Department of Defense
Fiscal Year (FY) 2012 Budget Estimates

February 2011

Army

Justification Book Volume 2

Research, Development, Test & Evaluation, Army

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FY 2012 RDT&E, ARMY
PROGRAM ELEMENT DESCRIPTIVE SUMMARIES

Introduction and Explanation of Contents

1. General. The purpose of this document is to provide summary information concerning the Research, Development, Test and Evaluation, Army program. The descriptive summaries are comprised of R-2 (Army RDT&E Budget Item Justification – program element level), R-2A (Army RDT&E Budget Item Justification – project level), R-3 (Army RDT&E Cost Analysis), R-4 (Schedule Profile Detail) and R-5 (Termination Liability Funding for MDAPs) Exhibits, which provide narrative information on all RDT&E program elements and projects through FY 2012.

2. Relationship of the FY 2012 Budget Submitted to Congress to the FY 2011 Budget Submitted to Congress. This paragraph provides a list of program elements/projects that are major new starts, restructures, developmental transitions, newly established, terminated or for which funding existed in the FY 11 budget but no longer exists in the FY 12 budget. Explanations for these changes can be found in the narrative sections of the Program Element R-2A Exhibits.

A. New Start Programs:

PE/PROJECT	PE TITLE	PROJECT TITLE
0604115/DS3	Technology Maturation Initiatives	Technology Maturation Initiatives
0203735/DS5	Combat Vehicle Improvement Program	Armored Multi Purpose Vehicle (AMPV)
0604808/434	Close Combat Capabilities Eng Dev	Anti-Personnel Landmine Alternatives
0603820/D20	UAS Modifications/Product Imp Prg	VTOL MODS/PIP
0603807/VS7	Medical Systems Advanced Dev	MEDEVAC Mission Equipment Package
0603817/S52	Soldier Systems – Adv Dev	Soldier Support Equipment – AD
0604270/VS6	EW Development	Integrated Electronic Warfare Sys
0604818/JN1	Army Tac Comm & Cont Hardware And Software	*Joint Network Node (JNN) Testing
0604820/E10	Radar Development	Sentinel
0203726/33C	Advanced Field Artillery Tactical Data System	Improved Position Azimuth Determining System (IPADs)
0303141/VU2	Global Combat Support System	Installation Fixed Base (IFB)

*Program Re-start

B. Program Element/Project Restructures:

Old PE/Project	New Project Title	New PE/Project
0601104/J22	Network Science and Technology Research Center	0601104/H50
0602787/878	Warfighter Health Prot and Perf Stds	0602787/869
0602787/879	Warfighter Health Prot and Perf Stds	0602787/869
0603005/C66	Tractor Nail	0603130/DS8
0603006/DF7	Tractor Eggs	0603131/DS9
0603308/978	Tractor Jute	0604131/DT1
0604270/L20	Common Missile Warning System (CMWS)	0604270/VU7
	Common Infrared Counter Measure (CIRCM)	0604270/VU8
0604805/589	Army Sys Engineering & Warfighting	0604805/593
0305204/114	RQ-7 Shadow UAV	0305233/RQ7
0305204/D10	RQ-11 Raven (MIP)	0305232/RA7
0604710/L76	Dismounted Fire Support Laser Targeting System	0604710/L79
0604817/482	Ground Combat ID	0604284/VU4
0605605/E97	DOD HELSTF	0605601/F30
0605857/061	Material Sustainment Support AD	0603804/K42
0203759/122	Joint Battle Command – Platform	0604805/593
0203801/DF8	Tractor Barn	0203808/DS1
0203801/DF9	Tractor PUMA	0203808/DS2

C. Developmental Transitions:

Old PE/Project	New Project Title	New PE/PROJECT
0603804/L04	Joint Light Tactical Vehicles (JLTV) – SD	0604804/L50
0603827/S49	Ground Soldier Ensemble	0604827/S75

D. Establishment of new FY 2012 Program Elements/Projects. (Does not include any major new starts)

TITLE	PE/PROJECT
Surface Science Research	0601102/VR9
Center for Advanced Research	0601104/VS2
Expeditionary Mobile Base Camp Technology	0602786/VT4
Expeditionary Mobile Base Camp Demonstration	0603001/VT5
Tractor Nails	0603130/DS8

Tractor Eggs	0603131/DS9
*High Performance Computing Modernization Program	0603461/DS7
Tractor Jute	0604131/DT1
Soldier Protective Equipment	0603827/VS4
Combat Service Support Systems – AD	0603804/VR8
Joint Effects Targeting Systems (JETs)	0604710/L79
Combat Service Support Systems	0604804/VR7
TWV Protection Kits	0604622/VR5

*transferred from RDT&E,DW PE 0603755D8Z

E. Program Terminations.

TITLE	PE/PROJECT
Electric Gun Technology	0602618/H75
Aircraft Weapons	0603003/435
BCT Non-Line-of-Sight Launch System	0604646/F72
BCT Reconnaissance (UAV) Platforms	0604662/FC3
Close Combat Capabilities Eng Dev	0604808/016

F. Programs for which funding existed in the FY 11 budget but no longer exists in the FY 12 budget.

PE/PROJECT	TITLE	Brief Explanation
0601104/J22	Network Science & Tech Res	Restructure to 0601104/H50
0602618/H75	Electric Gun Tech	Termination
0602787/878	Hlth Haz Mil Material	Restructure to 0602787/869
0602787/879	Med Fact Enh Sold Eff	Restructure to 0602787/869
0603003/435	Aircraft Weapons	Termination
0603005/C66	DC66	Restructure to 0603130/DS8
0603006/DF7	DF7	Restructure to 0603131/DS9
0603308/978	Space Control	Restructure to 0604131/DT1
0603804/K42	Material Sustainment Support	Transition to Army Supply System
0603804/L04	Jt Light Tact Vehicle (JLTV)-AD	Transition to 0604804/L50
0603827/S49	Ground Soldier System (GSS)	Transition to 0604827/S75
0604270/L20	ATIRCM/CMWS	Restructured to 0604270/VU7 & VU8
0604609/198	Target Defeating System	Completed R&D
0604609/200	Smoke/Obscurant System	Completed R&D
0604622/659	Family of Hvy Tac Veh	Transition to production

0604642/E40	LTV Prototype	Completed R&D
0604646/F72	BCT NLOS Launch Sys	Termination
0604710/L76	Dismounted Fire Support Laser Targeting System	Restructured to 0604710/L79
0604804/L47	Improved Environmental Control Unit	Transition to production
0604805/589	Army Sys Engr & Warfighting	Restructured to 0604805/593
0604808/016	Close Combat Capabilities ED	Termination
0604817/482	Ground Combat ID	Restructured to
0605013/087	Distributed Learning System	Transition to production
0604662/FC3	BCT Reconnaissance (UAV) Platforms	Termination
0605605/E97	DOD HELSTF	Restructured to 0605601/F30
0203759/122	Jt Battle Command Platform	Restructured to 0604805/593
0203801/DF8	DF8	Restructured to 0203808/DS1
0203801/DF9	DF9	Restructured to 0203808/DS2
0305204/114	Tactical Unmanned Aerial Vehicles (MIP)	Restructured to 0305233/RQ7
0305204/D10	SUAV (MIP)	Restructured to 0305233/RA7
0305208/D15	MUSE & TES TADSS (MIP)	Completed R&D

3. **Classification:** This document contains no classified data Appropriately cleared individuals can obtain further information on Classified/Special Access Programs by contacting the Department of the Army (ASA(ALT)) Special Programs Office.

4. **Performance Metrics.** Performance metrics may be found in the Department's Performance Budget Justification Book, dated February 2012.

Department of the Army

FY 2012 RDT&E Program

President's Budget 2012/13

Summary

Exhibit R-1

10-Feb-2011

Thousands of Dollars

Summary Recap of Budget Activities	FY2010	FY2011	FY2012	FY2012 OCO	FY2012 Total
Basic research	420,190	406,873	436,920	0	436,920
Applied Research	1,321,605	841,364	869,332	0	869,332
Advanced technology development	1,366,194	696,592	976,812	0	976,812
Advanced Component Development and Prototypes	982,111	804,148	753,084	0	753,084
System Development and Demonstration	4,285,025	5,035,046	4,190,788	0	4,190,788
Management support	1,487,815	1,142,383	1,048,671	8,513	1,057,184
Operational system development	1,843,989	1,553,445	1,403,837	0	1,403,837
Total RDT&E, Army	11,706,929	10,479,851	9,679,444	8,513	9,687,957

Appropriation: 2040 A RDT&E, Army

10-Feb-2011

Line No	Program Element Number	Act	Item	Thousands of Dollars FY2010	FY2011	FY2012	FY2012 OCO	FY2012 Total
			Basic research					
1	0601101A	01	IN-HOUSE LABORATORY INDEPENDENT RESEARCH	19,278	21,780	21,064		21,064
2	0601102A	01	DEFENSE RESEARCH SCIENCES	196,921	195,845	213,942		213,942
3	0601103A	01	UNIVERSITY RESEARCH INITIATIVES	96,409	91,161	80,977		80,977
4	0601104A	01	UNIVERSITY AND INDUSTRY RESEARCH CENTERS	107,582	98,087	120,937		120,937
			Total: Basic research	420,190	406,873	436,920	0	436,920
			Applied Research					
5	0602105A	02	MATERIALS TECHNOLOGY	88,022	29,882	30,258		30,258
6	0602120A	02	SENSORS AND ELECTRONIC SURVIVABILITY	82,449	48,929	43,521		43,521
7	0602122A	02	TRACTOR HIP	13,807	14,624	14,230		14,230
8	0602211A	02	AVIATION TECHNOLOGY	44,810	43,476	44,610		44,610
9	0602270A	02	ELECTRONIC WARFARE TECHNOLOGY	23,581	17,330	15,790		15,790
10	0602303A	02	MISSILE TECHNOLOGY	69,871	49,525	50,685		50,685
11	0602307A	02	ADVANCED WEAPONS TECHNOLOGY	19,906	18,190	20,034		20,034
12	0602308A	02	ADVANCED CONCEPTS AND SIMULATION	22,070	20,582	20,933		20,933
13	0602601A	02	COMBAT VEHICLE AND AUTOMOTIVE TECHNOLOGY	79,649	64,740	64,306		64,306
14	0602618A	02	BALLISTICS TECHNOLOGY	73,456	60,342	59,214		59,214
15	0602622A	02	CHEMICAL, SMOKE AND EQUIPMENT DEFEATING TECHNOLOGY	8,706	5,324	4,877		4,877
16	0602623A	02	JOINT SERVICE SMALL ARMS PROGRAM	9,001	7,893	8,244		8,244
17	0602624A	02	WEAPONS AND MUNITIONS TECHNOLOGY	140,727	42,645	39,813		39,813
18	0602705A	02	ELECTRONICS AND ELECTRONIC DEVICES	134,946	60,859	62,962		62,962
19	0602709A	02	NIGHT VISION TECHNOLOGY	48,250	40,228	57,203		57,203
20	0602712A	02	COUNTERMINE SYSTEMS	27,892	19,118	20,280		20,280
21	0602716A	02	HUMAN FACTORS ENGINEERING TECHNOLOGY	30,395	21,042	21,801		21,801
22	0602720A	02	ENVIRONMENTAL QUALITY TECHNOLOGY	17,545	18,364	20,837		20,837
23	0602782A	02	COMMAND, CONTROL, COMMUNICATIONS TECHNOLOGY	31,691	25,573	26,116		26,116
24	0602783A	02	COMPUTER AND SOFTWARE TECHNOLOGY	9,896	6,768	8,591		8,591
25	0602784A	02	MILITARY ENGINEERING TECHNOLOGY	60,536	79,189	80,317		80,317

Appropriation: 2040 A RDT&E, Army

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Line No	Program Element Number	Act	Item	Thousands of Dollars FY2010	FY2011	FY2012	FY2012 OCO	FY2012 Total
26	0602785A	02	MANPOWER/PERSONNEL/TRAINING TECHNOLOGY	16,358	22,198	18,946		18,946
27	0602786A	02	WARFIGHTER TECHNOLOGY	37,040	27,746	29,835		29,835
28	0602787A	02	MEDICAL TECHNOLOGY	231,001	96,797	105,929		105,929
	Total:		Applied Research	1,321,605	841,364	869,332	0	869,332
			Advanced technology development					
29	0603001A	03	WARFIGHTER ADVANCED TECHNOLOGY	51,596	37,364	52,979		52,979
30	0603002A	03	MEDICAL ADVANCED TECHNOLOGY	336,741	71,510	68,171		68,171
31	0603003A	03	AVIATION ADVANCED TECHNOLOGY	104,229	57,454	62,193		62,193
32	0603004A	03	WEAPONS AND MUNITIONS ADVANCED TECHNOLOGY	92,638	64,438	77,077		77,077
33	0603005A	03	COMBAT VEHICLE AND AUTOMOTIVE ADVANCED TECHNOLOGY	261,689	89,499	106,145		106,145
34	0603006A	03	COMMAND, CONTROL, COMMUNICATIONS ADVANCED TECHNOLOGY	12,074	8,102	5,312		5,312
35	0603007A	03	MANPOWER, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY	7,220	7,921	10,298		10,298
36	0603008A	03	ELECTRONIC WARFARE ADVANCED TECHNOLOGY	55,903	50,359	57,963		57,963
37	0603009A	03	TRACTOR HIKE	10,945	8,015	8,155		8,155
38	0603015A	03	NEXT GENERATION TRAINING & SIMULATION SYSTEMS	25,895	15,334	17,936		17,936
39	0603020A	03	TRACTOR ROSE	13,997	12,309	12,597		12,597
40	0603105A	03	MILITARY HIV RESEARCH	29,277	6,688	6,796		6,796
41	0603125A	03	COMBATING TERRORISM - TECHNOLOGY DEVELOPMENT	11,366	10,550	12,191		12,191
42	0603130A	03	TRACTOR NAIL			4,278		4,278
43	0603131A	03	TRACTOR EGGS			2,261		2,261
44	0603270A	03	ELECTRONIC WARFARE TECHNOLOGY	23,766	18,350	23,677		23,677
45	0603313A	03	MISSILE AND ROCKET ADVANCED TECHNOLOGY	83,649	84,553	90,602		90,602
46	0603322A	03	TRACTOR CAGE	11,741	9,986	10,315		10,315
47	0603461A	03	HIGH PERFORMANCE COMPUTING MODERNIZATION PROGRAM			183,150		183,150
48	0603606A	03	LANDMINE WARFARE AND BARRIER ADVANCED TECHNOLOGY	35,765	26,953	31,541		31,541
49	0603607A	03	JOINT SERVICE SMALL ARMS PROGRAM	8,683	9,151	7,686		7,686
50	0603710A	03	NIGHT VISION ADVANCED TECHNOLOGY	81,157	39,912	42,414		42,414
51	0603728A	03	ENVIRONMENTAL QUALITY TECHNOLOGY DEMONSTRATIONS	16,584	15,878	15,959		15,959
52	0603734A	03	MILITARY ENGINEERING ADVANCED TECHNOLOGY	40,423	27,393	36,516		36,516

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Line No	Program Element Number	Act	Item	Thousands of Dollars FY2010	FY2011	FY2012	FY2012 OCO	FY2012 Total
53	0603772A	03	ADVANCED TACTICAL COMPUTER SCIENCE AND SENSOR TECHNOLOGY	50,856	24,873	30,600		30,600
	Total:		Advanced technology development	1,366,194	696,592	976,812	0	976,812
			Advanced Component Development and Prototypes					
54	0603024A	04	UNIQUE ITEM IDENTIFICATION (UID)	1,990				
55	0603305A	04	ARMY MISSLE DEFENSE SYSTEMS INTEGRATION	80,079	11,455	36,009		36,009
56	0603308A	04	ARMY SPACE SYSTEMS INTEGRATION	126,189	27,551	9,612		9,612
57	0603327A	04	AIR AND MISSILE DEFENSE SYSTEMS ENGINEERING	165,515				
58	0603619A	04	LANDMINE WARFARE AND BARRIER - ADV DEV	29,399	15,596	35,383		35,383
59	0603627A	04	SMOKE, OBSCURANT AND TARGET DEFEATING SYS-ADV DEV	5,607	2,425	9,501		9,501
60	0603639A	04	TANK AND MEDIUM CALIBER AMMUNITION	33,202	42,183	39,693		39,693
61	0603653A	04	ADVANCED TANK ARMAMENT SYSTEM (ATAS)	96,269	136,302	101,408		101,408
62	0603747A	04	SOLDIER SUPPORT AND SURVIVABILITY	40,392	76,456	9,747		9,747
63	0603766A	04	TACTICAL ELECTRONIC SURVEILLANCE SYSTEM - ADV DEV	17,023	17,962	5,766		5,766
64	0603774A	04	NIGHT VISION SYSTEMS ADVANCED DEVELOPMENT	8,000				
65	0603779A	04	ENVIRONMENTAL QUALITY TECHNOLOGY - DEM/VAL	20,203	4,695	4,946		4,946
66	0603782A	04	WARFIGHTER INFORMATION NETWORK-TACTICAL - DEM/VAL	164,014	190,903	297,955		297,955
67	0603790A	04	NATO RESEARCH AND DEVELOPMENT	4,848	5,060	4,765		4,765
68	0603801A	04	AVIATION - ADV DEV	13,177	8,355	7,107		7,107
69	0603804A	04	LOGISTICS AND ENGINEER EQUIPMENT - ADV DEV	56,153	80,490	19,509		19,509
70	0603805A	04	COMBAT SERVICE SUPPORT CONTROL SYSTEM EVALUATION AND ANALYSIS	9,898	14,290	5,258		5,258
71	0603807A	04	MEDICAL SYSTEMS - ADV DEV	32,851	28,132	34,997		34,997
72	0603827A	04	SOLDIER SYSTEMS - ADVANCED DEVELOPMENT	75,833	48,323	19,598		19,598
73	0603850A	04	INTEGRATED BROADCAST SERVICE	1,469	970	1,496		1,496
74	0604115A	04	TECHNOLOGY MATURATION INITIATIVES			10,181		10,181
75	0604131A	04	TRACTOR JUTE			15,609		15,609
76	0604284A	04	JOINT COOPERATIVE TARGET IDENTIFICATION - GROUND (JCTI-G) / TECHNOLOG			41,652		41,652
77	0305205A	04	ENDURANCE UAVS		93,000	42,892		42,892
	Total:		Advanced Component Development and Prototypes	982,111	804,148	753,084	0	753,084

Line No	Program Element Number	Act	Item	Thousands of Dollars FY2010	FY2011	FY2012	FY2012 OCO	FY2012 Total
			System Development and Demonstration					
78	0604201A	05	AIRCRAFT AVIONICS	76,491	89,210	144,687		144,687
79	0604220A	05	ARMED, DEPLOYABLE HELOS	61,643	72,550	166,132		166,132
80	0604270A	05	ELECTRONIC WARFARE DEVELOPMENT	168,496	177,669	101,265		101,265
81	0604280A	05	JOINT TACTICAL RADIO		784			
82	0604321A	05	ALL SOURCE ANALYSIS SYSTEM	12,562	30,674	17,412		17,412
83	0604328A	05	TRACTOR CAGE	20,564	23,194	26,577		26,577
84	0604601A	05	INFANTRY SUPPORT WEAPONS	64,930	80,337	73,728		73,728
85	0604604A	05	MEDIUM TACTICAL VEHICLES	5,460	3,710	3,961		3,961
86	0604609A	05	SMOKE, OBSCURANT AND TARGET DEFEATING SYS - ENG DEV	939	5,335			
87	0604611A	05	JAVELIN		9,999	17,340		17,340
88	0604622A	05	FAMILY OF HEAVY TACTICAL VEHICLES	8,072	3,519	5,478		5,478
89	0604633A	05	AIR TRAFFIC CONTROL	8,453	9,892	22,922		22,922
90	0604642A	05	LIGHT TACTICAL WHEELED VEHICLES	1,140	1,990			
91	0604646A	05	NON-LINE OF SIGHT LAUNCH SYSTEM	88,205	81,247			
92	0604660A	05	FCS MANNED GRD VEHICLES & COMMON GRD VEHICLE	231,103				
93	0604661A	05	FCS SYSTEMS OF SYSTEMS ENGR & PROGRAM MGMT	847,011	568,711	383,872		383,872
94	0604662A	05	FCS RECONNAISSANCE (UAV) PLATFORMS	92,444	50,304			
95	0604663A	05	FCS UNMANNED GROUND VEHICLES	122,418	249,948	143,840		143,840
96	0604664A	05	FCS UNATTENDED GROUND SENSORS	39,664	7,515	499		499
97	0604665A	05	FCS SUSTAINMENT & TRAINING R&D	685,524	610,389			
98	0604710A	05	NIGHT VISION SYSTEMS - ENG DEV	56,992	52,549	59,265		59,265
99	0604713A	05	COMBAT FEEDING, CLOTHING, AND EQUIPMENT	2,010	2,118	2,075		2,075
100	0604715A	05	NON-SYSTEM TRAINING DEVICES - ENG DEV	29,187	27,756	30,021		30,021
101	0604716A	05	TERRAIN INFORMATION - ENG DEV			1,596		1,596
102	0604741A	05	AIR DEFENSE COMMAND, CONTROL AND INTELLIGENCE - ENG DEV	32,450	34,209	83,010		83,010
103	0604742A	05	CONSTRUCTIVE SIMULATION SYSTEMS DEVELOPMENT	32,126	30,291	28,305		28,305
104	0604746A	05	AUTOMATIC TEST EQUIPMENT DEVELOPMENT	11,737	14,041	14,375		14,375
105	0604760A	05	DISTRIBUTIVE INTERACTIVE SIMULATIONS (DIS) - ENG DEV	15,184	15,547	15,803		15,803
106	0604778A	05	POSITIONING SYSTEMS DEVELOPMENT (SPACE)	7,275				

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Line No	Program Element Number	Act	Item	Thousands of Dollars FY2010	FY2011	FY2012	FY2012 OCO	FY2012 Total
107	0604780A	05	COMBINED ARMS TACTICAL TRAINER (CATT) CORE	25,241	27,670	22,226		22,226
108	0604802A	05	WEAPONS AND MUNITIONS - ENG DEV	99,626	24,345	13,828		13,828
109	0604804A	05	LOGISTICS AND ENGINEER EQUIPMENT - ENG DEV	35,046	41,039	251,104		251,104
110	0604805A	05	COMMAND, CONTROL, COMMUNICATIONS SYSTEMS - ENG DEV	57,040	90,736	137,811		137,811
111	0604807A	05	MEDICAL MATERIEL/MEDICAL BIOLOGICAL DEFENSE EQUIPMENT - ENG DEV	37,572	34,474	27,160		27,160
112	0604808A	05	LANDMINE WARFARE/BARRIER - ENG DEV	89,064	95,577	87,426		87,426
113	0604814A	05	ARTILLERY MUNITIONS - EMD	40,856	26,371	42,627		42,627
114	0604817A	05	COMBAT IDENTIFICATION	7,740	29,884			
115	0604818A	05	ARMY TACTICAL COMMAND & CONTROL HARDWARE & SOFTWARE	72,820	60,970	123,935		123,935
116	0604820A	05	RADAR DEVELOPMENT			2,890		2,890
117	0604822A	05	GENERAL FUND ENTERPRISE BUSINESS SYSTEM (GFEBS)	23,712	13,576	794		794
118	0604823A	05	FIREFINDER	19,534	24,736	10,358		10,358
119	0604827A	05	SOLDIER SYSTEMS - WARRIOR DEM/VAL	20,602	20,886	48,309		48,309
120	0604854A	05	ARTILLERY SYSTEMS - EMD	152,935	53,624	120,146		120,146
121	0604869A	05	PATRIOT/MEADS COMBINED AGGREGATE PROGRAM (CAP)	570,831	467,139	406,605		406,605
122	0604870A	05	NUCLEAR ARMS CONTROL MONITORING SENSOR NETWORK	6,860	7,276	7,398		7,398
123	0605013A	05	INFORMATION TECHNOLOGY DEVELOPMENT	108,146	23,957	37,098		37,098
124	0605018A	05	ARMY INTEGRATED MILITARY HUMAN RESOURCES SYSTEM (A-IMHRS)		100,500	68,693		68,693
125	0605450A	05	JOINT AIR-TO-GROUND MISSILE (JAGM)	118,459	130,340	127,095		127,095
126	0605455A	05	SLAMRAAM		23,700	19,931		19,931
127	0605456A	05	PAC-3/MSE MISSILE		62,500	88,993		88,993
128	0605457A	05	ARMY INTEGRATED AIR AND MISSILE DEFENSE (AIAMD)		251,124	270,607		270,607
129	0605625A	05	MANNED GROUND VEHICLE	76,861	934,366	884,387		884,387
130	0605626A	05	AERIAL COMMON SENSOR		211,500	31,465		31,465
131	0303032A	05	TROJAN - RH12		3,697	3,920		3,920
132	0304270A	05	ELECTRONIC WARFARE DEVELOPMENT		21,571	13,819		13,819
	Total:		System Development and Demonstration	4,285,025	5,035,046	4,190,788	0	4,190,788
			Management support					
133	0604256A	06	THREAT SIMULATOR DEVELOPMENT	23,120	26,158	16,992		16,992

Line No	Program Element Number	Act	Item	Thousands of Dollars FY2010	FY2011	FY2012	FY2012 OCO	FY2012 Total
134	0604258A	06	TARGET SYSTEMS DEVELOPMENT	13,183	8,614	11,247		11,247
135	0604759A	06	MAJOR T&E INVESTMENT	49,942	42,102	49,437		49,437
136	0605103A	06	RAND ARROYO CENTER	17,257	20,492	20,384		20,384
137	0605301A	06	ARMY KWAJALEIN ATOLL	157,391	163,788	145,606		145,606
138	0605326A	06	CONCEPTS EXPERIMENTATION PROGRAM	26,168	17,704	28,800		28,800
139	0605502A	06	SMALL BUSINESS INNOVATIVE RESEARCH	273,678				
140	0605601A	06	ARMY TEST RANGES AND FACILITIES	346,015	393,937	262,456	8,513	270,969
141	0605602A	06	ARMY TECHNICAL TEST INSTRUMENTATION AND TARGETS	82,054	59,040	70,227		70,227
142	0605604A	06	SURVIVABILITY/LETHALITY ANALYSIS	44,728	41,812	43,483		43,483
143	0605605A	06	DOD HIGH ENERGY LASER TEST FACILITY	7,307	4,710	18		18
144	0605606A	06	AIRCRAFT CERTIFICATION	3,745	5,055	5,630		5,630
145	0605702A	06	METEOROLOGICAL SUPPORT TO RDT&E ACTIVITIES	8,173	7,185	7,182		7,182
146	0605706A	06	MATERIEL SYSTEMS ANALYSIS	20,970	18,078	19,669		19,669
147	0605709A	06	EXPLOITATION OF FOREIGN ITEMS	5,403	5,460	5,445		5,445
148	0605712A	06	SUPPORT OF OPERATIONAL TESTING	78,360	68,191	68,786		68,786
149	0605716A	06	ARMY EVALUATION CENTER	63,961	61,450	63,302		63,302
150	0605718A	06	ARMY MODELING & SIM X-CMD COLLABORATION & INTEG	5,885	3,926	3,420		3,420
151	0605801A	06	PROGRAMWIDE ACTIVITIES	76,503	73,685	83,054		83,054
152	0605803A	06	TECHNICAL INFORMATION ACTIVITIES	77,926	48,309	63,872		63,872
153	0605805A	06	MUNITIONS STANDARDIZATION, EFFECTIVENESS AND SAFETY	84,951	53,338	57,142		57,142
154	0605857A	06	ENVIRONMENTAL QUALITY TECHNOLOGY MGMT SUPPORT	4,991	3,195	4,961		4,961
155	0605898A	06	MANAGEMENT HQ - R&D	15,772	16,154	17,558		17,558
156	0909980A	06	JUDGMENT FUND REIMBURSEMENT	226				
157	0909999A	06	FINANCING FOR CANCELLED ACCOUNT ADJUSTMENTS	106				
	Total:		Management support	1,487,815	1,142,383	1,048,671	8,513	1,057,184
			Operational system development					
158	0603778A	07	MLRS PRODUCT IMPROVEMENT PROGRAM	26,624	51,619	66,641		66,641
159	0603820A	07	WEAPONS CAPABILITY MODIFICATIONS UAV			24,142		24,142
160	0102419A	07	AEROSTAT JOINT PROJECT OFFICE	317,132	372,493	344,655		344,655

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Line No	Program Element Number	Act	Item	Thousands of Dollars FY2010	FY2011	FY2012	FY2012 OCO	FY2012 Total
161	0203347A	07	INTELLIGENCE SUPPORT TO CYBER (ISC) MIP		2,360			
162	0203726A	07	ADV FIELD ARTILLERY TACTICAL DATA SYSTEM	29,127	24,622	29,546		29,546
163	0203735A	07	COMBAT VEHICLE IMPROVEMENT PROGRAMS	169,400	204,481	53,307		53,307
164	0203740A	07	MANEUVER CONTROL SYSTEM	36,131	25,540	65,002		65,002
165	0203744A	07	AIRCRAFT MODIFICATIONS/PRODUCT IMPROVEMENT PROGRAMS	240,321	134,999	163,205		163,205
166	0203752A	07	AIRCRAFT ENGINE COMPONENT IMPROVEMENT PROGRAM	767	710	823		823
167	0203758A	07	DIGITIZATION	8,218	6,329	8,029		8,029
168	0203759A	07	FORCE XXI BATTLE COMMAND, BRIGADE AND BELOW (FBCB2)		3,935			
169	0203801A	07	MISSILE/AIR DEFENSE PRODUCT IMPROVEMENT PROGRAM	37,731	24,280	44,560		44,560
170	0203802A	07	OTHER MISSILE PRODUCT IMPROVEMENT PROGRAMS	3,979				
171	0203808A	07	TRACTOR CARD	19,249	14,870	42,554		42,554
172	0208053A	07	JOINT TACTICAL GROUND SYSTEM	13,189	12,403	27,630		27,630
173	0208058A	07	JOINT HIGH SPEED VESSEL (JHSV)	2,961	3,153	3,044		3,044
174	0301359A	07	SPECIAL ARMY PROGRAM					
175	0303028A	07	SECURITY AND INTELLIGENCE ACTIVITIES	17,348		2,854		2,854
176	0303140A	07	INFORMATION SYSTEMS SECURITY PROGRAM	61,313	118,090	61,220		61,220
177	0303141A	07	GLOBAL COMBAT SUPPORT SYSTEM	138,764	125,569	100,505		100,505
178	0303142A	07	SATCOM GROUND ENVIRONMENT (SPACE)	32,453	33,694	12,104		12,104
179	0303150A	07	WWMCCS/GLOBAL COMMAND AND CONTROL SYSTEM	13,683	13,024	23,937		23,937
180	0305204A	07	TACTICAL UNMANNED AERIAL VEHICLES	262,655	54,300	40,650		40,650
181	0305208A	07	DISTRIBUTED COMMON GROUND/SURFACE SYSTEMS	191,253	119,202	44,198		44,198
182	0305219A	07	MQ-1 SKY WARRIOR A UAV		123,156	137,038		137,038
183	0305232A	07	RQ-11 UAV		1,599	1,938		1,938
184	0305233A	07	RQ-7 UAV		7,805	31,940		31,940
185	0307207A	07	AERIAL COMMON SENSOR (ACS)	115,432				
186	0307665A	07	BIOMETRICS ENABLED INTELLIGENCE		14,114	15,018		15,018
187	0708045A	07	END ITEM INDUSTRIAL PREPAREDNESS ACTIVITIES	106,259	61,098	59,297		59,297
	Total:		Operational system development	1,843,989	1,553,445	1,403,837	0	1,403,837

Exhibit R-1

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Line No	Program Element Number	Act	Item	Thousands of Dollars FY2010	FY2011	FY2012	FY2012 OCO	FY2012 Total
Total:	RDT&E, Army			11,706,929	10,479,851	9,679,444	8,513	9,687,957

Master Program Element Table of Contents (by Budget Activity then Line Item Number)

Budget Activity 02: Applied Research
Appropriation 2040: Research, Development, Test & Evaluation, Army

Line Item	Budget Activity	Program Element Number	Program Element Title	Page
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06	02	0602120A	Sensors and Electronic Survivability	Volume 2 - 15
07	02	0602122A	TRACTOR HIP	Volume 2 - 37
08	02	0602211A	AVIATION TECHNOLOGY	Volume 2 - 41
09	02	0602270A	Electronic Warfare Technology	Volume 2 - 52
10	02	0602303A	MISSILE TECHNOLOGY	Volume 2 - 60
11	02	0602307A	ADVANCED WEAPONS TECHNOLOGY	Volume 2 - 73
12	02	0602308A	Advanced Concepts and Simulation	Volume 2 - 79
13	02	0602601A	Combat Vehicle and Automotive Technology	Volume 2 - 88
14	02	0602618A	BALLISTICS TECHNOLOGY	Volume 2 - 105
15	02	0602622A	Chemical, Smoke and Equipment Defeating Technology	Volume 2 - 117
16	02	0602623A	JOINT SERVICE SMALL ARMS PROGRAM	Volume 2 - 122
17	02	0602624A	Weapons and Munitions Technology	Volume 2 - 127
18	02	0602705A	ELECTRONICS AND ELECTRONIC DEVICES	Volume 2 - 148
19	02	0602709A	NIGHT VISION TECHNOLOGY	Volume 2 - 175

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Line Item	Budget Activity	Program Element Number	Program Element Title	Page
20	02	0602712A	Countermine Systems	Volume 2 - 186
21	02	0602716A	HUMAN FACTORS ENGINEERING TECHNOLOGY	Volume 2 - 196
22	02	0602720A	Environmental Quality Technology	Volume 2 - 204
23	02	0602782A	Command, Control, Communications Technology	Volume 2 - 216
24	02	0602783A	COMPUTER AND SOFTWARE TECHNOLOGY	Volume 2 - 227
25	02	0602784A	MILITARY ENGINEERING TECHNOLOGY	Volume 2 - 235
26	02	0602785A	Manpower/Personnel/Training Technology	Volume 2 - 262
27	02	0602786A	Warfighter Technology	Volume 2 - 267
28	02	0602787A	MEDICAL TECHNOLOGY	Volume 2 - 282

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Program Element Title	Program Element Number	Line Item	Budget Activity	Page
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AVIATION TECHNOLOGY	0602211A	08	02	Volume 2 - 41
Advanced Concepts and Simulation	0602308A	12	02	Volume 2 - 79
BALLISTICS TECHNOLOGY	0602618A	14	02	Volume 2 - 105
COMPUTER AND SOFTWARE TECHNOLOGY	0602783A	24	02	Volume 2 - 227
Chemical, Smoke and Equipment Defeating Technology	0602622A	15	02	Volume 2 - 117
Combat Vehicle and Automotive Technology	0602601A	13	02	Volume 2 - 88
Command, Control, Communications Technology	0602782A	23	02	Volume 2 - 216
Countermine Systems	0602712A	20	02	Volume 2 - 186
ELECTRONICS AND ELECTRONIC DEVICES	0602705A	18	02	Volume 2 - 148
Electronic Warfare Technology	0602270A	09	02	Volume 2 - 52
Environmental Quality Technology	0602720A	22	02	Volume 2 - 204
HUMAN FACTORS ENGINEERING TECHNOLOGY	0602716A	21	02	Volume 2 - 196
JOINT SERVICE SMALL ARMS PROGRAM	0602623A	16	02	Volume 2 - 122
MATERIALS TECHNOLOGY	0602105A	05	02	Volume 2 - 1
MEDICAL TECHNOLOGY	0602787A	28	02	Volume 2 - 282
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Program Element Title	Program Element Number	Line Item	Budget Activity	Page
MISSILE TECHNOLOGY	0602303A	10	02	Volume 2 - 60
Manpower/Personnel/Training Technology	0602785A	26	02	Volume 2 - 262
NIGHT VISION TECHNOLOGY	0602709A	19	02	Volume 2 - 175
Sensors and Electronic Survivability	0602120A	06	02	Volume 2 - 15
TRACTOR HIP	0602122A	07	02	Volume 2 - 37
Warfighter Technology	0602786A	27	02	Volume 2 - 267
Weapons and Munitions Technology	0602624A	17	02	Volume 2 - 127

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BA# 02: Applied Research

				Cost ($ in Millions)				
Line#	**BA#**	**PE#**	**PE Title**	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**
05	02	0602105A	MATERIALS TECHNOLOGY	88.022	29.882	30.258	-	30.258
06	02	0602120A	Sensors and Electronic Survivability	82.449	48.929	43.521	-	43.521
07	02	0602122A	TRACTOR HIP	13.807	14.624	14.230	-	14.230
08	02	0602211A	AVIATION TECHNOLOGY	44.810	43.476	44.610	-	44.610
09	02	0602270A	Electronic Warfare Technology	23.581	17.330	15.790	-	15.790
10	02	0602303A	MISSILE TECHNOLOGY	69.871	49.525	50.685	-	50.685
11	02	0602307A	ADVANCED WEAPONS TECHNOLOGY	19.906	18.190	20.034	-	20.034
12	02	0602308A	Advanced Concepts and Simulation	22.070	20.582	20.933	-	20.933
13	02	0602601A	Combat Vehicle and Automotive Technology	79.649	64.740	64.306	-	64.306
14	02	0602618A	BALLISTICS TECHNOLOGY	73.456	60.342	59.214	-	59.214
15	02	0602622A	Chemical, Smoke and Equipment Defeating Technology	8.706	5.324	4.877	-	4.877
16	02	0602623A	JOINT SERVICE SMALL ARMS PROGRAM	9.001	7.893	8.244	-	8.244
17	02	0602624A	Weapons and Munitions Technology	140.727	42.645	39.813	-	39.813
18	02	0602705A	ELECTRONICS AND ELECTRONIC DEVICES	134.946	60.859	62.962	-	62.962
19	02	0602709A	NIGHT VISION TECHNOLOGY	48.250	40.228	57.203	-	57.203
20	02	0602712A	Countermine Systems	27.892	19.118	20.280	-	20.280
21	02	0602716A	HUMAN FACTORS ENGINEERING TECHNOLOGY	30.395	21.042	21.801	-	21.801
22	02	0602720A	Environmental Quality Technology	17.545	18.364	20.837	-	20.837

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BA# 02: Applied Research

				Cost ($ in Millions)				
Line#	**BA#**	**PE#**	**PE Title**	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**
23	02	0602782A	Command, Control, Communications Technology	31.691	25.573	26.116	-	26.116
24	02	0602783A	COMPUTER AND SOFTWARE TECHNOLOGY	9.896	6.768	8.591	-	8.591
25	02	0602784A	MILITARY ENGINEERING TECHNOLOGY	60.536	79.189	80.317	-	80.317
26	02	0602785A	Manpower/Personnel/Training Technology	16.358	22.198	18.946	-	18.946
27	02	0602786A	Warfighter Technology	37.040	27.746	29.835	-	29.835
28	02	0602787A	MEDICAL TECHNOLOGY	231.001	96.797	105.929	-	105.929
Total: Applied Research				1,321.605	841.364	869.332	-	869.332

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army										DATE: February 2011	
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*				R-1 ITEM NOMENCLATURE PE 0602105A: *MATERIALS TECHNOLOGY*							
COST ($ in Millions)	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**Cost To Complete**	**Total Cost**
Total Program Element	88.022	29.882	30.258	-	30.258	27.999	28.898	29.164	29.630	Continuing	Continuing
H7B: *Advanced Materials Initiatives (CA)*	61.341	-	-	-	-	-	-	-	-	Continuing	Continuing
H7G: *NANOMATERIALS APPLIED RESEARCH*	4.968	5.238	5.299	-	5.299	5.411	5.509	5.593	5.671	Continuing	Continuing
H84: *MATERIALS*	21.713	24.644	24.959	-	24.959	22.588	23.389	23.571	23.959	Continuing	Continuing

Note

FY10 funding decrease to support higher priority efforts.

A. Mission Description and Budget Item Justification

The objective of this program element (PE) is to evaluate materials for lighter weight and more survivable armor and for more lethal armaments. Project H7G supports the design, development, and evaluation of nanostructure materials and project H84 supports the design, development and evaluation of materials for more survivable and lighter weight armor and armaments.

Work in this PE builds on the materials research transitioned from PE 0601102A (Defense Research Sciences), project H42 (Materials and Mechanics) and PE 0601104A (University and Industry Research Centers), project J12 (Institute for Soldier Nanotechnologies) and applies it to specific Army platforms and the individual Soldier.

This work complements and is fully coordinated with efforts in PE 0602618A (Ballistics Technology), PE 0602601A (Combat Vehicle and Automotive Technology), PE 0602786A (Warfighter Technology), PE 0603001A (Warfighter Advanced Technology), PE 0603004A (Weapons and Munitions Advanced Technology), PE 0603005A (Combat Vehicle Advanced Technology), and PE 0708045A (Manufacturing Technology).

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work is performed by the Army Research Laboratory (ARL), Adelphi, MD and Aberdeen Proving Ground, MD.

Project H7B funds congressional special interest items.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army					DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*		R-1 ITEM NOMENCLATURE PE 0602105A: *MATERIALS TECHNOLOGY*			
B. Program Change Summary ($ in Millions)	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**
Previous President's Budget	99.447	29.882	30.155	-	30.155
Current President's Budget	88.022	29.882	30.258	-	30.258
Total Adjustments	-11.425	-	0.103	-	0.103
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	-11.042	-			
• SBIR/STTR Transfer	-0.383	-			
• Adjustments to Budget Years	-	-	0.103	-	0.103

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602105A: *MATERIALS TECHNOLOGY*	PROJECT H7B: *Advanced Materials Initiatives (CA)*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
H7B: *Advanced Materials Initiatives (CA)*	61.341	-	-	-	-	-	-	-	-	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

Congressional Interest Item funding provided for Advanced Materials Initiatives.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Future Affordable Multi-Utility Materials for the Army Future Combat Systems. ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated rapid composite manufacturing process for vehicle materials, Unmanned Air Vehicles (UAVs), and prosthetics fabrication.	7.162	-	-
Title: Nanomanufacturing of Multifunctional Sensors. ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated materials and process methodologies for affordably producing nano to micro-scale multifunctional chemical/biological warfare agent sensors and structural health monitoring sensors.	3.979	-	-
Title: One-Step JP-8 Bio Diesel Fuel. ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated means for producing JP-8 biodiesel in a single step using enzymatic or chemical methods, and utilizing northern climate plants.	1.592	-	-
Title: Composite Applied Research and Technology for Future Combat System and Tactical Vehicle Survivability. ***Description:*** This is a Congressional Interest Item.	3.182	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602105A: *MATERIALS TECHNOLOGY*	PROJECT H7B: *Advanced Materials Initiatives (CA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
FY 2010 Accomplishments: Investigated approaches to advance lightweight multifunctional composites for combat, tactical, air manned/unmanned vehicles, and individual soldier systems.			
Title: Capability Expansion of Spinel Transparent Armor Manufacturing. ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated approaches to producing large, low cost magnesium aluminate (MgAl2O4) spinel transparent armor for lightweight armor technologies.	1.591	-	-
Title: Ultrasonic Impact Technology. ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated a portable device that uses ultrasonic impact technology to restore residual comprehensive stresses in materials.	1.990	-	-
Title: Dual Stage Variable Energy Absorber. ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated technology options to protect soldiers traveling in ground vehicles from mine and Improvised Explosive Device (IED) blasts and vehicle crashes.	2.388	-	-
Title: Modeling and Testing of Next Generation Body Armor. ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated multi-scale modeling capabilities related to personnel protective materials and systems.	1.990	-	-
Title: Development of Improved Lighter-Weight Armor Solutions for Improvised Explosive Devices/Explosively Formed Penetrators ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:***	1.592	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602105A: *MATERIALS TECHNOLOGY*	PROJECT H7B: *Advanced Materials Initiatives (CA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Investigated prospective high performance ballistic armor applications.			
Title: Advanced Conductivity Program (ACP). ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Fabricated transparent, conductive coatings intended to reflect in the infrared and evaluated their performance.	0.995	-	-
Title: Affordable Light-Weight Metal Matrix Composite (MMC) Armor ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Established a lightweight MMC production facility.	2.487	-	-
Title: Ballistic Armor Research ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Conducted research into advanced, lightweight, multifunctional composites.	3.183	-	-
Title: Lattice Block Structures for AM2 (aluminum matting) Matting Replacement ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated approaches for a lightweight, strong and easy to install replacement for AM-2.	1.592	-	-
Title: Moldable Fabric Armor ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated a moldable fabric technology.	2.228	-	-
Title: Renewable Jet Fuel from Lignocellulosic Feedstocks ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:***	2.388	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602105A: *MATERIALS TECHNOLOGY*	PROJECT H7B: *Advanced Materials Initiatives (CA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Investigated a bio-oil production process using lignocelluloses (refers to plant biomass that is composed of cellulose) materials.			
Title: Dev, Opt, & Trf of Reliable Test Tech for Materials Designed to Protect WF Against Toxic Chem Agents ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated approaches to assess the protective capabilities of different materials against permeation/penetration by chemical warfare agents.	0.478	-	-
Title: Ultra Lightweight Metallic Armor ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated materials technology for preliminary characterization, testing, and qualification of high strength magnesium alloy wrought materials.	0.796	-	-
Title: Aluminum Armor Project ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated technology options for providing better protection against attacks.	0.836	-	-
Title: Smart Integrated Systems: Materials, Manufacturing Methods, and Structures ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated options for implementing an integrated approach to smart materials, manufacturing methods, and structures.	0.995	-	-
Title: Reactive Materials ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated technologies for reactive materials.	1.194	-	-
Title: Large-Scale Manufacturing of Revolutionary Nanostructured Materials	1.194	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602105A: *MATERIALS TECHNOLOGY*	PROJECT H7B: *Advanced Materials Initiatives (CA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Assessed advanced materials concepts for military components.			
Title: Next Generation High Strength Glass Fibers for Ballistic Armor Applications ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated high strength glass fibers for use in composite armoring materials.	1.592	-	-
Title: High Strength Glass Production and Qualification for Armor Applications ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated development of alternative sources for high strength glass production.	1.592	-	-
Title: Advanced Nanocomposite Materials for Lightweight Integrated Armor Systems ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated technology options for lightweight nanocomposite materials.	1.592	-	-
Title: Materials Technology for light-emitting diode (LED) Lighting Applications ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated materials for improved thermal interface adhesive for LED lighting applications.	2.388	-	-
Title: Fused Silica for Large-Format Transparent Armor ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated new transparent armor materials technologies.	3.183	-	-
Title: Lightweight Metal Alloy Foam for Armor	3.183	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602105A: *MATERIALS TECHNOLOGY*	PROJECT H7B: *Advanced Materials Initiatives (CA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated approaches to produce small hollow shapes (spheres) of various metal alloys including stainless steel.			
Title: Advanced Composite Research for Vehicles ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Performed research on composite materials with potential military applications.	3.979	-	-
Accomplishments/Planned Programs Subtotals	61.341	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602105A: *MATERIALS TECHNOLOGY*	PROJECT H7G: *NANOMATERIALS APPLIED RESEARCH*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
H7G: *NANOMATERIALS APPLIED RESEARCH*	4.968	5.238	5.299	-	5.299	5.411	5.509	5.593	5.671	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

The objective of this project is to support the design, development, and evaluation of nanostructure materials that improve the Soldier's survivability. This project funds collaborative applied research and integration of government, academic, and industry scientific research on nanomaterials derived from PE 0601104A/project J12 (Institute for Soldier Nanotechnologies (ISN)) to advance innovative capabilities.

The work is a collaborative effort between the ISN at the Massachusetts Institute of Technology, the Army Laboratories and Research, Development, and Engineering Centers, and the ISN industrial partners.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this project is performed by the Army Research Laboratory (ARL), Adelphi, MD and Aberdeen Proving Ground, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Nanomaterials Applied Research	4.968	5.238	5.299
Description: Devise and validate improved, physics-based, materials property models and concepts for multifunctional, lightweight, and responsive hierarchical material technologies. Exploit breakthroughs in nanomaterials and multifunctional fiber processing technologies (e.g., scale-up of processes and fabrication into woven materials) to enable revolutionary future Soldier program's protection capabilities. Coordinated research program is conducted internally by ARL and externally through a collaborative effort with ISN and ISN industry partners.			
FY 2010 Accomplishments: Examined concepts for the absorption of energy in personnel protection applications.			
FY 2011 Plans: Research novel materials and hybridization of materials for personnel protection in ballistic environments.			
FY 2012 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602105A: *MATERIALS TECHNOLOGY*	PROJECT H7G: *NANOMATERIALS APPLIED RESEARCH*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Will investigate the incorporation of nanoparticles, nanotubes and nanofibers into materials systems to produce novel sensing capabilities for enhanced situational awareness.			
Accomplishments/Planned Programs Subtotals	4.968	5.238	5.299

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602105A: *MATERIALS TECHNOLOGY*	PROJECT H84: *MATERIALS*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
H84: *MATERIALS*	21.713	24.644	24.959	-	24.959	22.588	23.389	23.571	23.959	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

The objective of this project is to support the design, development, and evaluation of materials that enable more survivable and lighter weight armor and armaments. This project provides the technical foundation for materials technologies in metals, ceramics, polymers, and composites. This project addresses the need for more survivability and lighter weight armaments through nanomaterials research across the spectrum of applications to improve performance, improved, physics-based, material, mechanical, and structural models; high strain rate material characterization techniques, non-destructive inspection/evaluation technologies, new high strength/temperature materials and coatings; and advanced fabrication/processing methodologies. Applied research efforts are focused on armor/armament materials, as well as lightweight structural/electronic materials and materials affording protection against chemical, biological, or directed energy threats. The overarching goals of this research are to provide optimized lightweight armor structures, improved affordable processing methods, and the development of modeling and simulation tools to facilitate future design efforts in support of current and future force systems.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

The work is conducted by the Army Research Laboratory (ARL) at its Aberdeen Proving Ground, MD, and Hampton, VA, locations.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Structural Armor	5.225	5.913	6.975
Description: Optimize lightweight armor materials/structures, processing methodology, and modeling and simulation tools to enable formulation of lightweight, frontal, and structural armors.			
FY 2010 Accomplishments: Optimized glass-ceramic laminate transparent composite materials at reduced weight; and examined interlaminar properties of multilaminate materials to optimize performance and reduce weight.			
FY 2011 Plans: Determine candidate materials and configurations for ceramic only transparent armor solutions; and characterize materials properties and microstructures to determine optimal configurations for ballistic protection.			
FY 2012 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602105A: *MATERIALS TECHNOLOGY*	PROJECT H84: *MATERIALS*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Will develop and validate model capability for composite materials that includes high rate effects, thermal effects and fatigue; will characterize the high rate properties of structural adhesives for inclusion in armor solutions; and will synthesize novel adhesive compositions.			
Title: Soldier-Borne Armor ***Description:*** Optimize lightweight armor materials and defeat mechanisms against emerging threats to enable affordable design of multifunctional ballistic protective systems for the future Soldier. Provide quantitative scientific basis for modeling and simulation that result in new lethal mechanisms/protection schemes for the individual warfighter. ***FY 2010 Accomplishments:*** Developed and formulated materials that allow for optimal ballistic performance from low, intermediate, and high velocity impacts and blast waves; and refined three dimensional reinforcement concepts for composite materials. ***FY 2011 Plans:*** Develop new, mass-efficient, protection materials and technologies to mitigate energy from both ballistic and blast events. ***FY 2012 Plans:*** Will provide the capability to non-destructively characterize the relationship between ceramic tile quality and ballistic performance; and will validate the synthesis of rate dependent soft material tissue surrogates for the development and characterization of personnel armor concepts.	2.779	3.150	2.759
Title: Composites ***Description:*** Design, validate, and optimize advanced materials (ceramic, composite, polymers, lightweight and high-strength metals) including processing techniques for protection against smaller but more lethal penetrators/warheads using affordable, lightweight, high performance armaments for revolutionary weapons effectiveness in urban and irregular operations. ***FY 2010 Accomplishments:*** Developed novel nano to micro-structures in metallic materials; characterized microstructures including high and low rate properties; and identified effect of parameters leading to shear in plastically deformed metals. ***FY 2011 Plans:*** Establish a complete set of parameters that will lead to adiabatic (no heat given off or absorbed) shear behavior of fully dense pure metals; and will develop a scaled processing approach for fully dense pure metals and produce samples of sufficient size to permit sub-scale ballistic evaluation. ***FY 2012 Plans:***	4.118	4.533	3.916

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602105A: *MATERIALS TECHNOLOGY*	PROJECT H84: *MATERIALS*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Will develop cold spray techniques to successfully deposit novel material compositions in confined spaces; will validate methods for the composite cladding of advanced gun barrel designs; and will validate improvements in gun barrel erosion.			
Title: Electronic Materials ***Description:*** Design and optimize electro-ceramic materials and processing techniques for integration by the Communications-Electronics Research, Development, and Engineering Command (CERDEC) into advanced antennas that will enable affordable and reliable command, control and communications (C3) for current and future force platforms. ***FY 2010 Accomplishments:*** Developed methodologies to enable low defect synthesis of ferroelectric oxide thin film materials for high quality factor/ low insertion loss devices; evaluated and developed methodologies to enable materials for Complementary Metal-Oxide Semiconductor (CMOS) compatible low cost integration; and employed theoretical formalisms to aid the design of materials for tunable device components. ***FY 2011 Plans:*** Advance optimization methodologies to enable low defect synthesis of ferroelectric oxide thin film materials; and perform optimization of low temperature synthesis of ferroelectric oxide thin film materials for CMOS compatibility and integration. ***FY 2012 Plans:*** Will develop the material designs, fabrication methods, and process science protocols required for CERDEC to achieve high quality, affordable, performance consistent, tunable beam steering antenna elements.	0.497	0.500	0.514
Title: Nanomaterials ***Description:*** Mature and scale-up nanomaterials processes, fabrication, characterization and performance measures to enable revolutionary concepts for future force lethality and survivability beyond those addressed for individual Soldier protection in project H7G. ***FY 2010 Accomplishments:*** Developed relationships between scaled-up processing of nanoscale materials and processing; and characterized reactive materials and provided feedback to model developers. ***FY 2011 Plans:*** Develop new reactive structural material compositions and optimize microstructures based on models and experiments; and characterize nanoscale structures using analytical microscopy tools. ***FY 2012 Plans:***	1.390	1.486	1.544

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602105A: *MATERIALS TECHNOLOGY*	PROJECT H84: *MATERIALS*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Will validate nanograined metallic structures fabrication process using thermodynamic techniques, and will provide an initial validation of the improvement in the ballistic capability of transparent materials reinforced with natural cellulose nanofibers.			
Title: Multifunctional Armor ***Description:*** Armor Materials. Material technologies for Soldier personnel protection will be transitioned to PE 0602786/project H98. Materials for reactive armor and electromagnetic armor concepts will be used in PE 0602618/project H80, and refined in PE 0602601/project C05. ***FY 2010 Accomplishments:*** Characterized ceramic materials for high strain rate/shock properties; examined the tradeoff of stiffness versus damage tolerance in materials systems by quantified constitutive property behaviors; and completed investigation/design of material properties for reactive armor effectors and electromagnetic armors coils. ***FY 2011 Plans:*** Perform failure mode characterization of passive and active armor materials; determine propagation fracture toughness in ceramics; measure and model residual stress in metal matrix composite armor materials; develop scale up processes for multi-modal materials microstructures; and examine novel metallic structures to reduce weight and manage ballistic impact loads. ***FY 2012 Plans:*** Will provide new multifunctional composite materials with structural and power storage capability; will develop synthesis routes for soft polymer nano-composites with controllable electrical properties; and will provide composite materials with improved damage tolerance for use in ultra-lightweight structures and armors.	7.704	9.062	9.251
Accomplishments/Planned Programs Subtotals	21.713	24.644	24.959

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army										DATE: February 2011	
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*				R-1 ITEM NOMENCLATURE PE 0602120A: *Sensors and Electronic Survivability*							
COST ($ in Millions)	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**Cost To Complete**	**Total Cost**
Total Program Element	82.449	48.929	43.521	-	43.521	47.014	54.378	54.909	56.254	Continuing	Continuing
H15: *GROUND COMBAT ID TECH*	7.568	7.874	2.069	-	2.069	2.169	4.815	4.691	4.381	Continuing	Continuing
H16: *S3I TECHNOLOGY*	19.298	17.910	19.914	-	19.914	20.768	22.060	22.080	22.682	Continuing	Continuing
SA1: *Sensors and Electronic Initiatives (CA)*	33.246	-	-	-	-	-	-	-	-	Continuing	Continuing
SA2: *BIOTECHNOLOGY APPLIED RESEARCH*	5.585	5.884	5.485	-	5.485	5.895	6.203	6.304	6.413	Continuing	Continuing
TS1: *TACTICAL SPACE RESEARCH*	1.596	1.695	3.725	-	3.725	4.257	4.900	5.364	6.028	Continuing	Continuing
TS2: *ROBOTICS TECHNOLOGY*	15.156	15.566	12.328	-	12.328	13.925	16.400	16.470	16.750	Continuing	Continuing

Note

FY10 funding increase for congressional special interest items.
FY12 funding realigned to higher priority efforts.

A. Mission Description and Budget Item Justification

The focus of this program element (PE) is to investigate research and evaluation of sensors and electronic technologies that enhance survivability, lethality, deployability, and sustainability capabilities. Focus is on research that provides the ability for joint fires to locate, identify, track, and engage targets as necessary with the overall goal of increasing lethality and survivability through the reduction of fratricide (project H15); research on advanced sensors, signal processing and information technologies that provide decisive new capabilities to locate, identify, and engage battlefield targets in tactical and urban environments (project H16); research on biological sensors and biologically derived electronics that exploits breakthroughs in biotechnology basic research in collaboration with the Institute for Collaborative Biotechnology (ICB) a University Affiliated Research Center (UARC) led by the University of California, Santa Barbara in partnership with California Institute of Technology and Massachusetts Institute of Technology and their industry partners (project SA2); research and evaluation of space-based remote sensing, signal, and information processing technology in collaboration with other Department of Defense (DoD) and government agencies to support space force enhancement and space superiority advanced technology integration into Army battlefield operating systems (project TS1); research on advancing perception for autonomous ground mobility, intelligent vehicle control and behaviors, human-robot interaction, robotic manipulation, and unique mobility for unmanned vehicles (project TS2).

Projects SA1 and SA3 fund congressional special interest items.

Work in this program element (PE) complements and is fully coordinated with efforts in PE 0602307A (Advanced Weapons Technology), PE 0602705A (Electronics and Electronic Devices), PE 0602709A (Night Vision Technology), PE 0602782A (Command, Control, Communications Technology), PE 0603772A (Advanced Tactical

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army	DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	**R-1 ITEM NOMENCLATURE** PE 0602120A: *Sensors and Electronic Survivability*

Computer Science and Sensor Technology), PE 0603006A (Command, Control, Communications Advanced Technology), PE 0603710A (Night Vision Advanced Technologies), and PE 0603001A (Warfighter Advanced Technology). and PE 0603008A (Command Electronic Warfare Advanced Technology).

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work is performed by the Army Research Laboratory, Adelphi, MD and Aberdeen Proving Ground, MD, the Communications-Electronics Research, Development, and Engineering Center, Ft. Monmouth, NJ, and the US Army Space and Missile Defense Technical Center, Huntsville, AL.

B. Program Change Summary ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Previous President's Budget	70.272	48.929	50.543	-	50.543
Current President's Budget	82.449	48.929	43.521	-	43.521
Total Adjustments	12.177	-	-7.022	-	-7.022
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	13.350	-			
• SBIR/STTR Transfer	-1.173	-			
• Adjustments to Budget Years	-	-	-7.022	-	-7.022

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602120A: *Sensors and Electronic Survivability*	PROJECT H15: *GROUND COMBAT ID TECH*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
H15: *GROUND COMBAT ID TECH*	7.568	7.874	2.069	-	2.069	2.169	4.815	4.691	4.381	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project researches and investigates emergent combat identification (CID) technologies for Joint, allied, and coalition air-to-ground and ground-to-ground mounted, dismounted, forward observer, and forward air controller missions. Efforts include research on enabling technologies to provide a common battlespace picture for joint coalition situation awareness and fusion efforts to increase the survivability and lethality of coalition forces by fusing battlefield sensor and situational awareness data to identify friend from foe.

