to the chamber will be achieved through a main door at the rear which is 17' wide and 13' high. In addition, personnel will have access to the chamber by using personnel doors located at the rear and side of the chamber. The side entrance door is reached via a mechanics change room which is a smaller corrugated metal pipe arch 12' long and 11' diameter positioned perpendicular to the main chamber. The chamber is connected by air ducts to an Environmental Control System module which will condition, distribute, monitor and control the temperature and humidity of the air within the chamber. The Environmental Control System will be capable of controlling the environment within the chamber from -651F to 1451F and humidity between 5% and 95%. Cooling is provided by an air cooled mechanical refrigeration system heating by electric heating elements. Control and test instrumentation will be in a Control Room Module which will also house Project Engineer and other test personnel.

c. REQUIREMENTS FOR THE PROJECT: The objectives of this program is to provide a capability for testing the firing of large caliber weapons and associated materials under extreme climatic conditions. Programs either under development or modernization requiring these tests are the Armored Systems Modernization (which will include artillery, tank and fighting vehicles), liquid propellant propulsion systems, and electromagnetic guns. Production acceptance work requiring these testing capabilities includes the M184 cannon mount and M284 mount. Within the U.S. Army, the only existing facility is at Aberdeen Proving Ground and that facility is subject to increasing environmental and encroachment restrictions thereby restricting its use and materially delaying testing programs. Facility will be used for the test of present and future systems that are beyond the range safety capabilities of APG.

PART 2. SUPPORTING NARRATIVE STATEMENT (CONT'D):

AVIATION TRAINING SIMULATION TESTBED FACILITY, FT. RUCKER, AL:

a. DESCRIPTION: Construct a facility to house a research Simulator Complexity Testbed (SCTB) system.

b. TABULATION OF MAJOR ITEMS/NON-SEVERABLE:

Simulator/Admin Area-Information Systems	1283
Electric/Water/Paving/Storm Drainage, etc	305
Contingencies	79
Supervision, Inspection & Overhead	100
Total	1767

c. REQUIREMENTS: This R&D project is focused on issues of primary concern to the Army's aviation training community, therefore, it is imperative that the testbed be located at the Army's Aviation Center at Ft. Rucker, AL. The testbed system has been developed under an existing contract and is near completion, scheduled for delivery in February 1992. The facility to house this system is now required and essential for effective training. Construction of the facility is planned to begin June 1992, with completion by March 1993.

MAJOR IMPROVEMENTS TO AND CONSTRUCTION OF GOVERNMENT-OWNED FACILITIES FUNDED BY RDT&E, ARMY APPROPRIATION

PART 3. UTILIZATION OF RDT&E APPROPRIATION FOR MINOR CONSTRUCTION

For in-house installations, construction projects in support of R&D for $200,000 or less are funded from RDT&E appropriations. Such expenditures are authorized by 10 USC 2805 and the applicable provisions of the current DoD Appropriations Act. Under this procedure, project approval at this level is authorized by the Major Command concerned, or delegated to R&D installation commanders as appropriate. The table below provides a summary total of such minor construction accomplished in FY 1991, and the estimated amounts planned for FY 1992 and FY 1993. All minor construction must result in a complete and usable facility. In no event are two or more minor construction projects or minor and major construction projects to be contrived to form a usable facility.

SUMMARY OF MINOR CONSTRUCTION FUNDED BY RDT&E, ARMY
(Dollars in Thousands)

FY 1991	FY 1992	FY 1993
$16,734	$13,053	$ 9,416*

* Effective FY 1993, DoD policy change realigns RDT&E funded major repair and minor construction of real property (in excess of $15,000 per project), to the Military Construction Appropriations. These projects substantially prolong the useful life of the facility, and are all actually facility investments. This realignment will place all RDT&E facility operational investments of general utility into the construction investment accounts. Projects in direct support of RDT&E mission remain funded in the RDT&E appropriation.

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APPENDIX A
RDTE CONGRESSIONAL DESCRIPTIVE SUMMARIES
MAILING LIST

PRINT	ADDRESS
1	USD (Policy), DUSD(P&R), Pentagon, Room 1C469, Washington, DC 20310
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 20310-0200
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
1	HQDA (DASG-ZA), 5111 Leesburg Pike, Room 638, Falls Church, VA 22041

APPENDIX A
RDTE CONGRESSIONAL DESCRIPTIVE SUMMARIES
MAILING LIST - Continued

PRINT	ADDRESS
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
1	HQDA (CSSD-RM), P.O. Box 15280, Arlington, VA 22215-0150
1	HQDA (CSSD-DP), P.O. Box 15280, Arlington, VA 22215-0150
2	HQDA (AIA-RM), Pentagon, Room 1C470, Washington, DC 20310
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
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
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	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
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
2	HQ USAF/FMBMC, Pentagon, Room 5C129, Washington, DC 20330-5012
1	DOD Assistant Inspector General for Auditing, AM Division, Room 725, 400 Army-Navy Drive, Arlington, VA 22202
2	HQ Defense Mapping Agency, ATTN: RE, 8613 Lee Highway, Fairfax, VA 22031-2137
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	Defense Nuclear Agency, ATTN: COMP-2.2, 6801 Telegraph Road, Alexandria, VA 22310
1	Defense Advanced Research Projects Agency, Technical Information Branch, 1400 Wilson Blvd, Arlington, VA 22209
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
1	National Defence Headquarters, ATTN: DLPC (TRADOC LO), 101 Colonel By Drive, Ottawa, Ontario Canada K1A 0K2

APPENDIX A
RDTE CONGRESSIONAL DESCRIPTIVE SUMMARIES
MAILING LIST - Continued

PRINT	ADDRESS
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: AMCDE-PB, 5001 Eisenhower Avenue, Alexandria, VA 22333-0001
2	Commander, US Army Materiel Command, ATTN: AMCAE-P, 5001 Eisenhower Avenue, Alexandria, VA 22333-0001
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
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1	HQDA, US Army Cost and Economic Analysis Center, ATTN: CACC-FD, Pentagon, Room 2A680, Washington, DC 20310-2080
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1	ACDA/NWC/DPA, Room 5741, 320 21st Street, NW, Washington, DC 20451
1	DOD Explosives Safety Board, Hoffman Building 1, Room 856C, 2461 Eisenhower Avenue, Alexandria, VA 22331-0600
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