Efforts in this project are complimentary of PE 0603270A (EW Technology), PE 0602270A (EW Techniques), and other Services, allies and coalition partners as necessary.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work is performed by the Communications-Electronics Research, Development, and Engineering Center (CERDEC), Fort Monmouth, NJ and Aberdeen Proving Ground, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Combat Identification (CID) Technologies	4.083	4.557	2.069
Description: Focus of this effort is to develop and evaluate potentially cost effective CID approaches that reduce fratricide, using non-traditional sensors to increase situational awareness (SA), and increase combat effectiveness of Soldier based and Brigade Combat Team (BCT) CID technologies. Work being accomplished under PE 0603270A/project K16 complements this effort.			
FY 2010 Accomplishments: Assessed technologies for incorporation into a universal/multi-platform CID capability. Candidate technologies included the Soldier Radio Waveform, laser/RF time difference of arrival, and geometric pairing techniques at point of detection/response; experimented with CID/SA data display.			
FY 2011 Plans: Model fusion algorithms for improved battlespace awareness to include geolocation and target identification algorithms utilizing blue force emitter information to resolve current radar, laser, and ultra-violet/infrared (UV/IR) warning receiver sensor ambiguities;			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602120A: *Sensors and Electronic Survivability*	PROJECT H15: *GROUND COMBAT ID TECH*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
link to Distributed Common Ground System-Army (DCGS-A) Enterprise for initial assessment/user jury to obtain user community feedback and recommendations for algorithm improvements; perform communication and network modeling and simulation. ***FY 2012 Plans:*** Will improve algorithms to deconflict, fuse and correlate warning receiver and blue force emitter data with DCGS-A provided intelligence, surveillance and reconnaissance, based on initial user jury results; will investigate data transport requirements needed to support the generation of an enterprise-wide ground and air common operating picture that provides accurate and timely reporting of high value targets for enterprise-wide as well as organic platform SA for increased CID awareness.			
Title: Multi-Intelligence Data Fusion and Targeting ***Description:*** This effort investigates and develops software technologies for intelligence/battle command (Intel/BC) enterprise collaboration to provide faster and higher quality decision making support for the Commander and his key staff. Specific efforts focus on integrating the intelligence surveillance and reconnaissance planning and execution at the task force/battalion level through troop-level as well as efforts that enable the enterprise to identify, fuse, and trace/track specific human targets in an asymmetric environment. Work being accomplished under PE 0602270A/project 906 compliments this effort. ***FY 2010 Accomplishments:*** Coded, integrated and assessed a multi-intelligence sensor manager and planner into DCGS-A and Tactical Ground Reporting Network (TiGRNet); functionally mapped battle command mission tasks with the needed intelligence and geospatial data and collection opportunities; developed data extraction tools to incorporate political, military, economic and social information infrastructure and behavior modeling data using DCGS-A compliant multi-intelligence correlation service, integrated imagery and video data products for additional fidelity; developed a video-based tracker service for real-time and forensic viewing and analysis. ***FY 2011 Plans:*** Associate Intel requirements, geolocation data needs and collection opportunities with operational mission tasks for Intel and BC communities; mature common architecture and framework to provide a portable software environment, storage and access for Intel and Operations communities. Complementary work is also being accomplished under PE 0602270A/project 906.	3.485	3.317	-
Accomplishments/Planned Programs Subtotals	7.568	7.874	2.069

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	**R-1 ITEM NOMENCLATURE** PE 0602120A: *Sensors and Electronic Survivability*	**PROJECT** H15: *GROUND COMBAT ID TECH*

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

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APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602120A: *Sensors and Electronic Survivability*	PROJECT H16: *S3I TECHNOLOGY*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
H16: *S3I TECHNOLOGY*	19.298	17.910	19.914	-	19.914	20.768	22.060	22.080	22.682	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

The objective of this project is to focus on applied research of advanced sensors, signal processing, and information technologies that will enable the future Soldier with decisive new capabilities to locate, identify, and engage battlefield targets in tactical and urban environments. The ultimate impact and utility of this work will be to greatly increase the lethality, range, and speed of engagement of the Soldier. Emphasis is on solving critical Army-specific battlefield sensing and information management problems such as false targets, complex terrain (including urban applications), movement of sensors on military vehicles, and exploitation of multimodal sensors.

Significant areas of research include: low cost sensors designed to be employed in large numbers as unattended ground sensors (UGS) for force protection, hostile fire defeat, homeland defense, counter terrorism operations, and munitions; tagging, tracking, and locating (TTL) of non-traditional targets; fusion of disparate sensors such as acoustic, seismic, electric-field (E-field), magnetic, radar, infrared (IR), forward looking IR (FLIR), laser detection and ranging (LADAR), visible imagers; low cost acoustic, seismic, and magnetic sensors that can passively detect, classify, and track battlefield targets such as personnel, heavy/light vehicles, and helicopters. Other areas of research include sensing technologies to locate gun fire and other hostile threats; enable stand-off characterization of infrastructure, equipment or materials; and allow the detection, tracking, and assessment of humans, especially in urban terrain. Further areas of research are high performance multi-function radio frequency (RF) systems that allow consolidated target acquisition, combat identification (ID), active protection, surveillance, and communications systems; passive and active RF sensors capable of high-resolution imaging to detect targets hidden in foliage, smoke, and fog; ultra wideband radar work enabling buried mine detection and target imaging through dense foliage and greatly enhanced robotic mobility; and Ultra-violet (UV) optoelectronics for battlefield sensors. Additional areas of research are aided/automatic target recognition (ATR) allowing sensors to autonomously locate and identify targets; advanced battlefield sensor and information processing to conduct a dynamic and real time situational assessment to present a common picture of the battlespace focused on low echelon commanders; and advanced information processing methods to provide automatic information technologies that utilize widely dispersed sensor and legacy information sources.

This work complements and is fully coordinated with the Communications and Electronics Research, Development, and Engineering Center (CERDEC), other Research and Development Engineering Centers (RDECs), and the Defense Advanced Research Projects Agency (DARPA).

This work is related to and fully coordinated with efforts funded in PE 0602709A (Night Vision Technology), PE 0603710A (Night Vision Advanced Technologies), and PE 0603001A (Warfighter Advanced Technology).

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602120A: *Sensors and Electronic Survivability*	PROJECT H16: *S3I TECHNOLOGY*

Work in this area is performed by the Army Research Laboratory (ARL), Adelphi, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Unattended Ground Sensors (UGS)	4.731	6.042	6.260
Description: Develop technologies for multi-modal low-cost UGS to enhance persistent sensing capabilities with increased probability of target detection and reduced false alarms. Research focus is based on opportunities and feedback from UGS used in Operation Iraqi Freedom, Operation Enduring Freedom, and other theaters. A key focus is on detecting and discrimination between people and animals. ***FY 2010 Accomplishments:*** Along with the United States Marine Corps and others, advanced the concept of UGS for persistent surveillance and developed standard protocols and communications, implemented acoustic wind and flow mitigation techniques on moving and airborne systems; expanded transient classification capabilities; enhanced Micro Electro Mechanical System magnetic sensor sensitivity and detection algorithms; evaluated non-erasable magnetic memory; and implemented E-field sensor system to conduct target detection, material characterization, and subsurface imaging. ***FY 2011 Plans:*** Implementing the concept of UGS for persistent surveillance with increased interoperability with multiple UGS vendors; enhancing acoustic localization accuracy through meteorological correction of solution vectors; exploiting acoustic, seismic, magnetic, and electric fields for locating, reliable target characterization, and classification; and investigating airborne multimodal sensing of targets. ***FY 2012 Plans:*** Will investigate new fusion techniques for enhanced discrimination between vehicles, humans and animals and will develop algorithms for acquiring 360 degree situational awareness from multisensory wide-area persistent surveillance platforms.; will apply acoustic, seismic, magnetic, and E-field to subsurface anomaly detection and characterization; will apply advanced transient event classification algorithms to fielded acoustic systems; and will enhance detection range and localization accuracy of airborne acoustic systems to include an unmanned aerial vehicle (UAV) with both acoustic and E-field sensors.			
Title: Sensor and Data Fusion	4.515	4.722	5.427
Description: Investigate and devise hyper-modal sensor data fusion for detecting and classifying humans, human infrastructure in urban operations, such as personnel, adversarial, vehicles, machinery, RF emissions, chemicals, and computers in hidden and confined spaces such as tunnels, caves, sewers, and buildings. ***FY 2010 Accomplishments:***			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602120A: *Sensors and Electronic Survivability*	PROJECT H16: *S3I TECHNOLOGY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Transitioned sensor fusion research from the US-UK International Technology Alliance to support Coalition Warfare Programs; implemented diverse modality sensor and information fusion for enhanced situational awareness for hostile fire defeat; experimentally validated optical, acoustic, E-field, RF, IR, retroreflection and other threat-detection sensors and fusion algorithms on UGS, man-wearable, vehicles, robotic, as well as other airborne systems; and assessed low-cost implementations of solar blind avalanche detector. ***FY 2011 Plans:*** Implementing novel fusion methodologies, and decentralized and distributed data fusion using heterogeneous sensor systems, platforms, and networks to performing enhanced detection, tracking, and classification of threats; exploiting multi-modal sensing and fusion concepts to characterize underground facilities, materiel and tunnels; developing new policy-based sensor information algorithms for robust communication up to coalition level; and implementing new computationally efficient anomaly detection algorithms for imaging target recognition. ***FY 2012 Plans:*** Will apply advanced fusion algorithms to multimodal sensors and systems; will exploit magnetic and E-field fusion for equipment characterization, power line monitoring, and target localization; will employ acoustic and seismic techniques to augment E-field subsurface imaging; will enhance sensing from airborne platforms with multimodal sensors, cueing and fusion algorithms; and will implement fusion algorithms to discriminate humans versus other targets with high accuracy.			
Title: Tagging Tracking and Locating (TTL) ***Description:*** Conduct applied research to support advances in state-of-the-art clandestine TTL for non-traditional hostile forces and non-cooperative targets. Specific technical details related to this effort are classified. This effort will directly support the Communication-Electronics Research, Development, and Engineering Center's (CERDEC) advanced research in clandestine TTL. ***FY 2010 Accomplishments:*** Conducted research to integrate TTL with UGS; completed an advanced RF integrated circuit for an RF Tag; and completed the design of a 2nd generation IR Tag. ***FY 2011 Plans:*** Design, fabricate, and evaluate TTL experimental devices including UGS integration, RF Tags, and IR Tags for transition to CERDEC. ***FY 2012 Plans:***	0.985	1.028	1.553

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602120A: *Sensors and Electronic Survivability*	PROJECT H16: *S3I TECHNOLOGY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Will optimize and transition TTL technologies to CERDEC and implement improvements to RF and IR Tags.			
Title: Ultra Wideband Radar ***Description:*** Develop technical underpinnings of ultra wideband (UWB) radar for several key Army concealed target detection technology requirements including landmine detection, sensing through-the-wall (STTW), and obstacle detection. Validate advanced computational electromagnetic algorithms and estimate performance of proposed radar systems as well as predict target signatures. ***FY 2010 Accomplishments:*** Implemented effective target/clutter discrimination algorithms using advanced signal processing techniques including change detection; devised rough-ground models to compute radar backscatter over UHF and L-band and compare to radar forward-looking measurements over road surfaces; devised realistic computer-aided-design models for rooms of high complexity, including plumbing, heating ventilation, air-conditioning systems, and wiring; as well as computed radar images over typical STTW frequency band and compared the exact solution with approximate solver (Xpatch) to quantify approximations. ***FY 2011 Plans:*** Investigate advanced Improvised Explosive Device (IED)-discrimination algorithms and technologies that exploit physics-based features to reduce false alarms in low-artifact radar imagery. ***FY 2012 Plans:*** Will collect data with improved forward-looking UWB radar testbed to assess IED detection performance gains relating to the following areas: increased antenna height above ground, new antenna/balun design with enhanced low frequency content for better ground penetration, and polarimetric effects; and will investigate techniques to utilize information embedded in low frequency radar data to develop an effective combination of interior building maps, moving target indication algorithms and RF Measurement & Signatures Intelligence technology.	3.310	2.271	2.945
Title: Multi Function Radio Frequency System (MFRFS) and Wide Bandgap Optoelectronics ***Description:*** Develop MFRFS for use on small ground and air vehicles and future Soldier technologies. Develop understanding of phenomenology for an integrated RF sensor that performs radio, radar, and control functions to allow communications, combat ID, target acquisition/tracking, active protection, and munitions-command guidance. Develop Aluminum-Gallium-Nitride based semiconductor UV optoelectronics for communications, water/air/surface purification, and photoluminescent detection of biological threats. ***FY 2010 Accomplishments:***	3.365	1.236	1.138

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602120A: *Sensors and Electronic Survivability*	PROJECT H16: *S3I TECHNOLOGY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Developed algorithms to extract RF biometric signatures for CERDEC All-terrain Radar for Tactical Exploitation of Moving target indicator and Imaging Surveillance; programmed and explored sub-millimeter Wave (mmW) phenomenology for application to human-borne IED detection; and pursued high-efficiency 280-nm light-emitting-diode (LED) sources. ***FY 2011 Plans:*** Apply RF biometric algorithms to an unattended compact radar for perimeter watching as part of a larger Unmanned Ground System network and establish baseline designs of a sub-mmW imager for human-borne IED detection. Extend UV source and detector research to 250-nm. ***FY 2012 Plans:*** Will develop new methods of moving target classification based on micro-doppler analysis; will explore the phenomenology and image processing associated with sub-mmW imaging of human borne IEDs and validate new sub-mmW / terahertz device technology; and will continue and extend research on 230-275-nm optical sources including LEDs, lasers, and detectors.			
Title: Information Fusion ***Description:*** Improve the lower echelon commander's (i.e. platoon) situational understanding in complex/urban terrain by developing infrastructure and validating algorithms, filters and agent technologies to reduce cognitive load by fusing information. ***FY 2010 Accomplishments:*** Conducted experiments to assess the effectiveness of collaborative bio-inspired surveillance algorithms using fixed and mobile assets operating in Military relevant environments (e.g., Command, Control, Communications, Computers and Information, Surveillance and Reconnaissance On the Move). ***FY 2011 Plans:*** Investigate the transition of Network Science and the Micro Autonomous Systems and Technology Collaborative Technology Alliance technologies and assess their potential impact on persistent surveillance for situational awareness. ***FY 2012 Plans:*** Develop algorithms and enhance applications directed to persistent surveillance, sensor management, and asset-to-asset taskings to minimize the cognitive workload of a lower echelon commander.	2.392	2.611	2.591
Accomplishments/Planned Programs Subtotals	19.298	17.910	19.914

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602120A: *Sensors and Electronic Survivability*	PROJECT H16: *S3I TECHNOLOGY*

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602120A: *Sensors and Electronic Survivability*	PROJECT SA1: *Sensors and Electronic Initiatives (CA)*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
SA1: *Sensors and Electronic Initiatives (CA)*	33.246	-	-	-	-	-	-	-	-	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

Congressional Interest Item funding provided for Sensors and Electronic Initiatives.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Advanced Detection of Explosives Program ***Description:*** This is a Congressional Special Interest Item ***FY 2010 Accomplishments:*** Investigated an innovative remote sensor monitoring technology for advanced stand-off detection of explosives.	1.591	-	-
Title: Next Generation Wearable Video Capture System ***Description:*** This is a Congressional Special Interest Item ***FY 2010 Accomplishments:*** Investigated wearable video capturing technology for soldier applications.	0.796	-	-
Title: Advanced UV Light Diode Sensor Development ***Description:*** This is a Congressional Special Interest Item ***FY 2010 Accomplishments:*** Investigated options to improve wall plug efficiency in deep ultraviolet light sources.	0.796	-	-
Title: Diamond Lens Elements for High-Powered Lasers ***Description:*** This is a Congressional Special Interest Item ***FY 2010 Accomplishments:***	0.795	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602120A: *Sensors and Electronic Survivability*	PROJECT SA1: *Sensors and Electronic Initiatives (CA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Investigated technologies in 25 millimeter single crystal diamond substrates for the purpose of creating heat spreader and optical elements for high powered lasers.			
Title: Surveillance Augmentation Vehicle ***Description:*** This is a Congressional Special Interest Item ***FY 2010 Accomplishments:*** Investigated technologies for human target detection, recognition, and location in a 4 km diameter circle to improve situational awareness.	1.194	-	-
Title: Terahertz Sensing and Imaging Technology ***Description:*** This is a Congressional Special Interest Item ***FY 2010 Accomplishments:*** Investigated portable Terahertz (electromagnetic (EM) wave frequency equal to one trillion hertz) sensing and imaging technology that has the potential to detect hidden or concealed objects.	1.592	-	-
Title: Electronic Keel ***Description:*** This is a Congressional Special Interest Item ***FY 2010 Accomplishments:*** Investigated technologies intended to improve computing power in ground vehicles.	1.592	-	-
Title: Advanced Bonded Diamond for Optical Applications ***Description:*** This is a Congressional Special Interest Item ***FY 2010 Accomplishments:*** Investigated use of a chemical vapor deposition diamond heat spreader as a heat management component in solid state laser systems.	1.990	-	-
Title: Advanced Communications for Mobile Networks ***Description:*** This is a Congressional Special Interest Item ***FY 2010 Accomplishments:***	3.183	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602120A: *Sensors and Electronic Survivability*	PROJECT SA1: *Sensors and Electronic Initiatives (CA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Investigated technologies for small units with advanced mobile communications equipment.			
Title: Advanced Tactical Laser Flashlight ***Description:*** This is a Congressional Special Interest Item ***FY 2010 Accomplishments:*** Investigated technologies for an Advanced Tactical Laser Flashlight Devices (ATLFD) to address the potential Army needs.	0.796	-	-
Title: Compact Biothreat Rapid Analysis Concept ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This effort investigated technology concepts for biothreat detection.	4.775	-	-
Title: Command, Control, Communications Technology ***Description:*** This is a Congressional Interest Item ***FY 2010 Accomplishments:*** This Congressional Interest Item developed an application framework for edge-developed (configurable in the field) applications based on open software protocols and standards to improve component and service reuse, flexibility and platform portability.	1.592	-	-
Title: Nanoelectronic Memory, Sensor and Energy Devices ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated nanosensor technology with potential applications for detecting explosives, chemicals and motion.	6.267	-	-
Title: Distributed, Networked, Unmanned Ground Systems for Enhanced Reconnaissance, Surveillance, and Target Acquisition (RSTA) ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated technology approaches to increasing sensor coverage area on the battlefield while keeping within the current bandwidth limitations of tactical information networks.	3.183	-	-
Title: Nanophotonic Biosensor Detection of Bioagents and Pathogens	1.512	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602120A: *Sensors and Electronic Survivability*	PROJECT SA1: *Sensors and Electronic Initiatives (CA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This effort investigated nanophotonic biosensors to facilitate direct, rapid, and extremely sensitive detection of bioagents and pathogens using surface enhanced Raman spectroscopy.			
Title: Force Protection Radar for Forward Operating Bases ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated a portable, rugged radar system for the Army to identify perimeter threats despite obscured weather conditions or dense foliage at combat bases.	1.592	-	-
Accomplishments/Planned Programs Subtotals	33.246	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602120A: *Sensors and Electronic Survivability*	PROJECT SA2: *BIOTECHNOLOGY APPLIED RESEARCH*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
SA2: *BIOTECHNOLOGY APPLIED RESEARCH*	5.585	5.884	5.485	-	5.485	5.895	6.203	6.304	6.413	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

The objective of this project is to transition biotechnology research from PE 0601104/H05, Institute for Collaborative Biotechnologies (ICB). The ICB is led by the University of California, Santa Barbara (Santa Barbara, CA) in partnership with the California Institute of Technology (Pasadena, CA) and the Massachusetts Institute of Technology (Cambridge, MA). Applied research will be conducted that transitions breakthroughs in biotechnology basic research from the ICB to enable capabilities in sensors, electronics, photonics, and network science. Areas of applied research include bio-array sensors, biological, and bio-inspired power generation and storage, biomimetics, proteomics, genomics, network science, DNA research and development, control of protein, and gene expression. Efforts include designing and performing multi-scale dynamic and predictive modeling to understand biologically-inspired "sense and respond" systems: integrated system of sensor, information processing, and response mechanism and their components. The Army Research Laboratory and other Army organizations, including the Natick Soldier Research, Development, and Engineering Center, and Edgewood Chemical Biological Center, in collaboration with the ICB industry partners, will conduct applied research focused on biological sensors, biological, and bio-inspired materials, and biological and bio-inspired power generation and storage. The in-house research program (~20%) will link the ICB research to Army requirements and enhance the transition of this technology into the Army. The remaining funding (~80%) is focused on competitively awarded joint projects led by an ICB Industrial partner in collaboration with an Army laboratory and an ICB faculty member to transition ICB research into the Army and industry. The projects are programmed for three years each and are reviewed annually. Projects are intended to cover the entire breadth of the ICB program.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work is performed by the Army Research Laboratory, Adelphi, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Institute for Collaborative Biotechnologies (ICB)	5.585	5.884	5.485
Description: Transition biotechnology research from PE 0601104/H05, Institute for Collaborative Biotechnologies (ICB) to enable capabilities in sensors, electronics, photonics, and network science.			
FY 2010 Accomplishments:			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602120A: *Sensors and Electronic Survivability*	PROJECT SA2: *BIOTECHNOLOGY APPLIED RESEARCH*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Fabricated and evaluated uncooled thermal detector materials; evaluated algorithms for optimized collection of data from sensor networks; characterized reversible adhesive pads based on gecko-inspired design; designed and fabricated open-channel micro-fluidic devices for use in surface-enhanced Raman spectroscopy for explosives detection in the vapor phase; incorporated bio-inspired flocking and search algorithms into the GeoTrack system, and began the design of adaptive algorithms based on neural processing to control data display on Army vehicle systems. ***FY 2011 Plans:*** Fabricate and evaluate arrays of bio-inspired material-based thermal imagers; implement bio-inspired algorithms for optimized collection of data from sensor networks; implement gecko-mimicking reversible adhesives in robotic applications; experimentally validate surface-enhanced Raman spectroscopic detection of explosives in open-channel micro-fluidic devices; and implement bio-inspired flocking and search algorithms for unmanned vehicles in GeoTrack system. ***FY 2012 Plans:*** Will design/build hardware/software required to image single cells in 3D and collect initial 3D images; will apply the lessons learned in microbial fuel cells to implement enhanced fermentation, environmental monitoring, and investigate waste water treatment; will complete characterization and investigation of bacterial nanowires fabricated artificially from the naturally occurring proteins; and will complete and validate algorithms for control of data displayed on crew stations based on neural processing, and begin two new start projects selected in FY11.			
Accomplishments/Planned Programs Subtotals	5.585	5.884	5.485

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602120A: *Sensors and Electronic Survivability*	PROJECT TS1: *TACTICAL SPACE RESEARCH*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
TS1: *TACTICAL SPACE RESEARCH*	1.596	1.695	3.725	-	3.725	4.257	4.900	5.364	6.028	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project researches and investigates technologies with the potential for space-based, high altitude, and cyberspace applications. Applied research efforts include the design and development of sensors and electronic components, communications, signal and information processing, target acquisition, position/navigation, and threat warning within space and high altitude environments as well as the design and development of technologies and analytical tools for cyber risk assessment and mitigation in acquisition systems. The applied research and technology evaluations conducted under this Project leverage other DoD space science and technology applications to support space force enhancement and cooperative satellite payload development. Successful technologies emerging from this project transition for maturation and demonstration under the Space Applications Technology in program element 0603006A.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this project is performed by the US Army Space and Missile Defense Command (SMDC) in Huntsville, AL.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Tactical Space Research	1.596	1.695	2.725
Description: This effort designs, develops, and evaluates space-based technologies and components that lead to smaller, lighter, and more responsive payloads. These technologies allow for the rapid integration and development of tactical payloads in support of responsive space and high altitude environments.			
FY 2010 Accomplishments: Investigated multiple nano-satellite architectures and integration of multi-spectral and hyper-spectral bands for imaging sensors operating in high altitude and space environments; investigated use of multiple waveforms on single tactical radio relay payloads operating in high altitude and space environments; continued to conduct the Joint Space Experiment (JSE) for measurement of ground illumination.			
FY 2011 Plans: Develop component technologies for high altitude payloads and small satellites, such as sensor subsystems, data links/ cross links, propulsion, power, energy, guidance, navigation, and flight control; investigate protection technologies for uplinks,			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602120A: *Sensors and Electronic Survivability*	PROJECT TS1: *TACTICAL SPACE RESEARCH*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
downlinks, and cross-links of space and high altitude assets; investigate and design a Space Analysis Laboratory for component development, testing, and system integration for ground testing and evaluation in support of space and high altitude applications. ***FY 2012 Plans:*** Will continue development of advanced power technologies for use in space and high altitude payload efforts; will investigate and identify previously developed space sensor and power component technologies to implement in high altitude payloads; will begin tool development to support evaluations of cyber attack risks and remediation approaches for acquisition efforts, to include space and high altitude payloads and systems.			
Title: Space and Analysis Lab ***Description:*** This effort supports the design and analytic evaluations of space, high altitude, and cyberspace technologies. ***FY 2012 Plans:*** Will implement the design of the Space Analysis Lab to stand up an in-house capability to support component development and system integration for ground demonstrations and evaluation of space, high altitude, and cyberspace technology applications.	-	-	1.000
Accomplishments/Planned Programs Subtotals	1.596	1.695	3.725

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602120A: *Sensors and Electronic Survivability*	PROJECT TS2: *ROBOTICS TECHNOLOGY*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
TS2: *ROBOTICS TECHNOLOGY*	15.156	15.566	12.328	-	12.328	13.925	16.400	16.470	16.750	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

The objective of this project is to investigate autonomous mobility technology that will enable near autonomous unmanned ground vehicles (UGVs). Technical efforts are focused on advancing perception for autonomous ground mobility, intelligent vehicle control and behaviors, human-robot interaction, robotic manipulation, and unique mobility for unmanned vehicles. The project also evaluates the basis for the Robotics Collaborative Technology Alliance (CTA), a tri-Service research consortium joining researchers from the Department of Defense (DoD), other Government agencies, industry and academia in a concerted, collaborative effort to advance key enabling robotic technologies.

The applied research conducted in this program will be transitioned to technology development, demonstration, and materiel acquisition programs being conducted by the Office of the Secretary of Defense Joint Ground Robotics Enterprise and each of the Services. Research supports collaborative efforts with Defense Advanced Research Projects Agency (DARPA).

Robotics Technology was previously funded in PE 0602618A, project H03 and was transferred to PE 0602120, project TS2 starting in FY10 to more accurately align the research.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this project is performed by the Army Research Laboratory (ARL) at the Aberdeen Proving Ground, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Robotics CTA	6.554	6.895	7.260
Description: Conduct research to evaluate capabilities for advanced perception, intelligent control and tactical behavior, human-robot interaction, robotic manipulation, and unique mobility for unmanned systems to conduct multiple military missions for a full range of robots from man-portable to larger systems. Research focuses on new sensor and sensor processing algorithms for rapid detection and classification of objects in the environment enabling safe high-speed mobility and intelligent tactical behavior by future unmanned systems; implementing adaptive control strategies that will enable unmanned systems to display intelligent tactical behavior, formulation of control strategies that will facilitate use of unmanned systems in populated environments and			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602120A: *Sensors and Electronic Survivability*	PROJECT TS2: *ROBOTICS TECHNOLOGY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
minimize the cognitive workload on Soldier operators, enable more dexterous manipulation of objects, and explore unique modes of mobility enabled by removing Soldiers from the vehicle. CTA research will be integrated into test beds to assess technology maturity. ***FY 2010 Accomplishments:*** Evaluated ways to improve understanding of urban scenes and activities to promote enhanced autonomous situational awareness for safe, effective operations and survivability, to enhance techniques to plan and execute missions in uncertain and dynamic environments, as well as to examine concepts for dexterous manipulation. ***FY 2011 Plans:*** Extend research to examine robot understanding of cues and activity permitting more 'human-like' control of unmanned systems; will research methods for improving perception in increasingly cluttered environments from both a static and dynamic perspective, and increase application of learning techniques to improve flexibility in unknown environments. ***FY 2012 Plans:*** Will develop lower cost sensory capability for smaller unmanned systems; will examine issues of trust in automation and develop a common "mental" picture between soldier and unmanned system; and will examine mid- and long- range scene recognition to facilitate tactical behavior in unmanned systems.			
Title: Perception and Intelligent Control ***Description:*** Develop perception and intelligent control technologies required to meet objective capabilities for future unmanned vehicles of multiple size scales and to transition this technology to advanced development programs being conducted under PE 0603005A (Combat Vehicle and Automotive Advanced Technology) project 515 (Robotic Ground Systems) for integration into test bed systems. Leverage DARPA sponsored research for control of collaborating agents to enable mixed teams (manned/ unmanned) to conduct military missions. ***FY 2010 Accomplishments:*** Evaluated perception and control algorithms for safe operations in dynamic urban environments. ***FY 2011 Plans:*** Investigate tactical behavior appropriate to military missions in 'urban-like' environments. ***FY 2012 Plans:*** Will focus upon improved shared understanding of tactical environment between soldier and unmanned systems.	4.853	4.828	3.824
Title: Autonomous Robotics Integration	3.749	3.843	1.244

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602120A: *Sensors and Electronic Survivability*	PROJECT TS2: *ROBOTICS TECHNOLOGY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: Integrate technology on unmanned ground vehicle test beds and conduct extensive field evaluation and technology characterization to establish improved capability for near autonomous UGVs. Leverage algorithms being conducted under DARPA sponsored research, e.g., Learning Applied to Ground Robotics (LAGR). Conduct regular, periodic evaluation at Ft. Indiantown Gap, PA, and other military facilities that will stress the technology in complex environments to further focus CTA sponsored research, assess performance, and provide the opportunity for US Army Training and Doctrine Command to engage in the early development of the tactics, techniques, and procedures required for successful utilization of unmanned systems in future conflicts. ***FY 2010 Accomplishments:*** Evaluated ability to safely operate in mixed, dynamic, urban-like environments. ***FY 2011 Plans:*** Evaluate the ability of unmanned systems to maneuver intelligently and autonomously in urban-like environments. ***FY 2012 Plans:*** Will conduct initial assessments to establish baseline capability for unmanned systems to understand terrain and behaviors.			
Accomplishments/Planned Programs Subtotals	15.156	15.566	12.328

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army										DATE: February 2011	
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*				R-1 ITEM NOMENCLATURE PE 0602122A: *TRACTOR HIP*							
COST ($ in Millions)	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**Cost To Complete**	**Total Cost**
Total Program Element	13.807	14.624	14.230	-	14.230	13.407	10.595	10.686	10.867	Continuing	Continuing
622: *D622*	2.355	1.933	1.652	-	1.652	2.642	3.435	3.467	3.526	Continuing	Continuing
B72: *AB72*	2.066	3.008	3.290	-	3.290	2.503	2.271	2.251	2.289	Continuing	Continuing
B73: *AB73*	9.386	9.683	9.288	-	9.288	8.262	4.889	4.968	5.052	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program is reported in accordance with Title 10, United States Code, Section 119(a)(1) in the Special Access Program Annual Report to Congress.

B. Program Change Summary ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Previous President's Budget	-	-	-	-	-
Current President's Budget	13.807	14.624	14.230	-	14.230
Total Adjustments	13.807	14.624	14.230	-	14.230
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	13.807	14.624	14.230	-	14.230

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602122A: *TRACTOR HIP*	PROJECT 622: *D622*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
622: *D622*	2.355	1.933	1.652	-	1.652	2.642	3.435	3.467	3.526	Continuing	Continuing

Note

Not Applicable

A. Mission Description and Budget Item Justification

Not Applicable

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Not Applicable	2.355	1.933	1.652
Description: Not Applicable ***FY 2010 Accomplishments:*** Not Applicable ***FY 2011 Plans:*** Not Applicable ***FY 2012 Plans:*** Not Applicable			
Accomplishments/Planned Programs Subtotals	2.355	1.933	1.652

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602122A: *TRACTOR HIP*	PROJECT B72: *AB72*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
B72: *AB72*	2.066	3.008	3.290	-	3.290	2.503	2.271	2.251	2.289	Continuing	Continuing

A. Mission Description and Budget Item Justification

Not applicable for this program

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: . ***Description:*** . ***FY 2010 Accomplishments:*** . ***FY 2011 Plans:*** . ***FY 2012 Plans:*** .	2.066	3.008	3.290
Accomplishments/Planned Programs Subtotals	2.066	3.008	3.290

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602122A: *TRACTOR HIP*	PROJECT B73: *AB73*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
B73: *AB73*	9.386	9.683	9.288	-	9.288	8.262	4.889	4.968	5.052	Continuing	Continuing

A. Mission Description and Budget Item Justification

Not applicable for this program

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: . ***Description:*** . ***FY 2010 Accomplishments:*** . ***FY 2011 Plans:*** . ***FY 2012 Plans:*** .	9.386	9.683	9.288
Accomplishments/Planned Programs Subtotals	9.386	9.683	9.288

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army										DATE: February 2011	
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*				R-1 ITEM NOMENCLATURE PE 0602211A: *AVIATION TECHNOLOGY*							
COST ($ in Millions)	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**Cost To Complete**	**Total Cost**
Total Program Element	44.810	43.476	44.610	-	44.610	45.123	47.672	47.913	49.525	Continuing	Continuing
47A: *AERON & ACFT WPNS TECH*	36.413	38.028	39.034	-	39.034	39.442	41.460	41.358	42.587	Continuing	Continuing
47B: *VEH PROP & STRUCT TECH*	4.221	5.448	5.576	-	5.576	5.681	6.212	6.555	6.938	Continuing	Continuing
47C: *ROTORCRAFT COMPONENT TECHNOLOGIES (CA)*	4.176	-	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

This aviation technology program element (PE) conducts applied research applicable to rotary wing vehicle (RWV) technologies to move towards air vehicle objectives. Emphasis is on developing rotary wing platform technologies to enhance manned and unmanned RWV combat and combat support operations for attack, reconnaissance, air assault, survivability, logistics and command and control missions. The PE supports the research and development of components and subsystems for air vehicles in the areas of aviation and aircraft weapons technology (project 47A) and vehicle propulsion and structures technology (project 47B). This PE also supports the National Rotorcraft Technology Center (NRTC), a partnership of government, industry, and academia. Project 47C funds congressional special interest items. Efforts under this PE transition to projects supported by PE 0603003A (Aviation-Advanced Technology).

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this PE is performed by the Aviation and Missile Research, Development, and Engineering Center (AMRDEC), located at Redstone Arsenal, AL; Fort Eustis, VA; Moffett Field, CA; and Hampton, VA, and at the Army Research Laboratory (ARL), located at Adelphi, MD; Hampton, VA; and Cleveland, OH.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602211A: *AVIATION TECHNOLOGY*	

B. Program Change Summary ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Previous President's Budget	49.273	43.476	42.598	-	42.598
Current President's Budget	44.810	43.476	44.610	-	44.610
Total Adjustments	-4.463	-	2.012	-	2.012
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	-3.979	-			
• SBIR/STTR Transfer	-0.484	-			
• Adjustments to Budget Years	-	-	2.012	-	2.012

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602211A: *AVIATION TECHNOLOGY*	PROJECT 47A: *AERON & ACFT WPNS TECH*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
47A: *AERON & ACFT WPNS TECH*	36.413	38.028	39.034	-	39.034	39.442	41.460	41.358	42.587	Continuing	Continuing

A. Mission Description and Budget Item Justification

The objective of this project is to develop Rotary Wing Vehicle (RWV) technologies for manned and unmanned Army/ Department of Defense (DoD) rotorcraft to increase strategic and tactical mobility/deployability; improve combat effectiveness; increase aircraft and crew survivability; and improve combat sustainability. Areas of research address desired characteristics applicable to all aviation platforms, such as enhanced rotor efficiencies, improved survivability, increased structure and airframe capability, improved engine performance, improved sustainability, improved mission avionics performance, and reduced cost. This project supports the National Rotorcraft Technology Center (NRTC), a partnership of government, industry, and academia. This project leverages work accomplished in collaboration with the National Aeronautics and Space Administration (NASA). Technologies within this project transition to advanced technology development programs with application to future, as well as current, Army/DoD rotorcraft systems.

Work in this project is fully coordinated with PE 0603003A (Aviation Advanced Technology) and work in this project related to aircraft weapons integration is also fully coordinated with PE 0602624A (Weapons and Munitions Technology) and PE 0602303A (Missile Technology).

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this project is performed by the Aero-Flight Dynamics Directorate of the Aviation and Missile Research, Development, and Engineering Center (AMRDEC), (located at the NASA Ames Research Center, Moffett Field, CA; and the NASA Langley Research Center, Hampton, VA); and the Aviation Applied Technology Directorate, Fort Eustis, VA.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: National Rotorcraft Technology Center (NRTC)	7.741	8.091	8.060
Description: The goal of the NRTC is to focus government, US rotorcraft industry and academia resources on pre-competitive, high priority, military focused technology development to maintain U.S. preeminence in rotorcraft capabilities.			
FY 2010 Accomplishments: Correlated nonlinear aeroelasticity analysis results with wind tunnel and flight test data to improve understanding of predictive capability for rotor stall flutter; completed design and fabrication of 2-D oscillating rotor icing model; conducted icing evaluation			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602211A: *AVIATION TECHNOLOGY*	PROJECT 47A: *AERON & ACFT WPNS TECH*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
in the NASA Icing Research Tunnel (IRT); and developed crashworthiness models of single-rotor, tandem and tilt-rotor configurations. ***FY 2011 Plans:*** Evaluate metal matrix composite structural elements as replacements for titanium elements; incorporate new dynamic stall model, based on a hybrid computational approach, into a comprehensive code and validate the new model by comparison with test data; and validate physics-based analysis methodology predictions for hub drag reductions with available test data. ***FY 2012 Plans:*** Will conduct an icing evaluation of a spinning rotor in the NASA Icing Research Tunnel (IRT) to validate prediction tools; will conduct hover stand evaluation of rotor with Miniature Trailing-edge Effector (MiTE) actuation system; will perform validation testing of an in-flight acoustic detection footprint prediction system and in-cockpit display; and will validate analytic predictions with UH-60 wind tunnel and flight test data.			
Title: Rotor Technology ***Description:*** Evaluate performance enhancements gained from advanced rotor technologies, including on-blade controls. ***FY 2010 Accomplishments:*** Evaluated rotor aeromechanics issues for high speed configurations using high fidelity analysis; validated methods for UH-60 and active rotor evaluations; and fabricated Active Elevon Rotor (AER) and modified test stand to avoid dynamic instabilities. ***FY 2011 Plans:*** Acquire high quality interactional aerodynamics measurements for a high speed active flow control rotor configuration; execute active on-blade control evaluation; and utilize high quality UH-60 rotor measurements to assess rotorcraft modeling and simulation tools for rotor structural loads, deflections and flowfield measurements. ***FY 2012 Plans:*** Will apply advanced, high performance computing tools, simulating UH-60 rotor measurements, to assess accuracy of computed rotor structural loads, deflections and flowfield measurements; will perform pre-test computations and participate in international evaluation of an active twist rotor; and will apply aeromechanics analysis tools to rotorcraft configurations for improved performance in support of PE 0603003A, Project 313.	3.332	3.185	3.400
Title: Survivability Technologies ***Description:*** Investigate advanced technologies to reduce susceptibility and vulnerability of aircraft to damage from threats or accidents, as well as technologies to defeat small arms, rocket and missile threats.	7.409	8.993	7.114

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602211A: *AVIATION TECHNOLOGY*	PROJECT 47A: *AERON & ACFT WPNS TECH*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
FY 2010 Accomplishments: Completed conventional ballistic protection and advanced crew protection efforts; transitioned knowledge gained to ballistic protection and advanced crew protection technology maturation in PE 0603003A, Project 313; and developed remote Optical Parametric Oscillators (OPOs) to tune laser countermeasure wavelengths to desired threat bands for effective Infra-Red (IR) jamming of man-portable missiles. ***FY 2011 Plans:*** Fabricate crashworthy systems/subsystems, conduct evaluation, and correlate test results with models previously developed; and integrate optic laser fiber and OPO component technologies into a complete multi-function IR and visual laser countermeasure system, and transition to PE 0603003A, Project 313 effort for flight evaluation on a threat range. ***FY 2012 Plans:*** Will begin design of advanced IR/EO signature control materials; and will develop improved materials and airframe structural configurations that provide threat protection against non-conventional weapons, to include directed energy, blast/overpressure, and high velocity low mass fragments.			
Title: Advanced Engines ***Description:*** Design and develop advanced turboshaft engine component technologies to support goals of reduced fuel consumption, engine size, weight, cost, as well as improved reliability, maintainability and survivability. ***FY 2010 Accomplishments:*** For utility/attack sized aircraft, completed the design of an advanced compressor and conducted laboratory rig evaluation; and for cargo sized aircraft, completed fabrication of a gas generator turbine. ***FY 2011 Plans:*** For a cargo sized aircraft, complete advanced combustor design for improved engine performance and structural life; complete fabrication of advanced compressor for improved engine performance and reduced weight; and complete evaluation of gas generator turbine to validate improved engine performance and durability. ***FY 2012 Plans:*** For a cargo sized aircraft, will complete advanced mechanical systems fabrication for improved engine performance and structural life; will complete evaluation of advanced compressor for improved engine performance and reduced weight; and transition technologies to engine advanced development efforts under PE 0603003A, Project 447.	1.971	2.551	3.550
Title: System Concepts Studies	2.348	2.315	3.130

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602211A: *AVIATION TECHNOLOGY*	PROJECT 47A: *AERON & ACFT WPNS TECH*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: Enables new rotorcraft configurations by evaluating critical advanced technology using design and analysis methods with greater modeling fidelity. Introduces high fidelity methodology for improved performance and design predictions earlier in the development and acquisition process. ***FY 2010 Accomplishments:*** Extended the computational fluid dynamics (CFD) flight conditions for transition and maneuver flight; and continued the validation of modeling capabilities and the ability to pass/generate data within the integrated analysis environment, such as automating the methodology for transforming a 3-D Computer Aided Design (CAD) drawing into a grid which can be analyzed with CFD tools. ***FY 2011 Plans:*** Enhance/extend the fidelity of the integrated analysis and design environment to increase prediction accuracy as well as investigate techniques for rigorous optimization of the rotorcraft design in full flight envelope simulation. ***FY 2012 Plans:*** Will complete small scale wind tunnel test to validate performance predictions and will document requirements for multi-role configuration technology.			
Title: Network Operations and System Integration ***Description:*** Perform feasibility, operations, and concept studies to identify promising candidate technologies for improved and new platform capabilities. ***FY 2010 Accomplishments:*** Investigated Unmanned Aircraft Systems (UAS) supervisory techniques in flight to permit efficient assignment of distributed tasks; investigated geo-location improvements and lightweight sensors utilizing advanced image stabilization techniques incorporated to provide hemispherical situational awareness for improved pilotage; and pursued UAS/weaponization investigation initiatives with other Services. ***FY 2011 Plans:*** Investigate use of UAS supervisory techniques in Manned-Unmanned Teaming flight evaluations; develop/evaluate interface technologies for rapid immersion of UAS operators into remote environments; integrate a lightweight, distributed sensor array into a UAS test-bed platform to evaluate autonomous pilotage and collision avoidance techniques; develop/evaluate virtual interface technologies for rapid virtual immersion of UAS operators into UAS operating environment; extend supervisory control techniques to airborne control station applications; continue assessment of low space, weight and power wide field of view sensor systems for local situational awareness; and complete ground based evaluation of autonomous sniper system with fire control upgrades. ***FY 2012 Plans:***	5.051	5.444	5.136

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602211A: *AVIATION TECHNOLOGY*	PROJECT 47A: *AERON & ACFT WPNS TECH*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Will investigate UAS supervisory control techniques applied in relevant tactical operations through flight evaluation; will investigate integration of advanced lethality concepts for application to manned and unmanned aviation assets, addressing energy storage, system pointing accuracy, stabilization, and incapacitation effects.			
Title: Flight Controls ***Description:*** Develop advanced rotor and aircraft flight control architectures as well as control laws to permit enhanced vehicle performance over expanded and more challenging flight envelopes. ***FY 2010 Accomplishments:*** Developed handling quality criteria for legacy upgrades and future rotorcraft; developed the Rotorcraft Air Crew Systems Concepts Airborne Laboratory (RASCAL, a JUH-60A Black Hawk helicopter) into a variable-stability in-flight simulator; flight evaluated increased agility, obstacle field navigation and landing algorithms for unmanned platforms; and investigated geo-location improvements and lightweight sensors incorporating advanced image stabilization techniques to provide hemispherical situational awareness for improved pilotage. ***FY 2011 Plans:*** Define control system architectures for emerging rotorcraft configurations based on initial dynamic simulation models and in-flight simulation experiments. ***FY 2012 Plans:*** Will investigate integrated control of large rotorcraft using feedback of rotor state, external loads, and structural measurements.	3.483	2.603	4.169
Title: Durability and Sustainment Technologies ***Description:*** Develop prognostic and system health assessment technologies to enable transition to a Condition Based Maintenance supportability structure. ***FY 2010 Accomplishments:*** Investigated the accuracy and robustness of developed prognostic and diagnostic technologies; investigated the physics of failure models for electronics, as well as validated a prognostic reasoner to predict failures; and integrated a corrosion monitoring system into the Health and Usage Monitoring System and validated on an airframe structural component. ***FY 2011 Plans:***	5.078	4.846	4.475

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602211A: *AVIATION TECHNOLOGY*	PROJECT 47A: *AERON & ACFT WPNS TECH*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Develop prognostic capabilities for more chaotic, nonlinear dynamic failure modes of mechanical systems; develop improved probabilistic methods for prediction of failure initiation and progression; evaluate nano-sensing technology for real-time integrity monitoring; and implement improved design and analysis criteria. ***FY 2012 Plans:*** Will develop prognostic algorithms for predicting remaining life of engine controls, sensors and lubrication systems; will perform evaluation of data fusion of structural integrity algorithms for extending component time on wing and damage tolerance; and will develop algorithms to assess rotor component health and vehicle control systems.			
Accomplishments/Planned Programs Subtotals	36.413	38.028	39.034

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602211A: *AVIATION TECHNOLOGY*	PROJECT 47B: *VEH PROP & STRUCT TECH*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
47B: *VEH PROP & STRUCT TECH*	4.221	5.448	5.576	-	5.576	5.681	6.212	6.555	6.938	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

The objective of this project is to investigate engine, drive train, and airframe enabling technologies such as multifunctional materials, fluid mechanics and high temperature, high strength, low cost shaft materials.

Work in this project complements and is fully coordinated with PE 0603003A (Aviation Advanced Technology).

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy and the Army Science and Technology Master Plan.

Work in this project is performed by the Army Research Laboratory (ARL) at the NASA Glenn Research Center, Cleveland, OH, the NASA Langley Research Center, Hampton, VA, and the Aberdeen Proving Ground, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Rotor and Structure Technology	0.898	2.010	2.060
Description: Devise improved tools and methodologies to more accurately design for improved component reliability and durability, resulting in platforms that are lighter in weight and less costly to acquire and maintain. ***FY 2010 Accomplishments:*** Conducted structural and dynamic evaluations of a conceptual active rotor system to improve performance. ***FY 2011 Plans:*** Perform a series of analytical and validation studies, including in-flight evaluations conducted jointly with the Federal Aviation Administration and other Research, Development and Engineering Center field elements, to enhance analytical tools and methodologies for structural damage detection and condition-based maintenance of key structural components. Complete fabrication of six 1/4-scale high-performance active-twist rotor blades based on Apache baseline performance characteristics. Conduct parametric wind-tunnel evaluations of two sets of advanced active-twist rotor configurations, one of which has been			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602211A: *AVIATION TECHNOLOGY*	PROJECT 47B: *VEH PROP & STRUCT TECH*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
optimized for rotor performance improvements. Complete analytical comparison study with data validation to document benefits of high-performance active designs. ***FY 2012 Plans:*** Will complete wind-tunnel evaluation of high performance ATR blades and will validate prognostics and diagnostics technologies and framework for computation of remaining useful life of vehicle structures.			
Title: Propulsion and Drive Train Technology ***Description:*** Investigate high temperature materials, advanced models for flow physics and improved methods for predicting propulsion system mechanical behavior to increase fuel efficiency and reduce propulsion system weight. ***FY 2010 Accomplishments:*** Assessed the feasibility of fabricating sub-elements of hollow and solid turbine blades from monolithic ceramic/composite hybrid materials to reduce engine weight; and designed sand injection facility to enable the development of improved inlet particle separators. ***FY 2011 Plans:*** Develop joining technologies to enable the fabrication and integration of ceramic fuel injectors for improved combustion process design, and develop a coupled engine and drive train dynamic model that will enhance the accuracy of mechanical behavior predictions. ***FY 2012 Plans:*** Will demonstrate the feasibility of fabricating hybrid ceramic/metal turbine engine components.	3.323	3.438	3.516
Accomplishments/Planned Programs Subtotals	4.221	5.448	5.576

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602211A: *AVIATION TECHNOLOGY*	PROJECT 47C: *ROTORCRAFT COMPONENT TECHNOLOGIES (CA)*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
47C: *ROTORCRAFT COMPONENT TECHNOLOGIES (CA)*	4.176	-	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

Congressional Interest Item funding provided for Rotorcraft Component Technologies.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Composite Small Main Rotor Blades ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** In FY10, this Congressional Interest Item investigated innovative rotor design and fabrication processes that reduced the time and cost of a typical metal blade to composite blade conversion program; completed rapid prototype fabrication, structural testing, and whirl test.	2.983	-	-
Title: Intensive Quenching (IQ) for Advanced Weapons Systems ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** In FY10, this Congressional Interest Item investigated an advanced heat treating process to improve performance and cost of high strength steel components such as helicopter gears and gun barrels; processed full scale gears and gun barrels using IQ technique and subjected same to fatigue testing to validate benefits.	1.193	-	-
Accomplishments/Planned Programs Subtotals	4.176	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army										DATE: February 2011	
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*				R-1 ITEM NOMENCLATURE PE 0602270A: *Electronic Warfare Technology*							
COST ($ in Millions)	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**Cost To Complete**	**Total Cost**
Total Program Element	23.581	17.330	15.790	-	15.790	15.058	15.401	16.121	16.418	Continuing	Continuing
475: *ELECTRONIC WARFARE COMPONENT TECHNOLOGIES (CA)*	7.859	-	-	-	-	-	-	-	-	Continuing	Continuing
906: *Tactical Electronic Warfare Applied Research*	15.722	17.330	15.790	-	15.790	15.058	15.401	16.121	16.418	Continuing	Continuing

Note

FY12 funding realigned to higher priority efforts.

A. Mission Description and Budget Item Justification

This program element (PE) designs and develops electronic warfare (EW) component technologies that deny, disrupt, or degrade the enemy's use of the electromagnetic spectrum for offensive or defensive operations. This is accomplished through the investigation of electronic support measures (ESM), countermeasures against communications systems and networks; the development of sensors used to identify and locate threat forces in an asymmetric environment; and threat warning and electronic countermeasures (ECM) against munitions sensors and targeting capabilities, missile guidance and targeting systems, and booby traps. Project 475 funds congressional special interest items. Project 906 protects high-value ground platforms, aircraft, and the Soldier from threat surveillance and tracking systems; imaging systems; and advanced radio frequency (RF)/electro-optical (EO)/infrared (IR) missiles, artillery, and smart munitions. Information fusion research addresses sensor correlation, relationship discovery, and management services through use of automated processing, as well as higher level reasoning techniques that support automated combat assessment. Project 906 also supports efforts related to research and application of key EW technologies to intercept, locate, and disrupt, current and emerging threat communications and non-communications emitters, to provide vital, quality combat information directly to users in a timely actionable manner. Specifically, its technologies focus on detecting threat sensors and emitters associated with weapon systems, targeting systems and command, control, communications, computers, and intelligence systems and networks.

Work in this PE is compliments PE 0603270A (EW Technology), PE 0602120A (Sensors and Electronic Survivability), and PE 0603772A (Advanced Tactical Computer Science and Sensor Technology). This PE is related to and fully coordinated with PE 0603008A (Command, Control, Communications Advanced Technology) and PE 0603710A (Night Vision Advanced Technology).

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work is performed by the Army Research, Development and Engineering Command, Communications-Electronics Research, Development, and Engineering Center (CERDEC), Fort Monmouth, NJ and Aberdeen Proving Ground, MD.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602270A: *Electronic Warfare Technology*	

B. Program Change Summary ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Previous President's Budget	22.303	17.330	17.806	-	17.806
Current President's Budget	23.581	17.330	15.790	-	15.790
Total Adjustments	1.278	-	-2.016	-	-2.016
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	1.591	-			
• SBIR/STTR Transfer	-0.313	-			
• Adjustments to Budget Years	-	-	-2.016	-	-2.016

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602270A: *Electronic Warfare Technology*	PROJECT 475: *ELECTRONIC WARFARE COMPONENT TECHNOLOGIES (CA)*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
475: *ELECTRONIC WARFARE COMPONENT TECHNOLOGIES (CA)*	7.859	-	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for Electronic Warfare technology applied research.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Hostile Fire Indicator for Aircraft ***Description:*** This is a Congressional Interest Item ***FY 2010 Accomplishments:*** This Congressional Interest Item developed a short-wave infra-red airborne hostile fire indicator system.	1.492	-	-
Title: Silver Fox Unmanned Aerial Vehicle - Army ***Description:*** This is a Congressional Interest Item ***FY 2010 Accomplishments:*** This Congressional Interest Item investigated experimental deployment efforts and spiral development of sensor and micro-transponder technologies using the Silver Fox and Manta unmanned aerial systems (UAS).	1.592	-	-
Title: Locating and Tracking Explosive Threats with Wireless Sensors and Networks ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Developed and refined an ultra wide band radar system to detect and identify hidden/buried threats.	4.775	-	-
Accomplishments/Planned Programs Subtotals	7.859	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	**R-1 ITEM NOMENCLATURE** PE 0602270A: *Electronic Warfare Technology*	**PROJECT** 475: *ELECTRONIC WARFARE COMPONENT TECHNOLOGIES (CA)*

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602270A: *Electronic Warfare Technology*	PROJECT 906: *Tactical Electronic Warfare Applied Research*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
906: *Tactical Electronic Warfare Applied Research*	15.722	17.330	15.790	-	15.790	15.058	15.401	16.121	16.418	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project designs, develops, and applies key electronic warfare (EW)/information operations technologies to enhance platform survivability (to include ground combat vehicles, aircraft, and the dismounted Soldier) and to intercept and locate current and emerging threat communications and non-communications emitters. This project applies recent advances in radio frequency (RF), infrared (IR), and electro-optical (EO) sensor and jamming sources to detect, locate, deceive, and jam threats (to include radar directed target acquisition systems, target-tracking sensors, surface-to-air missiles (SAMs), air-to-air missiles (AAMs), top attack weapons, and electronically fuzed munitions), This project also pursues the ability to neutralize booby traps. This project develops information systems to provide vital, quality combat information directly to users in a timely actionable manner in accordance with concepts for future force intelligence operations. This project investigates RF collection and mapping technologies to offer real time emitter detection, location, and identification. In addition, this project enables a remote capability to disrupt, deny, or destroy threat communication signals and enables fusion (automated assimilation and synthesis) of battlefield intelligence data to enable interpretation of current and future enemy activities. This allows commanders to develop operational courses of action in time to act decisively and in a pre-emptive manner.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this project is performed by the Army Research, Development, and Engineering Command, Communications-Electronics Research, Development, and Engineering Center (CERDEC), Ft. Monmouth, NJ and Aberdeen Proving Ground, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Multi-Intelligence Data Fusion and Targeting	5.466	6.915	4.090
Description: This effort investigates and develops software technologies for advanced intelligence/mission command enterprise collaboration that enable the enterprise to identify, fuse, and trace/track specific human targets in an asymmetric environment. Work being accomplished under PE 0602120A/project H15 and PE 0603772A/project 243 compliments this effort.			
FY 2010 Accomplishments: Developed advanced data ingestion (throughput of high volume and non-traditional data types), data alignment/conversion (normalization), and correlation and data engineering management techniques.			
FY 2011 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602270A: *Electronic Warfare Technology*	PROJECT 906: *Tactical Electronic Warfare Applied Research*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Integrate additional fusion algorithms, data, sensor and message types, temporal enhancements, as well as integrated extraction, visualization, and conceptualization tools into a fusion & exploitation framework for improved target tracking and identification; conduct metrics study in support of non-cooperative biometrics for single and multi-modality matching and fusion algorithms. ***FY 2012 Plans:*** Will investigate biometric data matching and fusion algorithms for use in non-cooperative intelligence collection environment; will investigate standards of ingestion to facilitate addition of non-cooperatively collected biometrics (partial iris scans, scents, three dimensional (3D) face, thermal face, etc.) into biometrics database; will code enhanced algorithms to conduct near-real-time matching and fusion of cooperative and non-cooperative biometric intelligence into enhanced biometric intelligence products; will finalize data collection process, generate candidate templates, and conduct non-cooperative sensor data collection to assess the process and templates.			
Title: Offensive Information Operations Technologies ***Description:*** This effort investigates and develops techniques that identify and capture data traversing targeted networks for the purpose of information operations or otherwise countering adversary communications. ***FY 2010 Accomplishments:*** Defined distributed communications schema that allows software algorithms to communicate and migrate between nodes; began development of interception and countermeasure capabilities against network traffic flows of interest; developed network operations techniques against relevant high priority protocols; researched methods to link this computer network operations (CNO) framework to previously developed EW frameworks. ***FY 2011 Plans:*** Develop capability for identification and capture of protocols of interest; implement algorithms to allow for surgical and coordinated exploitation amongst nodes; develop traffic analysis techniques to discriminate amongst individual data sessions; develop communication and coordination capabilities between CNO and EW systems. ***FY 2012 Plans:*** Will refine techniques to perform computer network manipulation to include, traffic redirection, data-in-transit, and network situational awareness; will develop comprehensive visualization interface that takes into account CNO and EW missions; will assess feasibility of integrating next-generation EW systems with tactical CNO capabilities to maximize effects on targets and minimize the training requirements on operator to executing a CNO mission; will develop anti-tamper and adapted offensive components, networking resource mutation for network manipulation, and virtualization/virtual-machine monitors for isolation.	3.678	3.770	4.671
Title: Multispectral Threat Warning	3.180	3.068	3.500

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602270A: *Electronic Warfare Technology*	PROJECT 906: *Tactical Electronic Warfare Applied Research*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: This effort investigates the benefits of augmenting the currently fielded ultra-violet (UV)-based Common Missile Warning System (CMWS) threat detection capability with IR and acoustic sensors to improve the probability of detection of Man-Portable Air Defense System (MANPADS)-like threats; reduce atmospheric clutter and, thereby, the false alarm rate, and add detection of ball ammunition to the current CMWS tracer-only capability. ***FY 2010 Accomplishments:*** Integrated acoustic signals into UV-based hostile fire indication (HFI) algorithms; evaluated acoustic array hardware concepts with regard to algorithm design and began correlation of acoustic and UV-based HFI data based on hardware integration concepts. ***FY 2011 Plans:*** Finalize IR and UV sensor integration algorithms; experiment with integration concept of these multispectral sensors and their affect on detection and false alarm in a laboratory environment; determine effectiveness of acoustic sensor in enhancing HFI algorithms. ***FY 2012 Plans:*** Will investigate countermeasure techniques against next-generation man-portable air-defense systems employing digital imaging seekers; will use modeling and simulation and limited hardware-in-the-loop methods to investigate potential effectiveness of current platform-resident infrared focal plane arrays, likely tracking algorithms, digital IR counter measure lasers and available imaging sources against these advanced seekers.			
Title: Passive and Active Targeting Techniques ***Description:*** This effort investigates passive and active techniques and software algorithm development for three dimensional detection, identification, and precision geolocation of next-generation wireless communication threats and improved situational awareness. This effort also addresses operational conditions such as dense, co-channel, and multipath RF environments. ***FY 2010 Accomplishments:*** Assessed and selected precision geolocation techniques and analyzed performance results in the presence of jamming and under varying environmental conditions; designed software to implement selected techniques on commercial based software defined radio representative hardware; evaluated techniques for feasibility of implementation on representative hardware. ***FY 2011 Plans:*** Enhance geolocation techniques based on results of representative hardware analysis; perform additional simulation and laboratory validation of these enhancements utilizing synthesized and outdoor wireless RF data collected in relevant field	3.398	3.577	3.529

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602270A: *Electronic Warfare Technology*	PROJECT 906: *Tactical Electronic Warfare Applied Research*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
environments; transition executable software package, software model and associated engineering analysis quantifying technique performance and effectiveness to applicable follow-on technology demonstration, program of record or quick reaction capability. ***FY 2012 Plans:*** Will investigate techniques to improve the resolution of conventional non-cooperative time-difference-of-arrival (TDoA) based geolocation techniques; will investigate techniques to overcome multipath effects such as reflection, absorption and diffraction found in complex urban environments that cannot be resolved by traditional TDoA and angle of arrival techniques utilizing electromagnetic propagation mapping tools.			
Accomplishments/Planned Programs Subtotals	15.722	17.330	15.790

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army										DATE: February 2011	
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*				R-1 ITEM NOMENCLATURE PE 0602303A: *MISSILE TECHNOLOGY*							
COST ($ in Millions)	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**Cost To Complete**	**Total Cost**
Total Program Element	69.871	49.525	50.685	-	50.685	50.822	45.862	51.481	41.706	Continuing	Continuing
214: *MISSILE TECHNOLOGY*	49.398	49.525	50.685	-	50.685	50.822	45.862	51.481	41.706	Continuing	Continuing
223: *AERO-PROPULSION TECHNOLOGY*	7.560	-	-	-	-	-	-	-	-	Continuing	Continuing
G04: *AIR DEFENSE TECHNOLOGIES (CA)*	10.427	-	-	-	-	-	-	-	-	Continuing	Continuing
G05: *MISSILE TECHNOLOGY INITIATIVES (CA)*	2.486	-	-	-	-	-	-	-	-	Continuing	Continuing

Note

FY12 funding increase to support higher priority efforts.

A. Mission Description and Budget Item Justification

This program element (PE) designs, fabricates and evaluates advanced component technologies for tactical missiles, rockets, guided munitions, and their launch systems in order to increase lethality, precision, and effectiveness under adverse battlefield conditions while reducing system cost, size and weight. Major goals in Project 214 include enhancing the survivability of the munition, launch and fire control systems, and forward operating bases; increasing kill probabilities against diverse targets; and providing advanced simulation and virtual prototyping analysis tools. Projects 223, G04, and G05 fund congressional special interest items.

The work in this PE is complimentary to PE 0603313A (Missile and Rocket Advanced Technology), and fully coordinated with PE 0602624A (Weapons and Munitions Technology), PE 0603004A (Weapons and Munitions Advanced Technology), PE 0602618A (Ballistics Technology, Robotics Technology), PE 0602307A (Advanced Weapons Technology), and PE 0708045A (End Item Industrial Preparedness Activities).

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

The work in this PE is performed by the Aviation and Missile Research, Development, and Engineering Center (AMRDEC), Huntsville, AL.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602303A: *MISSILE TECHNOLOGY*	

B. Program Change Summary ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Previous President's Budget	70.924	49.525	45.426	-	45.426
Current President's Budget	69.871	49.525	50.685	-	50.685
Total Adjustments	-1.053	-	5.259	-	5.259
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.053	-			
• Adjustments to Budget Years	-	-	5.259	-	5.259

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602303A: *MISSILE TECHNOLOGY*	PROJECT 214: *MISSILE TECHNOLOGY*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
214: *MISSILE TECHNOLOGY*	49.398	49.525	50.685	-	50.685	50.822	45.862	51.481	41.706	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project designs, fabricates, and evaluates missile and rocket component technologies that support demonstration of affordable, lightweight, highly lethal missiles and rockets. Major areas of research include missile guidance components and subsystems; target acquisition systems; multi-spectral seekers; high-fidelity simulations; missile aerodynamics and structures; missile launch and fire control technologies; and missile propulsion including research to help solve the insensitive munitions requirements. A theme embedded throughout the efforts in this project is smaller, lighter, and cheaper (SLC) missile technology to reduce the cost and logistics burden of precision munitions. Major products of this PE transition to PE 0603313A (Missile and Rocket Advanced Technology).

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this project is performed by the Aviation and Missile Research, Development, and Engineering Center (AMRDEC), Huntsville, AL.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Embedded Deeply Integrated Guidance & Navigation Unit (eDIGNU)	7.296	-	-
Description: This effort built on previous High-G (gravitational force) micro-electromechanical systems (MEMS) Inertial Measurement Unit (IMU) and DIGNU research. The Embedded DIGNU incorporated the following: a next generation Selective Availability Anti-Spoofing Module (SAASM); enhanced anti-jam (A/J) capability; full system-on-a-chip technology for processor and memory to reduce DIGNU size; more robust deep integration algorithms; and improved inertial performance. This task was conducted in two phases in order to enable the first generation technology to be evaluated while the second generation design was matured. ***FY 2010 Accomplishments:*** Completed evaluation of the first generation inertial sensor assembly design and integrated with the eDIGNU to verify requirements were met. Evaluated IMU deliverables that included new gyro and accelerometer sensors, electronics, and packaging improvements. Evaluated the eDIGNU second generation deliverables that included a full system-on-a-chip module; increased A/J capability; updated software for the new inertial sensor assembly; and implemented algorithm improvements.			
Title: Smaller, Lighter, Cheaper Tactical Missile Technologies	7.720	8.548	12.764

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602303A: *MISSILE TECHNOLOGY*	PROJECT 214: *MISSILE TECHNOLOGY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: This effort designs and evaluates innovative smaller, lighter, and cheaper component technologies as well as system concepts to reduce precision missile cost per kill and/or logistics burden to meet urban and emerging threats. These technologies transition to PE 0603313A for maturation. ***FY 2010 Accomplishments:*** Designed nano/advanced composite mounting brackets to reduce missile component weight; conducted requirements definition and trade studies for a small height of burst sensor (HOBS) design that provides lethality against soft targets; continued miniaturized electronics packaging design for small lightweight missiles; evaluated common Electronic Safe and Arm Device (ESAD) architecture for small lightweight precision munitions; and completed initial designs and evaluation of a high performance insensitive munition compliant motor. ***FY 2011 Plans:*** Design, fabricate, and evaluate sample composite mounting brackets with integrated electrical conductivity to increase strength and reduce weight; tailor common ESAD design for upgrades to Tube-launched, Optically-tracked, Wire-guided (TOW) and Javelin missiles; complete small ESAD design, fabrication and component evaluation; design and evaluate candidate small HOBS and single chip inertial sensor designs for small precision munitions. ***FY 2012 Plans:*** Will perform trade studies and begin initial critical component design for a small, light, low power navigation-grade sensor package that can detect and maintain track of the direction north; will conduct initial packaging of single chip inertial sensor module; will conduct trade studies for small, low cost components for precision munitions; will design component technologies for the next generation of precision weapon systems including: 1) reduced cost, advanced light weight materials; 2) reduced cost, advanced seeker technologies for increased detection range; 3) lethality technologies for performance against increased target sets; and 4) advanced propulsion and controls technology for multiple mission capabilities.			
Title: Target Classification Sensors, Advanced Fuzing Technology and Warhead Integration ***Description:*** This effort designs and demonstrates a low cost inertial sensor capable of identifying the target material class (e.g., heavy armor, light armor, bunker) on impact, and advanced fuzing technology to use target classification sensor data for optimizing the warhead effectiveness based on target class. The determination of the different target classifications will be derived from the collaborative Multi-Mode, Multi-Effect warhead effort designed in PE 0602624A Weapons and Munitions Technology. ***FY 2010 Accomplishments:*** Completed design and fabrication of the second generation target classifying sensor and integrated with miniaturized electronics. Evaluated the inertial sensors ability to identify three different target material classes (heavy armor, light armor, and sand). Began preliminary design and fabrication of the third generation sensor with a goal to identify six different target classes. Designed an	5.250	3.815	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602303A: *MISSILE TECHNOLOGY*	PROJECT 214: *MISSILE TECHNOLOGY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
integrated fuze and bench evaluation equipment for sensor demonstration against target materials; conducted a preliminary fuze-level safety evaluation in preparation for warhead integration demonstrations; performed static evaluations of the fuze with warheads to assess performance; and performed inert demonstrations using a rocket to propel the sensor down a rope to demonstrate sensor function against target materials. ***FY 2011 Plans:*** Determine the ability of the third generation target classification sensor to identify the six target classes defined in collaboration with the Armaments Research, Development, and Engineering Center (ARDEC). Integrate the improved third generation target classification sensor with miniaturized electronics to reduce the sensor footprint in a hardened package that can operate in real-time. Integrate sensor with advanced fuzing technology and demonstrate in the lab with explosively driven reverse ballistic hardware and/or an air gun to impact the sensor with target materials.			
Title: Missile Guidance Systems and Seeker Technology ***Description:*** This effort focuses on the design and evaluation of missile seekers and sensors; guidance, navigation, and control technologies including software; and information and signal processing. Beginning in FY11, these efforts are captured in the Missile Seeker Technology and Missile Guidance and Controls Technologies tasks. ***FY 2010 Accomplishments:*** Initiated the design of infrared and millimeter wave radar target acquisition as well as tracking data fusion algorithms that combine imagery and image feature data. Completed the synthetic aperture radar design and began evaluation; and designed the Image Gyro system, which designs an independent navigation solution using camera imagery and terrain databases to provide geo-location data when Global Positioning System navigation data is not available.	11.466	-	-
Title: Missile Seeker Technology ***Description:*** This effort focuses on the design and maturation of missile seekers, sensors, and software. ***FY 2011 Plans:*** Design and evaluate affordable phased array and next-generation imaging seeker components to enable affordable all-weather missile fire control sensors, tactical seekers, and data links; mature technologies to monitor missile system health to extend missile shelf-life; and validate low cost synthetic aperture radar (SAR) seeker evaluation results. ***FY 2012 Plans:*** Will begin to address thermal issues for affordable phased array seeker technologies; will continue optimization of phased array seeker operating power levels; will begin integration of affordable phased array technologies to demonstrate a seeker array with appropriate power levels and in a form factor for missile applications; will continue design of the next-generation imaging seeker	-	9.952	9.153

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602303A: *MISSILE TECHNOLOGY*	PROJECT 214: *MISSILE TECHNOLOGY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
components including technologies for thermal loading reduction to minimize cool-down time and significantly reduce the cost of infrared seekers; will evaluate missile system health monitor performance in a relevant environment; will design reconfigurable SAR evaluation test-bed for demonstration of tactical missile applications.			
Title: Missile Guidance and Controls Technologies ***Description:*** This effort designs and develops guidance, navigation, and control systems including software, as well as information and signal processing systems for rocket and missile applications. ***FY 2011 Plans:*** Design image gyro system using camera imagery and terrain databases to provide a navigation solution when data is not available from the global positioning system; develop miniaturized guidance electronics; simulate imagery and image feature data combination for infrared and millimeter wave multi-mode seeker algorithm development; and complete evaluation of inertial navigation systems developed under the Enhanced Deeply Integrated Guidance and Navigation Unit effort in this Project. ***FY 2012 Plans:*** Will integrate image gyro system hardware and software for captive flight demonstration; will complete laboratory and limited environmental evaluation of a one-piece, integrated optical data pipe module; will design enhanced miniaturized image stabilization hardware module for transition to the Small Organic Precision Munition effort in PE 0603313 Project 263; will investigate technologies for increased accuracy and precision of acceleration measurements for navigation in a Global Positioning System denied environment; and will complete data combination for infrared and millimeter wave multi-mode seeker algorithm development.	-	6.961	7.428
Title: High Fidelity System Level Simulations and Missile Health Monitoring ***Description:*** This effort designs advanced simulation and aerodynamics tools to increase missile performance and reduce size, weight, and cost in missile systems; and designs advanced health monitoring technologies to increase missile reliability. ***FY 2010 Accomplishments:*** Transitioned initial solar infrared simulator components to PE 0603313A, Missile Simulation Technology, for system level development; continued extension of aerodynamic prediction codes and initiated an effort to design improved methods for missile subsonic airfoil design and characterization. ***FY 2011 Plans:*** Continue improving methods for subsonic airfoil design and characterization as well as complete updates to aerodynamic prediction codes; collect wind tunnel data on multiple airframe designs to validate and improve aerodynamic prediction models	1.917	2.933	3.059

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602303A: *MISSILE TECHNOLOGY*	PROJECT 214: *MISSILE TECHNOLOGY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
and techniques; design advanced simulation technologies to enable missile component trade studies, and design technologies to enable more reliable micro-electromechanical missile components. ***FY 2012 Plans:*** Will design aerodynamic prediction codes for hypersonic flight, dynamic damping derivatives prediction methods, airfoil section enhancements, and inlet aerodynamics; will design integrated baseline system engineering tool for system-level simulations linking missile component models to system capability; will design and evaluate health monitoring technologies for current and future missile systems.			
Title: Smart, Stealthy, and Smokeless Missile Propulsion, Smart Structures and Enhanced Lethality ***Description:*** This effort designs enabling technologies to advance missile propulsion including reduced launch signatures, increased lethality, and improved structural integrity of light weight missile cases. Advanced minimum smoke propellants that meet insensitive munition requirements have degraded performance, thus there is a need to regain this performance for increased ranges and decreased time-to-target. ***FY 2010 Accomplishments:*** Demonstrated and validated missile control thruster analysis tools and design concepts for small diameter applications; fabricated multi-point initiation warheads; and conducted evaluation to determine the energy deposition effect of the warhead. ***FY 2011 Plans:*** Perform a flight demonstration of a variable yield warhead against a representative concrete target and transition to Guided Multiple Launch Rocket System; investigate feasibility of using existing and new propellant ingredients in missile and rocket propulsion to regain performance while maintaining insensitive munitions compliance. ***FY 2012 Plans:*** Will demonstrate high performance propellants; will perform signature evaluations of current Army ignition materials as a baseline for the signature metrics; and will develop, screen for sensitivity, and characterize candidate ignition materials.	5.546	4.965	4.201
Title: Defense against Rockets, Artillery and Mortars (RAM) - Interceptor Development ***Description:*** This effort designs and develops enabling missile component technologies to transition to the Defense against RAM effort in PE 0603313A. ***FY 2010 Accomplishments:***	2.916	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602303A: *MISSILE TECHNOLOGY*	PROJECT 214: *MISSILE TECHNOLOGY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Completed bench level evaluation and integration of component technologies; performed Hardware-in-the-Loop evaluation; developed and integrated flight guidance and control software into RAM interceptor in support of planned live fire demonstrations under PE 0603313A.			
Title: Multi-Role Missile Component Design ***Description:*** This effort focuses on critical technology and component design for future affordable aviation and precision fires that provide overwhelming defeat of conventional and asymmetrical threats in all environments. Successful technologies are matured and demonstrated in PE 603313A Project 263. ***FY 2010 Accomplishments:*** Investigated, designed, and evaluated component technologies to 1) enable miniaturization/packaging of sensors, guidance packages, and electronics; 2) designed more efficient, advanced propulsion; and 3) explored advanced warhead integration for lethal effects and non-lethal payload options; performed high-fidelity modeling and simulation to support trade-studies, requirements definition, and performance evaluations of the specific technologies and components as they apply to various tactical missions. ***FY 2011 Plans:*** Refine, fabricate, and evaluate components and subsystems including: 1) miniaturization/packaging of sensors, guidance, and electronics; 2) more efficient, advanced propulsion; 3) warhead integration and lethal effects including non-lethal payload options; perform trade studies to determine the component technologies to support improved precision fire engagements. ***FY 2012 Plans:*** Will continue to evaluate components and subsystem technologies including 1) miniaturized and reduced cost guidance electronics, seekers, and sensors; 2) more efficient and insensitive munitions compliant propulsion systems for small guided munitions; 3) warhead integration for effects against diverse targets; and 4) fire control using hardware-in-the-loop evaluation, live-fire evaluation, and, appropriate test-beds to determine component and subsystem performance as well as suitability to various missions; will continue trade studies to optimize component, subsystem, and system design.	7.287	9.533	9.854
Title: Swarming Missile Technology ***Description:*** This effort evaluates advanced sensors, guidance, control, and fire control components for employing low-cost swarming missile concepts against individual as well as large arrays of air and ground targets. ***FY 2011 Plans:***	-	1.710	2.918

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602303A: *MISSILE TECHNOLOGY*	PROJECT 214: *MISSILE TECHNOLOGY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Define swarming missile mission concepts to derive and define key performance parameters for these missions; identify key component technologies for design and demonstration. ***FY 2012 Plans:*** Will finalize key component technology identification based on trade studies performed; will begin key component technology design; will begin guidance and control algorithm design to support attack of large arrays of targets; will evaluate options for low cost advanced sensor design for tracking of large arrays of targets.			
Title: Structural Electronics ***Description:*** This effort investigates innovative processes to embed electrical connections into the missile case structure for use in smaller missile designs. ***FY 2011 Plans:*** Investigate mechanical and electrical properties of emerging approaches to embed electrical connections in curved forms regarding their applicability to missile structure and component design. ***FY 2012 Plans:*** Will fabricate and evaluate sample missile electronics subsystems based on prior year results, will evaluate suitability for missile system application; and will document design guidelines based on results.	-	1.108	1.308
Accomplishments/Planned Programs Subtotals	49.398	49.525	50.685

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602303A: *MISSILE TECHNOLOGY*	PROJECT 223: *AERO-PROPULSION TECHNOLOGY*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
223: *AERO-PROPULSION TECHNOLOGY*	7.560	-	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

Congressional Interest Item funding provided for Aero-Propulsion Technology.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Mariah II Hypersonic Wind Tunnel Development Program	7.560	-	-
Description: This is a Congressional Interest Item.			
FY 2010 Accomplishments: Supported component technology development to enable a hypersonic wind tunnel capable of a full 60 seconds of operation at fully duplicated flight conditions.			
Accomplishments/Planned Programs Subtotals	7.560	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602303A: *MISSILE TECHNOLOGY*	PROJECT G04: *AIR DEFENSE TECHNOLOGIES (CA)*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
G04: *AIR DEFENSE TECHNOLOGIES (CA)*	10.427	-	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

Congressional Interest Item funding provided for Air Defense Technologies.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: D-NET: Electrically Charged Mesh (ECM) Defense Net Troop Protection System ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Supported development of a helicopter active protection system concept consisting of a lauchable net to intercept incoming threats and defeat via mechanical and/or electrical discharge.	5.971	-	-
Title: Portable Sensor for Toxic Gas Detection ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Improved the repeatability and sensitivity of microsensors utilized for chemical detection.	2.069	-	-
Title: Swarms Defense System ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Develops and explores advanced sensor, guidance and control, and C2 concepts/technologies for employing missile swarms against individual and/or large arrays of air and ground targets.	2.387	-	-
Accomplishments/Planned Programs Subtotals	10.427	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602303A: *MISSILE TECHNOLOGY*	PROJECT G04: *AIR DEFENSE TECHNOLOGIES (CA)*

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602303A: *MISSILE TECHNOLOGY*	PROJECT G05: *MISSILE TECHNOLOGY INITIATIVES (CA)*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
G05: *MISSILE TECHNOLOGY INITIATIVES (CA)*	2.486	-	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

Congressional Interest Item funding provided for Missile Technologies Initiatives applied research.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Novel Lightweight Armor Material for Insensitive Munitions Protection of Tactical Missiles	2.486	-	-
Description: This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Developed lightweight, low-cost endothermic armor with applicability to launchers/canisters.			
Accomplishments/Planned Programs Subtotals	2.486	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army										DATE: February 2011	
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*				R-1 ITEM NOMENCLATURE PE 0602307A: *ADVANCED WEAPONS TECHNOLOGY*							
COST ($ in Millions)	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**Cost To Complete**	**Total Cost**
Total Program Element	19.906	18.190	20.034	-	20.034	21.377	21.230	20.826	19.741	Continuing	Continuing
042: *HIGH ENERGY LASER TECHNOLOGY*	18.906	18.190	20.034	-	20.034	21.377	21.230	20.826	19.741	Continuing	Continuing
NA5: *Advanced Weapons Components (CA)*	1.000	-	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program element (PE) investigates enabling technologies for High Energy Laser (HEL) weapons. Project 042 develops component technologies such as efficient, high energy, solid state laser designs and adaptive optics, and lethality / effectiveness measurements that enable better models and simulations for future HEL weapon designs. Project NA5 funds congressional special interest items.

Work in this project is related to, and fully complements, efforts in PE 0602890F (HEL Research) and PE 0603924F (HEL Advanced Technology Program), PE 0605605A (DOD High Energy Laser Systems Test Facility (HELSTF)), PE 0602120A (Sensors and Electronic Survivability), and PE 0603004A (Weapons and Munitions Advanced Technology) Project L96, and is coordinated with PE 0603005A (Combat Vehicle and Automotive Advanced Technology) Project 441.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work is performed by the U.S. Army Space and Missile Defense Command (SMDC), in Huntsville, AL, the U.S. Army Aviation and Missile Research, Development, and Engineering Center (AMRDEC) in Huntsville, AL, and the High Energy Laser Systems Test Facility, at White Sands Missile Range, NM.

B. Program Change Summary ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Previous President's Budget	21.964	18.190	20.034	-	20.034
Current President's Budget	19.906	18.190	20.034	-	20.034
Total Adjustments	-2.058	-	-	-	-
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	-1.387	-			
• SBIR/STTR Transfer	-0.671	-			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602307A: *ADVANCED WEAPONS TECHNOLOGY*	PROJECT 042: *HIGH ENERGY LASER TECHNOLOGY*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
042: *HIGH ENERGY LASER TECHNOLOGY*	18.906	18.190	20.034	-	20.034	21.377	21.230	20.826	19.741	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project investigates and develops advanced technologies for High Energy Laser (HEL) weapon systems to enable more efficient lasers with greater power output. This includes technologies to support development of alternate laser sources; precision optical pointing and tracking components; adaptive optics to overcome laser degradation due to atmospheric effects; and thermal management systems to remove excess heat. In addition, this effort conducts laser lethality testing and analysis against a variety of targets and investigates the impact of low-cost laser countermeasures. Solid State Laser (SSL) efforts continue to leverage other funds provided by the HEL Joint Technology Office (JTO), the Air Force, and the Navy to develop multiple technical approaches that reduce program risk and maintain competition.

Work in this project is related to, and fully coordinated with, efforts in PE 0602890F (HEL Research) and PE 0603924F (HEL Advanced Technology Program), PE 0605605A (DOD High Energy Laser Systems Test Facility (HELSTF)), PE 0602120A (Sensors and Electronic Survivability), PE 0603004A (Weapons and Munitions Advanced Technology) Project L96, and to PE 0603005A (Combat Vehicle and Automotive Advanced Technology) Project 441.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy and the Army Science and Technology Master Plan.

Work is performed by the U.S. Army Space and Missile Defense Command (SMDC), in Huntsville, AL, the U.S. Aviation and Missile Research, Development, and Engineering Center (AMRDEC) in Huntsville, AL, and the High Energy Laser Systems Test Facility (HELSTF), at White Sands Missile Range, NM.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Solid State Laser (SSL) Effects	2.837	2.925	5.948
Description: This effort provides the underlying data required to support system engineering designs, lethality analysis, and modeling and simulation (M&S) tools for laser weapon systems.			
FY 2010 Accomplishments: Conducted expanded full scale static SSL lethality evaluations against rocket, artillery, and mortar (RAM) targets, unmanned aerial systems (UASs), and other high priority threats to determine the laser energy required both on target and at the laser source to defeat them under various engagement ranges.			
FY 2011 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602307A: *ADVANCED WEAPONS TECHNOLOGY*	PROJECT 042: *HIGH ENERGY LASER TECHNOLOGY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Determine SSL effectiveness against targets of interest in both static and dynamic test scenarios to assess a broad spectrum of mission applications and validate M&S tools that support analysis of alternatives, HEL power levels, and associated ranges across multiple mission sets. ***FY 2012 Plans:*** Will continue static and dynamic evaluations at various power levels up to 100kW using the SSL at the High Energy Laser Systems Test Facility (HELSTF) against RAM and UAS targets in conjunction with the other Services.			
Title: SSL Development, Phase 3 - 100 kW ***Description:*** The goal of this Joint High Power Solid State Laser (JHPSSL) Phase 3 effort is to develop and demonstrate 100 kW-class, near-diffraction-limited diode-pumped solid-state lasers that have architectures favorable for tactical weapon applications. ***FY 2010 Accomplishments:*** Completed integration of the selected laser device with the existing Beam Control System (BCS) and began evaluation of high power SSL performance against a variety of target types at tactical ranges of interest as a risk reduction activity for the High Energy Laser Technology Demonstrator (HEL TD). ***FY 2011 Plans:*** Decouple 100 kW SSL from existing BCS and integrate SSL with the mobile HEL TD BCS to demonstrate potential mission applications, including Counter-RAM (CRAM), and explore performance of the HEL TD BCS.	4.443	1.950	-
Title: Advanced Beam Control Component Development ***Description:*** This effort investigates technologies to enable lighter, more agile beam control systems that are robust enough to be used in Army ground platforms. This work is done in collaboration with the HEL JTO and other Services. ***FY 2010 Accomplishments:*** Designed advanced architectures for BCSs and developed component technologies that improved compactness, pointing accuracy, and agility of beam directors for improved compatibility with future all-electric tactical platforms. This included adaptive optics (AO) components to engage threats at longer ranges and low-absorbing HEL windows, shared aperture optics, and mirror coatings to minimize laser power and beam quality degradation. ***FY 2011 Plans:*** Fabricate and assemble advanced beam control components for integration into the HEL TD beam control system, such as AO, to increase the effective range of the system. ***FY 2012 Plans:***	4.820	2.620	0.751

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602307A: *ADVANCED WEAPONS TECHNOLOGY*	PROJECT 042: *HIGH ENERGY LASER TECHNOLOGY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Will coat optics, begin assembly, and conduct laboratory demonstrations of a lightweight beam director with the performance characteristics required for a tactical HEL weapon system.			
Title: High Efficiency Laser Development ***Description:*** This effort develops component technologies that lead to increased SSL wall-plug efficiencies that greatly improve the ability to integrate SSL systems onto mobile Army weapon platforms. This work is done in collaboration with the HEL JTO and other Services. ***FY 2010 Accomplishments:*** Continued to design and develop reliable electric laser component technologies that improve SSL efficiencies, such as improved gain media, pump power sources, optical elements, and diode arrays; and began to explore thermal management technologies. ***FY 2011 Plans:*** Begin risk reduction for assembly and integration of two 25 kW high efficiency breadboards using alternative technical approaches; begin the conceptual design of a 100 kW class high efficiency device; initiate multiple eye-safe laboratory demonstrations with greater than 30% efficiency; and continue to develop thermal management techniques specific to high efficiency lasers that minimize thermal distortions, alignment errors, and beam quality degradation. ***FY 2012 Plans:*** Will complete the design and risk reduction of the 25 kW high efficiency approaches, to include fabrication, integration, and evaluation of laser assemblies at 5 kW and 15 kW; will complete the interim design of the 25 kW laboratory devices; will complete the conceptual design of the 100 kW class device, to include thermal management techniques; and will leverage small business innovation research efforts to complete eye-safe laser component demonstrations.	6.334	9.720	12.521
Title: HEL Research and Development Laboratory ***Description:*** This effort focuses on developing in-house expertise through SSL assessments. This work is done in cooperation with the Aviation and Missile Research Development and Engineering Center (AMRDEC). ***FY 2010 Accomplishments:*** Conducted low-to-medium power studies on a 600 meter test range to investigate SSL atmospheric propagation and target interaction phenomenology. Initiated data analysis and model development to support atmospheric correction algorithm development and to provide validated inputs for wargaming modeling and simulation efforts. ***FY 2011 Plans:***	0.472	0.975	0.814

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602307A: *ADVANCED WEAPONS TECHNOLOGY*	PROJECT 042: *HIGH ENERGY LASER TECHNOLOGY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Investigate new deformable mirror designs to identify those with lower cost and sufficient performance; and investigate causes of poor beam quality in SSLs to determine where investments can advance the technology for Army applications. ***FY 2012 Plans:*** Will conduct modeling and simulation studies to characterize and optimize HEL system and component performance; and will enhance state-of-the-art reflectance measurement capability and continue collecting reflectance data of threat targets.			
Accomplishments/Planned Programs Subtotals	18.906	18.190	20.034

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602307A: *ADVANCED WEAPONS TECHNOLOGY*	PROJECT NA5: *Advanced Weapons Components (CA)*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
NA5: *Advanced Weapons Components (CA)*	1.000	-	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

Congressional Interest Item funding provided for Advanced Weapons Components applied research.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: UAV Directed Energy Weapons System Payloads	1.000	-	-
Description: This is a Congressional Interest Item.			
FY 2010 Accomplishments: This effort investigated a compact RF directed energy weapons system in a package that is capable of deployment on a presently mature UAV platform.			
Accomplishments/Planned Programs Subtotals	1.000	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army										DATE: February 2011	
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*				R-1 ITEM NOMENCLATURE PE 0602308A: *Advanced Concepts and Simulation*							
COST ($ in Millions)	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**Cost To Complete**	**Total Cost**
Total Program Element	22.070	20.582	20.933	-	20.933	21.291	21.629	21.778	22.073	Continuing	Continuing
C90: *Advanced Distributed Simulation*	11.125	14.503	14.736	-	14.736	14.978	15.205	15.251	15.435	Continuing	Continuing
D02: *MODELING & SIMULATION FOR TRAINING AND DESIGN*	5.771	6.079	6.197	-	6.197	6.313	6.424	6.527	6.638	Continuing	Continuing
D14: *Advanced Modeling and Simulation Initiatives (CA)*	5.174	-	-	-	-	-	-	-	-	Continuing	Continuing

Note

FY10 funding realigned to higher priority efforts.
FY12 funding increase for Large Scale Distributive Training.

A. Mission Description and Budget Item Justification

This program element (PE) develops enabling technologies to create effective training capabilities for the Warfighter. The PE supports the underpinning technologies and understanding to establish architecture standards and interfaces necessary for realizing the Army vision of creating a realistic synthetic "electronic battlefield" environment for use across the spectrum of doctrine, organization, training, leader development, materiel, personnel, and facilities (DOTLM-PF). The Advanced Distributed Simulation project (project C90) focuses on advancing component technologies required for real time interactive linking within and among constructive, virtual, and live simulation and training by refining technologies for advanced distributed interactive simulation. The Modeling and Simulation for Training and Design (project D02), further develops concepts for immersive training and learning environments with the Institute for Creative Technologies (ICT) at the University of Southern California, Los Angeles, California. Photonics Research and Advanced Modeling and Simulation Initiatives (projects D01 and D14) fund congressional special interest items.

Work in this PE complements and is fully coordinated with PE 0601104A (University and Industry Research Centers), PE 0602785A (Manpower/Personnel/Training Technology), PE 0602787A (Medical Technology), PE 0603007A (Manpower, Personnel and Training Advance Technology), and PE 0603015A (Next Generation Training & Simulation Systems).

Projects D01 and D14 fund Congressional Interest Items.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army	DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	**R-1 ITEM NOMENCLATURE** PE 0602308A: *Advanced Concepts and Simulation*

Work in this PE is performed by the Research, Development, and Engineering Command (RDECOM), Army Research Laboratory, Human Research and Engineering Directorate, Simulation and Training Technology Center (STTC), Orlando, FL.

B. Program Change Summary ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Previous President's Budget	27.330	20.582	18.128	-	18.128
Current President's Budget	22.070	20.582	20.933	-	20.933
Total Adjustments	-5.260	-	2.805	-	2.805
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	-4.775	-			
• SBIR/STTR Transfer	-0.485	-			
• Adjustments to Budget Years	-	-	2.805	-	2.805

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602308A: *Advanced Concepts and Simulation*	PROJECT C90: *Advanced Distributed Simulation*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
C90: *Advanced Distributed Simulation*	11.125	14.503	14.736	-	14.736	14.978	15.205	15.251	15.435	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

This project develops enabling technologies for advancing distributed interactive simulation in synthetic environments such as networking of models, complex data interchange, and collaborative training. The project researches and develops the ability to create a virtual representation of combined arms environments, with the Warfighter-in-the-loop that constructive (event driven) simulation cannot simulate. Efforts in this project are fully integrated with the Army Research Laboratory (ARL) since the realignment of STTC to ARL, and coordinated with work at the Army Research Institute and the Medical Research Materiel Command.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this project is performed by the Research, Development, and Engineering Command (RDECOM), Army Research Laboratory, Human Research and Engineering Directorate, Simulation and Training Technology Center (STTC), Orlando, FL.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Live, Virtual, Constructive (LVC) Simulations	3.130	3.716	3.949
Description: This effort investigates the combination of Live, Virtual and Constructive (LVC) training technologies into a seamless event. Live training refers to personnel and systems performing an exercise mission; virtual training refers to personnel using simulators; and constructive training refers to computer-aided simulations that introduce a wider control of virtual forces. Developed methods and technologies are transitioned to PE 0603015A/project S29.			
FY 2010 Accomplishments: Investigated use of predictive technologies and artificial intelligence in constructive training to investigate behaviors and reasoning for computer-generated forces in asymmetric warfare simulations; continued technology improvements of sensor components for physics-based real-time dynamic environments for LVC training.			
FY 2011 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602308A: *Advanced Concepts and Simulation*	PROJECT C90: *Advanced Distributed Simulation*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Continue investigations in predictive technologies for behaviors and reasoning of computer generated forces; and complete development of real-time physics-based rendering of asymmetric forces in urban environments to support asymmetric warfare simulations in embedded training for LVC training. ***FY 2012 Plans:*** Will investigate technologies to create visual and aural battlefield effects; will produce a more holistic sensory experience for a live training audience; and will complete laboratory experiments of dynamic terrain/environment shared architecture, physics based algorithms in virtual and constructive simulations, as well as apply high performance computing in preparation for future advance technology demonstrations.			
Title: Modeling and Simulation Training Technologies ***Description:*** This effort investigates and evaluates military medical training technologies and their effectiveness. The effort also conducts applied research to develop training technologies and techniques for Soldiers with unmanned systems. ***FY 2010 Accomplishments:*** Investigated methods and technologies to increase medical simulation capabilities for surgical training to include initial designs for a surgical simulator; developed simulations to support the safe operations of unmanned systems in complex environments. ***FY 2011 Plans:*** Investigate methods and technologies to emulate live tissue replacement, and conduct experiments to assess training effectiveness; initiate structured research and conduct testing with medical holograms and virtual patients; develop low-cost, rugged person-worn immersive systems for dismounted Soldier training as well as tracking systems and hand-held devices to support dismounted training exercises. ***FY 2012 Plans:*** Will conduct human agent teaming research studies to improve collaboration with focus on improving team performance, confidence, multi-tasking and workload with unmanned systems in support of the ARL-Robotics Collaborative Technology Alliance(PE 0601104A, project H09); and will investigate game engine and virtual world in terms of improving the human interfaces as well as developing new innovative training environments in accordance with the United States Army Learning Concept for 2015 document.	3.887	3.969	3.969
Title: Collaborative and Immersive Environment Technologies ***Description:*** This effort investigates adaptive learning environments with social simulations to conduct non-kinetic asymmetric warfare training. ***FY 2010 Accomplishments:***	4.108	6.818	6.818

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602308A: *Advanced Concepts and Simulation*	PROJECT C90: *Advanced Distributed Simulation*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Continued development of Joint, Interagency, Intergovernmental, Multi-National (JIIM) environment for squad team level training using distributed simulations and after action reviews; developed immersive environments to support infantry training and mission rehearsal; as well as investigated algorithms and methodologies to enhance the realism of simulation environments for battle command training and decision making. ***FY 2011 Plans:*** Continue the development of infantry immersive simulation and learning environments to include intelligent tutoring feedback; develop the enhanced realism of simulation environment to support the battle command training and decision making; validate algorithms and methodologies through user assessments; as well as investigate and develop virtual world and gaming technologies to accomplish multi-player, large scale, distributed training and learning; with evaluation of the technologies and the impact on human performance. ***FY 2012 Plans:*** Will continue development of infantry immersive simulation and learning environments to include representing multi-party interpersonal interactions and the development of tools, so these simulation and learning environments can be readily created by others.			
Accomplishments/Planned Programs Subtotals	11.125	14.503	14.736

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602308A: *Advanced Concepts and Simulation*	PROJECT D02: *MODELING & SIMULATION FOR TRAINING AND DESIGN*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
D02: *MODELING & SIMULATION FOR TRAINING AND DESIGN*	5.771	6.079	6.197	-	6.197	6.313	6.424	6.527	6.638	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

This project develops training applications to enable the Army to train any time and any place. Efforts include designing virtual humans that embody natural language, speech recognition in noisy environments, gesture, gaze, and conversational speech. Techniques and methods are assessed for integrating different sensory cues into virtual environments that result in enhanced training and leader development. The project leverages the capabilities of industry and the research and development community through the synthesis of creativity and technology, including work at the Army Research Institute and the Army Research Laboratory.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this project is performed by the Research, Development, and Engineering Command (RDECOM), Army Research Laboratory, Human Research and Engineering Directorate, Simulation and Training Technology Center (STTC), Orlando, FL.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Immersive Technology Environments	2.710	2.916	3.034
Description: This effort performs research and develops technologies that enable responsive and reconfigurable simulations that immerse human senses such as sight, sound, and touch in mixed reality environments consisting of physical elements providing touch and feel, objects such as obstacles and walls in combination with virtual imagery. Developed technologies and techniques are transitioned for maturation and demonstration to PE 0603015A/project S28. ***FY 2010 Accomplishments:*** Designed and developed approaches for rapidly inserting virtual content into large-scale, real-world training environments that can be rapidly reconfigured. ***FY 2011 Plans:*** Investigate technologies to make mixed reality training,which combines real and imagined images as well as environments, more portable and affordable. ***FY 2012 Plans:***			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602308A: *Advanced Concepts and Simulation*	PROJECT D02: *MODELING & SIMULATION FOR TRAINING AND DESIGN*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Will develop tools that allow others to easily create immersive environments; will develop and integrate improved natural language capabilities into the multi-party conversational agent simulation to investigate improved contextual knowledge and understanding of events within the simulation.			
Title: Immersive Technology Techniques ***Description:*** This effort develops tools, techniques and technologies for improving the immersion of human senses within simulation environments and therefore creating enhanced realism. ***FY 2010 Accomplishments:*** Developed software tools for rapidly creating automated tutoring systems that can be tailored to multiple training applications/ needs and support team training, performance assessment, and team after-action reviews. ***FY 2011 Plans:*** Investigate and develop technologies and techniques to implement high-quality video and interactive experiences on mobile hand-held devices; evaluate and develop research technologies and components for supporting interactive learning. ***FY 2012 Plans:*** Will investigate tools for semi-automatically creating training materials based on rapid assimilation of actual experiences; and will conduct analysis of pilot data from a complex negotiation/bargaining task to develop implementation of emotional behaviors in virtual humans.	3.061	3.163	3.163
Accomplishments/Planned Programs Subtotals	5.771	6.079	6.197

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602308A: *Advanced Concepts and Simulation*	PROJECT D14: *Advanced Modeling and Simulation Initiatives (CA)*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
D14: *Advanced Modeling and Simulation Initiatives (CA)*	5.174	-	-	-	-	-	-	-	-	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for applied research in Advanced Modeling and Simulation.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Advanced Live, Virtual and Constructive (LWC) Training Systems. ***Description:*** This is a Congressional Special Interest Item ***FY 2010 Accomplishments:*** Investigated technology options for software tools and simulators which would support training in immersive virtual environments.	2.786	-	-
Title: Protective Gear Development through Man-In-Stimulant-Test Chamber. ***Description:*** This is a Congressional Special Interest Item ***FY 2010 Accomplishments:*** Investigated technology options for testing protective gear concepts.	0.796	-	-
Title: Cognitive Based Modeling and Simulation for Tactical Decision Support. ***Description:*** This is a Congressional Special Interest Item ***FY 2010 Accomplishments:*** Explored cognitive map-based modeling and simulation to support tactical decision-making by military planners in training and operation scenarios.	1.592	-	-
Accomplishments/Planned Programs Subtotals	5.174	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602308A: *Advanced Concepts and Simulation*	PROJECT D14: *Advanced Modeling and Simulation Initiatives (CA)*

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army										DATE: February 2011	
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*				R-1 ITEM NOMENCLATURE PE 0602601A: *Combat Vehicle and Automotive Technology*							
COST ($ in Millions)	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**Cost To Complete**	**Total Cost**
Total Program Element	79.649	64.740	64.306	-	64.306	62.264	66.001	67.521	67.360	Continuing	Continuing
C05: *ARMOR APPLIED RESEARCH*	19.083	25.660	25.839	-	25.839	23.348	24.437	25.851	25.559	Continuing	Continuing
H77: *National Automotive Center*	15.739	16.515	15.144	-	15.144	15.489	16.285	16.729	17.152	Continuing	Continuing
H91: *Ground Vehicle Technology*	21.548	22.565	23.323	-	23.323	23.427	25.279	24.941	24.649	Continuing	Continuing
T26: *Ground Vehicle Technologies (CA)*	21.686	-	-	-	-	-	-	-	-	Continuing	Continuing
T31: *NAT'L AUTO CENTER APP RES INIT (CA)*	1.593	-	-	-	-	-	-	-	-	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

This program element (PE) researches and develops automotive technologies that enable Army transformation. The PE supports the research and development of components and subsystems for ground combat/tactical vehicles in the areas of survivability (project C05), advanced automotive technology (project H77), and tank and automotive technology (project H91). Projects T26 and T31 fund congressional special interest items.

Work in this PE is related to, and fully coordinated with, PE 0603005A (Combat Vehicle and Automotive Advanced Technology), PE 0602618A (Ballistics Technology, Robotics Technology, PE 0602105A (Materials Technology), PE 0602716A (Human Factors Engineering Technology), PE 0602705A (Electronics and Electronic Devices), and PE 0708045A (Manufacturing Technology). Work in this PE is coordinated with the U.S. Marine Corps, the Naval Surface Warfare Center, and other ground vehicle developers within the Defense Advanced Research Projects Agency (DARPA) and the Departments of Energy, Commerce, and Transportation.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this PE is performed by the Tank Automotive Research, Development, and Engineering Center (TARDEC), Warren, MI.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army	DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	**R-1 ITEM NOMENCLATURE** PE 0602601A: *Combat Vehicle and Automotive Technology*

B. Program Change Summary ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Previous President's Budget	78.923	64.740	62.571	-	62.571
Current President's Budget	79.649	64.740	64.306	-	64.306
Total Adjustments	0.726	-	1.735	-	1.735
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	1.500	-			
• SBIR/STTR Transfer	-0.774	-			
• Adjustments to Budget Years	-	-	1.735	-	1.735

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602601A: *Combat Vehicle and Automotive Technology*	PROJECT C05: *ARMOR APPLIED RESEARCH*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
C05: *ARMOR APPLIED RESEARCH*	19.083	25.660	25.839	-	25.839	23.348	24.437	25.851	25.559	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project investigates, designs, and evaluates advanced armor concepts, ballistic defeat mechanisms, and armor packaging concepts to achieve lightweight, ballistically-superior armors/structures for combat and tactical vehicles. Armors are being investigated to meet anticipated ground combat and tactical vehicle survivability objectives. Additionally, this project focuses on analysis, modeling, and characterization of potential survivability solutions that could protect against existing and emerging threats. This analysis is used to aid in the identification of technologies to enter maturation and development in PE 0603005A/project 221.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this project is performed by the Tank Automotive Research, Development, and Engineering Center (TARDEC) Warren, MI and is fully coordinated with work at the Army Research Laboratory (ARL), Aberdeen Proving Ground, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Vehicle Armor Protection for Lightweight Combat Systems:	9.774	10.881	10.007
Description: This effort designs, fabricates, and investigates add-on lightweight armor packages to protect combat systems against projectiles, warheads, penetrators and blast fragments. ***FY 2010 Accomplishments:*** Performed initial assessment of ground vehicle armor and third generation mine kits to meet emerging threats; analyzed and evaluated material/recipes performance for various armor/mine protection areas; and provided initial characterization of next generation armor materials to identify risks for maturation; and matured improved ballistic performance armor with embedded health monitoring. ***FY 2011 Plans:*** Perform armor recipe optimization to establish armor efficiency; complete ballistic testing of selected armor systems to validate the armor design; downselect materials/armor systems for entire vehicle protection and procure long lead items for future demonstration builds; and mature and validate performance of multifunctional armor. ***FY 2012 Plans:***			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602601A: *Combat Vehicle and Automotive Technology*	PROJECT C05: *ARMOR APPLIED RESEARCH*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Will complete armor design and fabrication; and will perform shaker and ballistic assessment to validate and improve armor design, armor attachment durability, and ballistic performance for combat vehicles. This work is done in conjunction with program elements 0602105A, 0602618A, and 0603005A.			
Title: Advanced Armor Development: ***Description:*** The objective of this effort is to investigate advanced armors for combat and tactical vehicle applications to defeat single and multiple chemical and kinetic energy (CE and KE) emerging threats. ***FY 2010 Accomplishments:*** Continued investigation and maturation of candidate reactive and passive armor concepts for single emerging threat(s) (KE) and downselected solutions for maturation with respect to capability, weight, and ease of integration. ***FY 2011 Plans:*** In FY11, validate advanced armor designs at the panel level while reducing armor weight; improve armor recipe to meet threshold areal density while defeating threshold threat. ***FY 2012 Plans:*** Will develop advanced armor designs at the panel level that will reduce areal density from the threshold level while still defeating threshold threat. Will investigate integration of select C4ISR equipment into armor recipe and design. This work is done in conjunction with program elements 0602105A, 0602618A and 0603005A.	4.378	8.772	7.160
Title: Blast Mitigation: ***Description:*** This effort matures modeling and simulation (M&S) tools and blast mitigation technologies to improve ground vehicle structural performance against blast threats. Assessments are conducted to validate the M&S tools. ***FY 2010 Accomplishments:*** Developed advanced crew protection technologies for land mine/explosive events; investigated potential techniques for 3-dimensional vehicle models and crew protection methods for land mine/explosive events; validated survivability enhancements of integral fuel tanks against objective threats; began development of external fire suppression methods to address fuel, track, and stowage fire vulnerabilities for combat vehicles; and improved blast tolerance of automatic fire extinguishing systems. ***FY 2011 Plans:*** In FY11, develop techniques for complete vehicle structure design and crew protection methods for landmine/explosive events; investigate performance and integration of extinguishing mechanisms; enhance fire M&S tools to incorporate new extinguishing	4.931	6.007	8.672

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602601A: *Combat Vehicle and Automotive Technology*	PROJECT C05: *ARMOR APPLIED RESEARCH*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
agents, delivery systems, and predictive capabilities for ballistic events; increase cook-off resistance of small arms ammunition via improved stowage without compromising accessibility. ***FY 2012 Plans:*** Will increase fidelity in end-to-end M&S tools for occupant protection and vehicle underbody and Soldier blast protection. Will validate live fire test and evaluation events with M&S to reduce program risk and expense, and will use high fidelity models to identify quick reaction solutions to the Warfighter. Will mature techniques to reduce flammability of vehicle tires, track, and composite materials and protect lithium-ion batteries against fire events			
Accomplishments/Planned Programs Subtotals	19.083	25.660	25.839

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602601A: *Combat Vehicle and Automotive Technology*	PROJECT H77: *National Automotive Center*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
H77: *National Automotive Center*	15.739	16.515	15.144	-	15.144	15.489	16.285	16.729	17.152	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project researches and develops automotive component technologies to meet ground combat and tactical vehicle objectives. The project funds the National Automotive Center (NAC), which conducts shared government and industry technology programs to leverage commercial investments in automotive technology research and development for Army ground combat and tactical vehicle applications.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this project is performed by Tank Automotive Research, Development, and Engineering Center (TARDEC), Warren, Michigan and is coordinated with PE 0602705A (Electronics and Electronic Devices).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Alternative Energy:	8.541	8.859	9.086
Description: This effort leverages opportunities from industry to develop alternative energy technologies for Army applications. ***FY 2010 Accomplishments:*** Investigated waste to energy technologies for application in power generation devices; pursued dual-use power and energy component development; investigated vehicle platform with high output power capabilities tied to power grid and the modeling tools needed to understand this interaction; expanded development and commercialization of dual-use simulation-based tools that incorporate 3D terrain topology modeling for validation and verification of vehicle designs; and designed and developed an energy storage system on hybrid electric vehicles for forward operations applications utilizing renewable energy sources and/or generator set(s). ***FY 2011 Plans:*** Continue development of waste to energy technologies to reduce fuel consumption in power generation; continue to conduct experiments with synthetic and renewable fuel blends for alternative fuels qualification program for ground vehicle systems; expand development and commercialization of dual-use Modeling and Simulation (M&S) tools by conducting high-density hybrid engine modeling and vehicle thermal management modeling. ***FY 2012 Plans:*** Will conclude development of dual-use M&S tools for advanced high-density hybrid engine powered non-tactical vehicle business case analysis; will begin planning for large scale investigation of vehicle-to-grid and grid-to-vehicle capabilities integrated into			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602601A: *Combat Vehicle and Automotive Technology*	PROJECT H77: *National Automotive Center*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
a power grid with a high proportion of renewable generation; will continue to pursue qualification of alternative fuels for use in ground vehicle systems; will conduct system level assessments of synthetic and renewable fuel blends supporting their implementation into military fleets. This work is being done in conjunction with program element 0602705A.			
Title: Conditioned Based Maintenance (CBM) and Intelligent Systems: ***Description:*** This effort advances condition based maintenance and intelligent systems technologies for dual use applications, including the investigation of commercial hybrid electric non-tactical vehicles on military bases to gather performance, reliability and maintainability data. ***FY 2010 Accomplishments:*** Continued to develop and evaluate dual-use CBM tools by conducting lithium-ion and lead acid battery characterization experiments and thermo electric power unit studies. ***FY 2011 Plans:*** Expand development and investigation of dual-use CBM tools by developing battery prognostics and diagnostics M&S tools, as well as investigating on-board vehicle health awareness tools. ***FY 2012 Plans:*** Will pursue fleet level evaluation of dual-use CBM tools for battery prognostics and diagnostics and begin development and investigation of dual-use CBM tools for additional vehicle subsystem prognostics and diagnostics.	2.136	2.212	2.272
Title: Power, Energy and Mobility: ***Description:*** This effort investigates dual use power, energy, and mobility technologies. ***FY 2010 Accomplishments:*** Investigated performance capabilities of commercially available technologies applied to military ground vehicle platforms in suspension, torque vectoring differentials, batteries, brakes, electrical subsystems, and alternative chassis structures; developed hybrid electric vehicle requirements and software integration to facilitate the design and development of a communication system between vehicle and the power control using intelligent software; and continued M&S efforts by modeling advanced diesel and hybrid powertrains by developing predictive M&S modeling tools and validation methodologies . ***FY 2011 Plans:*** Develop dual-use automotive subsystems and components that can be modified for application to military platforms and alternative chassis structures; pursue power and energy component development; design high-yield renewable energy generation	2.312	3.690	3.786

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	**R-1 ITEM NOMENCLATURE** PE 0602601A: *Combat Vehicle and Automotive Technology*	**PROJECT** H77: *National Automotive Center*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
technology architecture and prepare distributed generation transition criteria for PM Mobile Electric Power; and expand development of methodologies to validate and explore true potential of proposed advanced engine technologies. ***FY 2012 Plans:*** Continue the pursuit of dual-use power and energy component development and integrate initial products into non-tactical vehicles for assessment on military installations. Continue to support transition of distributed generation hardware to PM Mobile Electric Power or other materiel developers.			
Title: Joint Recovery and Distribution System (JRaDS): ***Description:*** Provides a Family of Systems (FoS) which enables execution of multiple mission profiles via a small number of trailer variants vs. the large inventory of distinct type trailer systems currently in the service trailer inventory. Will offer high reliability and parts commonality, thus, reducing Service logistics and maintenance requirements; associated costs of ownership, and requirements for supplementary Materiel Handling Equipment and supporting personnel may be reduced. ***FY 2010 Accomplishments:*** Four 40 ton, four 34 ton and one 13 ton trailer have been produced and reviewed; the 34T and 13T trailers began evaluation performance; 40 ton trailers underwent capability, safety confirmation and limited durability testing; team conducted an Operational Demonstration with Soldiers from the 101st Sustainment Brigade in which they performed seven recovery scenarios on various versions and levels of disabled Mine Resistant Ambush Protected (MRAP) vehicles ***FY 2011 Plans:*** Reduce risk for DoD Joint Recovery and Distribution System (JRaDS) JCTD by enabling the purchase of additional prototype trailer systems and support the broader scoped Operational Military Utility Assessment.	2.750	1.754	-
Accomplishments/Planned Programs Subtotals	15.739	16.515	15.144

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602601A: *Combat Vehicle and Automotive Technology*	PROJECT H91: *Ground Vehicle Technology*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
H91: *Ground Vehicle Technology*	21.548	22.565	23.323	-	23.323	23.427	25.279	24.941	24.649	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project designs, develops, and evaluates a variety of innovative and enabling technologies in the areas of vehicle concepts, virtual prototyping, power, thermal management, propulsion, mobility, survivability, vehicle diagnostics, fuels, lubricants, water purification, intelligent systems, and other component technologies for application to combat and tactical vehicles.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this project is performed by the Tank Automotive Research, Development, and Engineering Center (TARDEC), Warren, Michigan.

Efforts in this project are closely coordinated with the Army Research Laboratory (ARL), the Defense Advanced Research Projects Agency (DARPA), the U.S. Army Engineer Research, Development, and Engineering Center, Edgewood Chemical Biological Center, and the Army Medical Department.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Pulse Power: ***Description:*** This effort focuses on growing technology for compact, high frequency/high energy/high power density components and devices, which are enablers for several advanced electric-based weapon systems. ***FY 2010 Accomplishments:*** Designed and fabricated improved gate and bus structure design for high power applications; designed and developed Super Gate Turn-Off (SGTO) switch technology using Silicon Carbide (SiC) for high power applications. ***FY 2011 Plans:*** Investigate full up Si and SiC based SGTO applications such as high power microwaves, electrified armors, and directed energy weapons applications. ***FY 2012 Plans:*** Will investigate SiC based SGTO switches for electro-mechanical armor applications; will investigate SiC components in DC-DC chargers, and pulse chargers; will investigate improvements in fast high energy density capacitors with improved clearing agents using newly developed films for directed energy weapons (DEW).	6.615	6.123	3.820
Title: JP-8 Reformation for Military Fuel Cells:	2.065	2.104	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602601A: *Combat Vehicle and Automotive Technology*	PROJECT H91: *Ground Vehicle Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: This effort investigates JP-8 reformer and desulfurization technologies so that JP-8 may be utilized as a fuel source for fuel cells used in future military vehicle power applications. ***FY 2010 Accomplishments:*** Began tracking sulfur handling capacity and operational temperatures of JP-8 reformer, desulfurization devices, and fuel cell system; and began design and development on all major reformer fuel cell system components to determine functionality within the claim space limitations. ***FY 2011 Plans:*** Mature major JP-8 reforming fuel cell system components performance and interoperability; design and develop balance of components for the JP-8 reforming fuel cell system and ensure program specifications meet user capability requirements. This effort is done in coordination with efforts in PE 0603005A, project 441. For FY12, this effort is continued under title Auxiliary Power.			
Title: Propulsion-Prime Power: ***Description:*** The goal of this effort is to design and develop engines and generators and their components with significantly improved performance characteristics, efficiencies, and power densities. ***FY 2010 Accomplishments:*** Investigated the performance of modified commercial diesel engines with a control strategy to enable operation of JP-8 fuel; and assessed compact, high power density hybrid electric components performance. ***FY 2011 Plans:*** Complete common rail fuel pump development and conduct durability experiments with JP-8; complete the design and fabrication of closed-loop fuel injection system; conduct initial fuel injection system performance tests; begin advanced drivetrain efficiency design and development; and advance powertrain noise abatement technology development. ***FY 2012 Plans:*** Will investigate the durability and reliability of advanced fuel systems operating on JP-8 fuel at high temperatures; will examine engine performance when using military grade fuels; will complete powertrain analysis for efficiency and thermal heat rejection; will examine designs to improve the mechanical efficiency of advanced transmissions while increasing ratio spread and electronic controls; will investigate and develop components to reduce engine cooling burden and assessed hybrid electric components performance.	2.018	1.834	5.201
Title: Non-primary Power System (NPS):	2.605	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602601A: *Combat Vehicle and Automotive Technology*	PROJECT H91: *Ground Vehicle Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: This effort investigates component technologies for energy storage and generation. ***FY 2010 Accomplishments:*** Developed system controls for advanced power and energy system demonstrator; investigated strategies to reduce non-primary power generation system exhaust noise; and developed techniques to mitigate safety challenges for advanced energy storage devices on vehicles. This effort is done in coordination with efforts in PE0603005A, project 441.			
Title: Power & Thermal Management: ***Description:*** This effort investigates power and thermal management components, including traction motors, inverters, dc-dc converters, new motor and generator concepts and control strategies to meet objective power requirements. ***FY 2010 Accomplishments:*** Developed combined power and thermal management system level architecture from modeling and simulation toolset; designed and developed integrated electronic power and thermal management device/component level technology; and investigated advanced intelligent (learning and adaptive) power management control algorithms using artificial intelligence techniques. ***FY 2011 Plans:*** Develop advanced intelligent (learning and adaptive) control architecture to control multiple vehicular power sources and loads; initiate development of reliable, cost effective, high temperature power electronic components to reduce system cooling burden. This effort is done in coordination with efforts in 0603005A. For FY12, this effort is continued under titles Power Management and Power Electronics and On-Board Vehicle Power Components.	3.094	6.295	-
Title: Power Management: ***Description:*** This effort investigates technologies to more effectively distribute power within military vehicle platforms. ***FY 2012 Plans:*** Will enhance advanced intelligent (learning and adaptive) control architecture to control multiple vehicular power sources and loads.	-	-	1.016
Title: Power electronics and On-Board Vehicle Power Components: ***Description:*** This effort will develop high temperature and more efficient power conversion components using Silicon Carbide (SiC) switching devices. ***FY 2012 Plans:***	-	-	6.446

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602601A: *Combat Vehicle and Automotive Technology*	PROJECT H91: *Ground Vehicle Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Will investigate the feasibility of increasing the operating temperature of the power devices to reduce the thermal management burden of the total vehicle system that incorporates power generation for internal and external use; will develop Integrated Starter Generator controls to provide on-board and export power; will investigate and evaluate thermal systems to increase Heating Ventilation Air Conditioning (HVAC) efficiency; will evaluate electronics cooling technologies to reduce the system cooling burden.			
Title: Auxiliary Power : ***Description:*** This effort investigates small engines for on-board vehicle auxiliary power; power sources for small unmanned ground vehicles, and JP-8 reformer and desulfurization technologies for use with fuel cell-based auxiliary power applications onboard military ground vehicles. ***FY 2012 Plans:*** Will begin investigating JP-8 reformer/fuel cell system models and component level evalution data; will finalize JP-8 reformer/fuel cell system design; will investigate small engine technologies for use on small unmanned ground vehicles.	-	-	2.119
Title: Mobility: ***Description:*** This effort focuses on improving drive component performance and reliability through elastomer component development, to reduce the logistics burden associated with the sustainment of manned and unmanned tactical and combat vehicles. ***FY 2010 Accomplishments:*** Validated high performance bushings on a standard Abrams track through simulated endurance assessment; analyzed suspension loads and the effects of suspension loading into the track elastomer systems; developed computer model which determined new camber angle to reduce energy into elastomer components from suspension loading; fabricated enhanced bushings and backer stock elastomers for Abrams on vehicle evaluations.	1.015	-	-
Title: Intelligent Systems Technology Research: ***Description:*** This effort assesses improved operations of manned platforms through the application of sensing and autonomy technologies developed for unmanned systems. ***FY 2010 Accomplishments:*** Determined the sensor data required to allow for safe unmanned ground system operations in an urban environment; developed embedded real-time dynamic mobility models that predicted manned and unmanned vehicle responses and prevented unsafe mobility situations while under robotic control. ***FY 2011 Plans:***	2.894	4.628	4.721

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	**R-1 ITEM NOMENCLATURE** PE 0602601A: *Combat Vehicle and Automotive Technology*	**PROJECT** H91: *Ground Vehicle Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Analyze the integration of robotic sensor data into a network communication model to validate accurate vehicle operations; develop algorithms from the fused sensor data that allow more accurate and precise vehicle manipulation within various virtual environments and predict vehicle payload effects; develop and evaluate approaches to enhance the capabilities for unmanned systems to work in a dynamic environment; and -develop interoperability profiles and architectures to facilitate command and control of the unmanned systems from a common warfighter machine interface. ***FY 2012 Plans:*** Will conduct initial trade studies in the areas of intelligence, perception, communications, robotic control and payload integration for a weaponized robotic system; will advance technologies for manned/unmanned collaboration and teaming, unmanned tactical behaviors, command and control of the unmanned systems from a common warfighter machine interfaces, intelligence agents, and develop intelligent architectures for systems level weaponized robotic control.			
Title: Diagnostics/Prognostics for Condition Based Maintenance: ***Description:*** This effort focuses on reduction of maintenance time and cost by developing the tools to gather data from ground vehicles to allow more accurate diagnoses of problems, leading to prediction of failures before they occur. ***FY 2010 Accomplishments:*** Initiated characterization studies on powertrain and electrical power generation components to determine existing diagnostic capabilities and assessed opportunities for enhanced diagnostic/prognostic development. ***FY 2011 Plans:*** Leverage past algorithm development to create diagnostics and prognostics on power and energy components (batteries, power converters, alternators). This includes failure mode effects and analysis development, model development, root cause analysis, and algorithm updates.	1.242	1.581	-
Accomplishments/Planned Programs Subtotals	21.548	22.565	23.323

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602601A: *Combat Vehicle and Automotive Technology*	PROJECT T26: *Ground Vehicle Technologies (CA)*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
T26: *Ground Vehicle Technologies (CA)*	21.686	-	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for Ground Vehicle Technology applied research.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Nanofluids for Advanced Military Mobility ***Description:*** This is a Congressinal Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item investigated military grade petroleum, lubricant and oil products with nanoparticles for improvements to properties.	0.497	-	-
Title: Turbo Fuel Cell Engine ***Description:*** This is a Congressional Interest Item ***FY 2010 Accomplishments:*** This Congressional Interest Item developed a scalable solid oxide fuel cell (SOFC) power system, fueled with commercial diesel fuel or JP-8.	3.182	-	-
Title: Automotive Tribology Center ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item developed a comprehensive tribological model which utilized stresses and strains from contact mechanics analysis, temperature rise calculations, base oil characteristics and additive chemistry, including nanofluids, to predict output data such as friction coefficient, wear, scuffing, surface film chemistry and thickness.	1.592	-	-
Title: Smart Oil Sensor ***Description:*** This is a Congressional Interest item ***FY 2010 Accomplishments:***	2.388	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602601A: *Combat Vehicle and Automotive Technology*	PROJECT T26: *Ground Vehicle Technologies (CA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
This Congressional Interest Item developed military grade oil quality sensing hardware for engine/drive-train lubricant monitoring, to include the sensing elements themselves and the necessary electronics packaging for vehicle integration and the creation of a suite of analysis algorithms and electrochemical models to translate measured fluid electrical properties into fluid health information.			
Title: Automotive Technology Tactical Metal Fabrication System ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item completed integration of phase three of the Tac Fac Mobile cast part production system.	2.487	-	-
Title: Advanced Composite Materials Research for Air and Ground Vehicles. ***Description:*** This is a Congressional Interest item ***FY 2010 Accomplishments:*** This Congressional Interest Item performed research on composite materials and the accompanying science of ballistics, modeling, and non-destructive evaluation.	2.785	-	-
Title: Vehicle Systems Engineering and Integration Activities ***Description:*** This is a Congressional Interest item ***FY 2010 Accomplishments:*** This Congressional Interest Item reviewed existing systems engineering tools from the perspective of replacing stand-alone tools with integrated suite of tools and processes. Evaluated current training programs and analyzed systems engineering needs; examined systems engineering-related course contents at various universities to determine if those needs are covered. Developed case studies and other supporting material to address current systems engineering curriculum/training deficiencies.	7.959	-	-
Title: Tactical Metal Fabrication System (TacFab) ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item in the Tac Fabs mobile cost part production capability casts parts in the field faster by reverse engineering broken parts into a 3D model needed to create a new part.	0.796	-	-
Accomplishments/Planned Programs Subtotals	21.686	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602601A: *Combat Vehicle and Automotive Technology*	PROJECT T26: *Ground Vehicle Technologies (CA)*

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602601A: *Combat Vehicle and Automotive Technology*	PROJECT T31: *NAT'L AUTO CENTER APP RES INIT (CA)*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
T31: *NAT'L AUTO CENTER APP RES INIT (CA)*	1.593	-	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for National Automotive Center applied research.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Ultra Light Weight Transmission for FCS	1.593	-	-
Description: This is a Congressional Interest item ***FY 2010 Accomplishments:*** This Congressional Interest Item developed hydraulic hybrid drivetrain technology for military tactical vehicle applications.			
Accomplishments/Planned Programs Subtotals	1.593	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army										DATE: February 2011	
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*				R-1 ITEM NOMENCLATURE PE 0602618A: *BALLISTICS TECHNOLOGY*							
COST ($ in Millions)	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**Cost To Complete**	**Total Cost**
Total Program Element	73.456	60.342	59.214	-	59.214	58.340	59.346	61.758	65.827	Continuing	Continuing
H75: *ELECTRIC GUN TECHNOLOGY*	3.973	0.032	-	-	-	-	-	-	-	Continuing	Continuing
H80: *Survivability and Lethality Technology*	56.551	60.310	59.214	-	59.214	58.340	59.346	61.758	65.827	Continuing	Continuing
HB1: *SURVIVABILITY AND LETHALITY TECHNOLOGIES (CA)*	12.932	-	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program element (PE) investigates and evaluates materials and ballistic technologies required for armaments and armor that will enable enhanced lethality and survivability. The PE supports applied research on lightweight armors and protective structures for the Soldier and vehicles; kinetic energy active protection for crew and components protection from ballistic shock and mine-blast; insensitive propellants/munitions formulations, novel multi-function warhead concepts; affordable precision munitions design; and physics-based techniques, methodologies, and models to analyze combat effectiveness of future technologies (project H80). Project H75 completed in FY10.

Work in this PE complements and is fully coordinated with efforts in PE 0602105A (Materials Technology), PE 0602120A (Sensors and Electronic Survivability), PE 0602601A (Combat Vehicle and Automotive Technology), PE 0602624A (Weapons and Munitions Technology), PE 0602705A (Electronics and Electronic Devices), PE 0602716A (Human Factors Engineering), PE 0603004A (Weapons and Munitions Advanced Technology), and PE 0603005A (Combat Vehicle Advanced Technology).

Project HB1 funds Congressional Interest Items.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this PE is performed by the Army Research Laboratory (ARL), Aberdeen Proving Ground, MD and Hampton, VA.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army					DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*		R-1 ITEM NOMENCLATURE PE 0602618A: *BALLISTICS TECHNOLOGY*			
B. Program Change Summary ($ in Millions)	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**
Previous President's Budget	78.034	60.342	59.623	-	59.623
Current President's Budget	73.456	60.342	59.214	-	59.214
Total Adjustments	-4.578	-	-0.409	-	-0.409
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	-3.581	-			
• SBIR/STTR Transfer	-0.997	-			
• Adjustments to Budget Years	-	-	-0.409	-	-0.409

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602618A: *BALLISTICS TECHNOLOGY*	PROJECT H75: *ELECTRIC GUN TECHNOLOGY*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
H75: *ELECTRIC GUN TECHNOLOGY*	3.973	0.032	-	-	-	-	-	-	-	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

In FY10, applied research for Electronic Gun (EM) Gun technology was to determine the effect of velocity and novel penetrator design on lethality; investigate advanced propulsion concepts to achieve velocities above current ordnance velocities; and research advanced energetics to increase penetrator performance.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this project is performed by the Army Research Laboratory (ARL), Aberdeen Proving Ground, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: EM Pulse Power ***Description:*** Evolve the high strength composite materials critical for compact pulsed alternators. ***FY 2010 Accomplishments:*** Investigated advanced propulsion concepts.	1.863	-	-
Title: Launcher/Projectile ***Description:*** Research technologies needed to incorporate high strength, low density materials necessary for a long life, field-worthy EM cannon and develop lethal mechanisms that take advantage of the hypervelocity capability of EM guns and provide the armature and sabot technologies needed for accurate, low parasitic mass launch packages. ***FY 2010 Accomplishments:*** Investigated advanced energetics to increase projectile performance, and performed analysis of novel penetrator effects on advanced targets. Starting in FY11, research effort transitions to PE 0602618A, Project H80.	1.601	-	-
Title: EM Gun Analysis ***Description:*** EM Gun Analysis	0.509	0.032	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602618A: *BALLISTICS TECHNOLOGY*	PROJECT H75: *ELECTRIC GUN TECHNOLOGY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
FY 2010 Accomplishments: Analyzed and documented the EM armament system technical barriers. ***FY 2011 Plans:*** Research effort transitions to PE 0602618A, Project H80.			
Accomplishments/Planned Programs Subtotals	3.973	0.032	-

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602618A: *BALLISTICS TECHNOLOGY*	PROJECT H80: *Survivability and Lethality Technology*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
H80: *Survivability and Lethality Technology*	56.551	60.310	59.214	-	59.214	58.340	59.346	61.758	65.827	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

This project investigates materials and design for armor/anti-armor formulations that provide advanced protection through tailored terminal ballistic mechanisms. Specific technology thrusts include: lightweight armors and protective structures; crew and component protection from ballistic shock and/or mine-blast; insensitive high energy propellants/munitions to increase lethality and reduce propellant/munitions vulnerability to attack; novel kinetic energy (KE) penetrator concepts to maintain/improve lethality; novel multi-function warhead concepts to enable defeat of a full-spectrum of targets (anti-armor, bunker, helicopter, troops); and physics-based techniques, methodologies, and models to analyze combat effectiveness of future technologies for improved ballistic lethality and survivability.

Work in this PE builds on the materials research transitioned from PE 0601102A (Defense Research Sciences): project H42 (Materials and Mechanics) and project H43 (Ballistics); and PE 0602105A (Materials Technology) and applies it to specific Army platforms and the individual Soldier. The work complements and is fully coordinated with efforts in PE 0602601A (Combat Vehicle and Automotive Technology), PE 0602786A (Warfighter Technology), PE 0603001A (Warfighter Advanced Technology), PE 0603004A (Weapons and Munitions Advanced Technology), PE 0603005A (Combat Vehicle Advanced Technology), and PE 0708045A (Manufacturing Technology).

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this project is performed by the Army Research Laboratory (ARL), Aberdeen Proving Ground, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Structural Armor	12.128	12.890	9.640
Description: Optimize advanced lightweight structural, ceramic, and electromagnetic armor technologies for transition to current and future tactical and combat vehicle designers.			
FY 2010 Accomplishments:			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602618A: *BALLISTICS TECHNOLOGY*	PROJECT H80: *Survivability and Lethality Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Confirmed multi-hit capability of third generation armor concepts designed from emerging materials in PE 0602105/project H84 at goal weights against objective threats for vehicles; validated Electrical Protection System performance for tactical vehicles, both computationally and with experiments, in relevant environment. ***FY 2011 Plans:*** Validate the performance of third generation armor concepts under realistic environmental conditions, through testing coupled with modeling and simulation with emphasis on ceramic-composite and encapsulated ceramic technologies. ***FY 2012 Plans:*** Will investigate third generation structural armor performance incorporating most promising ceramic-composite and encapsulated ceramic materials technologies; will evaluate novel mechanisms against objective level future threats and transition validated concepts to the United States Army Tank Automotive Research, Development and Engineering Center (TARDEC) (PE 0602601A/ project C05); will use modeling and simulation coupled with experimentation to validate emerging ballistic defeat mechanisms that couple structural materials w/energy absorbing mechanisms against future threats.			
Title: Mine Blast Protection ***Description:*** Develop mine blast, ballistic shock mitigation, and crew protection technologies to enable survivability of current and future platforms, ground tactical vehicles, and the individual Soldier. ***FY 2010 Accomplishments:*** Analyzed the ballistic shock effects of objective threat defeat on future vehicles; computationally addressed the interaction of blast waves from objective blast threat with magnetic plate materials investigated in PE 0602105A/project H84. ***FY 2011 Plans:*** Assess and computationally validate advanced mine protection concepts (to include active seating) at goal weights for threshold threat defeat, and prove performance under relevant environmental conditions. ***FY 2012 Plans:*** Will incorporate computationally representative energy absorbing seats and local soil characteristics into models and simulations of full-scale blast events in order to refine simulations for system design optimization by TARDEC in PE 0603005A; and will experimentally validate the simulated results for mine blast events.	4.012	3.844	5.407
Title: Precision Munitions ***Description:*** Develop advanced technologies to enable a broad spectrum of affordable precision munitions. Develop a multi-disciplinary approach to munitions system design by coupling physics-based models of interior ballistics, launch dynamics, flight	4.456	4.488	4.833

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602618A: *BALLISTICS TECHNOLOGY*	PROJECT H80: *Survivability and Lethality Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
mechanics, and high-G guidance, navigation, and control (GN&C) technologies to enable smaller, cheaper, and lighter low-collateral-damage precision munitions for future asymmetric operations in military operations on urban terrain (MOUT). ***FY 2010 Accomplishments:*** Validated reduced state GN&C methods that will significantly reduce cost of precision munitions; validated low cost robust actuator technology for indirect fire application. ***FY 2011 Plans:*** Show feasibility of non-GPS guidance technologies. Provide technology assessment of precision hit technology across munition size and domain. ***FY 2012 Plans:*** Will combine reduced state GN&C methods, robust actuators, novel guidance technologies, with understanding of interior and exterior ballistics to computationally and experimentally validate accuracy improvements for direct fire individual soldier and weapons platforms.			
Title: Energetics ***Description:*** Develop propulsion and energetics technologies. Evaluate, select, and validate novel/nanostructural insensitive energetic materials concepts that exploit managed energy release required for improving the effectiveness and reducing the vulnerability of future gun/missile systems and warheads. ***FY 2010 Accomplishments:*** Provided technology assessment of reactive material as structural components for Army munition systems; incorporated reactive materials into structural components for Army munition systems and validated the performance of the system; as well as transitioned hypergolic rocket motor and understanding to Research, Development & Engineering Centers (RDECs). ***FY 2011 Plans:*** Study green energetic material formulation and investigate feasibility of replacing Hexahydro-Trinitro-Triazine (RDX) in novel energetics. ***FY 2012 Plans:*** Will validate ability to characterize energetic materials through multiscale modeling; will provide understanding to synthesizers and formulators; will support hypergolic propulsion demonstration at the U. S. Army Aviation and Missile Research Development and Engineering Center (AMRDEC) through insertion of green energetics into effort; and will investigate solid rocket throttleable propulsion.	4.606	4.650	5.496
Title: Advanced Munitions	3.863	3.800	3.087

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602618A: *BALLISTICS TECHNOLOGY*	PROJECT H80: *Survivability and Lethality Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: Develop advanced ammunition and lethality technologies. Identify and model preferred options to reduce energy/ mass required to defeat emerging armor threats and to provide multi-purpose capabilities for revolutionary future lethality. In addition, investigate technology options for scaling warhead lethality to enhance MOUT war fighting including control of collateral damage. ***FY 2010 Accomplishments:*** Researched advanced scalability concepts for medium and large caliber projectiles and missiles. ***FY 2011 Plans:*** Conduct assessments and document advances in scalable effects on targets. ***FY 2012 Plans:*** Will identify next level in scalability, which expands past blast and fragmentation munitions and offers potential to defeat a range of threats with a single munition (i.e. collapse calibers); and will research and prove novel lethal mechanisms for defeat of expanding target set, which includes vehicles, buildings and soldiers.			
Title: Survivability/Lethality Analyses ***Description:*** Devise state-of-the-art survivability/lethality/vulnerability methodologies to dynamically model the interaction of conventional ballistic threats versus future systems. ***FY 2010 Accomplishments:*** Investigated alignment of methodology development to the coupling of emerging and predicted threats with advancing armor materials/recipes and medical community inputs. ***FY 2011 Plans:*** Complete integration of ballistics effects into a system-of-systems context with other threat classes including electronic and information warfare; perform improvements to tools, techniques, and methodologies for ballistic survivability/lethality analysis to ensure analysis tools are relevant and credible for developmental army systems using new lethality and survivability technologies. ***FY 2012 Plans:*** Will develop new methodologies for assessing soldier/platform occupant injury probabilities in support of efforts to develop a new military specific anthropomorphic test device (WIAMAn); will continue advanced experimentation and simulation to improve biofidelic characterization and injury correlation of helmet back face deformation; will integrate an enhanced shot-line viewer, virtual components, active protection systems and multiple threat functionalities to Modular UNIX-based Vulnerability Estimation Suite (MUVES) 3.	7.602	5.350	4.219
Title: Armor Formulations	19.884	21.203	22.363

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602618A: *BALLISTICS TECHNOLOGY*	PROJECT H80: *Survivability and Lethality Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: Devise and mature multi-threat hybrid armor technologies incorporating both active and passive mechanisms for ground vehicle systems that are effective against future conventional weapons and evolving improvised threats. ***FY 2010 Accomplishments:*** Continued composite ceramic materials investigations developed in PE 060215A/project H84 for personnel protection applications; conducted experiments with candidate single and dual-threat (chemical and kinetic energy) defeat armor components (reactive armor (RA) and electromagnetic (EM)) to design vehicle armor concepts; conducted first proof of principle experiments with hybrid armor components (combines RA and EM technologies) for dual threat defeat; and developed new validation methodologies, diagnostics, and modeling and simulation tools to better support active and hybrid armor development. ***FY 2011 Plans:*** Determine and refine candidate dual threat defeat armor solution candidates for maturation in PE 0602601A/project C05; validate the assessment and computational tools that will be used to design and develop active and hybrid armors concepts and prove the feasibility of using a hybrid armor in a multi-threat scenario with component level proof of principle validation in relevant environments. ***FY 2012 Plans:*** Will downselect most promising multi-threat armor concepts and transition technology to TARDEC (PE 0602601A/project C05); will investigate advanced reactive and EM physics for defeat of multiple threat types to include development of algorithms that capture the symbiotic relationships between the mechanisms; will develop multi-disciplinary physics-based modeling tools that connect personal protection technologies to Soldier performance and survivability; and will develop experimentally validated constitutive material mechanics models that capture high-rate human tissue mechanics.			
Title: Penetrator Lethality research. ***Description:*** Evaluate effects on lethality of velocity and also the effect of novel penetrator designs. ***FY 2011 Plans:*** Validate effects on lethality of velocity - ranging from ordnance velocity to hypervelocity - and also the effect of novel penetrator designs; complete validation and assessment of benefits of novel penetrator effects at ordnance velocity; conduct initial validation of most promising novel penetrator designs at hypervelocity, and improve penetration and lethality models based on novel penetrator data; and investigate advanced propulsion system concepts to achieve velocities above current ordnance velocities. ***FY 2012 Plans:***	-	4.085	4.169

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602618A: *BALLISTICS TECHNOLOGY*	PROJECT H80: *Survivability and Lethality Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Will prove benefit of novel penetrator technology at both ordnance and hypervelocities and transition technology approaches to RDECs for both gun and missile application; and will validate concepts that overcome current propulsion technology limitation of muzzle pressure that enables use of next generation propellants.			
Accomplishments/Planned Programs Subtotals	56.551	60.310	59.214

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602618A: *BALLISTICS TECHNOLOGY*	PROJECT HB1: *SURVIVABILITY AND LETHALITY TECHNOLOGIES (CA)*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
HB1: *SURVIVABILITY AND LETHALITY TECHNOLOGIES (CA)*	12.932	-	-	-	-	-	-	-	-	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

These are Congressional Interest Items

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Beneficial Infrastructure for Rotorcraft Risk Reduction Demonstrations (BIRRRD) ***Description:*** This is a Congressional Special Interest Item. ***FY 2010 Accomplishments:*** Investigated options for Unmanned Aerial Vehicles (UAVs) to deliver medical supplies to forward areas.	0.795	-	-
Title: Super High Accuracy Range Kit - 105mm Artillery Technology ***Description:*** This is a Congressional Special Interest Item. ***FY 2010 Accomplishments:*** Investigated technology to improve accuracy of artillery ammunition through the use of Global Positioning System (GPS) and an electro-mechanical control actuation system.	3.979	-	-
Title: Advanced Composite Armor For Force Protection ***Description:*** This is a Congressional Special Interest Item. ***FY 2010 Accomplishments:*** Investigated advanced composite materials for ballistic threat protection.	1.592	-	-
Title: Eye-Safe Standoff Fusion Detection of CBE Threats ***Description:*** This is a Congressional Special Interest Item. ***FY 2010 Accomplishments:***	1.990	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602618A: *BALLISTICS TECHNOLOGY*	PROJECT HB1: *SURVIVABILITY AND LETHALITY TECHNOLOGIES (CA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Investigated technologies for eye-safe standoff detection of CBE threats.			
Title: Enabling Optimization of Reactive Armor ***Description:*** This is a Congressional Special Interest Item. ***FY 2010 Accomplishments:*** Investigated technology enhancements for vehicle survivability.	2.984	-	-
Title: Next Generation Lightweight Electric Drive Systems for Army Weapons ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Assessed technologies to reduce the weight and enhance efficiency of electric drive and power generation systems.	1.592	-	-
Accomplishments/Planned Programs Subtotals	12.932	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army										DATE: February 2011	
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*				R-1 ITEM NOMENCLATURE PE 0602622A: *Chemical, Smoke and Equipment Defeating Technology*							
COST ($ in Millions)	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**Cost To Complete**	**Total Cost**
Total Program Element	8.706	5.324	4.877	-	4.877	4.431	4.471	3.067	1.195	Continuing	Continuing
552: *SMOKE/NOVEL EFFECT MUN*	5.125	5.324	4.877	-	4.877	4.431	4.471	3.067	1.195	Continuing	Continuing
BA1: *Protection Technologies (CA)*	3.581	-	-	-	-	-	-	-	-	Continuing	Continuing

Note

FY10 funding realigned to higher priority efforts.

A. Mission Description and Budget Item Justification

The objective of this program element (PE) is to investigate and evaluate obscurant technologies to increase personnel and platform survivability and develop and validate forensic analysis methods for military and homemade explosive devices, including their precursors and residue. This PE pursues research in materials science and dissemination methodologies and mechanisms and technologies and techniques to enable forensic analysis of explosive signatures (project 552).

Work in this PE is related to, and fully coordinated with, PE 0603004A/project L97 (Smoke and Obscurants Advanced Technology) and PE 0603606A/project 608 (Countermine & Barrier Development).

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

This work is performed by the Army Research, Development, and Engineering Command (RDECOM), Edgewood Chemical Biological Center (ECBC), Edgewood, MD.

B. Program Change Summary ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Previous President's Budget	13.622	5.324	4.877	-	4.877
Current President's Budget	8.706	5.324	4.877	-	4.877
Total Adjustments	-4.916	-	-	-	-
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	-4.775	-			
• SBIR/STTR Transfer	-0.141	-			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602622A: *Chemical, Smoke and Equipment Defeating Technology*	PROJECT 552: *SMOKE/NOVEL EFFECT MUN*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
552: *SMOKE/NOVEL EFFECT MUN*	5.125	5.324	4.877	-	4.877	4.431	4.471	3.067	1.195	Continuing	Continuing

A. Mission Description and Budget Item Justification

The project investigates and evaluates obscurant technologies that degrade threat force surveillance sensors and defeat the enemy's target acquisition devices, missile guidance, and directed energy weapons. This project investigates advanced infra-red (IR) and multi-spectral obscurant materials that provide effective, affordable, and efficient screening of deployed forces, while being safe and environmentally acceptable. Additionally, it researches and investigates forensic analysis technology in explosives and explosives-related chemical signatures, and develops and validates field sampling and forensics methods for use in a forward-deployed laboratory.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this project is performed by the Army Research, Development, and Engineering Command (RDECOM), Edgewood Chemical Biological Center (ECBC), Edgewood, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Advanced Obscurants ***Description:*** This effort investigates technologies which enable safe, effective screening of personnel and equipment. ***FY 2010 Accomplishments:*** Investigated, through chamber and field evaluation, bi-spectral packaging and dissemination concepts to improve overall obscuration performance. ***FY 2011 Plans:*** Develop, refine and optimize bi-spectral packaging and dissemination concepts through testing and modifications to make them suitable for weaponization. ***FY 2012 Plans:*** Will evaluate optimized bispectral materials and initiate analysis of spectrally selective obscurant concepts	1.427	1.400	1.400
Title: Obscurant Enabling Technology ***Description:*** This effort investigates distribution technologies for various obscurants. ***FY 2010 Accomplishments:***	0.830	0.904	0.970

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602622A: *Chemical, Smoke and Equipment Defeating Technology*	PROJECT 552: *SMOKE/NOVEL EFFECT MUN*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Conducted modeling and chamber evaluation studies to examine performance improvements possible for low hazard visual obscurants. ***FY 2011 Plans:*** Conduct studies of dissemination techniques for low hazard visual obscurants to increase their obscuration performance and to make them suitable for weaponization. ***FY 2012 Plans:*** Will refine and optimize new visual low hazard obscurants.			
Title: Forensic Analysis of Explosive Signatures ***Description:*** This effort will develop an understanding of signatures required to provide improved point, proximity, and stand-off detection of explosives and precursor materials. Will transition technologies to PE (0603004A/Project L97 (Smoke and Obscurants Advanced Technology). ***FY 2010 Accomplishments:*** Identified viable chemical signatures; initiated environmental persistence, fate and transport studies for chemical residues relevant to counter High Explosive (HE) and Home Made Explosive (HME) sensing operations; conducted experiments to develop novel forensic methods that determine the components in HMEs. ***FY 2011 Plans:*** Establish and validate forensic sampling protocols for sensing explosives on sufaces; identify the differences in instrumentation used in theater and within continental United States-based laboratories; continue fate and transport studies of trace energetics and chemical components focusing on surface residues; evaluate and determine decomposition patterns and pathways to provide additional signature markers; identify chemical signatures for sensing, leveraging data from DARPA Portable Open Source Security Elements (POSSE) program; investigate the ability to combine chemical and explosive hazard detection; and utilize findings to help guide detector/detection specifications. ***FY 2012 Plans:*** Will investigate improved signature information and novel algorithms and experimentally evaluate performance for explosives and precursor materials in existing chemical point and stand-off detection sensor systems.	2.868	3.020	2.507
Accomplishments/Planned Programs Subtotals	5.125	5.324	4.877

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602622A: *Chemical, Smoke and Equipment Defeating Technology*	PROJECT 552: *SMOKE/NOVEL EFFECT MUN*

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602622A: *Chemical, Smoke and Equipment Defeating Technology*	PROJECT BA1: *Protection Technologies (CA)*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
BA1: *Protection Technologies (CA)*	3.581	-	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for Protection Technologies applied research.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Highlander Electro-Optical Sensors ***Description:*** This is a Congressional Interest Item ***FY 2010 Accomplishments:*** This effort incorporated a hyperspectral imager on an unmanned aerial vehicle. The effort performed data reduction of the spectra and provide information to a ground station for action.	1.591	-	-
Title: Missouri Multi-Threat Detection Initiative (M2TDI) ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** The Multi-Threat Defeat Initiative developed standoff detection of CBRNE threats via common sensor platforms through signal processing and data fusion techniques which combined weakly-correlated data streams from multiple sensor modalities, auxiliary sensors, and time-series data, and improved system performance factors including detection sensitivity, selectivity, and the range of threats detectable with a single platform.	1.990	-	-
Accomplishments/Planned Programs Subtotals	3.581	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602623A: *JOINT SERVICE SMALL ARMS PROGRAM*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
Total Program Element	9.001	7.893	8.244	-	8.244	8.604	8.758	8.904	9.055	Continuing	Continuing
H21: *JT SVC SA PROG (JSSAP)*	7.409	7.893	8.244	-	8.244	8.604	8.758	8.904	9.055	Continuing	Continuing
S50: *SMALL ARMS APPLIED RESEARCH (CA)*	1.592	-	-	-	-	-	-	-	-	Continuing	Continuing

Note

FY10 funding increase for congressional special interest items.

A. Mission Description and Budget Item Justification

The objective of this program element is to design, develop and evaluate individual and crew-served weapon technologies that enhance the fighting capabilities and survivability of dismounted battlefield personnel in support of all the Services. All Joint Service Small Arms Program (JSSAP) efforts are based upon the Joint Service Small Arms Master Plan (JSSAMP) and the Joint Capabilities Integration Development System's Small Arms Analyses. Project S50 funds congressional special interest items.

Work in this PE is related to, and fully coordinated with, efforts in PE 0602624A (Weapons and Munitions Technology), PE 0603607A (Joint Service Small Arms Program), and PE 0603827A (Soldier Systems-Advanced Development).

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

This program is managed by the US Army Armament Research, Development, and Engineering Center (ARDEC), Picatinny Arsenal, NJ.

B. Program Change Summary ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Previous President's Budget	7.634	7.893	8.244	-	8.244
Current President's Budget	9.001	7.893	8.244	-	8.244
Total Adjustments	1.367	-	-	-	-
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	1.592	-			
• SBIR/STTR Transfer	-0.225	-			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602623A: *JOINT SERVICE SMALL ARMS PROGRAM*	PROJECT H21: *JT SVC SA PROG (JSSAP)*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
H21: *JT SVC SA PROG (JSSAP)*	7.409	7.893	8.244	-	8.244	8.604	8.758	8.904	9.055	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project designs, develops and evaluates individual and crew-served weapon component technologies that enable increased lethality for survivability of dismounted battlefield personnel in all the Services. All efforts are based upon the Joint Service Small Arms Master Plan (JSSAMP) and the Joint Capabilities Integration Development System's Small Arms Analyses.

Work in this PE is related to, and fully coordinated with, efforts in PE 0602624A (Weapons and Munitions Technology) and PE 0603607A (Joint Service Small Arms Program) and PE 0602786A (Warfighter Technology).
The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

This program is managed by the US Army Armament Research, Development, and Engineering Center (ARDEC), Picatinny, NJ.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Advanced Lethal Armament Technology for Small Arms ***Description:*** This effort addresses terminal effects and launch aspects of small arms weapon systems. ***FY 2010 Accomplishments:*** Fabricated and evaluated two advanced 40mm payload/warheads in laboratory; assessed microelectromechanical systems (MEMs) setback generator critical components in lab environment; designed ammo breadboard to demonstrate launch survivability, assessed recoil reduction to multiple variation in loads and confirmed with model. ***FY 2011 Plans:*** Asses optimum small caliber payloads, fire control and advanced fuzing through component demonstrations confirming critical characteristics, (such as flight dynamics) in a wind tunnel and confirm results with modeling and simulation; develop target-orientation sensors for small caliber payloads designs.	3.705	3.267	-
Title: Advanced Fire Control Technology for Small Arms ***Description:*** This effort addresses advanced fire control technologies to reduce miss distance of small arms weapon systems. ***FY 2010 Accomplishments:***	3.704	4.626	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	**R-1 ITEM NOMENCLATURE** PE 0602623A: *JOINT SERVICE SMALL ARMS PROGRAM*	**PROJECT** H21: *JT SVC SA PROG (JSSAP)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Developed modeling and simulation tools to evaluate the soldier-small arms interface to determine factors influencing loss of accuracy in aiming; designed and fabricated advanced modular rail components; evaluated weapon aiming concepts using target testbed components; demonstrated critical gun barrel reference sensor components. ***FY 2011 Plans:*** Evaluate capability of critical components to engage defilade and covered targets; design weapon-aiming components improving timeline and target centroid location to increase effectiveness; perform critical lab advanced-aiming assessments; conduct evaluation of tradeoffs resulting from the incorporation of enhancements to small arms critical components.			
Title: JSSAP Mini Grand Challenge ***Description:*** This effort addresses future small arms technology investments. ***FY 2012 Plans:*** Will design and develop the next generation (2016 and beyond) small arms weapons platforms; will investigate critical technologies and concepts that can be integrated into weapons system platforms to provide the warrior the next generation small arms capabilities; will conduct experiments to mature small arms component technologies in target engagement, target effectiveness, and power and energy requirements.	-	-	4.500
Title: Small Arms Material and Process Technology ***Description:*** This effort addresses state of the art material substrates and surface coatings to improve reliability, reduce maintenance and improve weapon diagnostics through embedded technology. ***FY 2012 Plans:*** Will perform a detailed investigation of these new materials and techniques as applied to current and new weapon systems; will mature past investments in lubricous weapon coatings, shot counters and other indicators to increase weapon life, improve durability and reduce weight.	-	-	3.744
Accomplishments/Planned Programs Subtotals	7.409	7.893	8.244

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602623A: *JOINT SERVICE SMALL ARMS PROGRAM*	PROJECT H21: *JT SVC SA PROG (JSSAP)*

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602623A: *JOINT SERVICE SMALL ARMS PROGRAM*	PROJECT S50: *SMALL ARMS APPLIED RESEARCH (CA)*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
S50: *SMALL ARMS APPLIED RESEARCH (CA)*	1.592	-	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for Small Arms Applied Research.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Aluminum Cartridge Case 5.56mm, Lake City Army Ammunition Plant	1.592	-	-
Description: This is a Congressional Interest Item.			
FY 2010 Accomplishments: Investigated technology for providing a lightweight alternative to the current brass cartridge case used on 5.56mm ammunition.			
Accomplishments/Planned Programs Subtotals	1.592	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army										DATE: February 2011	
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*				R-1 ITEM NOMENCLATURE PE 0602624A: *Weapons and Munitions Technology*							
COST ($ in Millions)	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**Cost To Complete**	**Total Cost**
Total Program Element	140.727	42.645	39.813	-	39.813	37.740	35.705	35.355	34.285	Continuing	Continuing
H18: *Weapons & Munitions Technologies*	16.814	19.300	11.964	-	11.964	12.618	12.738	13.127	12.918	Continuing	Continuing
H19: *ASYMMETRIC & COUNTER MEASURE TECHNOLOGIES*	11.830	11.781	16.232	-	16.232	13.151	11.090	10.527	8.782	Continuing	Continuing
H1A: *WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE*	100.813	-	-	-	-	-	-	-	-	Continuing	Continuing
H28: *WARHEADS/ ENERGETICS TECHNOLOGIES*	11.270	11.564	11.617	-	11.617	11.971	11.877	11.701	12.585	Continuing	Continuing

A. Mission Description and Budget Item Justification

The objective of this program element (PE) is to design and develop enabling technology for improved lethal and nonlethal weapons and munitions with increased performance and the potential for lower weight, reduced size, and improved affordability. This PE supports weapons and munitions development (project H18); technologies to maintain the lethality of US weapons and directed energy (DE) technologies and subsystems to support the weaponization of high power microwave (HPM), and short pulse lasers (project H19) and development of munition components such as fuzes, power, warheads with tailorable effects, and insensitive munition compliant energetic materials (project H28). Project H1A funds congressional special interest items.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this PE is primarily performed by the Armament Research, Development, and Engineering Center (ARDEC) at Picatinny Arsenal, NJ, in cooperation with the Army Research Laboratory (ARL) at Aberdeen Proving Ground, MD, the Communications-Electronics Research, Development, and Engineering Center (CERDEC), Fort Belvoir, VA, the Tank Automotive Research, Development, and Engineering Center (TARDEC), Warren, MI, and the Aviation and Missile Research, Development, and Engineering Center (AMRDEC), Huntsville, AL.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602624A: *Weapons and Munitions Technology*	

B. Program Change Summary ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Previous President's Budget	144.864	42.645	39.459	-	39.459
Current President's Budget	140.727	42.645	39.813	-	39.813
Total Adjustments	-4.137	-	0.354	-	0.354
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	-3.219	-			
• SBIR/STTR Transfer	-0.918	-			
• Adjustments to Budget Years	-	-	0.354	-	0.354

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602624A: *Weapons and Munitions Technology*	PROJECT H18: *Weapons & Munitions Technologies*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
H18: *Weapons & Munitions Technologies*	16.814	19.300	11.964	-	11.964	12.618	12.738	13.127	12.918	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project designs and develops component technologies to enable affordable smart munitions that can be launched from multiple platforms as well as provide increased lethality and performance with reduced logistics and advanced direct/indirect fire capabilities.

Work in project H18 is related to, and fully coordinated with, efforts in projects H19 and H28 (also in PE 0602624A), PE 0602618A (Ballistics Technology), and projects 232 and L94 in PE 0603004A (Weapons and Munitions Advanced Technology).

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

The work in this project is performed by the Armament Research, Development, and Engineering Center (ARDEC), at Picatinny Arsenal, NJ, and the Army Research Laboratory (ARL) at Aberdeen Proving Ground, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: High Power Microwave (HPM) - Anti-Materiel Munitions	3.753	3.247	-
Description: This effort designs and develops HPM technology for use in non-lethal (NL) munitions. ***FY 2010 Accomplishments:*** Developed non-fragment producing materials for carriers to achieve NL effects; developed, tested and integrated HPM technology to obtain higher energy density, high voltage, nano-second discharge times, and solid state switches for nano-second discharge rates; identified components that provide the greatest ability to tune the system to get the desired effects; and test components integrated into a system to characterize defeat mechanisms for target sets. ***FY 2011 Plans:*** Develop, test and integrate frequency adjusting technology components for graduated effects on multiple targets. In addition, bound target set frequency vulnerabilities through use of susceptibility analysis and modeling to enable optimization of weapon antenna, radio frequency source, power conditioning, and prime power; explore ability to create graduated target effects through geometry variations, dielectric and magnetic material choices, and antenna gain design; and integrate components to determine performance improvements and insure repeatable results.			
Title: Novel Propulsion Technology for the Future	1.850	1.658	3.029

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602624A: *Weapons and Munitions Technology*	PROJECT H18: *Weapons & Munitions Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: This effort develops propellant technologies for advanced gun launch and directional thrusters including those that deliver a broad spectrum of effects. ***FY 2010 Accomplishments:*** Fabricated and tested propellants and igniters in component tests; began integration with the objective munition designs (30mm medium caliber cartridge and 105mm artillery shell); developed, verified, and utilized M&S to predict performance in components. ***FY 2011 Plans:*** Fabricate more propellant for objective demonstrations and complete integration with objective munition designs; characterize performance in live fire tests; continue to develop, verify, and refine M&S to predict performance in an integrated munition. Efforts described here are coordinated and complimentary to related Scaleable Effect efforts in PE 0602624A/Project H28 and PE 0603004A/Project 232. ***FY 2012 Plans:*** Will model propulsion systems and conduct trade studies for candidate conventional and new chemical ingredients, formulations, and configurations to maximize the performance of chemical propellants while improving their insensitivity to unplanned stimuli; will formulate promising propellants and evaluate them for performance and insensitivity.			
Title: Advanced Munition Components ***Description:*** This effort designs and develops individual components in the firing chain for gun launched munitions. ***FY 2010 Accomplishments:*** Focused on designing and developing scalable adaptable munition components; evaluated various munition components and determined options to modify components to support scalable munition development; evaluated performance through M&S tools and selected a caliber to design the initial scalable munition round and initiated design. ***FY 2011 Plans:*** Complete design of scalable adaptable munition and begin fabrication of the laboratory demonstrators; test and evaluate the performance of laboratory demonstrator munitions in selected system configurations against a spectrum of targets to determine performance and effectiveness.	2.576	3.568	-
Title: Advanced Munition Payloads ***Description:*** This effort develops novel payloads and related components for integration into gun-fired munitions and missiles. ***FY 2010 Accomplishments:***	4.679	5.205	3.512

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Assessed advanced fuze technologies capable of either detonating or deflagrating submunitions such as Dual-Purpose Improved Conventional Munitions (DPICM) in selected environments; conducted study concepts of extremely insensitive energetics and sensor-fuzed munitions to determine optimal design configurations that reduce and eliminate unexploded ordnance (UXO) on the battlefield while retaining area denial capability. ***FY 2011 Plans:*** Develop and validate M&S tools for deflagrating munitions; perform trade studies to evaluate submunition component technologies; and conduct initial tests to verify deflagration models. Efforts described here are coordinated and complimentary to related efforts in PE 0603004A/Project 232. ***FY 2012 Plans:*** Will investigate environments that will provide useful data for the development of components- setback, expulsion and impact; will mature components and validate effectiveness and reliability through component and bench level testing. Efforts described here are coordinated and complimentary to related efforts in PE 0603004A/Project 232.			
Title: Advanced Weapons Technology ***Description:*** This effort investigates innovative weapon technologies for future medium caliber direct fire systems that provide similar or greater lethality than current systems. ***FY 2010 Accomplishments:*** Assessed detailed designs of distributive technologies for new weapon delivery effects; conducted detailed analysis to select novel weapon schemes for use in recoilless medium caliber weapons such as rarefactory wave gun and novel light gas guns; and developed critical design factors for launch survivability, component reliability, and recoil energy management. ***FY 2011 Plans:*** Select the most promising weapon technologies to develop breadboard components and begin target effectiveness tests to determine optimum size, weight, and power required to defeat various targets; and optimize selected technologies based on their ability to defeat the widest variety of targets. ***FY 2012 Plans:*** Will continue to mature most promising weapon technologies and evaluate for transition to advanced development; will conduct additional small scale research into multiple novel weapon system candidate technologies.	3.085	3.608	2.214
Title: Affordable Precision Technology ***Description:*** This effort develops and incorporates technologies to provide affordable precision to the full spectrum of gun calibers.	0.871	2.014	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
FY 2010 Accomplishments: Identified technologies that can potentially increase delivery accuracy and lethal performance of weapons. ***FY 2011 Plans:*** Sort most promising technologies by applicable caliber size and prioritize by greatest capability increase and cost to implement; and choose and initiate development of the most promising/most affordable efforts to enhance weapon precision. Efforts described here are coordinated and complimentary to related efforts in PE 0602624A/Project H19.			
Title: Fire Control Target Recognition ***Description:*** This effort investigates innovative fire control and target recognition technologies to improve the effectiveness of small, medium, and large caliber weapon systems. ***FY 2012 Plans:*** Will model fire control hardware and fire control and target recognition algorithms and conduct trade studies for candidate technologies to maximize the performance of weapon systems while maintaining commonality for future application to multiple weapon system calibers and configurations.	-	-	1.120
Title: Line-of-Sight (LOS) Course Correction Munition Technology ***Description:*** This effort develops and evaluates technologies to improve precision and lower collateral damage in munitions with in-flight adjustment capabilities. ***FY 2012 Plans:*** Will design and develop components for line-of-sight (LOS) course correction munitions, i.e. warhead, sensor, communication link and guidance/Control; will investigate performance enhancements of a LOS Course correction munitions.	-	-	2.089
Accomplishments/Planned Programs Subtotals	16.814	19.300	11.964

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602624A: *Weapons and Munitions Technology*	PROJECT H19: *ASYMMETRIC & COUNTER MEASURE TECHNOLOGIES*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
H19: *ASYMMETRIC & COUNTER MEASURE TECHNOLOGIES*	11.830	11.781	16.232	-	16.232	13.151	11.090	10.527	8.782	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project designs and develops technologies to support asymmetric countermeasures such as radio frequency and ultra-short pulse directed energy and efforts to maintain the lethality and overmatch of US weapons. Work in this project is related to, and fully coordinated with, efforts in projects H18 and H28 (also in PE 0602624A), PE 0602618A (Ballistics Technology), and projects 232 and L94 in PE 0603004A (Weapons and Munitions Advanced Technology).

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

This work is performed by the Armament Research, Development, and Engineering Center (ARDEC), at Picatinny Arsenal, NJ, and the Army Research Laboratory (ARL) at Aberdeen Proving Ground, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Pulsed Laser Component Technologies	3.783	3.615	-
Description: This effort develops and miniaturizes key Directed Energy technology components to enable a Laser Induced Plasma Channel (LIPC) capability. The LIPC effect uses a short pulse laser to generate a conductive path in the air in which high powered microwaves (HPM) and/or high voltage bursts are channeled to defeat different targets at stand-off. Related work continues in 0602624A/Project H19 in FY12 under title DE Standoff Enabler. ***FY 2010 Accomplishments:*** Matured model of critical components of LIPC system for optimal interaction of laser induced channel and high voltage waveforms; conducted studies of LIPC subsystems parameters to enhance transmission of the high voltage waveform required for desired range and target effects; and initiated design of advanced high quality critical subcomponents for a LIPC system. ***FY 2011 Plans:*** Develop LIPC system design based upon results of parametric studies and modeling efforts; and continue to mature and integrate subsystem components towards fieldable requirements, i.e. volume, weight, ruggedness.			
Title: Novel Battlefield Effectors	3.764	2.073	1.970
Description: This effort develops unique weapon and munitions enabling technologies to achieve tunable effects on targets and that are capable of providing a full range of effects from non-lethal to highly lethal via a single weapon or munition			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
FY 2010 Accomplishments: Selected the most promising munitions/weapons to achieve the projection of tunable effects for line-of-sight (LOS), beyond-line-of sight (BLOS), and non-line-of-sight (NLOS) missions; developed the technologies into a breadboard system and begin target effectiveness studies; and conducted trade studies to determine the proper power, size, and weight to achieve required lethal effects on various targets. ***FY 2011 Plans:*** Complete full target effectiveness testing with the bread board system and design a brassboard to demonstrate novel battlefield effects for direct and indirect fire platforms. ***FY 2012 Plans:*** Will continue to develop most promising effector technologies and evaluate for transition to advanced development; will conduct additional research into multiple novel battlefield effector candidate technologies.			
Title: Active Denial Technologies ***Description:*** This effort develops compact non-lethal, counter-personnel DE technologies. . ***FY 2011 Plans:*** Complete design of brassboard to determine scalability for different platforms; investigate different technologies to mature components in terms of weight, input and output power, effective range beam formation, characterization, control, operational environment, and thermal management. ***FY 2012 Plans:*** Will complete design and build of a palletized system to validate that solid state active denial technology can achieve desired range (100 meters); will conduct experiments to determine personnel incapacitation or repel effects are achievable.	-	2.500	3.400
Title: Counter Countermeasure (CCM) Technologies for weapons and munitions ***Description:*** This effort develops technology to enable continued effectiveness of US weapon systems against enemy countermeasures including Active Protection Systems (APS), Global Positioning System (GPS) jamming, and active seeker jamming. ***FY 2010 Accomplishments:*** Conducted systems effectiveness analysis to determine which weapons/rounds are most susceptible to countermeasures; investigated potential counter-countermeasure techniques/technologies and identify the most promising that reduce the	4.283	3.593	4.564

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
effectiveness of threat countermeasure technologies. Efforts are coordinated and complimentary to related efforts in PE 0603004A/Project 232. ***FY 2011 Plans:*** Prioritize and down select CCM technologies and begin design and fabrication of breadboard components to demonstrate superior counter-countermeasure technologies with respect to current systems. ***FY 2012 Plans:*** Will continue to develop most promising CCM technologies and evaluate for transition to advanced development; will conduct additional small scale research into multiple counter countermeasure candidate technologies.			
Title: Novel Penetrator Designs ***Description:*** This effort provides novel direct fire capabilities against advanced heavy armor threats. ***FY 2012 Plans:*** Will design and develop novel penetrator designs concepts and conduct penetration experiments against range targets.	-	-	2.984
Title: Directed Energy (DE) Standoff Enabler ***Description:*** This effort develops the capability for stand-off neutralization technology utilizing high power, directed energy (DE) sources. ***FY 2012 Plans:*** Will design and develop DE standoff improvised explosive device (IED) neutralization technology; will conduct research on high voltage and RF coupling to laser induced plasma filaments; will mature components required to achieve multi-mode anti-materiel DE effects	-	-	3.314
Accomplishments/Planned Programs Subtotals	11.830	11.781	16.232

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602624A: *Weapons and Munitions Technology*	PROJECT H1A: *WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
H1A: *WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE*	100.813	-	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for Weapons and Munitions Technology applied research.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Green Armaments/Range Safe ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item developed innovative technologies to reduce the environmental impact of Army armaments, munitions and operations on natural resources.	1.592	-	-
Title: Advanced Materials & Process for Armament Structures (AMPAS) ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item implemented pilot-scale research, with capital equipment, using native Ohio titanium production facilities for low-cost titanium products used in U.S. Army applications.	3.183	-	-
Title: Armament System Engineering and Integration Initiative (ASEI2) ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item implemented pilot-scale research, with capital equipment, using native Ohio titanium production facilities for low-cost titanium products used in U.S. Army applications.	1.592	-	-
Title: Army Center of Excellence in Acoustics ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:***	3.979	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
This Congressional Interest Item developed acoustic sensor systems for aerostats and unmanned aerial vehicle platforms for various targeting, detection/tracking, and collision avoidance scenarios.			
Title: Developmental Mission Integration ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item supported a dedicated effort that matured, updated, prototyped and spun out armament and munitions technologies needed by the warfighter in the near term (6 to 12 months).	5.572	-	-
Title: Ripsaw Unmanned Ground Vehicle Weaponization ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item supported integration of the ARDEC Remote Weapon Systems Armaments onto the Ripsaw unmanned ground vehicle, Specifically, the add finished the testing phase of the Ripsaw platform and acquired an essential safety Released from the US Army.	1.990	-	-
Title: Advanced Rarefaction Weapon Engineered System ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item supported development of next generation rarefaction wave gun technology which aims to achieve significant improvements in performance, lethality, survivability, and economy.	3.183	-	-
Title: Effects Based Operations Decision Support Services (EBODSS) ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item researched, developed and tested probabilistic reasoning intelligent agents within a commercial Service Oriented Architecture environment to provide decision support services to targeting personnel	1.592	-	-
Title: Rapid Response Force Protection System (Remote Weapons Platform) ***Description:*** This is a Congressional Interest Item.	1.592	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
FY 2010 Accomplishments: This Congressional Interest Item supported integration of Tactical Autonomous Combat-Chassis (TAC-C) robotic vehicles with mortars and Remote Armament Systems (RAS) mission packages to give soldiers increased stand-off protection against ambushes and provide a rapid response means to significantly enhance force protection.			
Title: Center for Borane Technology ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item applied nanotechnology research to develop explosive and gun propellants for applications in miniature and lightweight weapons systems.	1.990	-	-
Title: Exploding Foils Initiators with Nanomaterial-based Circuits ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item researched ways to reduce the cost of exploding Foils Initiators (which can save numerous lives by reducing unintended detonation) by 2 orders of magnitude, from hundreds of dollars to several dollars.	2.387	-	-
Title: Research for Army Cannon Systems ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item developed analytical and testing systems for composite cannon barrels.	2.387	-	-
Title: MATRIC- Project National Shield Integration Center ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item supported establishment of an integration center capability for Project National Shield (PNS), a System of Systems Security integration program. PNS is managed by the U.S. Army ARDEC and is focused on shielding the United States from all potential disasters, man-made or natural, by providing an integrated surveillance, warning, response and recovery capability.	1.194	-	-
Title: Specialized Compact Automated Mechanical Clearance Platform	3.183	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item supported development of technology to make mine clearance faster, cheaper and more effective.			
Title: Kinetic Energy Enhanced Lethality and Protection Materials ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item supported analysis, testing and demonstration of four leading possibilities for using tungsten as a depleted uranium replacement in Army ammunition: Layered Long Rod Composite; Nanostructures for Severe Plastic Deformation; Steel Jacketed Tungsten Penetrators; and, Infiltrated Solid State Sintered Penetrators.	1.990	-	-
Title: Advanced Technologies Energy and Manufacturing Science ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item identified solutions to meet a wide array of diverse challenges including energetics and insensitive munitions (IM) development, directed energy & laser vulnerability of weapons and munition systems, armaments power and energy, and advanced materials manufacturing processes.	6.964	-	-
Title: Threat Detection and Neutralization Project ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item supported the design and implementation of a comprehensive threat detection and neutralization system for autonomous air, water, and ground devices.	3.183	-	-
Title: Defense Support for Civil Authorities (DSCA) for Key Resource Protection ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:***	0.796	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
This is a Congressional Interest Item supported efforts to combine and harmonize a number of Homeland Defense and Homeland Security programs under the umbrella of Project National Shield (PNS); the program developed processes and protocols to improve the ability to communicate with Federal, State and local jurisdictions as it relates to local first responders.			
Title: SLEUTH Tungsten Heavy Alloy Pen/Warhead Dev. ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item researched development of 1) a non-cobalt containing tungsten alloy can replace depleted uranium (DU) in medium and large cal armor piercing rounds and 2) development of an improved 30mm/40mm airburst warhead and 40mm grenade body through the use of tungsten based materials containing no cobalt while incorporating special production processes that improve stability and increase lethality.	1.194	-	-
Title: Acoustic Gun Detection System for Tracked Combat Vehicles ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item incorporated novel acoustic techniques to detect and locate the sources of hostile small arms fire	1.592	-	-
Title: Building a Unified Information Framework ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item supported development of a unified information framework that will improve the integration of local, regional and military systems, in Gloucester County, NJ.	1.592	-	-
Title: Multifunctional Nanomaterials for Homeland Defense, Counter-Terrorism and Dual-Use Applications ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item established a research and development partnership between Rutgers University and U.S. Army ARDEC at Picatinny Arsenal to develop critical nano-based technologies for homeland defense, counter-terrorism, and dual-use (energy) Applications.	1.990	-	-
Title: Highly Integrated Production for Expediting RESET.	1.990	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item supported utilization of laser scanning technology at Anniston Army Depot to (1) quickly determine battle damaged and/or defective parts that need replacing, avoiding the need to replace good parts, and 2) rapidly determine if a part is non-conforming before it is inserted into a weapon (and subsequently has to be replaced).			
Title: Laser-Guided Energy (LGE) Demonstrator. ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item supported development of a laser guided energy (LGE) demonstrator mounted on an Army tactical vehicle capable of firing to tactical ranges.	2.228	-	-
Title: Air Drop Mortar Guided Munition for the Tactical UAV ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item will supported qualification rapid fielding of a miniature (11 lb) guided munition for tactical UAV weaponization.	2.387	-	-
Title: Rare Earth Mining Separation and Metal Production. ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item accelerated engineering and demonstration scale implementation of rare earth mining separation and metal production.	2.387	-	-
Title: Projectile Unmanned Aerial Systems. ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This is a Congressional Interest Item supported development and testing of a hybrid unmanned aerial systems projectile.	2.387	-	-
Title: Armaments Academy	2.984	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item supported establishment of an Armaments Academy at Picatinny Arsenal for training and certifying armament engineers and scientists.			
Title: Highly Integrated Lethality Systems Development ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item supported research on ways to increase combat power by networking sensors, decision makers, and shooters to achieve shared awareness, increased speed of command, higher tempo of operations, greater lethality, increased survivability, and a degree of self-synchronization.	3.970	-	-
Title: Scaleable Efficient Power for Armament Systems and Vehicles Dual Use ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item supported a high power, high energy power system project to accelerate and demonstrate scalability and manufacturability elements of emerging dual use power supply technology offering advanced performance for armaments including scaleability, safety, planar packaging and resistance to mechanical shock and vibration.	3.979	-	-
Title: Perimeter Security Systems ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item. supported establishment of a 150 acre military compound as a live, virtual and constructive test bed for hardware, software and technology which will provide a testing platform to conduct research and development of technology to enhance situational awareness that will help establish a layered defense model.	4.479	-	-
Title: Reliability and Affordability Enhancement for Precision Guided Munition Systems. ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:***	4.775	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
This Congressional Interest Item provides technology solutions for joint warfighter with a focus on precision, safety, lethality and survivability demands for precision munitions and armaments.			
Title: Tamper Proof Organic Packaging as Applied to Remote Armament Systems ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item supported development of concepts that provided module/SiP designs with a packaging approach that included embedded mission independent features which enabled varying levels of hardware/software tamper proofing and detection, monitoring/tracking manufacturing processes, new and secure test methodologies and in-situ functional detection/monitoring.	4.775	-	-
Title: Nanotechnology Enterprise Consortium (NTEC) ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item supported research developed within the Nanotechnology Enterprise Consortium (NTEC) in Columbia, Missouri, with multiple industry members throughout the state.	4.977	-	-
Title: Titanium Extraction Mining and Process Engineering Research (TEMPER) ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item researched a revolutionary new process to extract titanium and manufacture titanium alloys from various types of titanium ore (which will ultimately deliver lightweight weapons at an affordable cost to for DOD, enhancing lethality and performance while reducing cost.)	4.778	-	-
Accomplishments/Planned Programs Subtotals	100.813	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	**R-1 ITEM NOMENCLATURE** PE 0602624A: *Weapons and Munitions Technology*	**PROJECT** H1A: *WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE*

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602624A: *Weapons and Munitions Technology*	PROJECT H28: *WARHEADS/ ENERGETICS TECHNOLOGIES*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
H28: *WARHEADS/ ENERGETICS TECHNOLOGIES*	11.270	11.564	11.617	-	11.617	11.971	11.877	11.701	12.585	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project designs and develops enabling warhead and energetic technologies such as novel warhead architectures, new propellant techniques, and high-density explosives to produce smaller, lighter, more effective, multi-role warheads. Work in project H28 is related to, and fully coordinated with, efforts in projects H18 and H19 in this PE, PE 0602618A (Ballistics Technology), and projects 232 and L94 in PE 0603004A (Weapons and Munitions Advanced Technology).

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

This work is performed by the U.S. Army Armament Research, Development, and Engineering Center (ARDEC), at Picatinny Arsenal, NJ, and the Army Research Laboratory (ARL) at Aberdeen Proving Ground, MD. The active protection system (APS) countermunition efforts are developed in collaboration with the Tank Automotive Research, Development, and Engineering Center (TARDEC), Warren, MI, PE 0603005A and the Aviation and Missile Research, Development, and Engineering Center (AMRDEC), Huntsville, AL, PE 0603313A.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Scalable Warhead Technology	7.570	8.016	4.433
Description: This effort designs scalable and adaptive explosives and reactive materials technology for either gun or missile-launched weapons and munitions that can deliver a broad spectrum of effects with reduced collateral damage. Efforts described here are coordinated and complimentary to related efforts in PE 0602624A/Project H18, PE 0603004A/Project 232 as well as PE 0602303/Project 214.			
FY 2010 Accomplishments: Designed and developed enhanced fragmentation, reactive materials technologies, multipurpose explosives, and initiation trains for warheads and scalable and adaptive munitions; compared performance of designs against predictive models, simulations, and baselines; and fabricated, tested and evaluated component technologies in static munition tests.			
FY 2011 Plans: Fabricate and investigate scalable and adaptive munitions; and test and evaluate warheads and munitions to determine characteristics and performance.			
FY 2012 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602624A: *Weapons and Munitions Technology*	PROJECT H28: *WARHEADS/ ENERGETICS TECHNOLOGIES*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Will mature scalable and adaptive technology components for small to medium caliber munitions; will determine levels of reduced collateral damage using scalable and adaptive technologies.			
Title: Energetic Materials and Warheads ***Description:*** This effort designs energetic materials with controlled energy release for precision munition and counter-munition applications. Efforts described here are coordinated and complimentary to related efforts in PE 0602624A/Project H18 and PE 0603004A/Project 232, PE 0602618A/Project H80 as well as PE 0602303/Project 214. ***FY 2010 Accomplishments:*** Investigated the use of exotic ingredient materials, including nano-scale oxidizers and fuels, in high fidelity models for the design of extremely high energy, low sensitivity initiation, propulsion, explosive and pyrotechnic formulations; down-selected promising ingredient materials for fabrication and characterization studies; and fabricated ingredient materials. ***FY 2011 Plans:*** Verify/validate model predications of the pyrotechnic formulations with the selected ingredient materials; conduct fabrication studies for integrating promising formulations into high efficiency energetic materials; fabricate energetic formulations for laboratory scale testing and model validation; and model use of energetic promising formulations in enhanced warheads. ***FY 2012 Plans:*** Will conduct scaled-up experiments with new pyrotechnic formulations, high efficiency energetics formulations and warheads with novel energetic material; will validate the performance enhancements of new pyrotechnics, energetics and warheads. Also, will model structural materials which exhibit potential for explosive characteristics and conduct trade studies for candidate conventional and new chemical ingredients, formulations, and configurations to maximize the performance of structural materials while improving their insensitivity to unplanned stimuli.	3.113	2.898	1.784
Title: Insensitive Munitions Multi-Scale Reactive Modeling (IM-MSRM) ***Description:*** The IM-MSRM effort designs and develops new M&S tools for the design and development of insensitive munitions. ***FY 2010 Accomplishments:*** Evaluated the structure and density predictions for insensitive energetic materials resulting from the M&S analysis. ***FY 2011 Plans:*** Design models of detonation products based on predictions obtained at the insensitive energetic material atomic and micro levels. ***FY 2012 Plans:***	0.587	0.650	0.700

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602624A: *Weapons and Munitions Technology*	PROJECT H28: *WARHEADS/ ENERGETICS TECHNOLOGIES*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Will investigate and mature continuum models of thermal kinetics ignition based on meso and molecular/atomic level predictions.			
Title: Explosives Research ***Description:*** This effort uses the new M&S tools developed under the IM-MSRM effort to formulate new IM explosives. ***FY 2012 Plans:*** Will design and develop new insensitive formulations using IM MSRM modeling and simulation tools; will begin to validate the models with experiments of new insensitive energetics ingredients; and will investigate different caliber munitions for the application of the new energetics.	-	-	4.700
Accomplishments/Planned Programs Subtotals	11.270	11.564	11.617

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army										DATE: February 2011	
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*				R-1 ITEM NOMENCLATURE PE 0602705A: *ELECTRONICS AND ELECTRONIC DEVICES*							
COST ($ in Millions)	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**Cost To Complete**	**Total Cost**
Total Program Element	134.946	60.859	62.962	-	62.962	63.203	64.039	63.947	63.885	Continuing	Continuing
EM4: *Electric Component Technologies (CA)*	38.766	-	-	-	-	-	-	-	-	Continuing	Continuing
EM6: *HEATING AND COOLING TECHNOLOGIES (CA)*	5.571	-	-	-	-	-	-	-	-	Continuing	Continuing
EM7: *POWER AND ENERGY COMPONENT TECHNOLOGIES (CA)*	35.514	-	-	-	-	-	-	-	-	Continuing	Continuing
EM8: *High Power and Energy Component Technology*	8.599	13.631	15.402	-	15.402	15.238	15.086	14.434	14.678	Continuing	Continuing
H11: *Tactical and Component Power Technology*	12.508	11.988	11.395	-	11.395	11.016	11.571	11.411	10.485	Continuing	Continuing
H17: *FLEXIBLE DISPLAY CENTER*	6.737	6.974	7.508	-	7.508	7.633	7.944	8.224	8.349	Continuing	Continuing
H94: *ELEC & ELECTRONIC DEV*	27.251	28.266	28.657	-	28.657	29.316	29.438	29.878	30.373	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program element (PE) is applied research on technologies in areas such as electronic components, power components, frequency control and timing devices, high power microwave devices, and display technologies. The applied research on these technologies will enable the ability to perform precision deep fires against critical mobile and fixed targets; investigate exceptional all-weather, day or night, theater air defense against advanced enemy missiles and aircraft; as well as investigate enhanced communications and target acquisition through support of capabilities such as autonomous missile systems, advanced land combat vehicles, smart anti-tank munitions, electric weapons, secure jam-resistant communications, automatic target recognition, foliage-penetrating radar, and combat identification. This PE sustains applied research on high-power, microwave, electronic components and technologies (project EM8), advanced portable power technologies (batteries, fuel cells, hybrids, engines, chargers, and power management) (project H11), applied research on flexible displays in conjunction with the Flexible Display Center (project H17), and applied research on electronic component technologies such as photonics, micro electromechanical systems (MEMS), imaging laser radar, magnetic materials, ferroelectrics, microwave and millimeter-wave components, and electromechanical systems (project H94).

Work in this PE complements and is fully coordinated with efforts in PE 0602120A (Sensors and Electronic Survivability), PE 0602782A (Command, Control, Communications Technology), PE 0602709A (Night Vision Technology), PE 0602783A (Computer and Software Technology), PE 0603001A (Warfighter Advanced Technology), and PE 0603772A (Advanced Tactical Computer Science and Sensor Technology).

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army	DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602705A: *ELECTRONICS AND ELECTRONIC DEVICES*

Projects EM4, EM6 and EM7 fund congressional special interest items.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work is performed by the Army Research Laboratory, Adelphi, MD, and the Army Communications-Electronics Research, Development, and Engineering Center, Fort Monmouth NJ and Aberdeen Proving Ground, MD.

B. Program Change Summary ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Previous President's Budget	134.532	60.859	62.285	-	62.285
Current President's Budget	134.946	60.859	62.962	-	62.962
Total Adjustments	0.414	-	0.677	-	0.677
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	1.431	-			
• SBIR/STTR Transfer	-1.017	-			
• Adjustments to Budget Years	-	-	0.677	-	0.677

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602705A: *ELECTRONICS AND ELECTRONIC DEVICES*	PROJECT EM4: *Electric Component Technologies (CA)*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
EM4: *Electric Component Technologies (CA)*	38.766	-	-	-	-	-	-	-	-	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for Electronic Component applied research.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Micromachined Switches in Support of Transformational Communications Architecture ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated technologies to optimize the performance of packaging for radio frequency (RF) Micro Electro Mechanical Systems (MEMS) switches and wafer-scale fabrication of Micro-Assemblies silicon on insulator RF MEMS switches.	2.387	-	-
Title: Advanced Power Source for Future Soldiers. ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Explored novel alkaline membrane electrolyte technologies for the next generation soldier fuel cell system.	1.193	-	-
Title: High-Frequency, High-Power Electronic and Optoelectronic Devices on Aluminum Nitride (AIN). ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Performed research on high frequency, high power electronic and optoelectronic devices.	3.184	-	-
Title: Self-Powered, Lightweight, Flexible Display Unit on a Plastic Substrate ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:***	3.024	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602705A: *ELECTRONICS AND ELECTRONIC DEVICES*	PROJECT EM4: *Electric Component Technologies (CA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Developed reflective display technology based on novel imprint lithography that will advance manufacturing base. Integrated solar cells with flexible displays.			
Title: Large Format Li-Ion Battery ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Developed technology for manufacturing large format lithium ion battery integrated with battery management system.	4.934	-	-
Title: Maryland Proof of Concept Alliance for Defense Technologies ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Fostered the commercialization of electronics components technologies through research, development, experiments, and worked with the various technology transfer offices and venture development offices.	1.592	-	-
Title: Advanced Power Generation Unit for Military Applications ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated an advanced power generation system technology.	0.647	-	-
Title: Mid-Infrared Super Continuum Laser ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated laser technology for potential electronic countermeasure applications.	0.796	-	-
Title: Soldier Situation Awareness Wristband ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated body-worn Situational Awareness technology.	1.114	-	-
Title: Printed and Conformal Electronics for Military Applications	1.592	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602705A: *ELECTRONICS AND ELECTRONIC DEVICES*	PROJECT EM4: *Electric Component Technologies (CA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated printed and conformed electronics technologies.			
Title: Eye Safe Laser Range Finder ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated technology for eye-safe laser range-finders.	2.388	-	-
Title: Unmanned System Algorithm Development ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Explored algorithms for integration of unmanned systems with manned systems.	3.184	-	-
Title: Special Operations Forces (SOF) Technology Insertion ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated technologies developed in small numbers for the Special Operations Forces (SOF) that might be applicable to broader Army use.	5.967	-	-
Title: Flexible Solar Cell for Man Portable Power Generator ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated technology for low cost, flexible solar cell generating systems.	0.796	-	-
Title: Direct Carbon Fuel Cell ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:***	2.785	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602705A: *ELECTRONICS AND ELECTRONIC DEVICES*	PROJECT EM4: *Electric Component Technologies (CA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Investigated technology for a portable power generating system.			
Title: Advanced Composite Nickel-Manganese-Cobalt Lithium Ion Battery ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated composite nickel-manganese-cobalt lithium ion battery to optimize electrode performance.	2.387	-	-
Title: Army Asset Visibility Enhancement ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This effort investigated automatic identification technologies to provide Army users with more accurate and up-to-date information on the logistics pipeline.	0.796	-	-
Accomplishments/Planned Programs Subtotals	38.766	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602705A: *ELECTRONICS AND ELECTRONIC DEVICES*	PROJECT EM6: *HEATING AND COOLING TECHNOLOGIES (CA)*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
EM6: *HEATING AND COOLING TECHNOLOGIES (CA)*	5.571	-	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for Heating and Cooling applied research.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Cogeneration for Enhanced Cooling and Heating of Advanced Tactical Vehicles ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item conducted advanced research to concurrently demonstrate a diesel engine driven (DED) engine integrated with a waste heat recovery co-generation system, an optimized powertrain cooling module, and a novel low-global warming potential (GWP) alternative refrigerant, showing system performance at military high ambient conditions.	3.183	-	-
Title: Advanced Tactical 2KW External Combustion Power Sources for Cogeneration Applications ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item matured and delivered a 2 kilowatt (KW) jet fuel propellant (JP-8) fueled demonstrator utilizing an external combustion free-piston Stirling engine.	2.388	-	-
Accomplishments/Planned Programs Subtotals	5.571	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602705A: *ELECTRONICS AND ELECTRONIC DEVICES*	PROJECT EM7: *POWER AND ENERGY COMPONENT TECHNOLOGIES (CA)*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
EM7: *POWER AND ENERGY COMPONENT TECHNOLOGIES (CA)*	35.514	-	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

Congressional Interest Item funding Power and Energy Component applied research.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Novel Zinc Air Power Sources for Military Applications ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item delivered fourth generation primary zinc-air batteries in several form factors, including body-worn, with state-of-charge indicator capability.	1.989	-	-
Title: Oregon Nanoscience and Microtechnologies Institute (ONAMI) Miniature Tactical Energy Systems Development ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item completed construction of a 5 kilowatt co-generation absorption system and a 5 kilowatt heat-actuated expander-compressor heat pump system.	2.486	-	-
Title: Bio-Battery ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item developed a hybrid biological battery with long run time for low drain applications.	0.795	-	-
Title: Ceramic Membrane - 10(X) More Energy for Battery Systems ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:***	2.387	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602705A: *ELECTRONICS AND ELECTRONIC DEVICES*	PROJECT EM7: *POWER AND ENERGY COMPONENT TECHNOLOGIES (CA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
This Congressional Interest Item optimized selected critical component technologies from Phase 1 and Phase 2 for final input into a manufacturing Phase 3 program; demonstrated optimized Lithium-Air high energy density batteries and Lithium-Air charger batteries to the U.S. Government for independent testing.			
Title: Enzyme Biofuel Cell (SEBC) ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item experimented with a biofuel cell power source that will operate an unmanned ground system.	1.194	-	-
Title: Soldier Portable Power Pack (SP3) for the 21st Century Warrior ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item developed a man-packable 300W 28V DC battery charger/auxiliary power unit that runs on pure methanol.	2.388	-	-
Title: Advanced Soldier Portable Power Systems Technologies ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item developed a half size primary and rechargeable battery with smart power manager that can process energy from multiple energy sources.	2.467	-	-
Title: Solid Oxide Fuel Cell Powered Tactical Smart Charger ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item experimented with a 500 Watt solid oxide fuel cell operating on military logistic fuel JP-8 with integrated battery charging capability and ruggedized the integrated charger package to protect against shock and vibration.	0.955	-	-
Title: High-Volume Manufacturing Development for Thin-film Lithium Stack Battery Technologies ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:***	0.796	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602705A: *ELECTRONICS AND ELECTRONIC DEVICES*	PROJECT EM7: *POWER AND ENERGY COMPONENT TECHNOLOGIES (CA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
This Congressional Interest Item developed low cost and high energy electrode material for lithium ion batteries, developed Silicon deposition on carbon nanotube, and developed higher voltage cathode battery.			
Title: Advanced Wearable Power System Manufacturing ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item developed advanced processes and supporting capabilities to ensure the domestic, affordable producability of this advanced wearable power system. Developed a 20 watt, 1,000 watt hour per kilogram (wh/kg) conformal, planar power system that is wearable with modular lightweight load-carrying equipment vest and body armor.	1.592	-	-
Title: Improved Energy Density Battery ***Description:*** This is a Congressional Interest Item ***FY 2010 Accomplishments:*** This Congressional Interest Item developed improved materials (manganese and iron doping nanophosphate) for lighter weight and faster charging BB-2590/U battery.	1.990	-	-
Title: Military Fuel Cell Genset Technology Demonstration ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item experimented with reliable and ruggedized solid oxide fuel cell (SOFC) technology and systems for military generator set applications.	1.990	-	-
Title: Advanced Flexible Solar Photovoltaic Technologies ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item developed an advanced flexible solar photovoltaic system based on novel photovoltaic chemistries, substrates, production processes, and coating techniques to achieve a flexible photovoltaic system for tactical power generation applications.	2.388	-	-
Title: Intelligent Energy Control Systems (IECS) ***Description:*** This is a Congressional Interest Item.	2.388	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602705A: *ELECTRONICS AND ELECTRONIC DEVICES*	PROJECT EM7: *POWER AND ENERGY COMPONENT TECHNOLOGIES (CA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
FY 2010 Accomplishments: This Congressional Interest Item developed an intelligent energy control system that networks stand-alone generator sets with alternative energy systems into a hybrid intelligent power management system to create an energy efficient and cost-effective mobile grid.			
Title: Advanced Hybrid Chemistry for Portable Power ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item created a power source for Army use that possesses both the extraordinary specific energy of carbon mono-fluoride (CFx), while also having the broad based rate and temperature capabilities necessary to replace Lithium-sulfur dioxide (Li/SO2) for field use, reducing battery weight by 1/2 and increasing energy by 2x.	2.547	-	-
Title: Market Viable, Dual-Use, Advanced Energy Storage Solutions Development ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item devised a cell system that is lower in cost and higher in performance than conventional graphite/ lithium cobalt oxide or graphite/lithium nickel manganese cobalt oxide.	3.979	-	-
Title: Ruggedized Military Laptop Fuel Cell Power Supply-Project Phase 3 ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Developed a Direct Methanol Fuel cell (DMFC) powered laptop power supply.	3.183	-	-
Accomplishments/Planned Programs Subtotals	35.514	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	**R-1 ITEM NOMENCLATURE** PE 0602705A: *ELECTRONICS AND ELECTRONIC DEVICES*	**PROJECT** EM7: *POWER AND ENERGY COMPONENT TECHNOLOGIES (CA)*

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602705A: *ELECTRONICS AND ELECTRONIC DEVICES*	PROJECT EM8: *High Power and Energy Component Technology*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
EM8: *High Power and Energy Component Technology*	8.599	13.631	15.402	-	15.402	15.238	15.086	14.434	14.678	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project conducts research and evaluate high-power electronic components and technologies. These technologies have application in compact, light-weight power and energy storage, power and energy conversion, conditioning, radio frequency (RF)/microwave and solid-state laser directed energy weapons (DEW), and traditional and non-traditional RF and laser electronic attack. The ongoing directed energy effects and power component work is coordinated with and, as appropriate, leveraged by DEW and power/energy programs in the Air Force, Navy, High Energy Laser Joint Technology Office, Defense Threat Reduction Agency, national labs, university consortia, and relevant industry and foreign partners.

The work in this project is coordinated with the Tank and Automotive Research, Development, and Engineering Center (TARDEC); the Armaments Research, Development, and Engineering Center (ARDEC); the Aviation and Missile Research, Development, and Engineering Center (AMRDEC); and the Communications and Electronics Research, Development, and Engineering Center (CERDEC). These efforts were previously funded in PE 0602120A (Sensors and Electronic Survivability).

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work on this project is performed by the Army Research Laboratory (ARL), Adelphi, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: High Power Components	2.069	2.323	1.177
Description: Research and evaluate materials and component structures that enable the investigation of the higher energy density and efficiency required by next generation Army systems such as electromagnetic armor, hybrid-vehicle propulsion electronics, directed energy sources, pulse power, small unattended ground sensors, and Soldier systems.			
FY 2010 Accomplishments: Designed power sources and antennas for higher frequency and power output; implemented silicon carbide (SiC) high-power density modules for pulse switching levels > 10 Mega Watt (MW).			
FY 2011 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602705A: *ELECTRONICS AND ELECTRONIC DEVICES*	PROJECT EM8: *High Power and Energy Component Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Implement system with new sources and antennas for counter electronics applications; develop SiC based high-power density modules for switching levels > 25 MW; as well as investigate and evaluate pulse power technologies for electromagnetic armor and microwave applications. ***FY 2012 Plans:*** Will investigate advanced wide band gap materials for use in high voltage pulse applications (>10kV).			
Title: High Energy Laser ***Description:*** Research novel solid-state laser concepts, architectures, and design components enabling high energy laser technology for Army specific DEW applications. Exploit breakthroughs in laser technology and photonics basic research to meet the stringent weight/volume requirements for platforms. Applied research will be conducted in close collaboration with domestic ceramic (and other) material vendors, university researchers, as well as major laser diode manufacturers. ***FY 2010 Accomplishments:*** Implemented cryogenically-cooled, gain medium in highly scalable, eye-safe, Erbium (Er)-doped lasers based on advanced laser ceramics. ***FY 2011 Plans:*** Investigate power and efficiency scaling potential of resonantly-pumped Ytterbium (Yb)-free Er-doped fiber laser architectures for high power eye-safe DEW applications. ***FY 2012 Plans:*** Will investigate scalability and efficiency potential of resonantly-pumped, eye-safe, lasers in a 2-2.1 micrometer atmospherically transparent spectral domain based on Holmium (Ho)-doped crystals and ceramics.	2.400	2.591	2.499
Title: Directed Energy (DE) ***Description:*** Investigate, research, and evaluate technologies related to DEW technology, electronic warfare (EW) survivability/ lethality, and supporting high power components to enhance the survivability/lethality of Army platforms. ***FY 2010 Accomplishments:*** Designed, developed and implemented components to reduce the size and weight of counter Improvised Explosive Device (IED) and mines systems, as well as continued to conduct lab and field assessments to understand susceptibility level of targets; investigated RF DE interoperability issues by conducting susceptibility analysis of Army radios. ***FY 2011 Plans:***	1.558	1.724	2.165

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602705A: *ELECTRONICS AND ELECTRONIC DEVICES*	PROJECT EM8: *High Power and Energy Component Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Support ARDEC in demonstrating military utility of payload concept. Support Air Defense Artillery Center and AMRDEC in investigating the feasibility and effectiveness of RF DEWs against electronically guided rockets, artillery and mortars (RAM) for their Enhanced Area Air Defense program. Transition target effects data and basic design package for RF DE Air Defense System to Center via AMRDEC. Investigate susceptibility profile for unmanned aerial vehicle system. ***FY 2012 Plans:*** Will continue the development of counter electronic systems and electronic warfare (EW) technology for CERDEC; will continue susceptibility investigations of a variety of targets; as well as transition effects data to applicable Research Development and Engineering Centers (RDECs).			
Title: Platform Power Components ***Description:*** Investigate, research, and evaluate compact, high efficiency, high-temperature, high power component technologies (switches, magnetics, capacitors, etc.) for hybrid platform propulsion, power generation, and power distribution. ***FY 2010 Accomplishments:*** Evaluated power components for high-temperature (100 degrees Centigrade (C) coolant), 250 kilowatt (kW) traction drive inverter and 150 kW battery-to-bus converter. ***FY 2011 Plans:*** Investigate power components for higher temperature operations (110 C coolant) and smaller circuits for platform upgrade programs. ***FY 2012 Plans:*** Will evaluate small high efficient wide band gap power modules and circuits utilizing high power component technologies as well as high performance passive components operating at a coolant temperature of 100 C.	1.500	3.862	4.708
Title: Platform Power Integration and Control ***Description:*** Investigate, research, and evaluate power stage and control circuit technologies for implementation of high-power density, high efficiency power converters for hybrid platform propulsion power generation and power distribution for new platforms and platform modernization efforts. ***FY 2010 Accomplishments:*** Validated gate control circuitry for high-temperature (100 C coolant) operation. ***FY 2011 Plans:***	0.446	1.482	3.628

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Conduct experiments with high-temperature, high power density 100 kW battery-to-bus converter. ***FY 2012 Plans:*** Will research control techniques and the use of advance passive devices to provide <60kW high-temperature (110 C) converters; and will investigate advanced power conversion techniques for directed energy applications.			
Title: Power Switching for Protective Systems ***Description:*** Investigate, research, and evaluate technologies relating to compact, high-power, high-efficiency pulse power for electronic survivability applications such as electromagnetic (EM) Armor, advance EM Armor, and Electronic Protection Systems. Such technologies include storage capacitors, direct current (DC-DC) converters, and high rate-of-current-rise pulse switches. ***FY 2010 Accomplishments:*** Evaluated fast rise storage capacitors at 1.5 joules/cubic centimeter (J/cc) and SiC pulse switch die at 3 kiloampere (kA) with fast rate-of-current-rise. ***FY 2011 Plans:*** Investigate component technology that can be implemented into a compact high-efficiency DC-DC pulse converter and SiC pulse switch die at 4.5 kA with fast rate-of-current-rise for powering a distributed EM Armor system. ***FY 2012 Plans:*** Will investigate SiC pulse switch die at 6 kA with fast rate-of-current-rise; and will experimentally validate a compact power converter for self-contained battery module concept that allows advanced high power systems to be used on current force and next generation vehicles.	0.626	1.649	1.225
Accomplishments/Planned Programs Subtotals	8.599	13.631	15.402

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602705A: *ELECTRONICS AND ELECTRONIC DEVICES*	PROJECT H11: *Tactical and Component Power Technology*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
H11: *Tactical and Component Power Technology*	12.508	11.988	11.395	-	11.395	11.016	11.571	11.411	10.485	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project identifies, advances, and enhances emerging power generation, energy storage, and power management technologies. This project funds research in electrochemistry, energy conversion, and signature suppression technologies, including those for primary batteries, rechargeable battery hybrids, fuel cells, power management, and components for electromechanical power generation. This project also researches power sources that are smaller and more fuel-efficient, advanced cooling systems that enable tactical sustainability and survivability, and investigates novel power management methods through low power design tools and operating system dynamic power management software.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this project is performed by the Army Research, Development and Engineering Command, Communications-Electronics Research, Development, and Engineering Center (CERDEC), Fort Monmouth, NJ and Aberdeen Proving Ground, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Soldier Hybrid Power and Smart Chargers	8.937	7.736	7.257
Description: This effort develops and validates hybrid power sources, rapid battery chargers, and power management technologies in order to decrease Soldier load, increase power capabilities, and decrease battery sizes and costs.			
FY 2010 Accomplishments: Developed advanced fabrication processes that enabled the reproduction of lithium air (Li/Air) battery cells in larger scale batches suitable for production, and conducted experiments in a laboratory environment on a lithium air battery in packaged form having greater than 400 watt hours per kilogram (Wh/kg); developed a 25W hybrid power source at greater than 400 Wh/kg; conducted experiments on a micro-electro mechanical system-based burner and integrated it with a thermal electric engine for a portable power source functioning in a laboratory environment.			
FY 2011 Plans: Develop processes and materials required for an integrated safe Li/Air battery; evaluate a disposable Soldier battery (Li/Air) at 800 Wh/kg in a relevant environment; experiment with a 150-300W portable squad power source/charger weighing 25 lbs, and a 50-100W hybrid power source weighing 3.5 lbs at 1000 Wh/kg.			
FY 2012 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602705A: *ELECTRONICS AND ELECTRONIC DEVICES*	PROJECT H11: *Tactical and Component Power Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Will develop a lower cost membrane for protected lithium anode portion of lithium air battery; will optimize solid electrolyte membrane to prevent lithium metal corrosion; will investigate and develop lower cost processes capable of high volume manufacturing of Li/Air battery; will experiment with packaged battery having >800 Wh/kg energy density; will validate safety characteristics of disposable Soldier battery (Li/Air); will experiment with disposable Soldier battery (Li/Air) in an operational environment; will assess balance of plant (controls, fans, heat transfer coatings, etc.) that will help improve efficiency for portable squad power source/charger and reduce weight of hybrid power source; will experiment with hybrid power source in a relevant environment.			
Title: Silent Mobile Power ***Description:*** This effort investigates component and system level power technologies that provide higher energy, reduced weight, quieter, and more fuel and cost efficient power generation sources to support the full spectrum of C4ISR power consumers. Products are silent mobile power technologies for waste-heat recovery systems, transitional power sources in the 500W-2kW range, and towable 100 kW generator sets. ***FY 2010 Accomplishments:*** Experimented in a laboratory environment with a waste-heat recovery system and a 500W transitional power source. ***FY 2011 Plans:*** Experiment with a high mobility multipurpose wheeled vehicle towable 100 kilowatt power unit in a relevant environment; experiment with a waste-heat recovery system in a relevant environment. ***FY 2012 Plans:*** Will conduct studies to identify emerging nanomaterials for applications to power electronics and fuel processing subsystems for 250W to 2 kW applications; will advance and incorporate a new generation of materials (like catalysts for processing JP-8 for use in gasoline engines, ceramic nanocoatings applied to key electromechanical components to enhance durability/life/power-output of current generator sets, and nanotubes applied to develop thermoelectric materials with high electrical but low thermal conductivity) to augment performance of emerging and military power systems in the less than 2 kW range.	3.571	4.252	4.138
Accomplishments/Planned Programs Subtotals	12.508	11.988	11.395

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602705A: *ELECTRONICS AND ELECTRONIC DEVICES*	PROJECT H11: *Tactical and Component Power Technology*

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602705A: *ELECTRONICS AND ELECTRONIC DEVICES*	PROJECT H17: *FLEXIBLE DISPLAY CENTER*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
H17: *FLEXIBLE DISPLAY CENTER*	6.737	6.974	7.508	-	7.508	7.633	7.944	8.224	8.349	Continuing	Continuing

A. Mission Description and Budget Item Justification

The objective of this project is to conduct and support applied research at the Army's Flexible Display Center (FDC) at the Arizona State University. The FDC conducts applied research on flexible display technologies that would make them inherently rugged (no glass), light weight, conformal, potentially low cost, and low power. The resultant display technology would enable enhanced and new capabilities across a broad spectrum of Army applications. Work in the FDC is performed collaboratively with the Army Research Development and Engineering Centers (RDECs) that include; the Natick Soldier RDEC(NSRDEC), Tank Automotive RDEC (TARDEC), Communications-Electronics RDEC (CERDEC), Armament RDEC (ARDEC), and Aviation and Missile RDEC (AMRDEC).

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this project is executed by the Army Research Laboratory (ARL), Adelphi, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Flexible Display Center (FDC) ***Description:*** The Flexible Display Center (FDC) is developing high resolution flexible reflective (electrophoretic) and emissive (organic light emitting diodes) displays. ***FY 2010 Accomplishments:*** The FDC continued full color designs and implemented color versions of flexible displays up to 6 inch diagonal (reflective) and 4 inch diagonal (emissive). ***FY 2011 Plans:*** FDC optimizes color reflective displays for size and resolution, and is transitioning reflective displays up to 6-8 inch diagonal to PEO Soldier. ***FY 2012 Plans:*** The FDC will continue to integrate color reflective displays and transition displays to integration efforts to include further development of emissive displays with size and resolution optimized to fulfill needs and requirements.	4.970	5.031	5.345
Title: FlexTech Alliance (FTA) (formerly known as U.S. Displays Consortium)	1.767	1.943	2.163

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: Flexible display partnerships funded through the FTA for tools, process, and materials development that directly support the FDC. ***FY 2010 Accomplishments:*** Investigated the integrated programs and identified new technology gaps for flexible displays. In addition, programs were developed to support emerging display technologies, such as higher performing thin film transistors for emissive displays, processes to enable flexible color filters and related integration; flexible display partnerships were reviewed and modified to ensure state-of-the-art tools, materials development and materials processes that directly support the goals of the FDC. ***FY 2011 Plans:*** FTA conducts flexible electronics development to enable emissive displays. The FTA continues supporting the development for emerging needs in state-of-the-art tools, materials development and materials processes that directly support the goals of the FDC. ***FY 2012 Plans:*** The FTA will continue to support the goals of the FDC and have direct impact on the development of reflective and emissive displays that will transition into a number of ongoing efforts; in addition, toolsets developing efforts necessary for further display and flexible electronics development will be supported.			
Accomplishments/Planned Programs Subtotals	6.737	6.974	7.508

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602705A: *ELECTRONICS AND ELECTRONIC DEVICES*	PROJECT H94: *ELEC & ELECTRONIC DEV*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
H94: *ELEC & ELECTRONIC DEV*	27.251	28.266	28.657	-	28.657	29.316	29.438	29.878	30.373	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

The objective of this project is to conduct applied research on electronics and electronic devices including opto-electronics to support advanced power and energy generation and storage; Command, Control, Communications, and Computers (C4); and Intelligence, Surveillance, and Reconnaissance (ISR) technologies. Areas of investigation include: low noise clocks and oscillators; lasers and focal plane arrays for eye-safe laser radar and standoff target acquisition sensors like forward-looking infrared; micro-electromechanical systems (MEMS) for multi-function radio frequency (RF) applications as well as smart munitions; advanced RF modules to support radars and communications systems; high-temperature high-power inverter circuits for electric drives; prognostics and diagnostics to reduce logistics demands; micro-power generators and advanced batteries, fuel reformers, and fuel cells for hybrid power sources; and novel structures on new electronic materials for oscillator and opto-electronic applications. This research enables enhanced battlefield situational awareness; increased vehicle mobility, survivability, and lethality; reduced acquisition cost; and reduced operations and support costs.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this project is performed by the Army Research Laboratory (ARL), Adelphi, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Antennas	1.743	1.774	3.473
Description: Design and develop high performance antennas and antenna arrays for RF front-end architectures supporting multifunction radar and communication systems. This work also includes evaluation and validation of these designs. Among the issues addressed in this antenna development are scanning techniques, broadbanding, beamforming, polarization, platform integration, and affordability.			
FY 2010 Accomplishments: Developed and assessed novel platform based antenna designs.			
FY 2011 Plans: Validate in-situ antenna performance.			
FY 2012 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Will develop and fabricate new antenna material structures.			
Title: RF MEMS ***Description:*** Investigate micro and nano technology for small, low cost, highly reliable, RF MEMS switches, resonators, and filters for multifunction RF applications; design highly stable low-noise oscillators with low-acceleration sensitivity by integrating photonic resonators and conventional microwave components to improve the capability of radar systems to detect slow moving targets; mature components and software for C4 technology; and perform research in advanced tactical software tools for mobile, ad hoc network access control, intrusion detection, and authentication techniques. ***FY 2010 Accomplishments:*** Investigated beam steering using an integrated piezoelectric MEMS (PiezoMEMS) enabled wafer level antenna, investigated an integrated PiezoMEMS switchable filter combining both low voltage switches with high-Q filters. ***FY 2011 Plans:*** Investigate system-in-package solutions for combining active components with PiezoMEMS wafer level antenna, PiezoMEMS switchable filters, and broadband PiezoMEMS switch matrices. Investigate building blocks for mechanical microcontroller based on PiezoMEMS switch technology (i.e. registers, latches, and arithmetic logic units). ***FY 2012 Plans:*** Will determine cycle reliability in packaged PiezoMEMS switches targeting lifetime in excess of 1 Billion Cycles; will develop switch technologies with extremely low on state resistances (<0.5 Ohm); will develop switchable filter technology spanning low MHz to low GHz; and will investigate PiezoMEMS devices for operation near or above 100 GHz.	1.606	2.394	4.231
Title: Millimeter Wave Components ***Description:*** Research, design, and investigate new component materials, structures, devices, and electromagnetic issues of millimeter wave (mmw) components and active devices, such as vacuum electronic (VE) devices monolithic microwave integrated circuits (MMICs), to achieve higher output power, power-added-efficiency, linearity, and dynamic range for increased operation and detection range. ***FY 2010 Accomplishments:*** Designed advanced mixed-signal RF integrated circuits (RFIC), and implemented models to investigate new materials and processes for high speed and high power electronic devices. ***FY 2011 Plans:***	7.251	6.499	3.701

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Develop reduced chip-set, thermally optimized RF modules, and perform material and device measurements to correlate and validate device models for new materials and processes for high speed and high power electronic devices. ***FY 2012 Plans:*** Will design highly integrated silicon based technology for multi-channel, multi-function RFICs; will develop emerging III-V devices for heterogeneous integration of mm-wave to TeraHertz (THz) subsystems.			
Title: Imaging Laser Radar (LADAR) ***Description:*** Investigate eye-safe, scanned and scannerless three dimensional (3-D) LADAR for both long-range reconnaissance and short-range unmanned ground and air vehicle applications. Conduct studies on technologies for long-range non-cooperative biometric identification. Investigate optical limiter designs with promising nonlinear materials for passive protection of electro-optic (EO) vision systems from damage from laser threat devices. ***FY 2010 Accomplishments:*** Implemented broad-aperture fast opto-electronic shutters for optical sights, sensors, and Soldier vision; improved performance of liquid cell optical limiting materials and transitioned to Tank and Automotive Research, Development, and Engineering Center, as well as developed electro-optic characterization methods for thick poled electro-optic polymers; evaluated 3-D autonomous navigation LADAR integrated onto a small robotic platform (Packbot); and developed an optical augmentation laser-based sensor. ***FY 2011 Plans:*** Extend opto-electronic sensor protection effort to address jamming threats; ruggedize and harden autonomous navigation LADAR; and implement solid-state scannerless LADAR for unmanned ground applications. ***FY 2012 Plans:*** Will perform skin-based phenomenology measurements for development of long-range uncooperative biometrics identification; will integrate LADAR onto additional small-robotic platforms and perform relevant-environment experiments; and will experimentally validate multi-element electro-optic shutter array.	3.223	3.109	2.591
Title: Infrared (IR) Imaging ***Description:*** Investigate large area multi-color, passive infrared (IR) imaging focal plane arrays (FPAs) for long range target detection and identification. Investigate molecular beam epitaxy (MBE) growth techniques for the growth of mercury cadmium telluride (HgCdTe) on Silicon(Si), Strained Layer Superlattices (SLS) and Corrugated Quantum Well Infrared Photodetector (C-QWIP) detector arrays for both the mid-wave infrared (MWIR) and long-wave infrared (LWIR) spectral region to significantly decrease the focal plane array cost. Design and fabricate arrays for higher operating temperature. ***FY 2010 Accomplishments:***	2.182	2.184	2.639

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Determined tradeoffs between filter complexity to best exploit high intensity emissions associated with hostile fire via a visible optic sensor; and characterized higher operating temperature HgCdTe devices, evaluated dual color C-QWIPs and measured lifetime in SLS detectors. ***FY 2011 Plans:*** Implement an Electro-Optic (EO) based sensor solution to detect threat launches prior to threat arrival. Determine feasibility of integrating commercially available EO imagers into a threat warning and location sensor system. Integrate narrow band filters into EO imager optical path to enhance threat signal count. Evaluate large area dual color Focal Plane Arrays (FPAs) suitable for such applications as persistent surveillance and distributed aperture systems. ***FY 2012 Plans:*** Will experimentally validate an improvement in SLS minority carrier lifetimes and show progress toward achieving 2K x 2K quantum well infrared focal plane arrays.			
Title: Photonics ***Description:*** Investigate a broad base of extremely quick, accurate, and novel photonic architectures to enable detection of hazardous substances to enhance Soldier survivability. Investigate the hybridization of Opto-electronic (OE) devices with electronics for optical fuze and IR scene projectors. ***FY 2010 Accomplishments:*** Evaluated hybrid recognition element/spectroscopy optical assay for hazardous chemical and/or energetics detection from previous down-selected evaluations; as well as investigated detectors for passive IR fuzing. ***FY 2011 Plans:*** Examine luminescence manipulation of hazardous materials using femto-second laser pulse-shaping excitation techniques; investigate Silicon photonic modulator devices for high bandwidth on-chip interconnects. ***FY 2012 Plans:*** Will investigate active and passive optical fuzes; will down-select laser pulse-shaping excitation scheme for further investigations of energetic materials detection; will down-select and develop photoacoustics method with most potential trace energetic detection using currently maturing infrared laser diodes sources; as well as will investigate construction of advanced peptide recognition elements using iterative process involving computational modeling coupled with experimental characterizations.	3.307	2.685	1.576
Title: MEMS ***Description:*** Investigate, design, and fabricate MEMS based components to improve power generation and micro-cooling technology for both the dismounted Soldier and future force systems.	2.072	1.570	3.190

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602705A: *ELECTRONICS AND ELECTRONIC DEVICES*	PROJECT H94: *ELEC & ELECTRONIC DEV*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
FY 2010 Accomplishments: Developed miniature power converters using MEMS passive components. ***FY 2011 Plans:*** Validate low power atomizer integrated with heavy fuel combustors for portable power generators. ***FY 2012 Plans:*** Will mature a milliwatt scale battery to actuator power converter component for micro robotic system.			
Title: Prognostics and Diagnostics ***Description:*** Investigate and evaluate prognostics and diagnostics (P&D) algorithms; design, fabricate, and evaluate MEMS and other sensors; and design, develop code, and evaluate database for the integration into decision systems to extend sensor rationalization and minimize downtime via condition-based maintenance. ***FY 2010 Accomplishments:*** Evaluated multi-mode algorithms for diagnostic extension of electronics. ***FY 2011 Plans:*** Design scheme for implementation on electronic subsystems. ***FY 2012 Plans:*** Will implement and conduct experiments of P&D on electronic system.	2.773	3.013	2.979
Title: Power and Energy ***Description:*** Investigate technology for advanced batteries, fuel reformers, and fuel cells to be used in hybrid power sources for future electromagnetic armor and smart munitions, Hybrid Electric Vehicle, and Soldier power applications. Investigate silicon carbide (SiC) power module technologies to enable compact high efficiency, high temperature (up to 150 C heat sink temperature) and high power density converters for motor drive and pulse power applications. ***FY 2010 Accomplishments:*** Investigated and developed high-temperature (80-100 C) SiC power modules for high-efficiency medium power conversion; investigated the stability of lithium cobalt phosphate (LiCoPO4) chemistries as a high voltage cathode material for Li ion batteries; incorporated new gas gettering agents into thermal batteries for munitions; investigated and implemented heat sources for thermal batteries, and explored higher energy materials for primary batteries; evaluated anion conducting membranes for fuel	3.094	5.038	4.277

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602705A: *ELECTRONICS AND ELECTRONIC DEVICES*	PROJECT H94: *ELEC & ELECTRONIC DEV*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
cell applications; and developed improved Gallium Nitride (GaN) substrates and diodes for high efficiency and high temperature electronics. ***FY 2011 Plans:*** Develop high temperature (100-110 C) SiC power modules for high-efficiency high density power conversion; develop higher rate cathodes for Li-ion chemistries; investigate and develop materials, components, and devices for thin film and conformal thermal batteries and advanced liquid reserve batteries. ***FY 2012 Plans:*** Will investigate high-temperature (110-120 C) high-frequency SiC power modules with integrated sense and gate drive for use in compact high-efficiency power conversion modules; will investigate stable high voltage anode, cathode and electrolyte components for Li ion batteries; will incorporate Si anode materials in Li ion cells; will develop improved alkaline fuel cell membranes; as well as will evaluate lifetime and rise time of thin film batteries.			
Accomplishments/Planned Programs Subtotals	27.251	28.266	28.657

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army										DATE: February 2011	
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*				R-1 ITEM NOMENCLATURE PE 0602709A: *NIGHT VISION TECHNOLOGY*							
COST ($ in Millions)	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**Cost To Complete**	**Total Cost**
Total Program Element	48.250	40.228	57.203	-	57.203	53.704	44.043	38.097	38.663	Continuing	Continuing
H95: *Night Vision and Electro-Optic Technology*	26.514	40.228	57.203	-	57.203	53.704	44.043	38.097	38.663	Continuing	Continuing
K90: *NIGHT VISION COMPONENT TECHNOLOGY (CA)*	21.736	-	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program element (PE) designs and develops core night vision and electronic sensor technologies to improve the Army's capability to operate in all battlefield conditions. Technologies pursued in this PE have the potential to provide the Army with new, or enhanced, capabilities to detect and identify targets farther on the battlefield, operate in obscured conditions, and maintain a higher degree of situational awareness (SA). Project H95 researches new infrared (IR) Focal Plane Array (FPA) technologies, assesses and evaluates sensor materials, designs advanced multi-function lasers for designation and range finding, and develops modeling and simulation for advanced sensor technologies. In FY11 through FY16 investments in advanced IR FPA technologies are increasing to expand research in novel FPA designs to ensure a world-wide technological and competitive IR sensor advantage for the United States. Project K90 funds congressional special interest items.

Work in this PE is fully coordinated with PE 0602120A (Sensors and Electronic Survivability), PE 0602705A (Electronics and Electronic Devices), PE 0602712A (Countermine Technology), and PE 0603710A (Night Vision Advanced Technology).

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this PE is performed by the Army Research, Development, and Engineering Command (RDECOM)/Communications-Electronics Research, Development, and Engineering Center (CERDEC)/Night Vision and Electronic Sensors Directorate (NVESD), Fort Belvoir, VA.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army	DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	**R-1 ITEM NOMENCLATURE** PE 0602709A: *NIGHT VISION TECHNOLOGY*

B. Program Change Summary ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Previous President's Budget	50.877	40.228	57.438	-	57.438
Current President's Budget	48.250	40.228	57.203	-	57.203
Total Adjustments	-2.627	-	-0.235	-	-0.235
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	-2.388	-			
• SBIR/STTR Transfer	-0.239	-			
• Adjustments to Budget Years	-	-	-0.235	-	-0.235

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602709A: *NIGHT VISION TECHNOLOGY*	PROJECT H95: *Night Vision and Electro-Optic Technology*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
H95: *Night Vision and Electro-Optic Technology*	26.514	40.228	57.203	-	57.203	53.704	44.043	38.097	38.663	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project researches and develops component technologies that enable improved situational awareness (SA) at an affordable price. Component technologies include novel focal plane arrays (FPAs), processing and electronics improvements, and modeling and simulation to predict performance and to determine operational effectiveness. This research focuses on dual band infrared (IR) FPAs necessary to search, identify and track mobile targets in all day/night visibility and battlefield conditions, and to improve standoff detection in ground-to-ground and air-to-ground operations. In addition, very large format IR FPAs are needed for sensors to simultaneously provide wide area coverage in addition to providing the resolution for situation awareness, persistent surveillance and plume/gunflash detection. With the development of multispectral and hyperspectral algorithms, advanced dual band FPAs are being developed with on-chip hyperspectral functionality, which offer the ability to perform detection, identification, and signature identification at extended ranges as well as the ability to detect targets in "deep hide". In FY11 through FY16 investments in advanced IR FPA technologies are increasing to expand research in novel FPA designs to ensure the United States' technological and competitive IR sensor advantage.

Work in this project is fully coordinated with PE 0602705A (Electronics and Electronic Devices), PE 0602712A (Countermine Technology), and PE 0603710A (Night Vision Advanced Technology).

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this PE is performed by the Army Research, Development, and Engineering Command (RDECOM)/Communications-Electronics Research, Development, and Engineering Center (CERDEC)/Night Vision and Electronic Sensors Directorate (NVESD), Fort Belvoir, VA.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Distributed Aided Target Recognition (AiTR) Evaluation Center of Excellence	1.278	1.288	1.323
Description: This effort researches a Defense-wide virtual/distributed capability to interactively process both real and generated 3-Dimension multispectral scenes from sensors simulations for evaluation of automatic target recognition (ATR) algorithms against realistic operational scenarios in aided or fully autonomous reconnaissance, surveillance, and target acquisition (RSTA) missions to include roadside threats/explosively formed projectiles.			
FY 2010 Accomplishments:			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602709A: *NIGHT VISION TECHNOLOGY*	PROJECT H95: *Night Vision and Electro-Optic Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Continued testing of fused multiple ground-based sensors; investigated and developed hyperspectral and multi-spectral sensors. ***FY 2011 Plans:*** Research, investigate and develop algorithms for the autonomous detection and tracking of mounted and dismounted targets/ threats for distributed aperture systems, targets of focus are those that emerge from hiding/defilade in an urban combat arena. ***FY 2012 Plans:*** Will investigate the AiTR algorithm evaluation process for multiple sensor modalities including threat explosive detection; will evaluate AiTR algorithms in order to quantify performance against established figures of merit using real data of threat explosives in urban environments to differentiate threat explosives from clutter; will evaluate AiTR algorithms using real world scenario data including urban environments, threat explosive targets, and hard targets in order to further populate AiTR algorithm performance databases.			
Title: Sensor Modeling and Simulation Technology ***Description:*** This effort develops and investigates supporting engineering models, measurement techniques, and simulations concurrently with the development and transition of core sensor technologies. ***FY 2010 Accomplishments:*** Completed the development and validation of an air to ground persistent surveillance model; developed and validated sensor performance model improvements to more accurately address the search process to include: moving targets, moving observers, and environmental effects such as glint (reflective components), and complex clutter (foliage and urban structures). ***FY 2011 Plans:*** Develop and implement new sensor measurement models to include visible and short wave infrared (IR) bands and systems with nonlinear image processing; conduct analysis to define the next generation of cooled IR technology; begin the development of next generation simulations to support wargames and engineering tradeoff studies; develop and validate models to represent color or visible electro-optical (EO) IR sensors and distributed aperture systems. ***FY 2012 Plans:*** Will refine and complete development and validation of complex search and persistent surveillance models and simulations incorporating the next generation cooled IR technology; will incorporate the ability to effectively model and simulate moving targets and platforms in a full spherical (180 degrees by 180 degrees) sensor simulation; will continue development of next generation sensor simulations to support wargames and engineering tradeoff studies.	5.008	5.054	5.187
Title: Advanced Multifunction Laser Technology	4.023	4.044	4.001

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602709A: *NIGHT VISION TECHNOLOGY*	PROJECT H95: *Night Vision and Electro-Optic Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: This effort investigates and evaluates laser architectures and materials required to produce multiple wavelength bands and pulse modulation formats for future laser-based systems, including laser designation, range finding, explosive detection and warning lasers. ***FY 2010 Accomplishments:*** Completed component testing and integrated laser components (to include optical receivers and electronics suitable for small unmanned aerial sensors and lightweight Soldier applications) into multi-function brass-board system. ***FY 2011 Plans:*** Evaluate and optimize operation of individual laser segment; select and optimize best technique for fabrication of structure, segmented laser diode stack and segmented output coupler mirror; evaluate candidate of laser optical bench configuration and components in the laboratory, and determine the key performance parameters of each design. ***FY 2012 Plans:*** Will investigate laser output (pulse energies, wavelength, beam divergence) to support the laser capabilities for designation, range finding, daytime pointing and explosive detection; will evaluate laser modules to perform size, weight and power trade-offs for assessment of platform transition opportunities; will assemble breadboard laser modules capable of generating the required energy or power to produce three or more wavelengths in selectable modes.			
Title: High Performance Small Pixel Uncooled Focal Plane Array (FPA) ***Description:*** This effort researches high performance, small pixel, uncooled longwave infrared (LWIR) and shortwave infrared (SWIR) technology with the objective of using large format arrays to increase recognition and identification ranges. ***FY 2010 Accomplishments:*** Investigated and developed high definition format uncooled FPA material structures enabling greater sensitivity, lower noise and faster time constants than current sensors. ***FY 2011 Plans:*** Develop a 1920 x 1080 pixel read out integrated circuit (ROIC) design for large format LWIR; research and demonstrate the large format LWIR focal plane array packaging using an in-house developed capability; deliver and test the leveraged Defense Advanced Research Project Agency (DARPA) SWIR array electronics; and investigate the development of recognition and identification ranges for both large format LWIR and large format SWIR focal plane arrays. ***FY 2012 Plans:*** Will continue the development of the pixel material processing of the LWIR FPA with associated ROICs; will develop a novel approach (increase number of pixels from 640 to 1920 pixels) to achieve high definition (HD) to optimize wafer die size based for	2.334	2.830	7.730

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602709A: *NIGHT VISION TECHNOLOGY*	PROJECT H95: *Night Vision and Electro-Optic Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
performance; will investigate and evaluate the identification range performance of the large format LWIR/SWIR FPA electronic system; will design and develop the brass-board optics for SWIR hyperspectral imaging; will research new low noise ROIC that supports HD format clocking and timing; establish multiple design lots to prove out the performance of the HD detector and ROIC; investigate camera electronics that support 60Hz HD video (>276MB/sec data rate) in order to support the testing and video analysis of the HD focal plane array.			
Title: Advanced Structures for Cooled Infrared (IR) Sensors ***Description:*** This effort researches new detector materials and substrates, and develops technologies to minimize detector defects and increase reliability through new growth and substrate preparation techniques. ***FY 2010 Accomplishments:*** Developed and evaluated large area high performance dual color (midwave/longwave) (MW/LW) infrared (IR) FPAs grown on low cost substrates such that defective pixels are reduced to less than 1%. ***FY 2011 Plans:*** Develop and test LWIR Type II Strained Layer Superlattice (SSL) 256x256 FPAs with improved material uniformity, better material and substrates structural view and lower noise levels. ***FY 2012 Plans:*** Will validate the proof of concept of 2-color 256x256 pixel LWIR and 640x480 pixel MWIR/LWIR performance; will investigate and validate new techniques for FPA development of very large (2000 x 2000 pixels) FPA grown on low cost substrates with less than 0.5% pixel defects.	4.274	4.250	3.517
Title: Soldier Sensor Component and Signal Processing ***Description:*** This effort investigates new digital image intensified (I2) components to improve maneuver and situational awareness for the dismounted and mounted Soldier, benefiting pilotage, unmanned aerial systems and unmanned ground vehicle (UGV) applications. ***FY 2010 Accomplishments:*** Investigated and developed a brass-board sensor, objective lens and monochrome display with field programmable gated array image processing. ***FY 2011 Plans:***	6.700	6.815	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602709A: *NIGHT VISION TECHNOLOGY*	PROJECT H95: *Night Vision and Electro-Optic Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Evaluate and test (laboratory, controlled environment field testing and human factors studies) the brass-board low-light camera, handsfree focus optics and monochrome display utilizing digital on-chip processing for high speed video transmission, high resolution, high dynamic range and no-focus digital filtering/closed loop control.			
Title: Compact Hyperspectral Imaging (HSI) Component Technology ***Description:*** This effort investigates hyperspectral focal plane arrays (FPAs) and sensors for ground and air based platforms that possess the capability to detect targets and discriminate from clutter for overwatch scenarios, while ground-based hyperspectral sensors can detect targets from clutter in close-in urban situations. ***FY 2010 Accomplishments:*** Developed a HSI program to investigate advanced FPAs in the visible, near infrared (NIR) and long wave infrared (LWIR) region, incorporating on-chip multispectral capability via novel processing, to assist in identification of difficult military significant targets in urban and rural environments; investigated and selected best HSI configurations for visible, NIR and LWIR HSI, including FPAs. ***FY 2011 Plans:*** Characterize HSI imagers from each modality and waveband of interest to exploit sensor capability and identify targets of military significance in diverse environments; integrate sensor hardware and software; will conduct tests on the HSI images to assess the sensor capability.	2.897	3.447	-
Title: Digital Readout Integrated Circuit (ROIC) ***Description:*** This effort investigates and develops new ROIC technology (analog to digital) incorporated into affordable very large format and multiband infrared focal plane arrays (IR FPAs) used in sensors for targeting, situational awareness, and persistent surveillance that maintain performance with increasingly smaller pixel sizes. ***FY 2011 Plans:*** Conduct design of small digital ROIC unit cell to meet dynamic range requirements by doing analog to digital conversion within the pixel; improve digital ROIC sampling noise to meet signal/noise requirements through improved control of parasitic capacitances; research and investigate innovative on-chip signal processing designs to reduce overall IR sensor size, weight and power. ***FY 2012 Plans:*** Will fabricate 640x480 pixel digital ROIC implementing innovative on-chip signal processing designs with reduced pitch unit cell; will measure dynamic range and signal/noise performance; will conduct analysis allowing correlation of digital ROIC sampling noise and parasitic capacitances to signal/noise data; will conduct design of ROIC for the 640x480 pixel FPA with reduced pitch unit cell while maintaining performance.	-	2.600	7.500
Title: Enhanced IR Detector ("nBn") Technology	-	4.300	10.300

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602709A: *NIGHT VISION TECHNOLOGY*	PROJECT H95: *Night Vision and Electro-Optic Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: This effort investigates and improves a new detector structure ("nBn") that enables very small pixel and higher operating temperatures both of which should lead to much more affordable sensor systems due to smaller system optics and cryogenic coolers. ***FY 2011 Plans:*** Develop structures to improve the "nBn" detector through varying dopant levels, types and thickness of individual semi-conductors material layers; investigate the optimal focal plane array (FPA) design for smaller pixels, longer wavelength sensitivity and higher operating temperatures to reduce size, weight and power; perform ("nBn") growth on Gallium Antimonide (GaSb) and/or Gallium Arsenide (GaAs) wafers to reduce defects in the "nBn" FPA. ***FY 2012 Plans:*** Will fabricate 1-2 Mega pixel (Mpix) FPA implementing successes from design of experiments on dopant level, type and thickness of individual semi-conductors material layers; will further investigate growth of semi-conductor material layers (nBn) on larger diameter (approximately 4-6 inches) GaSb and/or GaAs wafers to reduce defects of the FPA and determine cause of defects; will design 5Mpix FPA incorporating feedback from the results of the 1-2Mpix FPA design process.			
Title: Strained Layer Superlattices (SLS) Technology ***Description:*** This effort investigates and improves the recent advances in III-V material thin film crystal growth of infrared focal plane arrays (IR FPAs) using a very flexible Strained Layer Superlattice (SLS) structure which allows multiband IR FPAs to be produced at much lower costs with improved uniformity. ***FY 2011 Plans:*** Improve the performance of SLS detectors through increased sensitivity; reduce excess noise of SLS longwave infrared detectors levels through novel side-wall passavation materials and techniques and novel diode architectures; develop lithography suitable for high definition format, small pixel, multiband SLS FPAs; design uniform large area SLS wafers by transitioning SLS growth from 3-inch to 4 to 5-inch diameter Gallium Antimonide (GaSb) wafers or establishing new growth processes on alternative Gallium Arsenide (GaAs) substrates to reduce defects in the SLS FPA. ***FY 2012 Plans:*** Will fabricate 640x480 pixel, dual band, midwave infrared/longwave infrared (MWIR/LWIR) or MWIR/MWIR FPA utilizing results of design of experiments involving passivation material and techniques, diode architectures and lithography; will design 640x480 small pixel (15/20 micrometer) dual band MWIR/LWIR FPA on alternate substrates, incorporating feedback from the results of experiments involving passivation material and techniques, diode architectures and lithography; will correlate material	-	5.600	11.700

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602709A: *NIGHT VISION TECHNOLOGY*	PROJECT H95: *Night Vision and Electro-Optic Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
performance of growth on GaSb versus GaAs; will convert detector fabrication processes from 3 inches to 5 inches diameter GaSb wafer capability.			
Title: Wide Field of View Displays and Processing for Head Mounted Display Systems ***Description:*** This effort researches and investigates wide field of view leap-ahead technology for Soldier vision enhancement components. ***FY 2012 Plans:*** Will investigate and evaluate techniques for the development of foveated (pitted) pixel architecture sensors and displays for ultra high resolution without trading field of view or low power.	-	-	3.328
Title: Solid State Low Light Imaging ***Description:*** This effort develops true starlight and below low light sensing, solid state focal plane technology with very low power and low production cost for Soldier vision enhancement under reduced visibility and low light conditions. ***FY 2012 Plans:*** Will research, investigate and assess the power, cost and low light sensitivity trade-offs for employing pixel enhanced quantum efficiency silicon material; will evaluate pixel design architecture for in-pixel gain and ultra-low noise readout circuits.	-	-	2.617
Accomplishments/Planned Programs Subtotals	26.514	40.228	57.203

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602709A: *NIGHT VISION TECHNOLOGY*	PROJECT K90: *NIGHT VISION COMPONENT TECHNOLOGY (CA)*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
K90: *NIGHT VISION COMPONENT TECHNOLOGY (CA)*	21.736	-	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for Night Vision Component Technology applied research.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Next Generation Communications System ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item, continued the development of fiber optic based sensor network into the existing expeditionary sensor platform for persistent surveillance.	0.795	-	-
Title: Night Vision Technology Research ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item, developed advanced infrared (IR) focal plane array components to improve the capability to rapidly search for targets in clutter and provide wide area persistent surveillance; developed building blocks for IR FPA product that enable cost effective, end-system manufacturing, and sensor material production; an emerging sensor technology, Strained Layer Superlattice (SLS) that may have higher operating temperatures eliminating the need for complex and expensive cryocoolers. Developed an extended MWIR response, 5 megapixel nBn array and associated test set so that performance could be verified. Performed pixel design optimization studies to incorporate commercial-off-the-shelf (COTS) fabrication techniques. Designed and developed a LWIR pointer for utilization with current uncooled LWIR based systems especially the deployed thermal weapon sight. Developed a dual f number cooler dewar assembly (ICDA) incorporating an 860 x 480 dual band array.	8.207	-	-
Title: Personal Miniature Thermal Viewer (PMTV) ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:***	0.796	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602709A: *NIGHT VISION TECHNOLOGY*	PROJECT K90: *NIGHT VISION COMPONENT TECHNOLOGY (CA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
This Congressional Interest Item, provided a small, lightweight (9 ounces), low power handheld or weapon mounted 20 degrees or 40 degrees field of view 320x240 pixel or 640x480 pixel uncooled thermal imager.			
Title: IR-Vascular Facial Fingerprinting ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item, developed an infrared sensor that passively tracked the spectral ratio over time providing cues to location of cancer.	2.388	-	-
Title: Materials for Infrared Night Vision Equipment ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item, assisted with the production of large Cadmium Telluride on Silicon alternate substrates by a US merchant supplier. The current state-of-the-art HgCdTe, used for infrared detector manufacturing, is grown on small CdZnTe substrates supplied by an off-shore company.	7.163	-	-
Title: Power Efficient Microdisplay Development for US Army Night Vision ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Researched a more power efficient microdisplay suitable for inclusion into U.S. military thermal imaging and night vision devices.	2.387	-	-
Accomplishments/Planned Programs Subtotals	21.736	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army										DATE: February 2011	
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*				R-1 ITEM NOMENCLATURE PE 0602712A: *Countermine Systems*							
COST ($ in Millions)	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**Cost To Complete**	**Total Cost**
Total Program Element	27.892	19.118	20.280	-	20.280	20.878	21.257	21.446	21.756	Continuing	Continuing
H24: *COUNTERMINE TECH*	15.575	16.242	17.348	-	17.348	17.888	18.213	18.351	18.608	Continuing	Continuing
H35: *CAMOUFLAGE & COUNTER-RECON TECH*	2.767	2.876	2.932	-	2.932	2.990	3.044	3.095	3.148	Continuing	Continuing
HB2: *COUNTERMINE COMPONENT TECHNOLOGY (CA)*	9.550	-	-	-	-	-	-	-	-	Continuing	Continuing

Note

FY10 funding increase is for congressional special interest items.

A. Mission Description and Budget Item Justification

This program element (PE) investigates and develops applied technologies to improve countermine, signature management, and counter-sensors capabilities. The focus is on sensor technologies to improve detection of mines, explosive threats and directed energy; ballistic methods to defeat mines and explosive threats; and signature management technologies to reduce reconnaissance capabilities of the enemies. This PE also supports DoD's Center of Excellence for Unexploded Ordnance which coordinates and standardizes land mine signature models; maintains a catalogue of mine signatures; supports the evaluation of mine detection sensors and algorithms; and working in conjunction with the US Army Engineering, Research and Development Center (ERDC), examines countermine phenomenology of surface and buried mines, and explosive threats. This PE advances the state of the art in Countermine Technologies (project H24) and Camouflage and Counter Reconnaissance Technologies (project H35). Countermine Component Technology (project HB2) funds congressional special interest items.

Work in this PE is related to and is fully coordinated with PE 0602120A, (Sensors and Electronic Survivability), PE 0602624A, (Weapons and Munitions Technology), PE 0602709A, (Night Vision Technology), PE 0602622A , (Chemical, Smoke and Equipment Defeating Technology), PE 0602784A (Military Engineering Technology), PE 0603606A, (Landmine Warfare and Barrier Advanced Technology), PE 0603710A (Night Vision Advanced Technology).

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this PE is performed by the Army Research, Development, and Engineering Command (RDECOM), Communications-Electronics Research, Development, and Engineering Center (CERDEC), Fort Belvoir, VA.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602712A: *Countermine Systems*	

B. Program Change Summary ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Previous President's Budget	23.621	19.118	20.480	-	20.480
Current President's Budget	27.892	19.118	20.280	-	20.280
Total Adjustments	4.271	-	-0.200	-	-0.200
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	4.775	-			
• SBIR/STTR Transfer	-0.504	-			
• Adjustments to Budget Years	-	-	-0.200	-	-0.200

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602712A: *Countermine Systems*	PROJECT H24: *COUNTERMINE TECH*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
H24: *COUNTERMINE TECH*	15.575	16.242	17.348	-	17.348	17.888	18.213	18.351	18.608	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project investigates and develops new countermine technologies that use man-portable, ground-vehicular, and airborne platforms for detection, discrimination, and neutralization of individual mines, minefields, and other explosive threats. The goal of this project is to accurately detect threats with a high probability, reduce false alarms, and enable an increased operational tempo.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this project is performed by the Army Research, Development, and Engineering Command (RDECOM)/Communications-Electronics Research, Development, and Engineering Center (CERDEC), Fort Belvoir, VA.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Department of Defense Unexploded Ordnance (UXO) Center of Excellence (UXOCOE)	0.479	0.495	0.493
Description: The Army serves as executive agent of the UXOCOE, which provides for the coordination of UXO across the Department of Defense (DoD) and serves as the focal point for research, development, testing and evaluation (RDT&E) for UXO detection and clearance technologies. ***FY 2010 Accomplishments:*** Analyzed catalogued detection and clearance requirements, and technologies to determine RDT&E shortfalls and leveraging opportunities. ***FY 2011 Plans:*** Continue the coordination, with the Joint services, for the UXO detection and clearance research, demonstration, test and evaluation program. ***FY 2012 Plans:*** Will research and evaluate the UXO RDT&E detection and clearance information and coordinate across the DoD.			
Title: Standoff Mine/Defeat Neutralization Technology	7.426	7.612	3.562
Description: This effort investigates and evaluates the ability to pre-detonate and neutralize mines, and emerging threats at tactically relevant standoff ranges.			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602712A: *Countermine Systems*	PROJECT H24: *COUNTERMINE TECH*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
FY 2010 Accomplishments: Developed and evaluated two neutralization technologies: a brassboard for laser drilling technologies and a brassboard for munitions against buried and obscured threats. ***FY 2011 Plans:*** Conduct laboratory tests with the brassboards for laser drilling and for munitions in an environment that simulates theater operations (e.g. threat, weather, and environmental conditions) to assess the relative performance against a spectrum of buried and obscured threats. ***FY 2012 Plans:*** Will investigate and integrate diode based laser pump technology into a neutralization brassboard; will evaluate the power and energy output with regards to requirements to defeat mine and threat explosives.			
Title: Standoff Explosive Compound Detection Technology ***Description:*** This effort investigates ground based detection and confirmation technologies of explosives compounds from tactically relevant standoff distances. The effort is complimentary to the work being accomplished under PE 0602622A/project 552. ***FY 2010 Accomplishments:*** Performed an explosive compound behavioral study on different surfaces under various environmental conditions; and determined performance of ground based detection systems for a spectrum of threats. ***FY 2011 Plans:*** Perform a comprehensive evaluation of the candidate brassboard (such as laser induced breakdown spectroscopy and ultra-violet spectroscopy) for standoff performance validation (standoff range) and continue to refine the performance of the ground based and airborne detection systems. Conduct field evaluations of selected technologies. ***FY 2012 Plans:*** Will conduct data collection of domestic and foreign explosive compounds in order to populate and categorize signatures and will utilize the data in conjunction with algorithm development; will research potential to increase detection sensitivity with newly designed algorithms versus the sensitivity of current technology; will investigate explosive detection sensors that have potential to reduce false alarms in high clutter areas.	3.022	3.307	3.762
Title: Advanced Electro-Magnetic (EM) and Electro Optic (EO) Sensors for Detection Emerging Threats Devices ***Description:*** This effort investigates all-terrain standoff detection using multiple modalities in order to locate mine and emerging threats with minimal false alarms.	-	4.828	4.701

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602712A: *Countermine Systems*	PROJECT H24: *COUNTERMINE TECH*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
FY 2011 Plans: Begin efforts to investigate advanced electromagnetic induction technologies and EO sensors; incorporate the advances made in forward looking ground penetrating radar and electromagnetic induction and EO sensors for detection of metallic mines and explosive threats buried in-road and in urban areas. ***FY 2012 Plans:*** Will design and develop a brassboard with data collection capabilities incorporating EM, Electromagnetic Interference (EMI), and EO advancements; will evaluate EO sensing and EM detection concepts for detection of emerging threats; will integrate and combine emerging Defense Advanced Research Projects Agency standoff vibration detection technology with the EM, EMI, and EO based sensors and with a downward looking active EO laser and/or Laser Detection & Ranging (for ground surface profiling) technology			
Title: Detection of Home Made Explosive (HME) Production Facilities and Threats ***Description:*** This effort investigates and develops emerging homemade explosive (HME) detection technologies to address Warfighter needs for standoff detection and confirmation of HME production facilities and threats. Work related to this effort is also being accomplished under PE 0602622A/project 552. ***FY 2012 Plans:*** Will investigate short wave infrared and long wave infrared hyperspectral imaging techniques for detecting homemade explosive threats; will determine and analyze concentrations of HME required for reliable detection in different air and ground scenarios (e.g., production and drying facilities, spill sights, residue on vehicles and other objects); will research algorithm techniques for separation of HME signatures from background clutter leading to algorithms for automated HME detection.	-	-	4.830
Title: Anti-personnel/Anti-Tank Mine False Alarm Reduction ***Description:*** This effort investigates new sensor and signal processing component technology for ground based and airborne systems that provide the Warfighter solutions to standoff mine/emerging threat detection while reducing false alarm rates. ***FY 2010 Accomplishments:*** Performed a comprehensive evaluation of candidate sensors to assess threat detection performance using the processor in a variety of operational conditions; completed the phenomenology study and signal processing algorithm development.	4.648	-	-
Accomplishments/Planned Programs Subtotals	15.575	16.242	17.348

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602712A: *Countermine Systems*	PROJECT H24: *COUNTERMINE TECH*

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602712A: *Countermine Systems*	PROJECT H35: *CAMOUFLAGE & COUNTER-RECON TECH*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
H35: *CAMOUFLAGE & COUNTER-RECON TECH*	2.767	2.876	2.932	-	2.932	2.990	3.044	3.095	3.148	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project evaluates and develops advanced signature management and deception technologies for masking friendly force capabilities and intentions. Technologies pursued under this effort reduce the cross section of sensor systems. Technologies investigated include the decentered field lens, wavefront coding, and spectral filtering and threat sensing algorithms.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this project is performed by the Army Research, Development, and Engineering Command (RDECOM)/Communications-Electronics Research, Development, and Engineering Center (CERDEC), Fort Belvoir, VA.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Camouflage and Counter-Reconnaissance Technology for Advanced Spectral Sensors:	2.767	2.876	2.932
Description: This effort investigates and advances new technologies to reduce susceptibility of sensors and extends camouflage technology. ***FY 2010 Accomplishments:*** Investigated advanced signature reduction approaches for uncooled and dual band staring sensors, and other staring sensors; investigated the susceptibility of foreign and friendly systems to hyperspectral detection methods; developed near-term improvements to camouflage paints, coatings, and systems in both the visible and non-visible wavelength regions. ***FY 2011 Plans:*** Continue to develop the optical signature reduction effort; widen the key sensor waveband coverage and future staring sensors, such as day television and shortwave infrared; investigate camouflage paints or other systems for hyperspectral signature reduction; and validate for effectiveness and potential for implementation in operational systems. ***FY 2012 Plans:*** Will continue investigation of the susceptibility of foreign and friendly systems to hyperspectral detection methods; will conduct experiments and evaluate multiple technologies to ensure signature reduction is achieved and incorporate results into sensor			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602712A: *Countermine Systems*	PROJECT H35: *CAMOUFLAGE & COUNTER-RECON TECH*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
models for advanced characterization; will collaborate with industry to develop near-term improvements to camouflage paints, coatings, and systems in both the visible and other wavelength regions.			
Accomplishments/Planned Programs Subtotals	2.767	2.876	2.932

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602712A: *Countermine Systems*	PROJECT HB2: *COUNTERMINE COMPONENT TECHNOLOGY (CA)*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
HB2: *COUNTERMINE COMPONENT TECHNOLOGY (CA)*	9.550	-	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for Countermine Systems applied research.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Spectroscopic Materials Identification Center ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item developed spectroscopic signatures libraries for the identification of explosives and explosive-related compounds (ERCs)	1.592	-	-
Title: Standoff Detection of Explosives and Explosive Devices ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item researched the detection of explosive residues for force protection and route clearance missions and the detection of explosives-related cues indicative of homemade explosive weaponization.	3.183	-	-
Title: Standoff Improvised Explosive Device Detection Program ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item, investigated standoff explosives-based detection technology optical signatures (laser induced breakdown spectroscopy (LIBS) and photo-dissociation laser induced fluorescence (PD-LIF)); long wave-hyperspectral imaging (LW-HSI); Raman; and point vapor detection techniques).	4.775	-	-
Accomplishments/Planned Programs Subtotals	9.550	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602712A: *Countermine Systems*	PROJECT HB2: *COUNTERMINE COMPONENT TECHNOLOGY (CA)*

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602716A: *HUMAN FACTORS ENGINEERING TECHNOLOGY*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
Total Program Element	30.395	21.042	21.801	-	21.801	21.484	21.687	22.339	22.626	Continuing	Continuing
H70: *HUMAN FACT ENG SYS DEV*	18.457	21.042	21.801	-	21.801	21.484	21.687	22.339	22.626	Continuing	Continuing
J21: *HUMAN FACTORS APPLIED RESEARCH CA*	11.938	-	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

The objective of this program element (PE) is to conduct applied research on aspects of human factors engineering that impact the capabilities of individual and teams of Soldiers operating in complex, dynamic environments. The results of the research will enable maximizing the effectiveness of Soldiers and their equipment for mission success. The aspects of human factors that will be studied include sensing, perceptual and cognitive processes, ergonomics, biomechanics and the tools and methodologies required to manage interaction within these areas and within the Soldiers' combat environment. Research is focused on decision-making; human robotic interaction; crew station design; improving Soldier performance under stressful conditions such as time pressure, information overload, information uncertainty, fatigue, on-the-move and geographic dispersion; and enhancing human performance modeling tools (project H70).

Work in this PE complements, and is fully coordinated with, efforts in PE 0602601A (Combat Vehicle and Automotive Advanced Technology), PE 0602786A (Warfighter Technology), PE 0602120A (Sensors and Electronic Survivability), PE 0602784A (Military Engineering Technology), PE 0602783A (Computer and Software Technology), PE 0602308A (Advanced Concepts and Simulation), PE 0602785 (Manpower/Personnel/Training Technology), PE 0603005A (Combat Vehicle and Automotive Technology), PE 0603710A (Night Vision Advanced Technology), PE 0603015A (Next Generation Training and Simulation), and PE 0603007A (Manpower, Personnel, and Training Advanced Technology).

Project J21 funds Congressional interest item.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this project is performed by the Army Research Laboratory (ARL), Aberdeen Proving Ground, MD.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army	DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	**R-1 ITEM NOMENCLATURE** PE 0602716A: *HUMAN FACTORS ENGINEERING TECHNOLOGY*

B. Program Change Summary ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Previous President's Budget	30.446	21.042	20.001	-	20.001
Current President's Budget	30.395	21.042	21.801	-	21.801
Total Adjustments	-0.051	-	1.800	-	1.800
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.051	-			
• Adjustments to Budget Years	-	-	1.800	-	1.800

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602716A: *HUMAN FACTORS ENGINEERING TECHNOLOGY*	PROJECT H70: *HUMAN FACT ENG SYS DEV*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
H70: *HUMAN FACT ENG SYS DEV*	18.457	21.042	21.801	-	21.801	21.484	21.687	22.339	22.626	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

The objective of this project is applied research on human factors to maximize the effectiveness of Soldiers in concert with their equipment. The resulting data are the basis for weapon systems and equipment design standards, guidelines, handbooks, and Soldier training as well as manpower requirements to improve equipment operation and maintenance. Application of this research will yield reduced workload, fewer errors, enhanced Soldier protection, user acceptance, and allows the Soldier to extract the maximum performance from the equipment.

Major efforts in this project include research to identify sources of stress, potential stress moderators, intervention methods, adaptive learning, support information technology to reduce uncertainty and improve decision quality for leaders as well as teams engaged in Command and Control (C2) planning and execution; enhancement of human performance modeling tools to optimize Soldier machine interactions and the collection of empirical data on human perception (vision and hearing) to support the development and validation of human as well as system performance models; investigations on the effects on Soldier performance from integration of advanced concepts in crew stations designs; identification, assessment, and mitigation of the effects of vehicle motion on Soldier performance; investigations to determine interface design solutions for brigade combat team (BCT) information systems that enhance situational understanding and decision cycle performance; identification and quantification of human performance measures and methods to address future warrior performance issues; and improvement of human robotic interaction (HRI) in a full mission context.

Work in this project is conducted in cooperation with the Tank Automotive Research, Development, and Engineering Center (TARDEC); Natick Soldier Research, Development, and Engineering Center (NSRDEC); Communications-Electronics Research, Development, and Engineering Center (CERDEC); Human Research and Engineering Directorate (HRED), Simulation and Training Technology Center (STTC); Engineer Research and Development Center (ERDC); Army Research Institute for the Behavioral and Social Sciences (ARI); and Army Materiel Systems Analysis Activity (AMSAA).

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work is performed by the Army Research Laboratory (ARL), Aberdeen, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Adaptive Learning	4.469	5.003	4.478

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602716A: *HUMAN FACTORS ENGINEERING TECHNOLOGY*	PROJECT H70: *HUMAN FACT ENG SYS DEV*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: Identify sources of usability deficiencies (areas where training is needed to overcome deficiencies) and mismatches between Soldier capabilities as well as technological advances and provide tools to enable adaptive learning, reduce uncertainty, and increase situational awareness to improve decision quality for leaders and teams engaged in C2 planning and execution. ***FY 2010 Accomplishments:*** Determined performance of Soldiers executing multiple tasks simultaneously when using integrated technologies under differing conditions of task priority. ***FY 2011 Plans:*** Design and develop a Soldier-organization-information modeling capability for use in real-time military simulation exercises. ***FY 2012 Plans:*** Will validate Soldier-organization-information modeling in laboratory and field research; will further mature and validate tools and methods developed to train, improve, assess information sharing, decision making as well as collaboration in network-enabled operations that support decision making.			
Title: Human Performance Modeling ***Description:*** Enhance human performance modeling tools to optimize Soldier machine interactions. Collect empirical data on human perception (vision and hearing) to support human and system performance models. ***FY 2010 Accomplishments:*** Linked Improved Performance Research Integration Tool (IMPRINT) with the Army Manpower Cost System (AMCoS) tool; developed and distributed IMPRINT plug-in that provided multimodal interface design guidance; evaluated the use of head-mounted displays for sniper localization; and provided empirical data to developers of the Infantry Warrior Simulation(IWARS) model; head-mounted displays data allows for more behaviorally valid application of the ACQUIRE, a computer simulation program, target acquisition model within IWARS, more realistically model auditory performance, and should improve IWARS speed and accuracy as well as conducted a series of human-observer studies to characterize the situational-awareness benefits of various dynamic-range algorithms and devices. ***FY 2011 Plans:*** Verify networked, collaborative versions of select Soldier centered design tools; compare spatial vision, color vision and motion sensitivity in three discrete retinal regions, and translate those data for use in the ACQUIRE model. Conduct human-observer studies to examine human perceptual performance with prototype low-light cameras, monochrome displays, and objective-lens	3.031	3.678	3.080

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602716A: *HUMAN FACTORS ENGINEERING TECHNOLOGY*	PROJECT H70: *HUMAN FACT ENG SYS DEV*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
optics fabricated for: on-chip processing, high-speed video transmission, high resolution, high dynamic range and no-focus digital filtering/closed loop control. ***FY 2012 Plans:*** Will evaluate empirical data on the effects of Soldier Load on physical and cognitive performance to enhance models; will create and distribute a protected web-based repository of human performance models used in Manpower and Personnel Integration (MANPRINT) analyses.			
Title: Vehicle Mobility Systems ***Description:*** Develop and integrate intelligent, indirect-vision-based vehicle mobility; advanced crew stations; 360/90 degree situational awareness systems; crew and dismount scalable interfaces; and neurophysiologically as well as behavior-based technologies. Implement guidelines for: sensor and data handling; algorithms for characterizing Soldier brain activity in operational contexts; real-time techniques to integrate neurally-based information into systems designs. ***FY 2010 Accomplishments:*** Developed guidelines for noise reduction and cognitive state classification algorithms; advanced multi-aspect measurement of Soldier, system, and environment as well as evaluated the performance of and extended the development of software classification algorithms for Soldier cognitive state assessment. ***FY 2011 Plans:*** Devise potential designs to enable secure mobility with reduced manning, indirect vision and drive-by-wire systems; develop techniques for using real-time knowledge of Soldier neuro-cognitive state in optimizing Soldier-system performance and develop guidelines for Soldier state-based crew station design; and transition cognitive state measurement technologies for assessment in operational environments to TARDEC. ***FY 2012 Plans:*** Will assess and extend cognitive state modeling and simulation efforts to enhance operational relevance of experimental scenarios and real-time, state-based technologies for improving Soldier-system performance.	3.717	4.281	3.665
Title: Improved Man-Machine Interfaces ***Description:*** Investigate and determine interface design solutions for maneuver team information systems that enhance situational understanding and decision cycle performance; identify, mature, and quantify human performance measures as well as methods to address future warrior performance issues. ***FY 2010 Accomplishments:***	4.882	5.574	5.212

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602716A: *HUMAN FACTORS ENGINEERING TECHNOLOGY*	PROJECT H70: *HUMAN FACT ENG SYS DEV*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Examined the effects of information content and information display on individual and team performance in an operational setting; conducted research to identify assault rifle and optic characteristics that would improve Soldier reflexive firing performance. ***FY 2011 Plans:*** Examine the effects of information management and information flow on individual Soldier performance and team performance in an operational environment. ***FY 2012 Plans:*** Will examine effects and impact of rifle and optic remedies for shooting performance decrements associated with full facial protection; will conduct research and analysis on the effects of Soldier Load on Soldier physical and cognitive performance.			
Title: Human-Robotic Interaction (HRI) ***Description:*** Design and develop requirements and technologies for supervision and Soldier intervention for multiple semi-autonomous unmanned vehicles (UVs) in an urban environment. ***FY 2010 Accomplishments:*** Devised intuitive interface designs for supervising multiple assets; conducted baseline field evaluation for safe robotic operations in urban environments; collected Soldier performance data for marsupial small unattended ground vehicle missions at Fort Benning. ***FY 2011 Plans:*** Simulate supervisory control using ground and aerial UVs for multiple perspectives for robotic missions. Perform Soldier robotic controller interface evaluations in realistic venues. ***FY 2012 Plans:*** Will support evaluation of soldier monitoring crew station design as well as develop experimental designs and support final capstone field experiments to evaluate local situational awareness, assisted mobility, and soldier monitoring technologies.	2.358	2.506	3.566
Title: Understanding Socio-cultural Influence ***Description:*** Investigate and model cognitive aspects of socio-cultural influences on Soldier/Commander decision making and communication to enhance performance with systems, within teams and in the mission context. This work is complementary to and coordinated with PE 62784/T41 Socio-Cultural Modeling and PE 62785/790 Leader Development. ***FY 2012 Plans:***	-	-	1.800

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602716A: *HUMAN FACTORS ENGINEERING TECHNOLOGY*	PROJECT H70: *HUMAN FACT ENG SYS DEV*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Will develop cognitive framework and models depicting influence of socio-cultural factors on Soldier/Commander decision making and communication.			
Accomplishments/Planned Programs Subtotals	18.457	21.042	21.801

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602716A: *HUMAN FACTORS ENGINEERING TECHNOLOGY*	PROJECT J21: *HUMAN FACTORS APPLIED RESEARCH CA*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
J21: *HUMAN FACTORS APPLIED RESEARCH CA*	11.938	-	-	-	-	-	-	-	-	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for Human Factors applied research.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Leonard Wood Institute (LWI) Training-Based Collaborative Research	11.938	-	-
Description: This Congressional Interest Item is focused on training-based related research at Fort Leonard Wood and Maneuver Support Center (MANSCEN) to increase the pool of organizations that can support MANSCEN in the future. ***FY 2010 Accomplishments:*** Investigated training-based collaborative research efforts to transition useful technologies into the hands of Soldiers faster; established research collaborations among different centers with Ft. Leonard Wood and MANSCEN to educate, train and increase the pool of organizations that can support MANSCEN in the future.			
Accomplishments/Planned Programs Subtotals	11.938	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army										DATE: February 2011	
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*				R-1 ITEM NOMENCLATURE PE 0602720A: *Environmental Quality Technology*							
COST ($ in Millions)	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**Cost To Complete**	**Total Cost**
Total Program Element	17.545	18.364	20.837	-	20.837	20.834	21.161	21.450	23.131	Continuing	Continuing
048: *IND OPER POLL CTRL TEC*	3.080	3.186	2.653	-	2.653	2.546	2.532	2.660	3.535	Continuing	Continuing
835: *MIL MED ENVIRON CRIT*	3.176	5.836	6.175	-	6.175	6.226	6.300	6.387	6.917	Continuing	Continuing
895: *POLLUTION PREVENTION*	3.584	3.884	3.955	-	3.955	4.026	4.097	4.157	4.215	Continuing	Continuing
896: *BASE FAC ENVIRON QUAL*	5.716	5.458	8.054	-	8.054	8.036	8.232	8.246	8.464	Continuing	Continuing
F35: *Environmental Quality Applied Research (CA)*	1.989	-	-	-	-	-	-	-	-	Continuing	Continuing

Note

FY10 funding realigned to higher priority efforts.

FY12 funding increase for research in Environmental Nanotechnology and Environmental Military Materials.

A. Mission Description and Budget Item Justification

This program element (PE) investigates and evaluates enabling technologies that support the long-term sustainment of Army training and testing activities by improving the Army's ability to comply with requirements mandated by federal, state and local environmental/health laws and reducing the cost of this compliance. This program develops enabling technologies to decontaminate or neutralize Army-unique hazardous and toxic wastes at sites containing waste ammunition, explosives, heavy metals, propellants, smokes, chemical munitions, and other organic contaminants (Project 048); as well as technology to avoid the potential for future hazardous waste problems (Project 835), by reducing hazardous waste generation through process modification and control, materials recycling and substitution (Project 895). This program develops technologies to predict and mitigate range and maneuver constraints associated with current and emerging weapon systems, doctrine, and regulations (Project 896).

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, the Army Science and Technology Master Plan, and supports the Army Strategy for the Environment.

Technologies developed in this PE are transitioned to PE 0603728A (Environmental Quality Technology Demonstrations).

Work in this PE is performed by the US Army Engineer Research and Development Center, Vicksburg, MS, and the US Army Research, Development and Engineering Command, Aberdeen Proving Ground, MD.

Project F355 funds Congressional Interest Items.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army	DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	**R-1 ITEM NOMENCLATURE** PE 0602720A: *Environmental Quality Technology*

B. Program Change Summary ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Previous President's Budget	25.469	18.364	15.943	-	15.943
Current President's Budget	17.545	18.364	20.837	-	20.837
Total Adjustments	-7.924	-	4.894	-	4.894
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	-7.661	-			
• SBIR/STTR Transfer	-0.263	-			
• Adjustments to Budget Years	-	-	4.894	-	4.894

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602720A: *Environmental Quality Technology*	PROJECT 048: *IND OPER POLL CTRL TEC*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
048: *IND OPER POLL CTRL TEC*	3.080	3.186	2.653	-	2.653	2.546	2.532	2.660	3.535	Continuing	Continuing

Note

Not applicable for this item

A. Mission Description and Budget Item Justification

This program element (PE) designs and develops technologies to enable the Army to reduce or eliminate environmental impacts both in the United States and abroad. These technologies reduce the impact of legal and regulatory environmental restrictions on installation facilities, training and testing lands and ranges, as well as provide a means to avoid fines and facility shutdowns within the United States and reduce environmental impacts to the Warfighter abroad. New and innovative technologies are essential for the effective control and reduction of military unique hazardous and non-hazardous wastes on military installations and associated with contingency operations bases worldwide. Efforts focus on the impacts of new materiel that will enter the Army inventory within the next decade and beyond. This project focuses on developing sustainable environmental protection technologies that help the Army maintain environmental compliance for sources of industrial pollution such as production facilities, facility contamination, and other waste streams. Efforts abroad include a focus on designing and developing technologies for deployed forces with environmentally safe, operationally enhanced and cost effective technologies and/or processes to achieve maximum diversion, minimization, or volume reduction of base camp and field waste. Additional work is focused on environmental risk assessment for installations associated with noise, air quality and carbon footprint.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, the Army Science and Technology Master Plan, and supports the Army Strategy for the Environment.

Work in this project is performed by the US Army Engineer Research and Development Center, Vicksburg, MS.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Sustainable Ranges and Lands Research and Development	3.080	3.186	2.653
Description: This effort supports management of operations on ranges and training lands with the intent to reduce constraints and restrictions. Technologies are targeted both toward solutions for environmental compliance and associated requirements, as well as solutions that will enhance training and testing operations.			
FY 2010 Accomplishments: Developed physiologically relevant chip/organ response on micro-fluidic sensing platforms for real-time water analysis for heavy metals (lead), anionic contaminants (perchlorate), and water toxins; completed evaluation of anaerobic fluidized bed reactor and zero valent iron treatment reduction technologies to reduce or eliminate environmental impacts from selective insensitive munitions processing residues through a bacterial process allowing the carbon and nitrogen to be recycled in natural, aerobic			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602720A: *Environmental Quality Technology*	PROJECT 048: *IND OPER POLL CTRL TEC*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
cycles; and developed modeling approaches to determine noise attenuation in forests and to predict impacts of cumulative land use activities on Army training ranges through research to quantify changes that vary with respect to frequency, intensity, and duration for enabling land use availability for training. ***FY 2011 Plans:*** Complete development of an archetype chip device for acute toxicity measurement for compounds of military interest and begin development of air emission factors associated with wildfire and prescribed-fire burns on range and training lands; investigate ecosystem response to naturally occurring fires and adjust prescribed fire regimes. ***FY 2012 Plans:*** Will design and develop models to project vegetation response to wild and prescribed fire regimes for best land management practices; will design and develop methods to integrate simulation capability for efficient and effective management of base camp infrastructure.			
Accomplishments/Planned Programs Subtotals	3.080	3.186	2.653

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602720A: *Environmental Quality Technology*	PROJECT 835: *MIL MED ENVIRON CRIT*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
835: *MIL MED ENVIRON CRIT*	3.176	5.836	6.175	-	6.175	6.226	6.300	6.387	6.917	Continuing	Continuing

Note

Not applicable for this item

A. Mission Description and Budget Item Justification

This program element (PE) investigates a quantitative means to determine the environmental and human health effects resulting from exposure to explosives, propellants, smokes, and products containing nanomaterials produced or used in Army industrial, field, and battlefield operations or disposed of through past activities. The end results of this research include: determination of acceptable contaminant concentration levels for residual munitions constituents (MCs) and munitions and explosives of concern that minimize adverse effects on the environment and human health and the development of methods that guide the design of nanomaterials such that adverse effects on human health or the environment are minimized in their designed state and when they enter the environment where they may break down. New research in toxicogenomics, nanomaterial technologies, computational/molecular modeling tools for toxicity and exposure assessment; impacts of climate change on biological processes; and attributes of sustainable energy production further reduces the uncertainty associated with both the probability of exposure and the ultimate effect if exposed. Interim products are US Environmental Protection Agency approved health advisories and criteria documents to be used in risk assessment procedures. The Army uses these criteria during negotiations with regulatory officials to set scientifically and economically appropriate cleanup and discharge limits at Army installations.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, the Army Science and Technology Master Plan, and supports the Army Strategy for the Environment.

Work in this project is performed by the US Army Engineer Research and Development Center, Vicksburg, MS.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Military Materials in the Environment Research and Development	3.176	3.336	2.695
Description: This effort provides a quantitative means to determine the environmental and human health effects resulting from exposure to explosives, propellants, and obscurants produced in Army industrial, field, and battlefield operations or disposed of through past activities.			
FY 2010 Accomplishments: Established mathematical biological models forecasting MC toxicology; completed computational chemistry methods for the prediction of explosives degradation in water and explored methods for predicting MC binding and movement in soil;			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602720A: *Environmental Quality Technology*	PROJECT 835: *MIL MED ENVIRON CRIT*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
and established a nanomaterial periodic table and framework for integrating environmental attributes with nanotechnology development. ***FY 2011 Plans:*** Complete a computational biology model for predictive toxicology of MCs; devise computational chemistry methods relating chemical mechanisms to toxicity in soils.; complete beta version testing and release of the Training Range Environmental Evaluation and Characterization System for quantitative risk assessments of MC migration from ranges; begin developmental methods to incorporate environmental fate and effects into the design of nanomaterials; and begin analysis of environmental modeling of environmental toxicology and chemistry for composite nanonmaterials used in base sustainment and blast and ballistic protection. ***FY 2012 Plans:*** Will construct a comprehensive data set for the binding properties of MCs and emerging contaminants in biological/physiological networks to predict impacts to ecological receptors. The effort in this program associated with computational chemistry of contaminant behavior in the environment will move to 0602720A Project 896 in FY12.			
Title: Nanotechnology-Environmental Effects ***Description:*** This effort enables the Army's ability to field advanced nano-based technology by appropriate framing of the environmental impacts of nanomaterials. The end result of this research is the development of methods that guide the design of nanomaterials such that adverse effects on human health or the environment are minimized in their designed state and when they enter the environment where they may break down. ***FY 2011 Plans:*** Investigate developmental methods to incorporate fate and effects into the design of nanomaterials from the nano-scale or micro-scale to the macro-scale; and will begin analysis of fate and effects in soil and water for composite nanonmaterials supporting base sustainment and blast and ballistic protection. ***FY 2012 Plans:*** Will investigate and develop quantitative relationships to characterize role of surface chemistry in the fate and transport of nanoaluminum and nanosilver with environmental media to allow for development of predictive algorithms for potential extrapolation to environmental fate and effects of other nanomaterials.	-	2.500	2.500
Title: Green Remediation Technologies ***Description:*** This effort enables the ability of the Army to control, remediate, and detect contaminations such as depleted uranium; this effort also enables reductions in the volume of waste while minimizing energy usage.	-	-	0.980

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602720A: *Environmental Quality Technology*	PROJECT 835: *MIL MED ENVIRON CRIT*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
FY 2012 Plans: Will investigate novel methods to control and remediate Army relevant contaminants while minimizing energy usage, transpiration requirements and volume of waste; will research new methods for detection and remediation of depleted uranium on Army lands.			
Accomplishments/Planned Programs Subtotals	3.176	5.836	6.175

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602720A: *Environmental Quality Technology*	PROJECT 895: *POLLUTION PREVENTION*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
895: *POLLUTION PREVENTION*	3.584	3.884	3.955	-	3.955	4.026	4.097	4.157	4.215	Continuing	Continuing

Note

Not applicable for this item

A. Mission Description and Budget Item Justification

The program element (PE) develops pollution prevention technologies required to reduce/eliminate the environmental footprint resulting from the manufacture, maintenance, use and surveillance of Army ordnance and other weapon systems. This project researches and develops revolutionary technologies to eliminate or significantly reduce the environmental impacts that threaten the sustainment of production and maintenance facilities, training ranges and operational areas. The project supports the transformation of the Army by ensuring that advanced energetic materials required for high-performance munitions (gun, rocket, missile propulsion systems, and warhead explosives) are devised to meet weapons lethality/survivability stretch goals in parallel with, and in compliance to, foreseeable sustainment requirements. Specific technology thrusts include environmentally-benign explosives developed with computer modeling using Department of Defense high-performance computing resources; novel energetics that capitalize on the unique behavior of nano-scale structures; chemically engineered explosive and propellant formulations produced with minimal environmental waste, long-storage lifetime, rapid/benign environmental degradation properties, and efficient extraction and reuse; and fuses, pyrotechnics, and initiators that are free from toxic chemicals. Other focus areas include base camp energy reduction initiatives, elimination of waste streams in contingency operations and toxic metal reductions from surface finishing processes.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, the Army Science and Technology Master Plan, and supports the Army Strategy for the Environment.

Technologies developed in this project are fully coordinated and complementary to PE 0603728A, Project 025.

Work in this project is performed by the Research, Development, and Engineering Command's, the Army Research Laboratory, Aberdeen Proving Ground, MD, the Armaments Research, Development, and Engineering Center, Picatinny Arsenal, NJ, and the Aviation and Missile Research, Development, and Engineering Center, Huntsville, AL.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Pollution Prevention Technologies	3.584	3.884	3.955
Description: This effort develops pollution prevention technologies to reduce/eliminate the environmental footprint resulting from the manufacture, maintenance, use and surveillance of Army ordnance and other weapon systems.			
FY 2010 Accomplishments:			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	**R-1 ITEM NOMENCLATURE** PE 0602720A: *Environmental Quality Technology*	**PROJECT** 895: *POLLUTION PREVENTION*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Rocket and Missile Propellants: designed and modeled the next generation environmentally benign propellant ingredients; Conventional Ammunition: designed novel, environmentally benign explosive compositions consisting of new molecules; Pyrotechnics: down-selected candidate compositions for environmentally friendly obscurants; Heavy Metal Reduction: evaluated chromate/cadmium-free materials and processes in a laboratory environment; Zero Footprint Camp: evaluated technologies in a laboratory environment that reduce base camp energy and water supply demands. ***FY 2011 Plans:*** Rocket and Missile Propellants: simulate performance of next generation of environmentally benign propellant compositions; Conventional Ammunition: synthesize gram quantities of novel explosive compositions and conduct screening tests to determine most effective compositions; Pyrotechnics: transition sustainable flare, delay and signal formulations to advanced technology development; Heavy Metal Reduction: mature new processes for demonstration on gun barrels and fasteners; Zero Footprint Camp: refine water recycling technologies for demonstration in relevant environment. ***FY 2012 Plans:*** Conventional Ammunition: will scale up novel explosive compositions to kilogram quantities and conduct limited performance evaluation; Pyrotechnics: will evaluate feasibility of using novel, environmentally benign high-nitrogen molecules in next generation pyrotechnic compositions; Heavy Metal Reduction: will mature hexavalent chromium-free stripping agents and surface activation technologies for demonstration on aircraft components and assemblies; Zero Footprint Camp: will investigate feasibility of novel water vapor reclamation concepts for use in overseas contingency operations.			
Accomplishments/Planned Programs Subtotals	3.584	3.884	3.955

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602720A: *Environmental Quality Technology*	PROJECT 896: *BASE FAC ENVIRON QUAL*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
896: *BASE FAC ENVIRON QUAL*	5.716	5.458	8.054	-	8.054	8.036	8.232	8.246	8.464	Continuing	Continuing

Note

Not applicable for this item

A. Mission Description and Budget Item Justification

This program element (PE) investigates technologies for environmental risk assessment, analysis, monitoring, modeling, and mitigation to support sustainable use of Army facilities, training lands, firing ranges, and airspace to reduce or eliminate environmental constraints to military missions. This project provides the Army the technical capability to manage, protect, and improve the biophysical characteristics of training and testing areas needed for realistic ranges and training lands. Technologies within this project enable users to match mission events and training schedules with the resource capabilities of specific land areas and understand how the use of those resources effect mission support and environmental compliance. The project investigates, designs, and develops novel methods and technologies to restore lands damaged during training activities and allow sustained use of installation facilities and training land resources. The project supports readiness and full use of training lands through development of threatened and endangered species monitoring technology and management technologies for species at risk. The project also designs and develops tools and technologies to avoid training restrictions and reduce constraints on training lands associated with invasive species and potential impacts from climate change.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, the Army Science and Technology Master Plan, and supports the Army Strategy for the Environment.

Work in this project is performed by the US Army Engineer Research and Development Center, Vicksburg, MS.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Threatened and Endangered Species (TES) Management to Reduce Operational Constraints	1.532	-	-
Description: This effort develops detection techniques and models to understand multi-species population and manage threatened and endangered species at risk at Army training lands. ***FY 2010 Accomplishments:*** Completed development of detection techniques, multi-species population and risk prediction models and also understanding of advanced genetic methods to manage species at risk; this research assists the Army in reducing the number of future listed species and their associated constraints on military training.			
Title: Predictive Risk Assessment and Management for Army Ranges and Training Lands	4.184	5.458	4.550
Description: This effort develops technologies to minimize training land/natural resource conflicts for sustained mission support.			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602720A: *Environmental Quality Technology*	PROJECT 896: *BASE FAC ENVIRON QUAL*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
FY 2010 Accomplishments: Completed biometric sampling for detecting and assessing species invasiveness on Army ranges and training lands; developed unified landscape utility metrics for mission and resource condition to maximize landscape resources supporting evolving training doctrine. ***FY 2011 Plans:*** Complete a spatially explicit, multi-objective decision support model for management optimization of multiple invasive species accounting for ecological, economic, and training impacts; quantify synergistic and antagonistic interactions between training/non-military land uses to develop quantitative methods for comparative impact analysis of training and alternative land uses. ***FY 2012 Plans:*** Will determine impact of different training regimes on natural resources in terms of frequency, duration, and intensity of land use across multiple landscape scales; this information will lead to more informed and accurate predictive capabilities for impacts of training and land use.			
Title: Computational Contaminant Assessment ***Description:*** This effort computationally assesses contaminants to predict chemical behavior in variable environmental settings. ***FY 2012 Plans:*** Will continue investigation of Army relevant chemical interactions with simple surfaces, silicon and carbon, to include prediction and measurement of adsorption properties and kinetics of adsorption, partition and diffusion coefficients and trans-cellular transport in order to better understand and more accurately predict chemical behavior in variable environmental settings. This effort was formerly under PE 0602720A Project 835.	-	-	3.504
Accomplishments/Planned Programs Subtotals	5.716	5.458	8.054

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602720A: *Environmental Quality Technology*	PROJECT F35: *Environmental Quality Applied Research (CA)*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
F35: *Environmental Quality Applied Research (CA)*	1.989	-	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for Environmental Quality applied research.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Chemical Materials and Environmental Modeling Project	1.989	-	-
Description: This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Initiated action with Jackson State University to address biodegradation of structurally varying nerve agents and related compounds that will improve detection, protection, and treatment of highly dangerous substances.			
Accomplishments/Planned Programs Subtotals	1.989	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army										DATE: February 2011	
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*				R-1 ITEM NOMENCLATURE PE 0602782A: *Command, Control, Communications Technology*							
COST ($ in Millions)	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**Cost To Complete**	**Total Cost**
Total Program Element	31.691	25.573	26.116	-	26.116	26.710	27.233	27.284	27.762	Continuing	Continuing
779: *Command, Control and Platform Electronics Tech*	9.905	10.583	10.759	-	10.759	11.027	11.252	11.455	11.668	Continuing	Continuing
H92: *Communications Technology*	14.464	14.990	15.357	-	15.357	15.683	15.981	15.829	16.094	Continuing	Continuing
TR9: *C3 COMPONENT TECHNOLOGY (CA)*	7.322	-	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program element (PE) researches and develops communications technologies, command and control (C2), and electronics systems and subsystems that provide the Army with enhanced capabilities for secure, mobile, networked communications, assured information delivery, and presentation of information that enables decision-making. Commercial technologies are continuously investigated and leveraged where possible. Project 779 researches and develops technologies that enable management of information across the tactical and strategic battle space; provide automated cognitive reasoning and decision making; and allow timely distribution, display, and use of C2 data on Army platforms. Project H92 supports research in technologies which potentially allow field commanders to communicate on-the-move to/from virtually any location, through a seamless, secure, self-organizing, self-healing, network. Project TR9 funds congressional special interest efforts.

Work in this PE is complimentary of PE 0602705A (Electronics and Electronic Devices), PE 0603008A (Electronic Warfare Advanced Technology), and PE 0603772A (Advanced Tactical Computer Science and Sensor Technology), and is fully coordinated with PE 0602120A, (Sensors and Electronic Survivability), PE 0602783A (Computer and Software Technology), and PE 0602874A (Advanced Concepts and Simulation).

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this PE is performed by the Army Research, Development, and Engineering Command (RDECOM), Communications -Electronics Research, Development, and Engineering Center (CERDEC), Fort Monmouth, NJ and Aberdeen Proving Ground, MD.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army	DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	**R-1 ITEM NOMENCLATURE** PE 0602782A: *Command, Control, Communications Technology*

B. Program Change Summary ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Previous President's Budget	30.036	25.573	26.227	-	26.227
Current President's Budget	31.691	25.573	26.116	-	26.116
Total Adjustments	1.655	-	-0.111	-	-0.111
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	1.990	-			
• SBIR/STTR Transfer	-0.335	-			
• Adjustments to Budget Years	-	-	-0.111	-	-0.111

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602782A: *Command, Control, Communications Technology*	PROJECT 779: *Command, Control and Platform Electronics Tech*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
779: *Command, Control and Platform Electronics Tech*	9.905	10.583	10.759	-	10.759	11.027	11.252	11.455	11.668	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project researches technologies that enable commanders at all echelons to have better and more timely information and allows them to execute mission command from anywhere on the battlefield. Emphasis is on data management and automated analysis to provide course-of-action determination, mission planning and rehearsal, mission execution monitoring and re-planning, and precision positioning (pos) and navigation (nav). This project researches technologies that support multi-modal man-machine interactive technologies, battle space visualization, positioning and navigation in degraded environments (poor Global Positioning System (GPS) performance), automated cognitive decision aids, real-time collaborative tactical planning tools, data transfer, distributed data bases, open system architectures, service oriented architecture (SOA), and integration concepts which contribute to more mobile operations.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this project is performed by the Army Research, Development, and Engineering Command (RDECOM), Communications - Electronics Research, Development, and Engineering Center (CERDEC), Fort Monmouth, NJ and Aberdeen Proving Ground, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Battle Space Awareness and Positioning	1.776	1.800	2.152
Description: This effort investigates pos, nav and tracking sensor/integration technologies to provide position, velocity, and time information to support operational and training requirements, especially in hostile electro-magnetic interference and other radio frequency (RF) degraded/denied environments. Work being accomplished under PE 0603772A/project 101 compliments this effort.			
FY 2010 Accomplishments: Fabricated advanced pos/nav sensors, especially those that exploit the synergy between communications and position, such as RF ranging and network-assisted navigation for operation in GPS-denied environments.			
FY 2011 Plans: Evaluate candidate pos/nav sensors including micro-electrical mechanical and vision based sensors, evaluate integration techniques and navigation enhancing radio technologies for improved urban and indoor position performance.			
FY 2012 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602782A: *Command, Control, Communications Technology*	PROJECT 779: *Command, Control and Platform Electronics Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Will develop sensor integration algorithms to combine the selected pos/nav sensors in radios both with and without radio based nav technologies; will begin assessing brassboard sensor/radio system/suite in a laboratory environment.			
Title: Command and Control (C2) On-The-Move (OTM) Enabling Technologies	8.129	8.783	8.607
Description: This effort investigates and develops technologies to improve the Warfighters ability to access, use, present and understand relevant battle command information. Work on this effort transitions to PE 0603772A/project 101. ***FY 2010 Accomplishments:*** Coded speech and optical character recognition translation services within a SOA framework to allow Coalition forces to communicate more efficiently and securely, while providing additional translation options; coded text-to-text machine translation algorithms to enable translation of low density languages (languages currently not widely used), that are on the Defense Language Agency prioritized language list; investigated coordinated planning and execution software for multiple, heterogeneous, teamed unmanned ground vehicle/unmanned aerial system (UGV/UAS) platforms and developed user interface enhancements to more efficiently manage multiple, teamed vehicles; devised benchmarks/metrics for shared situation awareness and decision-making, and identified emerging patterns of interaction between individuals, intelligent agents, and teams of agents and humans; performed work flow analyses, based on approved scenarios, to identify and assess cognitive processes in decision-making and collaboration. ***FY 2011 Plans:*** Expand machine translation services to include speech-to-speech translation capabilities; integrate additional translation engines for increased language coverage; continue to investigate enhancement of unmanned collaboration and coordination between multiple assets and sensors, more complex UGV/UAS platform behaviors, and mission planning in urban and complex environments to produce technologies capable of dynamic mission management for multiple robotic assets; investigate workflow analyses to identify and assess technology to augment human cognition while performing Battle Command processes and evaluate methods to improve information sharing, decision-making, and collaboration in network-enabled operations; investigate techniques to enable users to share Warfighter composed software via a web-based gallery. ***FY 2012 Plans:*** Will refine how human understanding can be measured and improved; will refine how large and differing amounts of information can be presented to best align with human processing; will continue to improve technologies to enable collaborative mission execution and C2 for near-autonomous and autonomous unmanned systems; will investigate and devise techniques to automate portions of the governance and accreditation process for edge-enabled applications; will code and integrate intelligent agent technology for language translation services, which will provide automated intelligent reasoning of foreign language data.			
Accomplishments/Planned Programs Subtotals	9.905	10.583	10.759

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602782A: *Command, Control, Communications Technology*	PROJECT 779: *Command, Control and Platform Electronics Tech*

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602782A: *Command, Control, Communications Technology*	PROJECT H92: *Communications Technology*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
H92: *Communications Technology*	14.464	14.990	15.357	-	15.357	15.683	15.981	15.829	16.094	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project investigates, develops and applies advanced communications and network technologies by leveraging and adapting commercial technology to the maximum extent possible and focusing research efforts on emerging technology areas (e.g., mobile radio-based infrastructures, cyber security in narrowband environments, multiband on-the-move (OTM) transmit and receive antennas, adaptive protocols, and low probability-of-interception/low probability of detection waveforms).

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this project is performed by the Army Research, Development, and Engineering Command (RDECOM), Communications-Electronics Research, Development, and Engineering Center (CERDEC), Fort Monmouth, NJ and Aberdeen Proving Ground, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Antenna Technologies	4.130	5.703	6.394
Description: This effort fabricates and assesses low cost, power efficient, directional antenna technologies for terrestrial, airborne, and tactical satellite ground terminals to enable them to operate OTM over multiple frequency bands; and further investigates armor embedded antenna technologies. Work being accomplished under PE 0603008A/project TR1 compliments this effort.			
FY 2010 Accomplishments: Assessed C/Ku directional antenna and integrated platform feed and evolutionary aperture design to reduce antenna profile and cost; developed multi-beam low profile electronically steered Ka/Q band SATCOM OTM antenna components.			
FY 2011 Plans: Complete K/Ka/Q multi-beam low profile electronically steered SATCOM components and aperture development; integrate the SATCOM aperture with a drive and tracking system; develop single package Ka/Q band integrated power amplifiers; develop a blue force tracking (BFT) SATCOM antenna and modem architecture; investigate meta-materials for miniaturized antenna technologies; develop conformal antenna systems for ground and air platforms			
FY 2012 Plans: Will complete integrated K/Ka/Q band low profile electronically steered SATCOM antenna; will integrate single package Ka/Q band integrated power amplifier into the K/Ka/Q band SATCOM antenna; will complete development of blue force tracking			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602782A: *Command, Control, Communications Technology*	PROJECT H92: *Communications Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
(BFT) SATCOM antenna and modem; will develop wafer scale and distributed antenna components and architecture for very small profile on-the-move SATCOM antennas; will assess the Ku Band Simple Manufacturing Array Technology (SMArT) card antenna on an unmanned aerial system; will execute antenna performance and ballistic assessment on armor embedded antenna candidates.			
Title: Wireless Information Assurance (IA) ***Description:*** This effort investigates, codes and fabricates technologies to protect wireless tactical networks against computer network attacks. Work being accomplished under PE 0603008A/project TR1 compliments this effort. ***FY 2010 Accomplishments:*** Investigated distributed security key management concepts and technologies that allow mobile users to automatically affiliate, de-affiliate, and re-key the network to respond to a change or a compromise without requiring pre-placed keys; evaluated software cross-domain security services providing software separation of kernel that protected and established separation of classification levels; investigated adaptive middleware that supports interactive applications for mobile devices and smart phones; and conducted lab assessments of these technologies. ***FY 2011 Plans:*** Develop tactical intrusion detection system (IDS) to accommodate the small tactical bandwidth environment along with a common operational picture that provides a homogenous view of the IDS activity on the network. ***FY 2012 Plans:*** Will research and code IDS technology to proactively ascertain local threats on tactical host systems and networks using minimal system resources; will code technologies to automatically self-inoculate these systems to limit impact and contain spread of malicious activity; will devise suitable IDS agent collaboration schemes to ensure that trusted decisions are made in response to malicious behavior. Will configure IDS agents to share actionable security information with sustaining base assets for further analysis while still allowing the Warfighter to maintain mission focus and continuity while operating at the resource-constrained tactical edge.	2.662	2.489	3.331
Title: Cognitive Networking ***Description:*** This effort investigates, evaluates and creates a set of advanced cognitive networking technologies enabling wireless networks to sense the dynamic and uncertain nature of mobile ad-hoc multi-tiered, multi-band network environments and spectrum conditions, and automatically adapts to increase network level performance while reducing the time and human effort required to operate the network. Work being accomplished under PE 0603008A/project TR1 compliments this effort. ***FY 2010 Accomplishments:***	1.497	3.791	4.004

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602782A: *Command, Control, Communications Technology*	PROJECT H92: *Communications Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Began the design and development of cognitive network tools for mobile ad hoc networks that take into consideration network connectivity, end-to-end user requirements (bandwidth), survivability and optimality (goodness of design), and provide knowledge oriented representation of radio frequency (RF) connectivity, network operations/behaviors, and effectiveness of learning/ prediction techniques in a dynamic environment. ***FY 2011 Plans:*** Develop and refine a cognitive network design tool set; design and develop initial protocol function and capability for cognitive networking; conduct modeling and simulation on small scale networks to evaluate protocol functionality. ***FY 2012 Plans:*** Will exercise the Cognitive Network Engineering Design Analytic Toolset (CNEDAT) with 10 cognitive radios in a coordinated fashion through a set of assessments; will use the CNEDAT to design a cognitive network to meet a set of performance goals or requirements (such as robustness to node or link outage); will implement these designs in the radio hardware/software, and under the same set of traffic loads; will compare the measured network parameters (i.e., throughput, delay, loss, etc) with those predicted by the design tool; will conduct specific experiments in total applied traffic load, and/or various traffic mixes (voice, video, data, imagery, chat) as well as different mobility rates, mobility patterns, and different node/link outages due to simulated jamming and/or node destruction.			
Title: Dynamic Spectrum and Network Technologies ***Description:*** This effort investigates and fabricates technologies for radios and network management systems to enable access to spectrum that is unavailable because of current inefficient spectrum management methods. Work being accomplished under PE 0603008A/project TR1 compliments this effort. ***FY 2010 Accomplishments:*** Investigated and coded software policy agents for integration into software defined radios to allow the radios to accept dynamic spectrum access (DSA) from the network management system over the air; adapted the DARPA Disruption Tolerant Networking (DTN) technology for military communications systems to improve reliability and transportability. ***FY 2011 Plans:*** Expand the DSA policy generation design to include parameters for co-existence operations of DSA enabled radios with tactical communications and Intelligence, Surveillance and Reconnaissance (ISR) systems; integrate the DSA policy generation tool with existing spectrum database. ***FY 2012 Plans:***	2.975	3.007	1.628

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602782A: *Command, Control, Communications Technology*	PROJECT H92: *Communications Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Will code DSA technologies and add them to the automatic frequency channel sensing and selection capabilities of cellular base stations in order to assist the network planners to set the frequencies for mobile base station setup.			
Title: Network Designs ***Description:*** This effort investigates and devises technologies to support designing the next generation of mobile ad-hoc wireless networks to enable wireless networks to sense network and spectrum conditions and automatically adapt for more efficient use. ***FY 2010 Accomplishments:*** Enhanced the basic network design tool and performed a number of assessments using typical military maneuver and network traffic scenarios to ensure the tool successively met the goals for connectivity, throughput, delay, loss and time slot transmission schedules of all radio frequency links in the generated network structure.	3.200	-	-
Accomplishments/Planned Programs Subtotals	14.464	14.990	15.357

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602782A: *Command, Control, Communications Technology*	PROJECT TR9: *C3 COMPONENT TECHNOLOGY (CA)*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
TR9: *C3 COMPONENT TECHNOLOGY (CA)*	7.322	-	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for C3 Component Technology applied research.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Mobile Mesh Network Node ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item provided a low latency, high data rate, secure, Wi-Fi mesh network communications technology for the dismounted Soldiers using smart phones operating on commercial cellular networks.	1.751	-	-
Title: Lightweight 10-Meter Antenna Mast ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item developed a lightweight, reliable, corrosion resistant telescoping mast for use on shelters, vehicle platforms, and ground applications.	1.989	-	-
Title: Nanophotonic Devices ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated approaches to analyze and fabricate efficient light-emitting and sensing devices at the nano-scale.	1.592	-	-
Title: Integrated Lightweight Tracker System ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Developed a plastic housing for a prototype tracker system.	1.990	-	-
Accomplishments/Planned Programs Subtotals	7.322	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602782A: *Command, Control, Communications Technology*	PROJECT TR9: *C3 COMPONENT TECHNOLOGY (CA)*

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army										DATE: February 2011	
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*				R-1 ITEM NOMENCLATURE PE 0602783A: *COMPUTER AND SOFTWARE TECHNOLOGY*							
COST ($ in Millions)	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**Cost To Complete**	**Total Cost**
Total Program Element	9.896	6.768	8.591	-	8.591	8.782	8.947	9.055	9.076	Continuing	Continuing
Y10: *COMPUTER/INFO SCI TECH*	5.518	6.768	8.591	-	8.591	8.782	8.947	9.055	9.076	Continuing	Continuing
Y11: *COMPUTER & INFORMATION SCIENCE APPLIED RES CA*	4.378	-	-	-	-	-	-	-	-	Continuing	Continuing

Note

FY10 funding increase for congressional special interest items.
FY12 funding increase for Materials Force Protection technology efforts and Networks.

A. Mission Description and Budget Item Justification

The objective of this program element (PE) is to conduct applied research that would enable enhanced understanding and accelerate the decision cycle time for commanders and leaders operating in a mobile, dispersed, highly networked environment. This PE supports research on information and communications technology (project Y10).

Work in this PE complements and is fully coordinated with efforts in PE 0602705A (Electronics and Electronic Devices), 0602716A (Human Factors Engineering Technology), PE 0602782A (Command, Control, Communications Technology), PE 0603772A (Advanced Tactical Computer Science and Sensor Technology), and PE 0603008A (Command, Control, Communications Advanced Technology).

Project Y11 funds Congressional Interest Items.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this project is performed by the Army Research Laboratory (ARL) at the Adelphi and Aberdeen Proving Ground, MD locations.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army	DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	**R-1 ITEM NOMENCLATURE** PE 0602783A: *COMPUTER AND SOFTWARE TECHNOLOGY*

B. Program Change Summary ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Previous President's Budget	5.609	6.768	5.960	-	5.960
Current President's Budget	9.896	6.768	8.591	-	8.591
Total Adjustments	4.287	-	2.631	-	2.631
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	4.378	-			
• SBIR/STTR Transfer	-0.091	-			
• Adjustments to Budget Years	-	-	2.631	-	2.631

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602783A: *COMPUTER AND SOFTWARE TECHNOLOGY*	PROJECT Y10: *COMPUTER/INFO SCI TECH*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
Y10: *COMPUTER/INFO SCI TECH*	5.518	6.768	8.591	-	8.591	8.782	8.947	9.055	9.076	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

The objective of this project is to conduct applied research in information and communications processing technologies to automate the delivery of local/global information for decision making (planning, rehearsal, and execution) so that it is synchronized, parallel and real-time; and devise communication/network technologies to enable synchronization of secure data/information from humans to humans, humans to computers, computers to humans, and reduce dependence on mouse and keyboard versus other modes of computer interaction. This is the key to enabling enhanced understanding and for accelerating the decision cycle time for commanders and leaders operating in mobile, dispersed, highly networked environment envisioned for the future force.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this project is performed by the Army Research Laboratory (ARL), Adelphi and Aberdeen Proving Ground, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Information Processing	1.084	1.160	1.191
Description: Enhance information processing techniques in order to inform and protect the force from imminent threats. Develop user directed fusion techniques that, when combined with methods developed at the Communications-Electronics Research, Development, and Engineering Center, enable semi-automated fusion to improve the completeness and timeliness of decision-making in command and control (C2) operations. The integrated technology will be used to support a Distributed Common Ground Station-Army (DCGS-A) architecture (an integrated architecture of all ground/surface systems) and for future force assessment.			
FY 2010 Accomplishments: Evaluated measures to mine relevant information from social network information sources and augment that information with data from local (sensor) assets for improved understanding of the human/terrain battlefield interactions.			
FY 2011 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602783A: *COMPUTER AND SOFTWARE TECHNOLOGY*	PROJECT Y10: *COMPUTER/INFO SCI TECH*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Investigate the concept of social network exploitation and its relationship to communication and information network domains in collaboration with the Network Sciences International Technology Alliance (ITA); and investigate improved social network analysis tools, interfaces, and visualization routines for Army intelligence. ***FY 2012 Plans:*** Will extend these techniques to parallel architectures/algorithms and evaluate them in relevant tactical exercises, like Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) On-the-Move.			
Title: Information Assurance ***Description:*** Conduct applied research on tactical information protection technologies for agent-based vulnerability assessment over wireless bandwidth constrained links and security infrastructures for sensor networks. ***FY 2010 Accomplishments:*** Evaluated the wireless intrusion detection system (IDS) system performance in terms of network overhead (i.e., bandwidth, energy and latency). ***FY 2011 Plans:*** Evaluate secure information flow techniques in mobile tactical networks via simulation/emulation to enhance the reliable delivery of information to the Soldier. ***FY 2012 Plans:*** Will continue evaluating techniques for trading off IDS system performance and overall network performance in terms of network security metrics.	1.113	1.089	1.136
Title: Information Exchange ***Description:*** Investigate techniques to enable automated integration of global and local information, allowing tactical assets to cooperatively share sensed events within a wireless distributed fusion environment in order to inform the force of relevant events. ***FY 2010 Accomplishments:*** Evaluated data structures for policy-based information exchange (administrative approach used to simplify network management by establishing rules/guidelines to deal with situations that are likely to occur) and integrated information assurance modules to support the evaluation in tactically relevant environments. ***FY 2011 Plans:***	1.145	1.185	1.217

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602783A: *COMPUTER AND SOFTWARE TECHNOLOGY*	PROJECT Y10: *COMPUTER/INFO SCI TECH*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Design network service interfaces, refine policy-based information exchange structures, and conduct assessments on policy-based exchange software in an operational command, control, communications, computer, intelligence, surveillance and reconnaissance (C4ISR) On-the-Move environment. ***FY 2012 Plans:*** Will extend experiments to social network analysis, fusion and collection techniques in this environment, and develop metrics for assessing their overall effectiveness within the DCGS-A Cloud architecture.			
Title: Language Translation ***Description:*** Conduct research into techniques for developing the underlying computational multilingual software framework to enable commanders and troops to bridge language barriers in order to counter adversaries and collaborate with allies. ***FY 2010 Accomplishments:*** Assessed the impact of pre-processing tools on downstream processes like named entity extraction, machine translation, and summarization that are critical to the Intelligence Community. ***FY 2011 Plans:*** Integrate new optical character recognition/machine translation (OCR/MT) evaluation tools and expand the testbed to accommodate select Net Centric Enterprise Services; jointly evaluate/modify/transition best-of-breed language processing tools with PM-Sequoyah (machine foreign language translation system) for the Army and Intelligence Communities. ***FY 2012 Plans:*** Will integrate additional tools to automate development of new OCR/MT rapidly from prepared data and develop/evaluate use of mobile applications for language translation functions.	0.551	0.580	0.609
Title: Network Theory ***Description:*** Statistical based methods for studying networks to support theory development in network science; evaluate a basis to validate or invalidate theoretical results, identify gaps between theory prediction and field performance; evaluate verification of mobility, channel, and topology models, and of convergence of adaptive protocols; guide development of the theoretical effort by providing a basis for refining models and assumptions. The long-term goal is to develop a real-time adaptive statistical analysis system that is coupled to a monitoring system that can infer/learn global network behavior and to a control system that controls local behavior so as to predictively improve performance, while ensuring the stability of the overall system. ***FY 2010 Accomplishments:***	1.625	1.742	1.817

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602783A: *COMPUTER AND SOFTWARE TECHNOLOGY*	PROJECT Y10: *COMPUTER/INFO SCI TECH*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Created models that incorporated network characteristics and human information processing, as well as communication and decision making capabilities for enhanced system performance. ***FY 2011 Plans:*** Investigate bio-inspired approaches for robust resilient networking and assess the trade-offs between simplicity, resilience, overhead and performance for heterogeneous tactical networks (work in this area will build on technology transitioned from the Institute for Collaborative Biotechnologies, PE 0601104A/project H05). ***FY 2012 Plans:*** Will investigate and evaluate techniques for controlling the behavior of hybrid networks using a measure of information quality.			
Title: Heterogeneous Computing and Computational Sciences ***Description:*** Research into emerging architectures and software engineering paradigms for hybrid core configurations. The focus is on application development and acceleration targeting heterogeneous systems to allow for scalable algorithms across a range of combined computing cores and operating Scenarios. ***FY 2011 Plans:*** Investigate scalable interface algorithms for implementing heterogeneous computing systems on battlefield applications of robotics information decision aids and biometric applications. ***FY 2012 Plans:*** Will continue investigating scalable interface algorithms on heterogeneous computing systems for battlefield and biometric applications.	-	1.012	1.621
Title: Material Modeling-Force Protection ***Description:*** This research effort will develop fundamental capability for advanced computational scientific modeling that extend beyond known limitations of the current state of the art. This effort builds on FY11 work under Heterogeneous Computing and Computational Sciences on the PE 0602783A/Y10 (COMPUTER/INFO SCI TECH). ***FY 2012 Plans:***	-	-	1.000

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602783A: *COMPUTER AND SOFTWARE TECHNOLOGY*	PROJECT Y10: *COMPUTER/INFO SCI TECH*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Will explore innovative approaches in developing a parallel computational framework for next generation petaflop high-performance computers (both cluster and hybrid computers) to study coupled nonlinear multi-scale material problems on a massive scale.			
Accomplishments/Planned Programs Subtotals	5.518	6.768	8.591

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602783A: *COMPUTER AND SOFTWARE TECHNOLOGY*	PROJECT Y11: *COMPUTER & INFORMATION SCIENCE APPLIED RES CA*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
Y11: *COMPUTER & INFORMATION SCIENCE APPLIED RES CA*	4.378	-	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for Computer and Software Technology applied research.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Integrated Information Technology Policy Analyses Research ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Worked to create a more strategic, adaptive IT policy to advance the Army's Network Centric Operations vision for the future force, especially with regard to providing situational intelligence to soldiers on the battlefield.	3.184	-	-
Title: Optimizing Natural Language Processing of Open Source Intelligence ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Provided an all-source fusion tool for collecting data from open sources such as the web, blog, and social networking sites.	1.194	-	-
Accomplishments/Planned Programs Subtotals	4.378	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army										DATE: February 2011	
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*				R-1 ITEM NOMENCLATURE PE 0602784A: *MILITARY ENGINEERING TECHNOLOGY*							
COST ($ in Millions)	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**Cost To Complete**	**Total Cost**
Total Program Element	60.536	79.189	80.317	-	80.317	78.856	76.249	71.268	70.606	Continuing	Continuing
855: *TOPOGRAPHICAL, IMAGE INTEL & SPACE*	15.261	17.056	17.356	-	17.356	18.336	18.712	19.092	19.429	Continuing	Continuing
H71: *Meteorological Research for Battle Command*	5.627	5.588	6.157	-	6.157	6.298	6.444	6.592	6.742	Continuing	Continuing
T40: *MOB/WPNS EFF TECH*	20.303	31.231	41.052	-	41.052	38.092	34.630	29.722	30.237	Continuing	Continuing
T41: *MIL FACILITIES ENG TEC*	4.369	16.949	7.305	-	7.305	7.576	7.736	6.962	5.146	Continuing	Continuing
T42: *Terrestrial Science Applied Research*	5.491	5.090	5.244	-	5.244	5.348	5.457	5.565	5.660	Continuing	Continuing
T45: *ENERGY TEC APL MIL FAC*	3.237	3.275	3.203	-	3.203	3.206	3.270	3.335	3.392	Continuing	Continuing
T48: *Center for Geosciences & Atmospheric Research*	2.985	-	-	-	-	-	-	-	-	Continuing	Continuing
T53: *Military Engineering Applied Research (CA)*	3.263	-	-	-	-	-	-	-	-	Continuing	Continuing

Note

Not applicable for this item

A. Mission Description and Budget Item Justification

This program element (PE) investigates, evaluates, and matures military engineering technologies for geospatial, atmospheric, and weather characterization and modeling; force protection; force projection; and sustainable, cost efficient and resilient facilities and bases. Research supports special requirements for battlefield visualization, tactical decision aids, weather intelligence products, and capabilities to exploit space assets. Results are tailored to support the materiel development, testing, and operations communities in evaluating the impacts of weather, terrain, and atmospheric obscurants on military materiel and operations (Project 855 and H71). Major research efforts also focus on advanced technologies for adaptive and expedient force protection across the range of military operations; overcoming battlespace gaps; rapid port enhancement; mobility, survivability, and weapons effects in urban terrain modeling and simulation (Project T40). Research efforts to develop technology-enabled capabilities for deployable force protection to support troops operating at remote bases or integrated with local communities are performed in projects T40 and T41 starting in FY11. Facilities engineering efforts include simulation of infrastructure capabilities for force projection, protection, and readiness to improve the efficiency and cost effectiveness of the training, readiness, and force projection missions in garrison; force sustainment missions in theaters of operation; and critical infrastructure interdependencies (Project T41 and T45). Research in this PE also focuses on impacts of the battlespace environment on platforms, sensors, personnel, and systems (Project T42).

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army	DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602784A: *MILITARY ENGINEERING TECHNOLOGY*

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

This work is fully coordinated with and complementary to PE 0602784A (Military Engineering Technology). Deployable force protection activities are coordinated with US Army Research Development and Engineering Command, and the Services. Research is transitioned to PE 0603734A (Military Engineering Advanced Technology), PE 0603125A (Combating Terrorism, Technology Development).

The work in this PE is being led, managed or performed by the US Army Engineer Research and Development Center, Vicksburg, MS, and the Army Research Laboratory, Aberdeen Proving Ground, MD.

Projects T48 and T53 fund Congressional Interest Items.

B. Program Change Summary ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Previous President's Budget	60.779	79.189	77.608	-	77.608
Current President's Budget	60.536	79.189	80.317	-	80.317
Total Adjustments	-0.243	-	2.709	-	2.709
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.243	-			
• Adjustments to Budget Years	-	-	2.709	-	2.709

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602784A: *MILITARY ENGINEERING TECHNOLOGY*	PROJECT 855: *TOPOGRAPHICAL, IMAGE INTEL & SPACE*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
855: *TOPOGRAPHICAL, IMAGE INTEL & SPACE*	15.261	17.056	17.356	-	17.356	18.336	18.712	19.092	19.429	Continuing	Continuing

Note

Not applicable for this item

A. Mission Description and Budget Item Justification

This program element (PE) investigates, evaluates, and matures military engineering technologies. This effort provides research for managing, transforming, updating, improving, and disseminating extremely large volumes of terrain and weather effects data at, or near, real-time and dynamic analysis and reasoning of this data to enable future force command and control systems by providing superior knowledge of the battlespace terrain and environment. Work in this project significantly enhances the Army's spatial-temporal data analysis, management and dissemination capabilities. Efforts include developing logical and conceptual models to support Civil Military Operations (CMO), and examining unification of Geospatial Intelligence with environmental and emerging cultural geographical information requirements associated with CMO by extending geospatial tools support to military decision making within stability operation environment.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

This work is fully coordinated with and complementary to efforts funded in PE 0601102A, Project 52C and PE 0602784A, Project H71.

The work in this project is performed by the US Army Engineer Research and Development Center, Vicksburg, MS.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Terrestrial Data Generation	2.591	-	-
Description: This effort minimizes or eliminates the dramatic effects of dynamically changing terrain states on sensing and maneuver operations conducted by the Army; and provides effective decision-making tools such as models, simulations and mission planning and also rehearsal factors to accurately predict the state of the ground, near-surface atmospheric conditions, and system performance in complex environments. ***FY 2010 Accomplishments:*** Empirically tested optical reporting, or signal emission in the presence of certain target molecules, of remote sensors. In FY11, this research is conducted in task Terrain Analysis for Signal and Signature Phenomenology.			
Title: Data Generation and Management	5.776	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602784A: *MILITARY ENGINEERING TECHNOLOGY*	PROJECT 855: *TOPOGRAPHICAL, IMAGE INTEL & SPACE*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: This effort develops and investigates technologies that address Future Force battlespace awareness capability shortfalls, and where feasible, enhances Current Force capabilities through spiral development technology insertions. ***FY 2010 Accomplishments:*** Developed tools and techniques to exploit Buckeye, airborne and terrestrial Light detection and Ranging (LIDAR), and other sensor data, for bare earth digital elevation derivation, automated feature extraction, forest and tree canopy segmentation; modeled extracted data into realistic three-dimensional representations. In FY11, this research is conducted in task Geospatial Infostructure and Framework and task Imagery and GeoData Sciences.			
Title: Data Analysis ***Description:*** This effort develops analytic and decision support tools that provide actionable information of terrain, atmospheric and weather impacts on units, systems, platforms and soldiers to support Battle Command and Intelligence, Surveillance and Reconnaissance decision making. ***FY 2010 Accomplishments:*** Evolved evidential reasoning model(s) from standalone to reach back services. In FY11 research is conducted in task Geospatial Reasoning, task Geoenabled Battle Command, and task Geospatial Infostructure and Framework.	6.894	-	-
Title: Terrain Analysis for Signal and Signature Phenomenology ***Description:*** This effort minimizes or eliminates dramatic effects of dynamically changing terrain states on sensing and maneuvers operations conducted by the Army. This effort also provides effective decision-making tools such as models, simulations and mission planning and rehearsal factors to accurately predict the state of the ground, near-surface atmospheric conditions, and system performance in complex environments. ***FY 2011 Plans:*** Matrix test chemical, biological, radiological, nuclear and explosives reporters, which are engineered materials that emit signals when triggered by a target molecule. Conduct laboratory and field trials under real environmental conditions to optimize reporter selection for incorporation into a nano-material tool kit. ***FY 2012 Plans:*** Will develop data collection and processing algorithms for novel and advanced full waveform Geiger-mode light detection and ranging (LIDAR) data output for improved terrain analysis.	-	3.517	2.836
Title: Imagery and GeoData Sciences	-	2.514	3.230

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602784A: *MILITARY ENGINEERING TECHNOLOGY*	PROJECT 855: *TOPOGRAPHICAL, IMAGE INTEL & SPACE*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: This effort provides geospatial intelligence techniques that support the warfighter by providing a technical preparation of the joint operating environment (JOE); providing an information preparation of the JOE; and providing capability to evolve and transition an Army geospatial enterprise supporting mission and battle command functions and processes. ***FY 2011 Plans:*** Develop urban mapping tools and techniques, including modeling complex buildings, roofs, building interiors, and subterranean features. ***FY 2012 Plans:*** Will develop new feature extraction workflows that combine multi-source high-resolution imagery with elevation data to address tactical data gaps; provide capability to evolve and transition an Army geospatial enterprise supporting mission and battle command functions and processes.			
Title: Geospatial Reasoning ***Description:*** This effort designs and develops mature technologies that address joint operating environment awareness, maneuver support, and understanding of the battlespace environment; this effort also conducts operational research and development to create an integrated game-board of landscapes and relationships supporting Intelligence Preparation of the Battlefield (IPB) for Civil Military Operations (CMO). ***FY 2011 Plans:*** Develop geospatially-enabled decision support aids to meet uncertain adaptive threats and develop techniques to increase the rate at which large volumes of geospatial data and products are disseminated. ***FY 2012 Plans:*** Will develop rapid field-accessible terrain analysis tools for urban and complex environments; will develop urban and complex environment sensor placement decision support tools; will create an integrated game-board of landscapes and relationships supporting IPB for CMO.	-	1.511	3.540
Title: Geospatial Infostructure & Framework ***Description:*** This effort develops and evaluates technologies that address Future Force battlespace awareness capability shortfalls, and where feasible, enhance Current Force capabilities through spiral development technology insertions. ***FY 2011 Plans:***	-	5.766	5.655

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602784A: *MILITARY ENGINEERING TECHNOLOGY*	PROJECT 855: *TOPOGRAPHICAL, IMAGE INTEL & SPACE*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Incorporate weather effects and cultural feature analysis to support unmanned systems command and control; develop a framework for describing elements of political, military, economic, social, infrastructure, and information domains and linking to temporal and spatial analysis. ***FY 2012 Plans:*** Will develop feature linkage tools to identify common features across databases, opposing force movement index-based on suppression and interdiction capabilities, and data mining algorithms to support detection of important events.			
Title: Geo-Enabled Battle Command ***Description:*** This effort designs, develops, and provides agile and rapid military decision making process within a joint/coalition environment through semantic-based interoperability and use of mission-relevant geospatial information. ***FY 2011 Plans:*** Extend common geospatial architecture and services to support geospatial analysis tools and linkages to command and control for U.S. and coalition force applications. ***FY 2012 Plans:*** Will develop a geospatial architecture allowing input of user-generated content into the information system to enhance the decision-making battle command process.	-	3.748	2.095
Accomplishments/Planned Programs Subtotals	15.261	17.056	17.356

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602784A: *MILITARY ENGINEERING TECHNOLOGY*	PROJECT H71: *Meteorological Research for Battle Command*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
H71: *Meteorological Research for Battle Command*	5.627	5.588	6.157	-	6.157	6.298	6.444	6.592	6.742	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

This program element (PE) investigates, evaluates, and matures military engineering technologies. The objective of this project is to perform applied research and development of tactical weather and atmospheric effects/impacts algorithms and for their integration into battlefield information products. The Army requires capabilities to enhance battlefield commanders and Soldiers decision making based on knowledge of tactical weather data and other environmental impacts. The weather intelligence data must not only be accurate and timely, but also be distributed down to the lowest levels of command, (e.g., individual Soldier). Technologies include high-resolution, local assessments and forecasts of meteorological conditions in near real time including effects of urban and mountainous terrain; analytical tools to assess the impact of the atmosphere to optimize system performance and operations planning; and advanced atmospheric sensing applications to characterize and mitigate wind and turbulence in complex terrain. It provides detailed model applications for various effects of the atmosphere on electro-optical and acoustic target detection, location, and identification. This project develops both physics-based decision aids and rule-based decision support systems for assessing the impacts of weather/atmosphere across a spectrum of friendly and threat weapons systems, sensors, platforms, and operations. The technology can be applied to mission planning and execution, battlefield visualization, reconnaissance surveillance and target acquisition, route planning to maximize stealth and efficiency, web enabled tactical decision aids, and also modeling of environmental impacts for combat simulations and war games. This project supports the future Army through research and development of novel environmental methods and applications that support echelons at Brigade and below (down to the individual Soldier). Products include atmospheric impacts on Army systems and personnel, an Army scale on-scene weather sensing and prediction capability, optical imaging and acoustic tools for automatic target recognition, optical imaging tools for improvised explosive device (IED)/anomaly detection, and physics-based acoustic tools for helicopter collision avoidance and improved source localization.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

This work transitions technologies to the Project Manager for Target Identification and Meteorological Systems for field artillery systems, and to the Department of Defense weather and operations modeling community, and the Program Manager, Distributed Common Ground System-Army (DCGS-A), the Joint Improvised Explosive Device (IED) Defeat Organization, the Program Executive Office Aviation, the Product Manager, Tactical Airspace Integration System, and Project Manager for Robotics and Unmanned Sensors.

Work in this project is performed by the Army Research Laboratory located at Adelphi, MD/White Sands Missile Range, NM.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602784A: *MILITARY ENGINEERING TECHNOLOGY*	PROJECT H71: *Meteorological Research for Battle Command*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Weather Modeling ***Description:*** This effort develops new high resolution, short-range forecasting and high resolution urban diagnostic modeling capabilities. ***FY 2010 Accomplishments:*** Completed a dynamic weather data assimilation package for Weather Running Estimate-Nowcast (WRE-N) model; coupled a diagnostic microscale model 3-dimensional wind field (3DWF) to provide high resolution meteorological sources for weather products and applications; and improved the physics and computational accuracy of the 3DWF diagnostic model and follow-on 2-dimensional prognostic Atmospheric Boundary Layer Environment (ABLE) model by applying an immersed boundary approach and parameterization of unresolved turbulence to better model the effects of complex steep topography such as mountains and high-rise buildings in urban terrain. ***FY 2011 Plans:*** Complete a full physics version of the Weather Running Estimate-Nowcast (WRE-N) model for Defense Common Ground Station - Army (DCGS-A) Nowcasting, and verify the accuracy improvements in the 3DWF and ABLE models achieved by applying an immersed boundary method and parameterizations of unresolved turbulence in high resolution urban and complex terrain. ***FY 2012 Plans:*** Will develop computational optimization methods for the Atmospheric Boundary Layer Environment (ABLE) model using advances in high performance computing to produce a very high resolution meteorological model for use in urban and complex terrain; and will improve the Weather Running Estimate-Nowcast (WRE-N) model at kilometer and sub-kilometer scales validated with the data resulted from the model accuracy assessment studies.	2.259	2.188	2.405
Title: Weather Diagnostics ***Description:*** This effort measures critical value thresholds for weather impacts on systems for tactical decision aids; and devises technologies to improve environmental awareness and to enhance and protect autonomous and semi-autonomous systems. ***FY 2010 Accomplishments:*** Integrated acoustic detection algorithms into the Aviation Weather Routing Tool and verified the light urban model effects integrated into Target Acquisition Weapons Software to extend the capability to environmental effects in applications; developed bio-inspired methods to use local environmental sensing information to improve the performance and survivability of autonomous and semi-autonomous systems in complex terrain and urban atmospheric environments; and verified atmospheric propagation effects on wideband acoustic signals and develop applications that use wideband acoustics to improve local environment sensing. ***FY 2011 Plans:***	1.697	1.721	1.899

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602784A: *MILITARY ENGINEERING TECHNOLOGY*	PROJECT H71: *Meteorological Research for Battle Command*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Implement methods for optimizing aircraft routing in adverse weather conditions and integrate Atmospheric Impacts Routing 4-dimensional visualization, situational awareness tools, and weather decision support systems to improve the safety and efficiency of unmanned and manned aviation; experimentally validate applications of wide band acoustic information processing to improve the characterization of local atmospheric parameters and to detect, locate and identify sources of emitted and reflected acoustic sources. ***FY 2012 Plans:*** Will develop weather effects application models for the improved design of emerging technologies such as Terahertz spectroscopy and imaging systems, continuous solid state high energy laser weapons, and passive short wave infrared imaging systems; and will develop analysis tools to fuse thermal and infrared polarimetric images, so as to achieve increased target detection.			
Title: Weather Prediction ***Description:*** This effort devises models to improve prediction of atmospheric conditions in urban and complex terrain that integrate high resolution boundary layer meteorological (MET) measurements and verifies high resolution boundary layer models with field measurements. ***FY 2010 Accomplishments:*** Completed and evaluated the Doppler light detection and ranging (LIDAR) analysis toolkit for improving the effectiveness of real-time LIDAR data; investigated receiver arrays for remote sensing LIDAR. Investigated two-wavelength laser induced fluorescence spectra of aerosols; analyzed chemical and biological assays of aerosols to improve environmental monitoring; performed sampling with novel aerosol sampling equipment and analyzed coupled meteorological-sampler data in support of Warfighter health and enhance force protection; developed and evaluated a Local-Rapid Evaluation of Atmospheric Conditions (L-REAC) system to provide continuous automated 24/7 detailed wind flow maps to garrison commanders over installation and down to individual building scales by integrating local meteorological and terrain data, forecasts and urban wind models to support installation and forward operating base force protection. ***FY 2011 Plans:*** Complete testing of coupled 3DWF and WRE-N models for transition to the Distributed Common Ground System - Army (DCGS-A) Weather Services; employ active LIDAR with passive spectral sensing systems for environmental characterization; and extend the L-REAC system to integrate additional hazard models that will improve decisions on evacuation versus shelter in place and safe routing of emergency responders. ***FY 2012 Plans:***	1.671	1.679	1.853

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602784A: *MILITARY ENGINEERING TECHNOLOGY*	PROJECT H71: *Meteorological Research for Battle Command*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Will integrate real time networked environmental sensors and produce optimized sensor placement recommendations from the L-REAC system; and will complete accuracy studies of coupled microscale wind model with WRE-N for transition to DCGS-A.			
Accomplishments/Planned Programs Subtotals	5.627	5.588	6.157

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602784A: *MILITARY ENGINEERING TECHNOLOGY*	PROJECT T40: *MOB/WPNS EFF TECH*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
T40: *MOB/WPNS EFF TECH*	20.303	31.231	41.052	-	41.052	38.092	34.630	29.722	30.237	Continuing	Continuing

Note

Not applicable for this item

A. Mission Description and Budget Item Justification

This program element (PE) investigates, evaluates, and develops technologies for adaptive and expedient force protection across the range of military operations; for overcoming battlespace gaps (such as cliffs, ravines and other natural obstacles) through prediction, definition, avoidance, or defeat of the gaps; investigates technologies for rapid port enhancement; for scalable weapons effects; and for high-resolution representation of near-surface terrain and environment for use with sensor models for things such as target recognition and unmanned ground systems (UGS). This research supports development of the future force by providing physics-based representations of mobility, obstacle and barrier placement, survivability, and weapons effects in urban terrain modeling and simulation. Additionally, the project develops and assesses technologies that increase the survivability of critical assets from conventional and terrorist weapons, and maneuver support of deployed forces, while reducing their logistical footprint. Work in this project starting in FY12 in deployable force protection (DFP) supports overcoming critical capability gaps for protecting troops operating at smaller bases that are remote or integrated in with local communities.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this project is performed by the US Army Engineer Research and Development Center, Vicksburg, MS.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Adaptive Protection	8.297	10.645	6.483
Description: This effort develops, evaluates, and validates technologies that address Future Force protection capability shortfalls; and where feasible, enhance Current Force capabilities through spiral development technology insertions.			
FY 2010 Accomplishments: Developed interim lightweight rapidly erected protective systems for use inside and outside base perimeters to defeat emerging weapons effects; developed the capability to accurately predict vehicle loadings due to subsurface explosive detonations; and provided these models to armor/platform designers to increase the survivability of the current and future tactical wheeled vehicle fleet.			
FY 2011 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602784A: *MILITARY ENGINEERING TECHNOLOGY*	PROJECT T40: *MOB/WPNS EFF TECH*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Design and develop a computational protection testbed for validated high-performance modeling to predict and evaluate protective material and system response to blast and ballistic loads. Develop and evaluate force protection technologies for use in remote outposts or in other expeditionary modes, where there is little access to engineering equipment and explore options for use of organic materials in conjunction with light-weight, blast and penetration resistant composite materials and detection capabilities. This work is performed in collaboration with PE 0603005A/221 and activities in PE 0602618A and PE 0602105A. ***FY 2012 Plans:*** Will investigate and validate novel layered protective systems to include overhead protection from direct and indirect fire that must defeat large-caliber rockets, vehicle borne-improvised explosive devices (IEDs), human borne-IEDs, and shoulder-fired rockets; will mature the numerical modeling capability of ground vehicle protective schemes against surface and buried threats by improving coupling between the blast events, vehicles, and occupants. This work will be performed in collaboration with PE 0603005A/221 and activities in PE 0602618A and PE 0602105A.			
Title: Austere Entry and Maneuver ***Description:*** The objective of this research project is to develop and demonstrate technologies that address Future Force enable theater access strategic responsiveness capability shortfalls, and where feasible, enhance Current Force capabilities through spiral development technology insertions. ***FY 2011 Plans:*** Provide modeling solutions of physical and operational conditions (i.e. wetland, mudflats, or shallow rivers) that provide improved logistics and force projection capability for austere entry and maneuver. ***FY 2012 Plans:*** Will design and begin development of a sea-land intermodal mobility bridge for ship to shore transit of heavy military equipment and ground vehicles as well as heavy-lift expedient landing platforms and surfaces for aircraft.	-	1.036	2.000
Title: Scalable Weapons Effects ***Description:*** This effort provides a prediction capability for effects from scalable, selectable, and adaptive weapons that can destroy target function and/or neutralize attributes while limiting damage to surrounding structures/personnel. ***FY 2010 Accomplishments:*** Investigated warhead technologies for rapid wall breaching that can create a man-sized hole in a double-reinforced concrete wall in a single step, reducing time on target and enhancing Soldier survivability; quantified damage to concrete, brick, and adobe walls due to prototype shoulder launched munitions impact; completed evaluations of multi-phase low-to-high order detonation-	5.105	4.203	5.806

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602784A: *MILITARY ENGINEERING TECHNOLOGY*	PROJECT T40: *MOB/WPNS EFF TECH*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
blast effects against urban walls; conducted perforation evaluations against ultra-high strength concrete panels with current and advanced weapon designs; and characterized advanced materials. ***FY 2011 Plans:*** Participate in demonstrations of small, medium and large caliber scalable weapons against urban structure and bunker targets. Will provide ballistic data to validate and finalize prediction capabilities developed in for the use of scalable weapons. This work is performed in collaboration with PE 0602618A/H80, PE 0602105A/H84, PE 0602624A/H18/AH28, PE0603004A/232, PE 06022303A/214. ***FY 2012 Plans:*** Will complete development and will investigate the performance of the shoulder launched wall breaching system against reinforced concrete, triple block, and concrete masonry units; will complete weapon back-blast simulation methods to address safety concerns about firing in confined urban spaces. This work will be performed in collaboration with PE 0602618A/H80, PE 0602105A/H84, PE 0602624A/H18/AH28, PE0603004A/232, PE 06022303A/214.			
Title: Geospatial Research and Engineering Support ***Description:*** This effort develops analytic and decision support tools that provide actionable information of terrain, atmospheric and weather impacts on units, systems, platforms and soldiers to support Battle Command and Intelligence, Surveillance and Reconnaissance decision making. ***FY 2010 Accomplishments:*** Completed development of roadway and gap attribute intensification algorithms to improve mission planning and assessment of austere areas of operations.	0.460	-	-
Title: Near Surface Effects ***Description:*** This effort develops a physics-based, multiscale numerical testbed for virtual testing of unmanned ground systems for intelligent autonomous navigation and tactical behaviors for sensors and develops high fidelity models for surface and subsurface environment impacts and interactions with sensors. ***FY 2010 Accomplishments:*** Provided sophisticated innovative physics models for disturbed soil phenomenology to identify improvised explosive device (IED) locations. Developed joint architecture for unmanned systems compliant components for performance evaluations (i.e. tactical behaviors and perception submodels) for unmanned systems during mission simulations in complex environmentally enriched models. ***FY 2011 Plans:***	6.441	7.683	9.712

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602784A: *MILITARY ENGINEERING TECHNOLOGY*	PROJECT T40: *MOB/WPNS EFF TECH*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Provide novel automated target recognition algorithms for electro-optical, infrared, radar and multi-modal sensors. Develop and validate parameter estimation models to approximate terrain surface properties for false alarm reduction. Integrate sensor perception in unmanned systems for improved autonomous performance. ***FY 2012 Plans:*** Will provide high fidelity models to predict and improve the performance of current and future force sensor systems operating in multiple sensor modalities within complex geoenvironmental settings; will complete new perception algorithms of terrain to enable adaptive tactical behavior technologies for unmanned ground vehicles; will investigate technologies and methods leading to use of sensors above the soil surface with equivalent sensitivity as buried sensors thus allowing for adaptive use in variable environments; will research methodologies for characterizing sensor performance in areas where there is limited ground truth data.			
Title: NORAD-NORTHCOM Surveillance Research ***Description:*** This effort develops a physics-based, multi-scaled numerical testbed that provides an enriched virtual environment for evaluating, fusing, and simulating the interaction of local sensors with environmental factors; this effort would also develop high fidelity models to predict and improve performance of current and future force sensor systems for surface, near-surface, and sub-surface target detection within complex geo-environmental settings (solar, weather, soil, vegetation, clutter, etc.). ***FY 2011 Plans:*** Mature capability to image subsurface voids, or tunnels, up to thirty feet below surface. Conduct experiments using technologies and sensor fusion capabilities to characterize tunnel features, (such as axes of approach and cross sections) and movement of contraband. ***FY 2012 Plans:*** Will continue additional experiments of integrated technologies and sensor fusion capabilities to characterize tunnel features; will develop a physics-based, multi-scaled numerical testbed that provides an enriched virtual environment for evaluating, fusing, and simulating the interaction of local sensors with environmental factors to provide the ability to detect, deny, and aggressively alert Warfighters to clandestine subsurface approaches.	-	3.659	2.050
Title: Joint Integrated Base Defense ***Description:*** This funding is intended to support the stand-up of a Joint Program Office. ***FY 2011 Plans:***	-	4.005	4.000

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602784A: *MILITARY ENGINEERING TECHNOLOGY*	PROJECT T40: *MOB/WPNS EFF TECH*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
This funding is intended to support the stand-up of a Joint Program Office (JPO) with the purpose of achieving integration and interoperability among different sensor systems and suites used in bases and base camps, to include expeditionary and smaller base camps. It is understood that funding for this program will be moved to an appropriate non-S&T PE and project by FY12. ***FY 2012 Plans:*** This funding is intended to support the stand-up of a JPO. The funding is expected to be reprogrammed to a non-S&T PE by FY12 to support the efforts of the JPO.			
Title: Deployable Force Protection ***Description:*** This effort researches, designs, and develops rapidly deployable detection, assessment, and defensive technology-enabled capabilities to meet critical capability gaps for troops operating remotely at smaller bases or integrated with local communities. ***FY 2012 Plans:*** Will perform research to address high priority capability gaps in force protection needs for smaller bases operating in remote areas or integrated with local communities; will continue research on previously selected technologies to improve designs based on user assessment and feedback; will design and begin development of an integrated simulation tool for technology exploration and to provide decision support for identifying system improvements. This work is done in collaboration with PE 0603784A, PE 0603125A, PE 0603313A and PE 0602786A. This work is performed in PE 0602784/T41 in FY 11.	-	-	10.000
Title: Materials Modeling ***Description:*** This effort investigates and leverages physics-based computational models and laboratory experiments to understand the relationships between the chemical and micro-structural composition of material and its performance characteristics when used in protecting facilities. ***FY 2012 Plans:*** Will continue to develop foundational knowledge of nano- and macro-scale physical, chemical, and mechanical properties of materials for improved performance through computational modeling and laboratory experimental research with focus on composite and bio-inspired materials with exceptional properties such as tensile strength and resistance to cracking and penetration. This work is a continuation of work performed in 0602784/T41 in FY 11, Materials Modeling and is coordinated with ongoing activities in PE 0602720A/835, Nanotechnology - Environmental Effects.	-	-	1.001
Accomplishments/Planned Programs Subtotals	20.303	31.231	41.052

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	**R-1 ITEM NOMENCLATURE** PE 0602784A: *MILITARY ENGINEERING TECHNOLOGY*	**PROJECT** T40: *MOB/WPNS EFF TECH*

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602784A: *MILITARY ENGINEERING TECHNOLOGY*	PROJECT T41: *MIL FACILITIES ENG TEC*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
T41: *MIL FACILITIES ENG TEC*	4.369	16.949	7.305	-	7.305	7.576	7.736	6.962	5.146	Continuing	Continuing

Note

Not applicable for this item

A. Mission Description and Budget Item Justification

This program element (PE) investigates and evaluates technologies and techniques to ensure sustainable, cost efficient and effective facilities and to achieve resilient and sustainable installation and base operations. The project focuses on facilities and operations technologies directly supporting training, readiness, force projection, force protection, homeland security, and forward base operations. Facility enhancement technologies contribute to cost reductions in the Army facility life cycle process (infrastructure planning, assessment, design, construction, revitalization, sustainment, and disposal), and the supporting installation operations. This work improves the ability of installations to support forces to meet transformation goals, improves designs for close battle training facilities, and enhances security of Soldiers, families, and civilians. Technologies evolving from this work include integrated planning and design tools for US facilities and forward bases, models predicting water dispersed contaminant effects on facilities and occupants; sustainable facility and base management; collaborative decision support tools; and advanced materials. In addition, technologies from this work will support analysis of socio-cultural and facility issues in forward base operations, including urban environments.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this project is performed by the US Army Engineer Research and Development Center, Vicksburg, MS. The work in deployable force protection is coordinated with the US Army Research Development and Engineering Command, the Defense Advanced Research Projects Agency and the Services.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Multi-functional materials in support of Defeat of Emerging Adaptive Threats (DEFEAT)	2.796	2.860	0.900
Description: This effort assesses and develops self healing technologies; evaluates protective systems; and assesses the use of novel materials in multi-functional structural protection.			
FY 2010 Accomplishments: Conducted assessment of material enhancement using self healing technologies; began development of micro-scale design of high-performance carbon nanotube-composite materials.			
FY 2011 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602784A: *MILITARY ENGINEERING TECHNOLOGY*	PROJECT T41: *MIL FACILITIES ENG TEC*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Conduct evaluations of multi-layered protective systems and perform protection laboratory assessment; and develop decision tools for user community. ***FY 2012 Plans:*** Will complete laboratory assessment of material self healing technologies and optimal design methods for composite plates; will integrate use of novel materials into multi-functional structural protection systems. Transition of these products will be to PE 0603734A project T08 supporting Army Technology Objective DEFEAT.			
Title: Facility Modeling and Simulation ***Description:*** This effort develops sustainable, cost efficient and effective facilities; and provides technologies and techniques for achieving resilient and sustainable installation and base operations. ***FY 2010 Accomplishments:*** Developed and demonstrated new approach to advanced material development: closely-coupled atomistic simulations and nanoscale experiments. Developed a model for integrated ontology, or standardized categorization, for facility life-cycle model. Incorporated near real-time assessment of facility sustainment metrics for energy and water and expanded model framework for net-centric regional management with emerging resiliency concepts. Initiated micro-scale design of high-performance CNT-composite materials. ***FY 2011 Plans:*** Develop sensor integration sub-models to incorporate into a facility life-cycle model designed to reduce uncertainty in infrastructure costs and maintenance; develop sensor fusion algorithms for facility life-cycle model; conduct evaluations of multi-layered protective systems and protection decision/assessment tools. ***FY 2012 Plans:*** Will design and develop a computational framework for expanding to net-centric regional management of facilities with emerging resiliency concepts; will begin design of computer models to facilitate assessment of forward operating base operations to increase effectiveness and efficiency. This effort will be coordinated with efforts in PE 0602720A/T48 and PE 0602786A/VT4 and VT5.	1.573	1.333	3.405
Title: Socio-Cultural Modeling ***Description:*** This effort provides technologies which support analysis of socio-cultural and facility issues in forward base operations, including urban environments. Technology development efforts will include means to identify dynamic signatures, or indicators, in the socio-cultural realm to assist in estimating or predicting behavioral response to operations. ***FY 2011 Plans:***	-	2.750	3.000

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602784A: *MILITARY ENGINEERING TECHNOLOGY*	PROJECT T41: *MIL FACILITIES ENG TEC*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Develop models relating socio-cultural and cultural geographic factors to human behaviors to inform decision making in Counter-Insurgency Operations, Stability and Support Operations, and nation building; develop means to identify dynamic signatures, or indicators, in the socio-cultural realm to assist in estimating or predicting behavioral response to operations. ***FY 2012 Plans:*** Will extend the development of dynamic socio-cultural models for estimating host population response to military operations; will develop information framework linking socio-cultural data to Army tasks.			
Title: Materials Modeling ***Description:*** This effort improves designs for close battle training facilities; enhances security of Soldiers, families, and civilians; evolves technologies including integrated planning and design tools for US facilities and forward bases, and advanced materials to increase performance and decrease volume and weight while keeping the environment safe. ***FY 2011 Plans:*** Investigate and develop foundational knowledge of nano- and macro-scale physical, chemical, and mechanical properties of materials as well as understanding of the fate (i.e. movement, binding and degradation) of the materials once in the environment to research and develop designs that scale well for production and manufacturing; this research also focuses on composite materials with exceptional properties such as tensile strength and resistance to cracking and penetration; the goal is to increase performance and decrease volume and weight while keeping the environment safe. This work moves to PE 0602784A/T40 in FY12. This work is coordinated with Nanotechnology/Fate and Effects effort in PE 0602720A/Project 835.	-	1.006	-
Title: Deployable Force Protection ***Description:*** Develop rapid stand-off threat detection, warning capability, and survivability implementation using lightweight, low power technology that promotes survivability of fixed-sites and dismounted personnel in irregular warfare scenarios. ***FY 2011 Plans:*** Develop integrated system constructs for base protection technologies at smaller bases that often operate in remote locations or are near/with local populations and have a less overt security posture. The integrated designs include interoperable systems that are reliable, transportable by smaller vehicles or sling-load, use minimal power and energy, and have low manpower requirements for set-up and operation. Technologies pursued address detection of threats, assessment of activities and signals, and passive and active defense capabilities. Investigate means to increase sensor detection capabilities for layered defense of the operational environment, including electro-optical, infrared, seismic and acoustic. Develop designs for sustainable power and energy. This	-	9.000	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602784A: *MILITARY ENGINEERING TECHNOLOGY*	PROJECT T41: *MIL FACILITIES ENG TEC*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
effort moves to PE 0602784A/T40 in FY12. These efforts support deployable force protection activities in PE 0603734A, PE 0603313A, PE 062786A, and PE 0603125A.			
Accomplishments/Planned Programs Subtotals	4.369	16.949	7.305

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602784A: *MILITARY ENGINEERING TECHNOLOGY*	PROJECT T42: *Terrestrial Science Applied Research*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
T42: *Terrestrial Science Applied Research*	5.491	5.090	5.244	-	5.244	5.348	5.457	5.565	5.660	Continuing	Continuing

Note

Not applicable for this item

A. Mission Description and Budget Item Justification

This program element (PE) investigates and evaluates the physical environment's effect on personnel, platforms, sensors, and systems in order to develop improved tactics, techniques, procedures, and plans that ensure information superiority, situational awareness, and force projection. Specifically, this project seeks solutions for minimizing or eliminating the adverse effects of dynamically changing terrain states on sensing capabilities, engineer construction, and tactical maneuver conducted by the Army. To achieve this, effective decision-making tools such as models, simulations, and mission planning and rehearsal factors are required that accurately predict the state of the ground, near-surface atmospheric conditions, and system performance in complex environments.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this project is performed by the US Army Engineer Research and Development Center, Vicksburg, MS.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Terrain State	1.770	1.426	2.015
Description: This effort provides Warfighters with an accurate and timely understanding of the battlespace environment's effect on personnel, platforms, sensors, and systems in order to develop improved tactics, techniques, procedures, and plans that ensure information superiority, situational awareness, and force projection. Specifically, this project seeks solutions for minimizing or eliminating the adverse effects of dynamically changing terrain states on sensing capabilities, engineer construction, and tactical maneuver conducted by the Army.			
FY 2010 Accomplishments: Developed algorithms to interpret local terrain characteristics from on-board vehicle sensors (tactile and stand-off) through real-time terrain characterization for on-board mission decision logic to assure the tactical mobility of manned and unmanned ground systems on complex terrain.			
FY 2011 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602784A: *MILITARY ENGINEERING TECHNOLOGY*	PROJECT T42: *Terrestrial Science Applied Research*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Design weather effects physical security sensor planning tool integrated with passive protection systems. ***FY 2012 Plans:*** Will incorporate an optimal sensor placement and selection model including stationary and moving surveillance platforms into the Environmental Awareness for Sensor and Emitter Employment model supporting integration of many different sensors in the battlespace; develop a framework to achieve effective persistent monitoring of targets of interest, ground and airborne, providing timely knowledge of multi-modality sensor performance in dynamic complex weather-affected terrain and adverse weather conditions.			
Title: Signature Physics ***Description:*** This effort investigates the battlespace environment effect on personnel, platforms, sensors, and systems in order to develop improved tactics, techniques, procedures, and plans that ensure information superiority, situational awareness, and force projection. Specifically, this project seeks solutions for minimizing or eliminating the adverse effects of dynamically changing terrain states on sensing capabilities, engineer construction, and tactical maneuver conducted by the Army. ***FY 2010 Accomplishments:*** Built geo-precise software tools incorporating awareness about the physical environment (known and unknown) to optimize sensor emplacement and selection of sensor asset mixes. ***FY 2011 Plans:*** Define normal and anomalous sensor data features (statistical properties) as a function of the geospatial and socio-cultural context; leverage the Warfighter's understanding of important features and contextual cues; and develop street-level simulation of sensor data across a wide range of modalities and urban terrain contexts to develop signal propagation rules for fusion and anomaly recognition. Develop re-usable, object-oriented, software tools for cross-modality sensor performance modeling, high-level fusion including operational environment context, and emplacement recommendations that can be readily incorporated into Army command and control and terrain analysis systems. ***FY 2012 Plans:*** Will design and develop random sampling approaches for uncertainties across multiple sensing modalities and establish quantifiable approaches for the value of increased terrain and weather resolution on signal propagation predictive skill; will develop an adequate definition of the soil biology as a function of prevailing conditions, such as soil-water potential and temperature that can be predicted or measured using stand-off techniques supporting emerging developments of bio-inspired persistent standoff sensing capabilities.	3.721	3.664	3.229
Accomplishments/Planned Programs Subtotals	5.491	5.090	5.244

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602784A: *MILITARY ENGINEERING TECHNOLOGY*	PROJECT T42: *Terrestrial Science Applied Research*

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602784A: *MILITARY ENGINEERING TECHNOLOGY*	PROJECT T45: *ENERGY TEC APL MIL FAC*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
T45: *ENERGY TEC APL MIL FAC*	3.237	3.275	3.203	-	3.203	3.206	3.270	3.335	3.392	Continuing	Continuing

Note

Not applicable for this item

A. Mission Description and Budget Item Justification

This program element (PE) investigates and evaluates technologies necessary for secure, energy efficient, sustainable military installations, emphasizing energy and utility systems protection in response to evolving needs. Energy technologies and processes are also applied to the Army's industrial base to maintain its cost-effective readiness for munitions production, training, and in the theater of operations to reduce logistical footprint. This effort provides technologies to protect facility indoor air quality from contaminants such as mold, bacteria and viruses in work and living spaces as well as develops methods to optimize sustainable energy generation and use including integration of renewable energy resources and approaches for the reduction of carbon footprint. In addition, technologies from this work provide a better understanding of critical infrastructure interdependencies.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this project is performed by the US Army Engineer Research and Development Center, Vicksburg, MS.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Systems Response to Threats	2.437	1.701	-
Description: This effort investigates and validates technologies necessary for secure, energy efficient, sustainable military installations, emphasizing energy and utility systems protection from, and in response to, evolving threats such as chemical, biological and radiological attacks. ***FY 2010 Accomplishments:*** Predicted nanosensing complex stability under long term storage conditions that involved evaluating the stability of fluorescent nanoparticles, conjugated with antibodies, at various temperatures and in different environments. ***FY 2011 Plans:*** Evaluate sensing ability with encapsulation and re-suspension after freeze drying to assess improving the stability of the complex using chemical preservatives and encapsulation with silica.			
Title: Installation Modeling and Simulation	0.800	1.574	3.203

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602784A: *MILITARY ENGINEERING TECHNOLOGY*	PROJECT T45: *ENERGY TEC APL MIL FAC*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: This effort investigates and develops technologies necessary for energy efficient and sustainable military installations, emphasizing energy and utility systems. ***FY 2010 Accomplishments:*** Initiated development of parametric models of most effective energy measures for high demand Army facilities and initiated algorithms to identify high value clusters of facilities with complementary spatial, thermal, hydraulic, and electric power characteristics to provide enterprise solutions for Army Installations future energy efficiency requirements. ***FY 2011 Plans:*** Develop a computational framework for non-linear network simulation to predict performance and optimize integration of installation energy systems. ***FY 2012 Plans:*** Will mature operational user assessment of installations energy systems with a decision support concept; will begin design on a model for assessment and mitigation of energy losses.			
Accomplishments/Planned Programs Subtotals	3.237	3.275	3.203

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602784A: *MILITARY ENGINEERING TECHNOLOGY*	PROJECT T48: *Center for Geosciences & Atmospheric Research*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
T48: *Center for Geosciences & Atmospheric Research*	2.985	-	-	-	-	-	-	-	-	Continuing	Continuing

Note

Not applicable for this item

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for Geosciences/Atmospheric Research.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Geosciences/Atmospheric Research	2.985	-	-
Description: This is a Congressional Interest Item.			
FY 2010 Accomplishments: This funding supports the Center for Geosciences & Atmospheric Research			
Accomplishments/Planned Programs Subtotals	2.985	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602784A: *MILITARY ENGINEERING TECHNOLOGY*	PROJECT T53: *Military Engineering Applied Research (CA)*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
T53: *Military Engineering Applied Research (CA)*	3.263	-	-	-	-	-	-	-	-	Continuing	Continuing

Note

Not applicable for this item

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for Military Engineering applied research.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Cellulose Nanocomposite Panels for Blast and Ballistic Protection ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This effort addressed the development, manufacture, design, and utilization of nano-filled composites using thermosetting, thermoplastic, and inorganic matrices.	1.591	-	-
Title: Environmentally Intelligent Moisture and Corrosion Control for Concrete ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Demonstrated hydrophobic concrete in a potable water treatment facility renovation at Ft. Detrick, MD.	1.672	-	-
Accomplishments/Planned Programs Subtotals	3.263	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army										DATE: February 2011	
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*				R-1 ITEM NOMENCLATURE PE 0602785A: *Manpower/Personnel/Training Technology*							
COST ($ in Millions)	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**Cost To Complete**	**Total Cost**
Total Program Element	16.358	22.198	18.946	-	18.946	19.258	19.127	19.166	19.638	Continuing	Continuing
790: *Personnel Performance & Training Technology*	16.358	22.198	18.946	-	18.946	19.258	19.127	19.166	19.638	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

The objective of this program element (PE)/project is to conduct behavioral and social science applied research that provides non-materiel solutions to ensure that Soldiers can adapt and excel and improve the Army's capability to fully leverage advances in networks, systems, and technologies as they evolve. This research provides the scientific basis to recruit, select, assign, promote, educate, train, and retain Soldiers and leaders that comprise a ready and relevant Landpower capability. The human science applied research conducted in this program element provides knowledge-products, methods, techniques, and tools that will enable the Army to: select Soldiers who are predicted to perform well in future jobs; assign Soldiers to Military Occupational Specialties (MOS) and jobs that better match their skills and abilities; retain an effective career force through improved strategies and behavioral incentives to influence Soldiers to stay in the Army for longer periods of time; accelerate the development of leader critical thinking and interpersonal skills through virtual practice so that junior leaders are more adaptable and prepared for uncertain, rapidly changing missions; develop innovative training strategies for complex battle command skills in network-enabled environments; and design training tools for dismounted squad leadership and team maneuver with ground Soldier systems technologies. Additional research is focused on training techniques and procedures that make it easier for trainers and training developers to rapidly respond to changes in mission or operational requirements and provide a more synergistic training and education process (e.g., automated and improved diagnostics, coaching and mentoring, performance measures, and feedback methods). This program leverages efforts and coordinates research with a number of other Laboratories and Research, Development, and Engineering Centers including, the Simulation and Training Technology Center (STTC) and Army Research Laboratory - Human Research and Engineering Directorate (ARL-HRED) (PEs 0603015A, 0602308A and 0602716A), and the Communications-Electronics Research, Development, and Engineering Center (CERDEC). Research in this PE is related to and fully coordinated with efforts funded in PE 0603007A/project 792.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

This project is managed by the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI), Arlington, VA.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army	DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	**R-1 ITEM NOMENCLATURE** PE 0602785A: *Manpower/Personnel/Training Technology*

B. Program Change Summary ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Previous President's Budget	16.614	22.198	19.022	-	19.022
Current President's Budget	16.358	22.198	18.946	-	18.946
Total Adjustments	-0.256	-	-0.076	-	-0.076
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.256	-			
• Adjustments to Budget Years	-	-	-0.076	-	-0.076

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602785A: *Manpower/Personnel/Training Technology*	PROJECT 790: *Personnel Performance & Training Technology*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
790: *Personnel Performance & Training Technology*	16.358	22.198	18.946	-	18.946	19.258	19.127	19.166	19.638	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

The objective of this program element (PE)/project is to conduct behavioral and social science applied research that provides non-materiel solutions to ensure that Soldiers can adapt and excel and improve the Army's capability to fully leverage advances in networks, systems, and technologies as they evolve. This research provides the scientific basis to recruit, select, assign, promote, educate, train, and retain Soldiers and leaders that comprise a ready and relevant Landpower capability. The human science applied research conducted in this program element provides knowledge-products, methods, techniques, and tools that will enable the Army to: select Soldiers who are predicted to perform well in future jobs; assign Soldiers to Military Occupational Specialties (MOS) and jobs that better match their skills and abilities; retain an effective career force through improved strategies and behavioral incentives to influence Soldiers to stay in the Army for longer periods of time; accelerate the development of leader critical thinking and interpersonal skills through virtual practice so that junior leaders are more adaptable and prepared for uncertain, rapidly changing missions; develop innovative training strategies for complex battle command skills in network-enabled environments; and design training tools for dismounted squad leadership and team maneuver with ground Soldier systems technologies. Additional research is focused on training techniques and procedures that make it easier for trainers and training developers to rapidly respond to changes in mission or operational requirements and provide a more synergistic training and education process (e.g., automated and improved diagnostics, coaching and mentoring, performance measures, and feedback methods). This program leverages efforts and coordinates research with a number of other Laboratories and Research, Development, and Engineering Centers including, the Simulation and Training Technology Center (STTC), Army Research Laboratory - Human Research and Engineering Directorate (ARL-HRED), and the Communications-Electronics Research, Development, and Engineering Center (CERDEC). Research in this PE is related to and fully coordinated with efforts funded in PE 0603007/project 792.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

This project is managed by the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI), Arlington, VA.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Personnel	4.596	6.295	5.372
Description: Investigate personnel behaviour and performance.			
FY 2010 Accomplishments:			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602785A: *Manpower/Personnel/Training Technology*	PROJECT 790: *Personnel Performance & Training Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Initiated research to validate temperament/personality (i.e., non-cognitive) measures to better predict Soldier performance in initial training; and investigated the use of non-cognitive measures for predicting attrition (i.e., dropping out) in pre-commissioning. The Army's current selection measures primarily focus on a candidate's cognitive (e.g., technical and analytical) ability which does not predict attrition, discipline, and motivation. ***FY 2011 Plans:*** Conduct longitudinal (i.e., multiyear) research to validate non-cognitive measures and the extent to which they predict a Soldier's on-going job performance and continued success in the Army. ***FY 2012 Plans:*** Will develop non-cognitive measures to identify potential successful Officers (e.g., awarding ROTC scholarships).			
Title: Training ***Description:*** Investigate and develop training methods and tools. ***FY 2010 Accomplishments:*** Developed tools for unit-developed individual/small group training based on near-real time knowledge elicitation; conducted field assessments of role-playing distributed simulations; analyzed methods for improving automated, diagnostic, and prescriptive tutoring systems to tailor training experiences; and investigated methods to maintain relevance of unit and institutional training. ***FY 2011 Plans:*** Research innovative training methods and technology based on learning sciences; refining tools/methods for rapid training development to increase relevancy and timeliness of training; designing and developing methods of diagnostic evaluation of individual and unit performance; and developing cost-effective concepts to integrate live and simulated training in emerging large-scale distributed environments. ***FY 2012 Plans:*** Will develop training performance measurement techniques for large scale-distributed training environments and for units training at home station; and will identify strategies to create training tailored to the individual Soldier needs.	8.126	11.229	9.322
Title: Leader Development ***Description:*** Investigate and develop leader development tools and strategies. ***FY 2010 Accomplishments:***	3.636	4.674	4.252

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602785A: *Manpower/Personnel/Training Technology*	PROJECT 790: *Personnel Performance & Training Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Assessed multilevel influence strategies and the extent these strategies improved adaptive leadership and negotiation skills and techniques; developed team training modules for rapid team building and team adaptability; investigated training strategies and design guidelines to promote appropriate trust and automation reliance in networked human system teams. ***FY 2011 Plans:*** Refining techniques and strategies for developing the influence skills of leaders, with particular focus on military advisory training (i.e., training those who are training international partners); developing and refining a model of multi-team system performance characteristics and effectiveness for joint, interagency, intergovernmental, and multinational (JIIM) teams; and developing measures of socio-cultural capabilities for operational environments. ***FY 2012 Plans:*** Will develop innovative methods to train skills to operate across a variety of cultures; and will identify emerging battle command and staff skills for full spectrum operations.			
Accomplishments/Planned Programs Subtotals	16.358	22.198	18.946

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army										DATE: February 2011	
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*				R-1 ITEM NOMENCLATURE PE 0602786A: *Warfighter Technology*							
COST ($ in Millions)	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**Cost To Complete**	**Total Cost**
Total Program Element	37.040	27.746	29.835	-	29.835	28.180	28.481	28.694	29.557	Continuing	Continuing
283: *AIRDROP ADV TECH*	2.449	2.527	2.369	-	2.369	2.516	2.563	2.775	2.822	Continuing	Continuing
E01: *Warfighter Technology Initiatives (CA)*	10.585	-	-	-	-	-	-	-	-	Continuing	Continuing
H98: *CLOTHING & EQUIPM TECH*	18.594	19.624	19.602	-	19.602	18.447	18.517	18.320	18.867	Continuing	Continuing
H99: *JOINT SERVICE COMBAT FEEDING TECHNOLOGY*	5.412	5.595	5.514	-	5.514	5.732	5.841	5.949	6.118	Continuing	Continuing
VT4: *EXPEDITIONARY MOBILE BASE CAMP TECHNOLOGY*	-	-	2.350	-	2.350	1.485	1.560	1.650	1.750	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program element (PE) investigates and develops technologies which improve Soldier and Small Combat Unit survivability, sustainability, mobility, combat effectiveness, and field quality of life. This PE supports the design, development, and improvement of components used for air delivery of personnel and cargo (project 283), combat clothing and personal equipment (including protective equipment such as personal armor, helmets and eye wear) (project H98) and combat rations and combat feeding equipment (project H99) and expeditionary base camps (VT4). Project E01 funds congressional special interest items. The projects in this PE adhere to Tri-Service Agreements on clothing, textiles, and food with coordination provided through the Cross Service Warfighter Equipment Board, the Soldier as a System Integrated Concepts Development Team, and the DoD Combat Feeding Research and Engineering Board.

Work in this PE is related to, and fully coordinated with, PE 0602105A (Materials Technology), PE 0602618A (Ballistics Technology), PE 0603001A (Warfighter Advanced Technology, PE 0602787A (Medical Technology Initiatives)0602716A (Human Factors Engineering Technology) and PE 0602784A (Military Engineering Technology)

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work is led, performed, and/or managed by the Natick Soldier Research, Development, and Engineering Center (NSRDEC), Natick, MA.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602786A: *Warfighter Technology*	

B. Program Change Summary ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Previous President's Budget	38.347	27.746	28.335	-	28.335
Current President's Budget	37.040	27.746	29.835	-	29.835
Total Adjustments	-1.307	-	1.500	-	1.500
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	-0.812	-			
• SBIR/STTR Transfer	-0.495	-			
• Adjustments to Budget Years	-	-	1.500	-	1.500

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602786A: *Warfighter Technology*	PROJECT 283: *AIRDROP ADV TECH*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
283: *AIRDROP ADV TECH*	2.449	2.527	2.369	-	2.369	2.516	2.563	2.775	2.822	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project researches, investigates and evaluates component technologies to enhance cargo and personnel airdrop capabilities for global precision delivery, rapid deployment, and insertion for force projection into hostile regions. Areas of emphasis include parachute technologies, parachutist injury reduction, precision offset aerial delivery, soft landing technologies, and airdrop simulation.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this project is led, performed and/or managed by the US Army Natick Soldier Research, Development and Engineering Center (NSRDEC), Natick, MA.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Precision Aerial Delivery Enhancements	1.838	1.770	2.369
Description: This effort investigates technologies for enhanced payload extraction and subsequent gliding capabilities, improves delivery accuracy of varying load weights, and investigates technologies for improved insertion safety and security for airborne personnel. ***FY 2010 Accomplishments:*** Researched and evaluated performance of height sensor technology, to include a radar height sensor to augment existing Sound Detection and Ranging (SODAR) height sensors; investigated and developed wireless advanced navigational aid and display technologies for Military Free Fall (MFF) applications. ***FY 2011 Plans:*** Research and evaluate performance of adaptive Guidance Navigation and Control (GN&C) software and wind sensor technology to incorporate into on-board airborne guidance unit (AGU) enabling wind updates to be transmitted to the AGU for parafoil flight pattern adjustment. ***FY 2012 Plans:*** Will explore aerial delivery concepts from rotary wing Army aircraft to provide a wider range of resupply capabilities to include automatic helicopter sling load (SL) hook up/drop-off , will analyze human systems performance limits and injury mechanisms			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602786A: *Warfighter Technology*	PROJECT 283: *AIRDROP ADV TECH*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
during SL and MFF operations; will complete assessment of oxygen requirements for extended range, high altitude MFF operations; will develop a medium fidelity engineering model of the Army's new T11 parachute system steady state descent.			
Title: Enabling Airdrop Research and Technologies ***Description:*** This effort investigates technologies for enhanced payload extraction and subsequent gliding capabilities. ***FY 2010 Accomplishments:*** Expanded Domain Specific Software Architecture (DSSA) modeling capabilities to include low altitude opening and main parachute design to allow both extracting the payload from the aircraft and decelerating the payload to a desirable descent rate. ***FY 2011 Plans:*** Verify and validate both physics and engineering based aerial delivery models; investigate methods to increase the airfoil glide ratio, which allows the jumper/cargo to exit the aircraft further from the target. These methods include the optimization of parafoil canopy design, such as variations in canopy size, shape, materials, and suspension lines. In FY12 funding will transition to Precision Aerial Delivery Enhancements.	0.611	0.757	-
Accomplishments/Planned Programs Subtotals	2.449	2.527	2.369

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602786A: *Warfighter Technology*	PROJECT E01: *Warfighter Technology Initiatives (CA)*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
E01: *Warfighter Technology Initiatives (CA)*	10.585	-	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for Warfighter Technology Applied Research.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Biosecurity Research for Food Safety ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Developed a biosafety level 3 biocontainment facility to support both military and civilian research needs regarding biological agent contamination of the nation's food supply chain.	1.592	-	-
Title: Injection Molded Ceramic Body Armor ***Description:*** This is a Congressional interest Item. ***FY 2010 Accomplishments:*** Improved upon the density, dimensional stability and hardness of injection molded silicon carbide technology.	0.796	-	-
Title: Joint Precision Air Drop Systems-Wind Profiling Portable Radar ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated a method to obtain real-time wind updates on an aircraft for airdrop purposes.	1.830	-	-
Title: Nano-Enabled Ultra High Storage Density Non-volatile Memory for Commanders Digital Assistant ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Question	2.387	-	-
Title: Improved Thermal Resistant Nylon for Enhanced Durability and Thermal Protection in Combat Uniforms. ***Description:*** This is a Congressional Interest Item.	3.183	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602786A: *Warfighter Technology*	PROJECT E01: *Warfighter Technology Initiatives (CA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
FY 2010 Accomplishments: Worked on three objectives: migration from the manual to semi-automated process for metal nanodot synthesis for higher nanodot quality (i.e., diameter control, purity), repeatability and throughput; tighten nanodot coating uniformity while maintaining ultra-high coating density for better cell-to-cell distribution; and extend the single flash memory cell to high-density mini-arrays of memory transistors.			
Title: In-Theater Evaluation of Ballistic Protection ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Fabricated ballistic panel systems for tent systems and Containerized Housing Units.	0.797	-	-
Accomplishments/Planned Programs Subtotals	10.585	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602786A: *Warfighter Technology*	PROJECT H98: *CLOTHING & EQUIPM TECH*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
H98: *CLOTHING & EQUIPM TECH*	18.594	19.624	19.602	-	19.602	18.447	18.517	18.320	18.867	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project investigates and evaluates components and materials that have potential to enhance Soldier survivability from combat threats (flame and thermal threats, blast and ballistic threats, and lasers) and the field environment (e.g., cold, heat, wet) to increase operational effectiveness while decreasing the Soldier's cognitive and physical burden. Included are technologies and novel materials related to personnel armor, helmets, hearing protection, eyewear, and protective inserts for shelters. In addition, this project supports the development and refinement of essential analytic tools needed to predict and/or assess the combat effectiveness of next generation Soldier systems with a focus on network centric warfare technologies and human science investigation to identify and develop methods to assess human cognitive responses to sensory, physical, cognitive, and affective stimuli and stressors.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work is led, performed and/or managed by the Natick Soldier Research, Development, and Engineering Center (NSRDEC), Natick, MA.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Ballistic and Blast Protection for the Individual Soldier	5.621	5.594	7.207
Description: This effort focuses on material modeling, novel materials, and component designs to protect Soldiers against ballistic and blast threats. This effort is fully coordinated with PE 0602787/Project FH2, Project VB3 and Project 874 (Medical Technology). ***FY 2010 Accomplishments:*** Validated enhancements to survivability modeling tool (including the Integrated Casualty Estimation Methods model) for personnel ballistic and blast protection systems development. Developed improved ballistic body armor plate designs based on medical forensic data and 3D body scans. Completed ballistic experiments on selected materials configurations to obtain critical data for advancement of ballistic plate technology. ***FY 2011 Plans:*** Investigate and conduct trade analysis of parameters which could lead to lighter weight ballistic and blast protective systems for individuals and shelters; construct and evaluate initial soft armor and composite armor components using emerging materials (from PE 0602105A/project H84 or others) and geometry data from the Integrated Casualty Estimation Method modeling tool;			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602786A: *Warfighter Technology*	PROJECT H98: *CLOTHING & EQUIPM TECH*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
transition enhanced survivability analysis and modeling tools to materiel developers and Product Managers to aid in future requirements, design, and acquisition decisions. ***FY 2012 Plans:*** Will develop methodology to characterize multidirectional bending/ flexing behavior of multi-layer armor material systems, apply human flexure findings to digital human models and investigate advanced armor material and configurations to accommodate body flexure; will develop reduced weight material concepts for head and face protection and research emerging ballistic and blast protective materials for application to shelter systems. Conduct research to increase fundamental understanding of blast effects on humans; Personal Protective Equipment design factors effecting exposure limits, scope of future threats and the potential impact to Ground Soldiers.			
Title: Soldier Vision Protection and Enhancement ***Description:*** This effort focuses on technologies which provide eye protection from battlefield threats. ***FY 2010 Accomplishments:*** Developed an eyewear lens scaffold (pixilated lens with a battery operated sensor) that can sense and respond to visible and infrared (IR) irradiation sources to protect Soldiers' eyes, maximize overall visual acuity, and determine directionality of threats; matured lens technology to serve as the baseline for subsequent vision protection enhancement technologies and examined Soldier acceptance issues by evaluating the ability to differentiate color or objects in both day and night scenarios. ***FY 2011 Plans:*** Develop and evaluate against the baseline variable transmission eyewear technologies, material properties and methods to integrate glare, laser flash and dazzle protection into eyewear. ***FY 2012 Plans:*** Will begin integration of eye protection and variable transmission technologies into a single lens design with multiple levels of light transmission control.	2.120	2.493	2.546
Title: Soldier and Small Unit Modeling and Analysis ***Description:*** This effort will focus on Small Combat Unit (SCU) modeling and analysis to provide critical data and the rationale necessary for making technology decisions for the Soldier and Small Combat Units. This effort is fully coordinated with PE 0602716A/Project H70 (Human Factors Engineering Technology) and PE 0602784A/Project H71 (Military Engineering Technology.) ***FY 2010 Accomplishments:***	2.210	2.331	1.439

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602786A: *Warfighter Technology*	PROJECT H98: *CLOTHING & EQUIPM TECH*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Provided credible Soldier physiological representations within the suite of Soldier/Small Unit models and simulations to include effects of equipment load on Soldier movement and the effect of helmets on sound detection and direction; expanded analysis capabilities to determine impact to small unit effectiveness by using combined arms scenarios to identify a number of interactions that occur between ground Soldiers, base camps and vehicle platforms. ***FY 2011 Plans:*** Link models and simulations and provided data analysis to examine the issue of Soldier load; develop counterinsurgency scenarios for Soldier and SCUs; analyze SCU?s logistics supply chain and capability to sustain themselves in austere environments; model SCUs combat effectiveness utilizing notional capabilities compared to the current capabilities of Force Provider systems; analyze fuel and water systems, cost/benefits of unmanned sensors for stand-off recognition and intelligence gathering. ***FY 2012 Plans:*** Analyze the utility of tailorable/modular/scalable body armor and recommend optimal configurations to ensure the proper balance of protection and Soldier load for any given missions and scenario. Continue to conduct analyses to support Expeditionary Mobile Base Camps as Combat Outposts (COPs) that will allow SCUs to sustain themselves in austere environments.			
Title: Measurement, Prediction and Improvement of Soldier Performance ***Description:*** This effort focuses on human science methods (psychological, anthropometric, and psychophysical) and biomechanical models to assess human responses to sensory, physical, cognitive and affective stimuli and stressors to support human systems design concepts for Warfighter equipment. This work is collaborative with the Army Research Laboratory PE 0602716A/H70 and the Medical Research and Materiel Command PE 0602787. ***FY 2010 Accomplishments:*** Identified brain and cognitive mechanisms underlying dismounted Soldier performance relative to battlespace awareness using human experimental studies and cognitive task analysis of squad-level operations. ***FY 2011 Plans:*** Develop an initial set of standard cognitive metrics for quantifying and evaluating Soldier performance under stressed and non-stressed task situations based on cognitive task analysis and human experimental studies; conduct human research to quantify the influence of contextual variables (e.g., physical fatigue) on cognitive processes involved in performing squad-level infantry tasks. ***FY 2012 Plans:*** Will mature and validate cognitive metrics for quantifying and evaluating Soldier performance affected by contextual variables; conduct human research to identify mitigation strategies for performance decrements; provide anthropometric specifications for	2.976	3.590	2.956

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602786A: *Warfighter Technology*	PROJECT H98: *CLOTHING & EQUIPM TECH*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
3D digital human models representing body size/proportional variations for males and females and link individual Soldier physical task simulations to better predict and model the effect of equipment loads on Soldier performance.			
Title: Multifunctional Fibers, Textiles and Materials for the Soldier ***Description:*** This effort focuses on technologies that aid in the design and evaluation of multifunctional protective materials and concealment concepts for Soldier clothing, equipment and shelters. ***FY 2010 Accomplishments:*** Investigated textile and film-based alternatives to create wearable Soldier power technologies, completed laboratory testing of new flame-resistant (FR)/thermal protective materials and developed analytical tools to assess their protection levels. ***FY 2011 Plans:*** Investigate modeling and control of low cost electrospinning processes to produce micro/ nanostructure fibrous materials; apply analytical methods to design and fabricate multifunctional fibers for advanced flame, thermal and concealment/signature protective textiles and composite concepts. ***FY 2012 Plans:*** Will assess multifunctional fiber technologies for key flame and thermal protection capabilities, cut and abrasion resistance, concealment and electronic/electrical properties as well as fiber composite toughness enhancement improvement for multiple Soldier items; will integrate selected novel FR protective materials into fibers and research new FR characterization methodologies and modeling of layered FR materials to determine the physical properties controlling FR performance; will determine the effect of enhanced process control on electrospun materials, and evaluate performance for a wide range of operational conditions; and will investigate textile properties effecting signature reduction and performance evaluation techniques for a wide range of operational conditions and sensors.	5.667	5.616	5.454
Accomplishments/Planned Programs Subtotals	18.594	19.624	19.602

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602786A: *Warfighter Technology*	PROJECT H99: *JOINT SERVICE COMBAT FEEDING TECHNOLOGY*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
H99: *JOINT SERVICE COMBAT FEEDING TECHNOLOGY*	5.412	5.595	5.514	-	5.514	5.732	5.841	5.949	6.118	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project investigates, develops and evaluates novel ration packaging, combat feeding equipment/systems and advanced food processing technologies to prolong shelf-life. This project also investigates technologies that detect food safety hazards on the battlefield and enhances quality, nutritional content and the variety of food items in military rations. Efforts funded in this project support all Military Services, the Special Operations Command, and the Defense Logistics Agency. The Army serves as Executive Agent for this Department of Defense (DoD) program, with oversight and coordination provided by the DoD Combat Feeding Research and Engineering Board. Technologies developed within this effort transition to PE 0603001A/project C07 for maturation.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this project is led, performed, and/or managed by the US Army Natick Soldier Research, Development and Engineering Center (NSRDEC), Natick, MA, and this project has collaborative efforts with the US Army Research Institute for Environmental Medicine.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Combat Feeding Equipment Technologies	2.246	2.320	1.620
Description: This effort investigates equipment and energy technologies to enhance effectiveness and reduce logistics footprint of Joint Services field feeding operations in a wide range of environmental and operational contexts. ***FY 2010 Accomplishments:*** Developed technology concepts for a standard size container that extends the shelf life of semi-perishable rations in hot environments; designed and evaluated an off-grid pallet chiller with self-containing power supply for bottled water; and completed concept development of a flameless individual water heater. ***FY 2011 Plans:*** Develop recycling technology concepts for greywater (non-industrial wastewater) generated from field food sanitation systems for the Food Sanitation Center; and complete concept development of self-powered appliances with next generation high efficiency thermoelectric modules to reduce reliance on JP8. ***FY 2012 Plans:*** Will investigate innovative mission-specific, man portable feeding technologies; will evaluate high efficiency thermoelectric powered appliances to reduce reliance on JP8 and other power sources to operate kitchen appliances; will investigate novel			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602786A: *Warfighter Technology*	PROJECT H99: *JOINT SERVICE COMBAT FEEDING TECHNOLOGY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
heating technologies that will allow the warfighter to self heat a wider range or rations, including group rations, in a variety of environmental conditions without kitchen equipment.			
Title: Ration Stabilization and Novel Nutrient Delivery Technologies ***Description:*** This effort identifies and develops nutrient compositions to maximize Soldier cognitive and physical performance on the battlefield. ***FY 2010 Accomplishments:*** Researched acceptance of shelf-stable sandwiches containing emulsion-based fillings to control food water content; down-selected component food matrices for incorporation of performance optimizing and nano-sized functional ingredients. ***FY 2011 Plans:*** Explore shelf-stable pocket bread formulas and production parameters; evaluate the efficacy of carbon dioxide treatment of fresh fruits and vegetables and antimicrobial effects on ration components; and demonstrate nanotechnology-based carriers (ration component) for enhancing micronutrient stability in food items of military rations. ***FY 2012 Plans:*** Will explore the integration of antioxidants into various ration components to improve the overall health of the warfighter; will develop new baked food items that will increase the variety of baked goods available in military rations; will develop ration components that increase the warfighter appetite satisfaction rate relative to ration size to support Soldier mental and physical performance.	1.580	1.698	1.933
Title: Ration Packaging and Food Safety Technologies ***Description:*** This effort investigates biosensors models and designs for food products and novel ration packaging technologies to minimize nutritional degradation and protect the warfighter from foodborne illnesses. ***FY 2010 Accomplishments:*** Developed an integrated sensor circuit concept diagram for printed electronic display of real-time ration condition assessment to determine remaining shelf life; developed a bacteriophage (viruses that infect specific bacteria) cocktail to reduce bacteria in fresh fruits and vegetables; conducted polymer processing of thermoplastic materials to optimize novel multilayer polymer films properties; optimized conductive membranes for sensing to capture and detect pathogenic bacteria through optical detection techniques. ***FY 2011 Plans:***	1.586	1.577	1.961

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602786A: *Warfighter Technology*	PROJECT H99: *JOINT SERVICE COMBAT FEEDING TECHNOLOGY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Investigate compatibility and integration issues with printed electronic display applications on packaging structures for ration condition assessment; evaluate electrochemical measurements generated by an antibody-antigen reaction with conductive membranes for more rapid and reliable detection of pathogens in foods. ***FY 2012 Plans:*** Will conduct exploratory research on bioactive packaging materials which can detect and kill pathogens present in a food product to protect the warfighter?s health; and will evaluate ration packaging microencapsulation technologies that enhance barrier protection and packaging integrity resulting in higher ration quality and reduced waste.			
Accomplishments/Planned Programs Subtotals	5.412	5.595	5.514

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602786A: *Warfighter Technology*	PROJECT VT4: *EXPEDITIONARY MOBILE BASE CAMP TECHNOLOGY*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
VT4: *EXPEDITIONARY MOBILE BASE CAMP TECHNOLOGY*	-	-	2.350	-	2.350	1.485	1.560	1.650	1.750	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project matures and demonstrates fully integrated holistic expeditionary base camp (EBC) capabilities with mission-specific plug and play components, subsystems and modules designed to optimized manpower requirements, improve situational awareness, increase survivability, optimize habitation, reduce logistics footprint, enhance supportability and reduce cost. Expeditionary Base Camp (EBC) systems provide an operational capability for Small Combat Units (battalion and below) and Soldiers in varying environments which are rapidly deployable and re-locatable and require no Military Construction and limited materiel handing support. This project integrates mature technologies to create mission specific lab demonstrators and evaluates the performance capabilities using metrics and methodologies developed under PE 0602786//Project VT4.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this project is led, performed and/or managed by the US Army Natick Soldier Research, Development and Engineering Center (NSRDEC), Natick, MA and fully coordinated with PE 0602786A (Warfighter Technology), PE 0602784A and 0603734A (Military Engineering) PE 0603004A (Weapons and Munitions Advanced Technology), PE 0603005A (Combat Vehicle and Automotive Advanced Technology), PE 0603125A (Combating Terrorism Technology Development) and PE 0603772A (Advanced Tactical Computer Science and Sensor Technology).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Expeditionary Base Camp Component Technologies	-	-	2.350
Description: Identify and improve component interoperability and mature and scale component technologies for an integrated holistic base camp concept. ***FY 2012 Plans:*** Will develop a database of physical measurements (size, weight, volume); human metrics (manpower, cognitive load); and interfaces (power, network) and assess technical performance and maturity of technologies (i.e., level of ballistic, environmental and/or chem-bio protection); capture key data regarding mission planning from deploying units and component limitations from returning Soldiers; investigate data and prioritize critical new or improved capabilities through simulations and war-gaming, develop test protocols for technology assessment, and define design and technical performance criteria for achievable capability sets.			
Accomplishments/Planned Programs Subtotals	-	-	2.350

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602786A: *Warfighter Technology*	PROJECT VT4: *EXPEDITIONARY MOBILE BASE CAMP TECHNOLOGY*

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army										DATE: February 2011	
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*				R-1 ITEM NOMENCLATURE PE 0602787A: *MEDICAL TECHNOLOGY*							
COST ($ in Millions)	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**Cost To Complete**	**Total Cost**
Total Program Element	231.001	96.797	105.929	-	105.929	105.289	104.033	88.305	82.024	Continuing	Continuing
869: *Warfighter Health Prot & Perf Stnds*	33.933	34.718	38.740	-	38.740	39.710	38.206	32.371	25.123	Continuing	Continuing
870: *DOD MED DEF AG INF DIS*	17.091	13.914	16.869	-	16.869	16.603	16.797	16.898	17.186	Continuing	Continuing
873: *HIV EXPLORATORY RSCH*	8.914	9.243	9.392	-	9.392	9.582	9.638	9.584	9.747	Continuing	Continuing
874: *CBT CASUALTY CARE TECH*	17.363	16.782	17.044	-	17.044	17.417	17.293	17.171	17.486	Continuing	Continuing
878: *HLTH HAZ MIL MATERIEL*	-	0.078	-	-	-	-	-	-	-	Continuing	Continuing
879: *MED FACT ENH SOLD EFF*	-	0.106	-	-	-	-	-	-	-	Continuing	Continuing
968: *SYNCH BASED HI ENERGY RADIATION BEAM CANCER DETECT*	5.969	-	-	-	-	-	-	-	-	Continuing	Continuing
FH2: *FORCE HEALTH PROTECTION - APPLIED RESEARCH*	7.995	10.779	9.136	-	9.136	7.127	7.212	7.376	7.493	Continuing	Continuing
PA4: *WOUND HEALING PROJECT (CA)*	1.989	-	-	-	-	-	-	-	-	Continuing	Continuing
UA8: *PROTEIN HYDROGEL (CA)*	0.796	-	-	-	-	-	-	-	-	Continuing	Continuing
VB3: *MEDICAL TECHNOLOGY INITIATIVES (CA)*	125.821	-	-	-	-	-	-	-	-	Continuing	Continuing
VB4: *SYSTEM BIOLOGY AND NETWORK SCIENCE TECHNOLOGY*	1.130	1.177	4.748	-	4.748	4.850	4.887	4.905	4.989	Continuing	Continuing
VJ4: *SUICIDE PREVENTION/ MITIGATION*	10.000	10.000	10.000	-	10.000	10.000	10.000	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program element (PE) supports application of knowledge gained through basic research to develop drugs, vaccines, medical devices, diagnostics, medical practices/procedures, and other preventive measures essential to the protection and sustainment of Warfighter health. Research is conducted in five principal areas:

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army	DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602787A: *MEDICAL TECHNOLOGY*

Combat Casualty Care; Military Operational Medicine; Military Relevant Infectious Diseases, including Human Immunodeficiency Virus (HIV); Clinical and Rehabilitative Medicine; and Systems Biology/Network Sciences.

Project (869) supports and matures knowledge and technologies, such as screening tools and preventive measures, for Post-Traumatic Stress Disorder and mild Traumatic Brain Injuries, physiological monitors to protect Soldiers from injuries due to exposure to hazardous environments and materials, and medically valid testing devices and predictive models used for the development of Soldier protective equipment. This project is being coordinated with the Defense Health Program.

Project (870) supports designing and developing medical diagnosis, protection and treatment against naturally occurring diseases and wound infections of military importance, as identified by worldwide medical surveillance and military threat analysis. This project is being coordinated with the Defense Health Program.

Project (873) supports research on the human immunodeficiency virus (HIV), which causes Acquired Immunodeficiency Syndrome (AIDS). Work in this area includes developing improved identification methods to determine genetic diversity of the virus, preclinical work in laboratory animals including non-human primates to identify candidates for future vaccine development, and evaluating and preparing overseas sites for future vaccine trials. This project is being coordinated with the Defense Health Program.

Project (874) supports identification and evaluation of drugs, biologics (products derived from living organisms), medical devices, and diagnostics for resuscitation, life support and post-evacuation restorative and rehabilitative care, as well as trauma care systems for use by field medics and surgeons. Research focus is on identifying more effective critical care technologies and protocols to treat severe bleeding, traumatic brain injury and other blast related injuries, and treatments for ocular injury and visual system dysfunction, as well as laboratory and animal studies of regenerating skin, muscle, nerves, and bone tissue for the care and treatment of battle-injured casualties. This project is being coordinated with the Defense Health Program.

Project (968) supports Congressional Interest Item funding for Cancer Detection applied research.

Project (FH2) funds research to support applied research directed toward the sustainment of a healthy force of Warfighters from accession through retirement.

Project (PA4) supports Congressional Interest Item funding for Nanofabricated Bioartificial Kidney applied research.

Project (UA8) supports Congressional Interest Item funding for BioFoam protein hydrogel for battlefield trauma.

Project (VB3) supports Congressional Interest Item funding for Medical Technology applied research.

Project (VB4) supports applied research in systems biology to provide a highly effective mechanism to integrate iterative biological tests, computer simulations, and animal studies. Such developmental efforts using systems biology could ultimately reduce the time and effort invested in medical product development. This project is being coordinated with the Defense Health Program.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army	DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	**R-1 ITEM NOMENCLATURE** PE 0602787A: *MEDICAL TECHNOLOGY*

Project (VJ4) supports project funds research over a planned five-year period to examine the mental and behavioral health of Soldiers to counter suicidal behavior. This work will focus on advancing the understanding of the multiple determinants of suicidal behavior, psychopathology (study of the causes and nature of abnormal behavior), psychological resilience, and role functioning. Work on this project is being performed by the National Institute of Mental Health through extramural cooperative research grants in collaboration with the Department of the Army. This project is being coordinated with the Defense Health Program.

All medical applied research is conducted in compliance with US Food and Drug Administration (FDA) or Environmental Protection Agency (EPA) regulations. The FDA requires thorough testing in animals (referred to as preclinical testing) to assure safety and, where possible, effectiveness (i.e., efficacy) prior to approving controlled clinical trials where these early (previously unproven in humans) drugs, vaccines, and medical devices are tested in humans. These clinical trials are conducted in three phases (Phase 1, 2, and 3) to prove safety and effectiveness of the drug/vaccine/device for the targeted disease/condition. Each successive clinical trial includes more voluntary study subjects. This PE focuses on identifying candidate solutions on rese

B. Program Change Summary ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Previous President's Budget	221.944	96.797	99.310	-	99.310
Current President's Budget	231.001	96.797	105.929	-	105.929
Total Adjustments	9.057	-	6.619	-	6.619
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	11.534	-			
• SBIR/STTR Transfer	-2.477	-			
• Adjustments to Budget Years	-	-	6.619	-	6.619

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602787A: *MEDICAL TECHNOLOGY*	PROJECT 869: *Warfighter Health Prot & Perf Stnds*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
869: *Warfighter Health Prot & Perf Stnds*	33.933	34.718	38.740	-	38.740	39.710	38.206	32.371	25.123	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project funds research to prevent and protect Soldiers from training and operational injuries, the development of mechanisms for detection of physiological and psychological health problems, the evaluation of hazards to head, neck, spine, eyes, and ears, the standards for rapid return-to-duty, and the determination of new methods to sustain and enhance performance across the operational spectrum. This research provides medical information important to the design and operational use of military systems, and this work forms the basis for behavioral, training, pharmacological (drug actions), and nutritional interventions.

The four main areas of study are:

(1) Physiological Health
(2) Environmental Health and Protection
(3) Injury Prevention and Reduction
(4) Psychological Health and Resilience

Promising efforts identified in this project are further matured under PE 0603002A, project MM3.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this project is performed by the Walter Reed Army Institute of Research (WRAIR), Silver Spring, MD; US Army Research Institute of Environmental Medicine (USARIEM), Natick, MA; US Institute of Surgical Research (USAISR), Fort Sam Houston, TX; and the US Army Aeromedical Research Laboratory (USAARL), Fort Rucker, AL.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Environmental Health and Protection - Physiological Awareness Tools and Warrior Sustainment in Extreme Environments	1.961	2.379	3.567
Description: This effort evaluates remote monitoring of Soldier physiological status and mitigating/eliminating the effects of heat, cold, altitude and other environmental stressors on Soldier performance.			
FY 2010 Accomplishments:			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602787A: *MEDICAL TECHNOLOGY*	PROJECT 869: *Warfighter Health Prot & Perf Stnds*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Employed hydration sensor technologies to conduct early device evaluations; determined the effectiveness of a 7- to 8-hour nighttime exposure to a normal-altitude, low-oxygen environment for high-altitude pre-acclimatization; evaluated current heat strain decision aid capabilities for potential future enhancement. ***FY 2011 Plans:*** Develop low-oxygen training guidelines based on analysis of low-oxygen exposure studies; perform biomedical modeling to define individual differences affecting heat regulation; develop methods and models to predict core temperature using identified thermal parameters. ***FY 2012 Plans:*** Will develop altitude acclimatization and work performance models for altitudes between 7,000 and 14,000 feet.			
Title: Physiological Health - Nutritional Sustainment and Fatigue Interventions ***Description:*** This effort evaluates methods for managing and controlling the effects of nutrition and fatigue on Soldier operational performance. ***FY 2010 Accomplishments:*** Demonstrated effectiveness of nutritional supplements for sustaining cognition during military operational stress; determined impact of nutritional supplements on enhancing post-exercise recovery; determined effectiveness of zinc supplements for reducing the incidence of diarrhea; developed models to study the relationship between hormonal regulation and eating behavior; evaluated individualized alertness and performance prediction model software for the Sleep Management System. ***FY 2011 Plans:*** Develop nutritional countermeasures (supplements taken to counter or offset injury or trauma) for diminished bone health in response to operational stress; define impact of micronutrient status on performance and immune function during military training; demonstrate protective effects of probiotics (dietary supplements) for sustaining digestive and immune function during operational stress; demonstrate effectiveness of nutritional supplements for promoting fat loss in overweight Warriors; conduct study to determine changes in sleep brain activity on Soldiers in theater; conduct a study to determine extent to which sleep duration impacts resilience/sensitivity to combat experiences. ***FY 2012 Plans:*** Will investigate whether there is any association between disturbances in nutritional health and the prevalence of Warfighter psychological disorders; will determine the impact of weight status on risk of musculoskeletal injury; will define the muscle	2.118	2.787	2.281

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602787A: *MEDICAL TECHNOLOGY*	PROJECT 869: *Warfighter Health Prot & Perf Stnds*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
metabolic responses to energy deficit for development of treatment interventions; will determine impact of nutritional status on blast recovery; will demonstrate effectiveness of a non-prescription medication for promoting fat loss in overweight Warriors.			
Title: Injury Prevention and Reduction - Neurosensory Injury Prevention ***Description:*** This effort analyzes and models the effects of mechanical and operational stressors on Soldier performance, to include acoustic and impact trauma, vision, vibration and jolt to model the effects of these stressors on the brain, spine, eyes and hearing. ***FY 2010 Accomplishments:*** Characterized blunt-impact protection capabilities of current and future helmet designs to develop biomedically-valid criteria for US Army Test and Evaluation Command (ATEC) to develop realistic visual headforms and to model eye injury vulnerabilities for candidate protection solutions; developed auditory test fixtures/headforms for model hearing protection solutions; conducted assessment of candidate drugs to prevent hearing loss. ***FY 2011 Plans:*** Determine head injury thresholds in boxers and paratroopers for risk assessment and development of biomedically-valid criteria for use in materiel development; complete eye injury dose-response modeling for vulnerability assessments using the instrumented headform system; extend laser injury diagnostics to animal models; using improved headforms, will assess ear protection strategies with simulated battle sounds and conduct assessments of vulnerability models for jobs that define job-specific strategies and interventions; conduct comparative analysis of foam and preformed eartips for use with the Communications Earplug. ***FY 2012 Plans:*** Will determine thresholds of operationally relevant blunt head injury; complete additional eye injury dose-response modeling for the instrumented headform system; assess effectiveness of existing hearing protection in continuous high-noise training environments using otoacoustic emissions (sound generated within the inner ear, which can be used as a measure of inner ear health); will develop biomedically-based injury mechanism criteria to define auditory risk potential; will examine both biophysical and animal models of blast to characterize the nature and extent of effects on the eye.	10.237	8.926	7.176
Title: Injury Prevention and Reduction - Musculoskeletal Injury Prevention ***Description:*** This effort evaluates and assesses the effects of repetitive motion during military operations and training on the human body. ***FY 2010 Accomplishments:***	4.561	4.775	5.212

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602787A: *MEDICAL TECHNOLOGY*	PROJECT 869: *Warfighter Health Prot & Perf Stnds*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Characterized performance deficits from Warfighter injury and identified promising interventions for rapid return-to-duty following musculoskeletal injury; provided high-resolution musculoskeletal injury data for use in the training and overuse injury prediction model; evaluated physical impact forces on the lower leg associated with prolonged running and fatigue; evaluated musculoskeletal adaptations in response to military-relevant training and injuries to assess mechanisms of skeletal muscle repair, regeneration, and adaptation. ***FY 2011 Plans:*** Develop recovery assessment tests that are used to develop return-to-duty recommendations after musculoskeletal injury; refine and validate the training, overuse, and injury prediction model to incorporate stress fracture data. ***FY 2012 Plans:*** Will develop and validate a model that will identify relationships among multi-sensory and musculoskeletal injuries; will develop and implement an injury risk methodology for remediation and prevention in an effort to mitigate lost duty-time due to musculoskeletal injury; will develop strategies to evaluate predictions and generalizations of musculoskeletal injuries.			
Title: Injury Prevention and Reduction - Injury Return to Duty Standards: ***Description:*** This effort evaluates standards and methods for the rapid return-to-duty of Soldiers following injury. ***FY 2010 Accomplishments:*** Characterized specific performance deficits from Warfighter brain, eye, and hearing injury as well as developed promising interventions for rapid return-to-duty; developed return-to-duty standards for mission-critical occupations following brain, eye, and hearing injury; determined appropriate clinical and physical health assessment tools to enable early return-to-duty. ***FY 2011 Plans:*** Develop measures of effectiveness for interventions with baseline criteria for Warriors with brain, eye, and hearing injury; develop preliminary techniques and technologies to accelerate and assist Wounded Warriors in rapid return to military duty. ***FY 2012 Plans:*** Will develop strategies to validate if hearing following blast or blunt trauma is a predictor of mild Traumatic Brain Injury (mTBI); will evaluate the human vestibular system (system which contributes to our sense of balance and spatial orientation) as a predictor of mTBI from blast and blunt trauma.	2.619	2.798	2.598
Title: Psychological Health - Psychological Resilience ***Description:*** This effort develops and validates interventions to prevent and reduce combat-related behavioral health problems, including symptoms of Post-Traumatic Stress Disorder (PTSD), depression, anger problems, anxiety, substance abuse, post-	5.023	5.219	15.197

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602787A: *MEDICAL TECHNOLOGY*	PROJECT 869: *Warfighter Health Prot & Perf Stnds*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
concussive symptoms, and other health risk behaviors. This effort also assesses and develops interventions to enhance and sustain resilience throughout the service member?s career. ***FY 2010 Accomplishments:*** Revised Battlemind and integrated it into the Army's resilience training program sponsored by Comprehensive Soldier Fitness (G-3/5/7); developed initial recommendations for methods writing to increase efficacy of Post-Deployment Health Reassessment Battlemind Training; conducted two-group randomized trials at Basic Combat Training demonstrating the impact of performance psychology training on Soldier mental skills and performance. ***FY 2011 Plans:*** Finalize assessments of components of Advanced Battlemind; determine lessons-learned from post-deployment health assessments and healthcare utilization to determine outcomes of psychological disorders. ***FY 2012 Plans:*** Establish key targeted skills that leaders employ to effectively build resilience and handle behavioral health issues in their units. Develop training content for these leader skills. Conduct studies to assess efficacy of new advanced resilience training modules post-deployment and deliver validated training. Validate enhanced resilience training techniques and assess optimal training delivery strategies. Assess post-deployment reintegration strategies. Develop and assess efficacy of spouse resilience training to enhance mental health and reintegration. Provide evidence-based guidance for adequate resourcing of mental health services for military families.			
Title: Psychological Health & Resilience - Suicide Prevention and Treatment of PTSD ***Description:*** This effort supports investigation of methods to treat PTSD in a military population and identifies causative and preventive factors in military suicides. ***FY 2010 Accomplishments:*** Initiated a new research effort that evaluated PTSD risk factors, including co-occurring mTBI and mental health problems, as well as other factors (such as combat action and the stressors associated with single/ multiple deployments) to improve diagnostic capabilities; conducted a laboratory study to compare sensitivity of existing neurocognitive tests to PTSD; collected and evaluated all data on the suicide intervention programs. ***FY 2011 Plans:*** Conduct a laboratory study to determine effects of PTSD on objectively measured sleep and neurocognitive performance; conduct studies to assess effectiveness of suicide interventions on suicide behavior. ***FY 2012 Plans:***	5.183	5.193	1.013

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602787A: *MEDICAL TECHNOLOGY*	PROJECT 869: *Warfighter Health Prot & Perf Stnds*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Will conduct assessments to identify long-term effects of deployment (multiple and prolonged deployments, dwell time, and combat intensity) related to mental health symptoms (PTSD, etc) and other illnesses (respiratory, hearing, functional, and cognitive); will assess effectiveness of increasing suicide awareness training with decreasing suicide-related behaviors and intentions.			
Title: Psychological Health & Resilience - Concussion/Mild Traumatic Brain Injury (mTBI) Interventions ***Description:*** This effort develops and evaluates methods to detect and treat concussion as well as identify and evaluate the effects of cognitive deficits in Soldiers during operations. ***FY 2010 Accomplishments:*** Compared initial sensitivity and practicality of neuropsychological performance tests/batteries for diagnosis of concussion in Soldiers and civilians; conducted a study to determine susceptibility to concussion based upon baseline psychological and neurological functioning; determined short-term effects of concussion on sleep patterns and neurocognitive performance. ***FY 2011 Plans:*** Assess the utility of neuropsychological measures for tracking/monitoring recovery rate from concussion; conduct a study to determine predictive value of a neuropsychological test for subsequent pos-concussive symptoms; conduct a study to determine changes in sleep parameters coincident with concussion and correlate this data with changes in neuropsychological performance. ***FY 2012 Plans:*** Will determine if concussion/mTBI-related neurocognitive performance deficits predict other objective neurophysiological indicators of functional capability; will assess impact of neurocognitive measures for tracking/monitoring recovery rate and for providing guidance for the determination of return-to-duty status.	2.231	2.641	1.696
Accomplishments/Planned Programs Subtotals	33.933	34.718	38.740

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602787A: *MEDICAL TECHNOLOGY*	PROJECT 870: *DOD MED DEF AG INF DIS*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
870: *DOD MED DEF AG INF DIS*	17.091	13.914	16.869	-	16.869	16.603	16.797	16.898	17.186	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project funds applied research for medical countermeasures to naturally occurring infectious diseases that pose a significant threat to the operational effectiveness of forces deployed outside the United States. Effective preventive countermeasures (protective/therapeutic drugs and vaccines, insect repellents and traps) protect the force from disease and sustain operations by avoiding the need for evacuations from the theater of operations. Diseases of military importance are malaria, bacterial diarrhea, and viral diseases (e.g., dengue fever and hantavirus). In addition to countermeasures, this project funds development of improved diagnostic tools to facilitate early identification of infectious disease threats in an operational environment, informing Commanders of the need to institute preventive actions and improved medical care. Major goals are to integrate genomics (DNA-based) and proteomics (protein-based) as well as other new biotechnologies into the development of new concepts for new vaccine, drug, and diagnostics candidates.

Research conducted in this project focuses on the following five areas:

(1) Drugs to Prevent/Treat Parasitic (symbiotic relationship between two organisms) Diseases
(2) Vaccines for Preventing Malaria
(3) Bacterial Threats
(4) Diagnostics and Disease Transmission Control
(5) Viral threats

For the development of drugs and biological products, studies in the laboratory and in animal models provide a proof-of-concept for these candidate products including safety, toxicity, and effectiveness, and are necessary to provide evidence to the US Food and Drug Administration (FDA) to justify approval for a product to enter into future human subject testing. Additional non-clinical studies are often needed in Applied Research even after candidate products enter into human testing during Advanced Technology Development, usually at the direction of the FDA, to assess potential safety issues. Drug and vaccine development bears high technical risk. Of those candidates identified as promising in initial screens, the vast majority are eliminated after additional safety, toxicity, and/or effectiveness testing. Similarly, vaccine candidates have a high failure rate, as animal testing may not be a good predictor of human response, and therefore candidate technologies/products are often eliminated after going into human trials. Because of this high failure rate, a continuing effort to identify other potential candidates to sustain a working pipeline of countermeasures is critical for replacing those products that fail in testing.

Work is managed by the US Army Medical Research and Materiel Command in coordination with the Naval Medical Research Center. The Army is responsible for programming and funding all DoD naturally occurring infectious disease research requirements, thereby precluding duplication of effort within the Military Departments.

Promising medical countermeasures identified in this project are further matured under PE 0603002A, project 810.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602787A: *MEDICAL TECHNOLOGY*	PROJECT 870: *DOD MED DEF AG INF DIS*

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this project is performed by the Walter Reed Army Institute of Research (WRAIR), Silver Spring, MD, and its overseas laboratories; the US Army Medical Research Institute of Infectious Diseases (USAMRIID), Fort Detrick, MD; and the Naval Medical Research Center (NMRC), Silver Spring, MD, and its overseas laboratories.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Drugs to Prevent/Treat Parasitic Diseases (harmful effects on host by an infecting organism) ***Description:*** This effort conducts assessments and improves candidate drugs coming from the DoD discovery program and from other collaborations for prevention and treatment of malaria to counter the continuing spread of drug resistance to current drugs. Conducts assessments in animal models of currently available drugs for use against cutaneous leishmaniasis (a skin-based disease transmitted by sand flies). This program selects the most effective and safe candidates for continued development and possible clinical testing. ***FY 2010 Accomplishments:*** Optimized chemical compounds that have potential to be effective drugs against malaria and/or leishmaniasis, including new candidates. Completed optimization of one lead malaria drug to test in animals, and prepared for possible initial testing in humans. ***FY 2011 Plans:*** Synthesize promising compounds in larger quantities to support preclinical studies. Drugs against malaria and/or leishmaniasis are further screened in animal tests for toxicity and effectiveness. Complete testing and prepare for FDA application for clinical testing in humans. ***FY 2012 Plans:*** Will undertake preclinical effectiveness and toxicity evaluations of selected antiparasitic compounds, both in vitro (outside the body) and in vivo (within a living organism) in rat/nonhuman primates and down-select for advancement to clinical studies in human.	4.570	3.385	3.925
Title: Vaccines for Prevention of Malaria ***Description:*** This effort conducts studies to investigate new candidate vaccines for preventing malaria, and selects the best candidate(s) for continued development. A highly effective vaccine would reduce or eliminate the use of anti-malarial drugs and would minimize the progression and impact of drug resistance to current/future drugs. ***FY 2010 Accomplishments:***	4.323	2.798	4.661

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602787A: *MEDICAL TECHNOLOGY*	PROJECT 870: *DOD MED DEF AG INF DIS*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Manufactured and tested DNA-based Plasmodium falciparum (the severe form of malaria) vaccine candidates in animal models to support a new vaccine application with the FDA; filed the FDA application to test these candidates in humans; evaluated the safety and effectiveness in animals of DNA-based Plasmodium falciparum vaccine candidates. ***FY 2011 Plans:*** Down-select among the vaccine candidates based on results from safety and effectiveness studies in animals; prepare for vaccine testing in locations where the disease occurs naturally. ***FY 2012 Plans:*** Will select candidate antigens (substance that when introduced into the body stimulates the production of an antibody) for further evaluation in preclinical testing and advance those candidates demonstrating effectiveness in primate testing toward further development.			
Title: Diagnostics and Disease Transmission Control: ***Description:*** This effort designs and prototypes new medical diagnostic and surveillance tools for the field, focusing on bedside and field-deployable diagnostic systems. Develops interventions that protect Warfighters from biting insects, such as sand flies (responsible for transmitting leishmaniasis) and mosquitoes (responsible for transmitting a variety of diseases including dengue fever, Japanese encephalitis, and malaria). ***FY 2010 Accomplishments:*** Developed passive insect repellent systems that do not require application of chemicals to skin or clothing; evaluated new tests for detecting infectious organisms within insects that transmit diseases; validated field-deployable point-of-care diagnostic devices to prepare for FDA review; developed a repository of standardized critical reagents for producing consistent reproducible results in both laboratory and field-based diagnostic devices. ***FY 2011 Plans:*** Develop super-attractant traps that remove biting insects from localized areas; conduct proof-of-concept testing of passive insect repellent systems; optimize hospital-based diagnostic devices for selected infectious disease agents to be transitioned to the Joint Biological Agent Identification System (JBAIDS) platform; increase repositories of clinical samples and reagents needed to develop and validate multiple new disease-specific diagnostic devices. ***FY 2012 Plans:***	2.100	2.070	1.709

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602787A: *MEDICAL TECHNOLOGY*	PROJECT 870: *DOD MED DEF AG INF DIS*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Will develop and optimize a multi-drug resistant organism diagnostic tool in collaboration with a commercial partner; will transition the dengue virus diagnostic test for the JBAIDS platform to advanced development following preclinical trials; will determine the next group of pathogens for which to develop rapid diagnostic tools with commercial partnership.			
Title: Viral Threats Research ***Description:*** This effort designs and laboratory tests new vaccine candidates against dengue and other hemorrhagic fever viruses (severe viral infection that causes internal bleeding) such as hantaviruses (cause of Korean hemorrhagic fever) and other lethal viruses (i.e., Lassa fever and Crimean-Congo hemorrhagic fever), as well as assesses other non-vaccine technologies to protect against such lethal viral diseases. ***FY 2010 Accomplishments:*** Developed reagents, assays, and animal models to test medical countermeasures for hantaviruses; developed molecular vaccines and antibody-based countermeasures for flaviviruses (dengue fever, a severe debilitating disease caused by a virus and transmitted by a mosquito); explored the feasibility of combining inactivated, molecular, and attenuated vaccines into a single vaccine that is effective against four dengue fever strains. ***FY 2011 Plans:*** Develop proof-of-concept molecular vaccines for viruses of military importance and support vaccine candidate development by providing necessary laboratory and animal tests; provide laboratory support for dengue fever vaccine testing in humans. ***FY 2012 Plans:*** Will continue to develop proof-of-concept molecular vaccines for viruses of military importance; will conduct effectiveness studies to develop and/or maintain vaccine test site infrastructure; will refine and validate assays in animal studies for future testing of dengue fever vaccine trials; will establish partnerships with industry for pre-clinical and clinical evaluation of medical countermeasures.	2.484	2.861	2.989
Title: Bacterial Threats ***Description:*** This effort conducts studies to develop antibacterial countermeasures, including vaccine candidates, to prevent diarrhea (a common disease in deployed troops caused by E. coli, Campylobacter and Shigella), meningitis (a threat to trainee and deployed troops and military families), wound infection, and scrub typhus (a debilitating mite-borne disease that is developing resistance to currently available antibiotics). ***FY 2010 Accomplishments:*** Completed evaluation of E. coli subunit vaccine in monkeys; evaluated alternative Shigella constituents as potential vaccine candidates in animals; manufactured lead candidate Campylobacter vaccine for evaluation in humans; transitioned a	3.614	2.800	3.585

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602787A: *MEDICAL TECHNOLOGY*	PROJECT 870: *DOD MED DEF AG INF DIS*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
multicomponent Group B meningococcal vaccine to the next phase of development; evaluated scrub typhus for drug resistance, identified new proteins as candidate vaccine components, and evaluated vaccine delivery methods in animals; evaluated new therapeutic approaches to accelerate wound healing, such as vacuum-assisted closure of wounds using binding agents to kill bacteria. ***FY 2011 Plans:*** Prepare an alternative E. coli vaccine for testing in humans; evaluate alternative Shigella constituents as potential vaccine candidates in animals; test lead candidate Campylobacter vaccine in animals; continue to evaluate scrub typhus for drug resistance, identify new proteins as candidate vaccine components, and evaluate vaccine delivery methods in animals. ***FY 2012 Plans:*** Will determine level of protection of alternative E. coli vaccine in animal challenge studies (animal vaccinated and challenged with bacteria causing diarrhea); will perform animal and toxicology studies on alternative (Invaplex-AR) Shigella vaccine; will conduct human clinical trials on 12 to 24 healthy volunteers to determine safety of best lead candidate Campylobacter vaccine; will perform animal wound infection studies on several candidate products to prevent wound infection and biofilm (thin resistant layer of microorganisms that helps bacteria survive in wounds) formation.			
Accomplishments/Planned Programs Subtotals	17.091	13.914	16.869

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602787A: *MEDICAL TECHNOLOGY*	PROJECT 873: *HIV EXPLORATORY RSCH*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
873: *HIV EXPLORATORY RSCH*	8.914	9.243	9.392	-	9.392	9.582	9.638	9.584	9.747	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project funds research on the human immunodeficiency virus (HIV), which causes Acquired Immunodeficiency Syndrome (AIDS). Work in this area includes developing improved identification methods to determine genetic diversity of the virus, and evaluating and preparing overseas sites for future vaccine trials. Additional activities include developing candidate vaccines for preventing HIV and undertaking preclinical studies (studies required before testing in humans) to assess vaccine for potential to protect and/or manage the disease in infected individuals.

This program is jointly managed through an Interagency Agreement between the US Army Medical Research and Materiel Command and the National Institute of Allergy and Infectious Diseases of the National Institutes of Health. This project contains no duplication of effort within the Military Departments or other government organizations.

Work is related to and fully coordinated with work funded in PE 0603105A, project H29.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this project is performed by the Walter Reed Army Institute of Research (WRAIR) and the Naval Medical Research Center (NMRC), Silver Spring, MD, and their overseas laboratories. The Henry M. Jackson Foundation (HMJF), located in Rockville, MD provides support for FDA testing and other research under a cooperative agreement.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: HIV Research Program	8.914	9.243	9.392
Description: This effort supports projects assessing new HIV vaccine candidates, worldwide vaccine test site development, HIV disease outbreaks, and genetic attributes of HIV threat.			
FY 2010 Accomplishments: Continued to identify and characterize different HIV subtypes present in East Africa and Asia involved with the global epidemic of HIV-infected populations to include in vaccine development strategy; developed new human study test sites in Uganda to expand testing facilities, including production of new vaccine candidates against selected HIV subtypes found in East Africa; controlled production quality of new vaccine candidates to be used in humans.			
FY 2011 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602787A: *MEDICAL TECHNOLOGY*	PROJECT 873: *HIV EXPLORATORY RSCH*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Test the new East African subtype-based candidate vaccine in animals; identify and characterize new HIV infections; develop new field sites in Tanzania and Nigeria for future testing of vaccine candidates in humans; identify manufacturing processes with multiple combinations of vaccine candidates. ***FY 2012 Plans:*** Will characterize and develop new populations at high risk of being infected with HIV for clinical evaluation of potential vaccine candidates at overseas sites; will study the impact of human genetics on HIV vaccine development, disease acquisition, and disease progression; will manufacture vaccines for various HIV subtypes present worldwide and complete testing in animals; will evaluate and implement methods of disease prevention through clinical research.			
Accomplishments/Planned Programs Subtotals	8.914	9.243	9.392

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602787A: *MEDICAL TECHNOLOGY*	PROJECT 874: *CBT CASUALTY CARE TECH*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
874: *CBT CASUALTY CARE TECH*	17.363	16.782	17.044	-	17.044	17.417	17.293	17.171	17.486	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project funds the development and assessment of concepts, techniques, and materiel that improve survivability and ensure better medical treatment outcomes for Warfighters wounded in combat and other military operations. Combat casualty care research addresses: control of severe bleeding, revival and stabilization, prognostics and diagnostics for life support systems (predictive indicators and decision aids), treatment of burns, and Traumatic Brain Injury (TBI). Clinical and rehabilitative medicine research addresses: tissue repair including transplant technologies, orthopedic, eye injuries and face trauma.

Research involves extensive collaboration with multiple academic institutions to develop treatments for combat wounds through the Armed Forces Institute of Regenerative Medicine. This project contains no duplication of effort within the Military Departments or other government organizations.

Research conducted in this project focuses on the following five areas:

(1) Damage Control Resuscitation
(2) Combat Trauma Therapies
(3) Combat Critical Care Engineering
(4) Clinical and Rehabilitative Medicine
(5) Traumatic Brain Injury

All drugs, biological products, and medical devices, are developed in accordance with US Food and Drug Administration regulations, which governs testing in animals to assess safety, toxicity, and effectiveness prior to conducting human subject clinical trials.

Promising efforts identified in this project are further matured under PE 0603002A, project 840.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work on this project is performed by the US Army Institute of Surgical Research (USAISR), the US Army Dental Trauma Research Detachment, Fort Sam Houston, TX; the Walter Reed Army Institute of Research (WRAIR), Silver Spring, MD; and the Armed Forces Institute of Regenerative Medicine (AFIRM), Fort Detrick, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Damage Control Resuscitation	5.697	7.405	5.170

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602787A: *MEDICAL TECHNOLOGY*	PROJECT 874: *CBT CASUALTY CARE TECH*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: This effort supports knowledge products, materials, and systems for control of internal bleeding, minimizing the effects of traumatic blood loss, preserving blood, blood products, and resuscitation following trauma. ***FY 2010 Accomplishments:*** Continued animal studies of freeze-dried plasma; developed and evaluated performance of candidate blood substitutes and expanders (e.g., frozen and freeze-dried platelets); tested treatment interventions to stop internal bleeding in an animal model; characterized the body's blood clotting mechanism associated with head injury bleeding and other trauma to identify ways to better control clotting and determine the effects on resuscitation; continued evaluation in animal models of various combinations of plasma, clotting factors, and Complement Inhibitors (CI's) (a series of disease-fighting proteins and their reactions in the body) as therapies to stop severe bleeding and treat trauma. ***FY 2011 Plans:*** Complete identification and characterization of frozen and freeze-dried blood substitutes and expanders; complete testing of interventions to stop internal bleeding and transition most promising candidates to safety and effectiveness testing in human subjects; continue to identify and assess potential ways to control blood clotting; begin investigation of treatment interventions to mitigate effects of head injury on resuscitation; begin to evaluate products to treat intracavitary (non-compressible) or junctional (compressible) hemorrhage; complete animal study of blood components and CI's. ***FY 2012 Plans:*** Will initiate studies of blood vessels, platelets (cell fragments that play a role in blood clotting), and coagulation (blood clotting) factor contributions to the body?s ability to properly clot blood following trauma, as well as determine whether blood products cause inflammation.			
Title: Combat Trauma Therapies ***Description:*** This effort supports efforts to enhance the ability to diagnose and stabilize casualties with survivable wounds to the brain, face and head, and extremities to include accelerating wound healing and repair of damaged tissue. ***FY 2010 Accomplishments:*** Began several injury studies of Penetrating Ballistic-type Brain Injury (PBBI) in large animals; conducted animal study of oral surgical dressing; evaluated promising repair methods in laboratory and animal models. ***FY 2011 Plans:*** Continue poly-trauma studies (multiple injuries) of PBBI in large animals; complete oral surgical dressing study; continue to develop therapeutic strategies (drugs, stem cells and brain cooling) to manage TBI. ***FY 2012 Plans:***	4.031	3.168	1.634

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602787A: *MEDICAL TECHNOLOGY*	PROJECT 874: *CBT CASUALTY CARE TECH*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Will develop local antibiotic delivery that can be used with Negative Pressure Wound Therapy; conduct studies of pre- vs. post-deployment dental classification; conduct research in skin, muscle, and bone repair. Work related to neuroprotection research will move to the TBI program. Regenerative efforts in craniomaxillofacial trauma (soft tissue and skeletal injuries to the face, head and neck) will move to the Clinical and Rehabilitative Medicine Research Program.			
Title: Combat Critical Care Engineering ***Description:*** This effort supports development of diagnostic and therapeutic medical devices as well as associated algorithms, software, and data-processing systems for resuscitation, stabilization, life support, and surgical support that can be applied across the pre-hospital, operational field setting and initial definitive care facilities. ***FY 2010 Accomplishments:*** Conducted large animal studies evaluating change in electrical signals in the brain as a way to measure the degree of shock from blood loss. ***FY 2011 Plans:*** Evaluate algorithms being developed to control devices delivering oxygen under conditions of varying rates and levels of respiration, as well as for ability to track resuscitation in real-time; continue testing devices for use in intensive care units. ***FY 2012 Plans:*** Will develop advanced monitoring technology to rapidly and accurately detect early-onset of blood loss, continuously estimate blood loss volume, and predict patient's risk for cardiovascular collapse.	1.228	1.409	0.751
Title: Clinical and Rehabilitative Medicine ***Description:*** This effort supports laboratory and animal studies of regenerating skin, muscle, nerve and bone tissue for the care and treatment of battle-injured casualties, as well as studies regarding ocular and visual system traumatic injury. ***FY 2010 Accomplishments:*** Conducted studies of compounds to reduce cellular damage during compartment syndrome (nerve or tendon constriction in an enclosed space) in laboratory and animal models; tested a tissue-engineered functional human facial expression muscle; evaluated a biodegradable tissue-lined stent; tested reconstruction of a facial defect in the skull by using synthetic bone scaffold material; tested a dressing that mimics fetal skin structure to prevent wound scarring. ***FY 2011 Plans:*** Conduct studies using relevant animals to evaluate the most promising treatments for repairing traumatic eye injuries; continue regenerative medicine studies addressing ways to construct a nerve conduit scaffold to provide a guide for nerve regeneration;	6.407	4.800	7.706

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602787A: *MEDICAL TECHNOLOGY*	PROJECT 874: *CBT CASUALTY CARE TECH*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
evaluate engineered cartilage; study methods to reduce post-burn injury progression by use of inflammation inhibitors and agents to prevent cell death; explore the use of stem cells to repair soft and hard tissue defects. ***FY 2012 Plans:*** Will evaluate novel drug delivery, diagnostic and/or tissue repair strategies for eye injury; and evaluate candidate strategies for maxillofacial (head, neck, face and jaw) reconstruction, including wound-healing control and tissue engineering/regeneration techniques to restore facial features. Continue development and standardization of animal models for an artificial means for guiding nerve regeneration; continue studies of chronic bone defect and burn repair; continue studies of soft tissue repair strategies; continue development and testing of experimental stem cell therapies and scaffolds (tissue-engineered grafts) in animal models.			
Title: Traumatic Brain Injury ***Description:*** This effort supports development of drugs and therapeutic strategies to manage brain injury resulting from battlefield trauma, to include mature drug technologies, novel stem cell strategies, and selective brain cooling. ***FY 2012 Plans:*** Will realign neuroprotection research from the Combat Trauma Therapies task area to the TBI task area. Will continue studies of a single and combination drug therapies of silent seizures, animal studies of stem cell therapy for repair of brain tissue, and optimizing cooling temperature and duration of cooling to improve functional recovery.	-	-	1.783
Accomplishments/Planned Programs Subtotals	17.363	16.782	17.044

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602787A: *MEDICAL TECHNOLOGY*	PROJECT 878: *HLTH HAZ MIL MATERIEL*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
878: *HLTH HAZ MIL MATERIEL*	-	0.078	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project supports the Medical and Survivability technology areas with a focus on providing Soldier protection from health hazards associated with materiel and operational environments. Emphasis is placed on identifying health hazards inherent to the engineering design and operational use of equipment, systems, and materiel used in Army combat operations and training. Areas of emphasis include battlefield lasers, ballistic and mechanical injury (e.g., models of protection by soft body armor), and health hazards of operations in extreme environments and toxic environments. Hazards addressed include blast overpressure generated by weapons systems, toxic chemical hazards associated with deployment into environments contaminated with industrial and agricultural chemicals (effort complements ongoing Defense Threat Reduction Agency initiatives for chemical/biological threat agent detection), directed energy sources (laser), and environmental stressors (heat, cold, and high altitude). Specific research tasks include characterizing the extent of exposure to potential hazards; delineating exposure thresholds for illness, injury, and performance degradation; establishing biomedical databases to support protection criteria; and developing and validating models for hazard assessment, injury prediction, and health and performance protection.

In FY10, project 878 was consolidated into Project 869.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Mater Plan.

Work in this project is performed by the Walter Reed Army Institute of Research (WRAIR), Silver Spring, MD; the US Army Research Institute of Environmental Medicine (USARIEM), Natick, MA; the US Army Center for Environmental Health Research, Fort Detrick, MD; and the US Army Aeromedical Research Laboratory, Fort Rucker, AL.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Systems Biology	-	0.078	-
Description: Systems Biology and Network Science			
FY 2011 Plans: Beginning in FY10, this effort moved to project 869.			
Accomplishments/Planned Programs Subtotals	-	0.078	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602787A: *MEDICAL TECHNOLOGY*	PROJECT 878: *HLTH HAZ MIL MATERIEL*

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602787A: *MEDICAL TECHNOLOGY*	PROJECT 879: *MED FACT ENH SOLD EFF*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
879: *MED FACT ENH SOLD EFF*	-	0.106	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project supports applied research with a focus on sustaining and enhancing Soldier health and performance during military operations in the full spectrum of military environments. Emphasis is placed on the identification of baseline physiological performance and assessment of degradations produced by operational stressors. The resulting databases and collection of rules and algorithms for performance degradation in multi-stressor environments form the basis for the development of behavioral, training, pharmacological, and nutritional interventions that include psychological debriefing to prevent degradation in Soldier health and sustain Soldier performance. Key stressors include psychological stress from isolation, new operational roles, frequent deployments, inadequate restorative sleep, prolonged physical effort, and inadequate hydration in extreme environments. This project also assesses the adverse effect of shifting biological rhythms during deployments across multiple time zones (extreme jet lag), night operations, and thermal as well as altitude stress.

In FY10, project 879 was consolidated into project 869.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this project is performed by the Walter Reed Army Institute of Research (WRAIR), Silver Spring, MD; the US Army Research Institute of Environmental Medicine, Natick, MD; and the US Army Aeromedical Research Laboratory, Fort Rucker, AL.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: High Altitude Research	-	0.106	-
Description: High Altitude Research ***FY 2011 Plans:*** Beginning in FY10, this effort was consolidated into project 869.			
Accomplishments/Planned Programs Subtotals	-	0.106	-

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602787A: *MEDICAL TECHNOLOGY*	PROJECT 879: *MED FACT ENH SOLD EFF*

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602787A: *MEDICAL TECHNOLOGY*	PROJECT 968: *SYNCH BASED HI ENERGY RADIATION BEAM CANCER DETECT*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
968: *SYNCH BASED HI ENERGY RADIATION BEAM CANCER DETECT*	5.969	-	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for Cancer Detection applied research.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Synchrotron-Based Scanning Research with the Neuroscience and Proton Institute	5.969	-	-
Description: This is a Congressional Interest Item.			
FY 2010 Accomplishments: Conducted research into Synchrotron-Based Scanning with the Neuroscience and Proton Institute.			
Accomplishments/Planned Programs Subtotals	5.969	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602787A: *MEDICAL TECHNOLOGY*	PROJECT FH2: *FORCE HEALTH PROTECTION - APPLIED RESEARCH*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
FH2: *FORCE HEALTH PROTECTION - APPLIED RESEARCH*	7.995	10.779	9.136	-	9.136	7.127	7.212	7.376	7.493	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project funds research to support applied research directed toward the sustainment of a healthy force of Warfighters from accession through retirement. This research focuses on enhanced protection of Soldiers against health threats in military operations and training. Stressors that adversely affect individual Soldier health readiness are identified and studied to develop interventions that will protect Soldiers and improve their health and performance in stressful environments. This is follow-on research that extends and applies findings from over a decade of research on Gulf War Illnesses and other chronic multi-symptom illnesses that have suspected nerve and behavioral alterations due to environmental contaminants and deployment stressors. Key databases include the Millennium Cohort Study and the Total Army Injury and Health Outcomes Database. These databases allow us to evaluate interactions of psychological stress and other deployment and occupational stressors that affect Warfighter health behaviors.

Force Health Protection applied research is conducted in close coordination with the Department of Veterans Affairs. This project contains no duplication with any effort within the Military Departments and includes direct participation by other Services working on Army projects.

Research conducted in this project focuses on the following three areas:

(1) Physiological Response and Blast and Blunt Trauma Models of Thoracic (chest) and Pulmonary (lung) Injuries
(2) Millennium Cohort Research
(3) Biomarkers of Exposure and Environmental Biomonitoring.

Promising efforts identified in this project are further matured under PE 0603002A, project FH4.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this project is performed by the US Army Center for Environmental Health Research, Fort Detrick, MD; the Naval Health Research Center (NHRC), San Diego, CA; and the US Army Research Institute of Environmental Medicine (USARIEM), Natick, MA.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Millennium Cohort Research	3.289	4.212	4.401

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: This effort supports a long-term study of Soldiers that includes psychological, physical, and spiritual impacts of military service throughout their lifetime. ***FY 2010 Accomplishments:*** Performed analyses of newly reported Post-Traumatic Stress Disorder (PTSD), depression, and anxiety symptoms among Millennium Cohort participants in conjunction with increased mental and physical health problems; linked Millennium Cohort data with DoD and Veteran Administration health risk databases; conducted long-term studies to investigate the use of tobacco and alcohol among Service members in order to provide policy recommendations that enhance the long-term health of deploying forces. ***FY 2011 Plans:*** Conduct analyses to determine resilience factors for PTSD symptoms over time; conduct analysis to determine factors that influence resistance to depression symptoms over time and enhance mental resilience in deploying forces; conduct death analysis with specific interest in modifying factors for post-combat suicide. ***FY 2012 Plans:*** Will develop policy recommendations and potential intervention strategies for reduction of PTSD, depression, and anxiety symptoms and factors with a goal to reduce overall mental health symptoms.			
Title: Biomarkers of Exposure and Environmental Biomonitoring ***Description:*** This effort supports development and evaluation of methods to detect environmental contamination and toxic exposure during military operations. ***FY 2010 Accomplishments:*** Reviewed available sensor technology and conducted down-selection of sensors best suited to meet user performance requirements; evaluated biomarkers of exposure to selected Militarily Relevant Chemicals (MRCs) and evaluated relevant toxicity pathways to develop a method to detect toxic exposure in Soldiers. ***FY 2011 Plans:*** Evaluate biomarkers of exposure to additional MRCs; evaluate and accelerate discovery methods for new biomarkers; optimize individual toxicity sensor performance and minimize system components to comply with logistical deployment requirements for use in the final increment of the Environmental Sentinel Biomonitor.	2.546	2.936	-
Title: Physiological Response and Blast and Blunt Trauma Models of Thoracic (Chest) and Pulmonary (Lung) Injury	2.160	3.631	4.735

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: This effort supports modeling and assessment of the combined effects of blast, impact, and ballistic trauma on the chest and lung system. ***FY 2010 Accomplishments:*** Conducted modeling of lung function disruption due to blunt-force trauma to the chest; combined thoracic (chest) blunt trauma model with performance decrement models and compared with large animal exercise data for the development of advanced survivability assessment and health hazard analysis tools. ***FY 2011 Plans:*** Refine combined thoracic (chest) blunt trauma/physiology models against combined thoracic blunt trauma and inhalation large animal exposure tests; combine thoracic blast trauma model with performance decrement models to develop an integrated tool for survivability assessment and health hazard analysis. ***FY 2012 Plans:*** Will develop software that evaluates the combined physiological effects of toxic gas exposure; will assess software that estimates lung, heart, and rib injury from blunt trauma due to debris impact (secondary blast injury); will assess increased functionality and support end-users for health hazard assessment, survivability assessment, and personal protection evaluation and improvement.			
Accomplishments/Planned Programs Subtotals	7.995	10.779	9.136

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602787A: *MEDICAL TECHNOLOGY*	PROJECT PA4: *WOUND HEALING PROJECT (CA)*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
PA4: *WOUND HEALING PROJECT (CA)*	1.989	-	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for Wound Healing applied research.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Rapid Wound Healing Technology Development	1.989	-	-
Description: This is a Congressional Interest Item.			
FY 2010 Accomplishments: Researched rapid wound healing technology.			
Accomplishments/Planned Programs Subtotals	1.989	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602787A: *MEDICAL TECHNOLOGY*	PROJECT UA8: *PROTEIN HYDROGEL (CA)*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
UA8: *PROTEIN HYDROGEL (CA)*	0.796	-	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for Protein Hydrogel applied research.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: BioFoam Protein Hydrogel for Battlefield Trauma	0.796	-	-
Description: This is a Congressional Interest Item.			
FY 2010 Accomplishments: Researched biofoam protein hydrogel for battlefield trauma.			
Accomplishments/Planned Programs Subtotals	0.796	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602787A: *MEDICAL TECHNOLOGY*	PROJECT VB3: *MEDICAL TECHNOLOGY INITIATIVES (CA)*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
VB3: *MEDICAL TECHNOLOGY INITIATIVES (CA)*	125.821	-	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for Medical Technology applied research.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Cancer Prevention Through Remote Biological Sensing ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Cancer Prevention Through Remote Biological Sensing	1.592	-	-
Title: Center for Injury Biomechanics ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Center for Injury Biomechanics	3.978	-	-
Title: Impact of Intensive Lifestyle Modification on Chronic Medical Conditions ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Impact of Intensive Lifestyle Modification on Chronic Medical Conditions	1.492	-	-
Title: Neuroscience Research Consortium to Study Spinal Cord Injury ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Neuroscience Research Consortium to Study Spinal Cord Injury	1.194	-	-
Title: Cold Spring Harbor Laboratory Women's Cancer Genomics Center ***Description:*** This is a Congressional Interest Item.	2.387	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
FY 2010 Accomplishments: Cold Spring Harbor Laboratory Women's Cancer Genomics Center			
Title: New Vaccines to Fight Respiratory Infection ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** New Vaccines to Fight Respiratory Infection	4.775	-	-
Title: Complementary and Alternative Medicine Research (MIL-CAM) ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Complementary and Alternative Medicine Research (MIL-CAM)	5.173	-	-
Title: Lehman Injury Research Center-Ryder Trauma Center ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Lehman Injury Research Center-Ryder Trauma Center	3.183	-	-
Title: Advanced Functional Nanomaterials for Biological Processes ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Advanced Functional Nanomaterials for Biological Processes	2.387	-	-
Title: Battlefield Research Accelerating Virtual Environments for Mil Indiv Neuro Disorders (BRAVEMIND) ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Battlefield Research Accelerating Virtual Environments for Mil Indiv Neuro Disorders (BRAVEMIND)	0.995	-	-
Title: Control of Vector-Borne Diseases ***Description:*** This is a Congressional Interest Item.	2.387	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
FY 2010 Accomplishments: Control of Vector-Borne Diseases			
Title: Extended Duration Silver Wound Dressing-Clinical Trials ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Extended Duration Silver Wound Dressing-Clinical Trials	0.796	-	-
Title: Nano-Imaging Agents for Early Disease Detection ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Nano-Imaging Agents for Early Disease Detection	0.796	-	-
Title: Self-Powered Prosthetic Limb Technology ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Self-Powered Prosthetic Limb Technology	1.592	-	-
Title: Development of Drugs for Malaria and Leishmaniasis in US Military and Civilian Personnel ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Development of Drugs for Malaria and Leishmaniasis in US Military and Civilian Personnel	3.104	-	-
Title: Expansion and Development, Upper and Lower Bionic Limbs ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Expansion and Development, Upper and Lower Bionic Limbs	1.990	-	-
Title: Optical Neural Techniques for Combat/Post-Trauma Healthcare ***Description:*** Optical Neural Techniques for Combat/Post-Trauma Healthcare	3.482	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
FY 2010 Accomplishments: This is a Congressional Interest Item.			
Title: National Eye Eval & Research Network (NEER)-Clinical Trials of Orphan Retinal Degenerative Diseases ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** National Eye Eval & Research Network (NEER)-Clinical Trials of Orphan Retinal Degenerative Diseases	2.387	-	-
Title: New York Medical College Bioterrorism Research ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** New York Medical College Bioterrorism Research	0.131	-	-
Title: Center for Engineered Biomedical Devices ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Center for Engineered Biomedical Devices	0.286	-	-
Title: Lightweight, Battery Driven and Battlefield Deployment Ready NG Feeding Tube Cleaner ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Lightweight, Battery Driven and Battlefield Deployment Ready NG Feeding Tube Cleaner	0.496	-	-
Title: Eye Trauma and Visual Restoration ***Description:*** Eye Trauma and Visual Restoration ***FY 2010 Accomplishments:*** This is a Congressional Interest Item.	0.795	-	-
Title: Carbide-Derived Carbon for Treatment of Combat Related Sepsis ***Description:*** This is a Congressional Interest Item.	0.796	-	-

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
FY 2010 Accomplishments: Carbide-Derived Carbon for Treatment of Combat Related Sepsis			
Title: Clinical Trial to Investigate Efficacy of Human Skin Substitute ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Clinical Trial to Investigate Efficacy of Human Skin Substitute	0.796	-	-
Title: Cleveland Clinic Rehabilitation Research ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Cleveland Clinic Rehabilitation Research	0.796	-	-
Title: Military Family Empowerment Initiative ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Military Family Empowerment Initiative	0.796	-	-
Title: Myositis Association-Exposure to Environmental Toxins ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Myositis Association-Exposure to Environmental Toxins	0.995	-	-
Title: Nanofiber Based Synthetic Bone Repair Devices for Limb Salvage ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Nanofiber Based Synthetic Bone Repair Devices for Limb Salvage	0.995	-	-
Title: Regenerative Medicine for Battlefield Injuries ***Description:*** This is a Congressional Interest Item.	0.995	-	-

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
FY 2010 Accomplishments: Regenerative Medicine for Battlefield Injuries			
Title: Center for Bone Repair and Military Readiness ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Center for Bone Repair and Military Readiness	1.194	-	-
Title: Flu Vaccine Technology Program ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Flu Vaccine Technology Program	1.194	-	-
Title: Non-Leaching Antimicrobial Surface for Orthopedic Devices ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Non-Leaching Antimicrobial Surface for Orthopedic Devices	1.194	-	-
Title: Technology Solutions for Brain Cancer Detection and Treatment ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Technology Solutions for Brain Cancer Detection and Treatment	1.194	-	-
Title: Westchester County Medical Center Health Imaging Upgrades ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Westchester County Medical Center Health Imaging Upgrades	1.194	-	-
Title: Stabilized Hemoglobin Wound Healing Development ***Description:*** This is a Congressional Interest Item.	1.194	-	-

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
FY 2010 Accomplishments: Stabilized Hemoglobin Wound Healing Development			
Title: Alginate Oligomers to Treat Infectious Microbial Biofilms ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Alginate Oligomers to Treat Infectious Microbial Biofilms	1.592	-	-
Title: Diabetes Care in the Military ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Diabetes Care in the Military	1.592	-	-
Title: Evaluation of Integrative Approaches to Resilience ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Evaluation of Integrative Approaches to Resilience	1.592	-	-
Title: Neuro-Performance Research ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Neuro-Performance Research	1.592	-	-
Title: Portable Low-Volume Therapy for Severe Blood Loss ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Portable Low-Volume Therapy for Severe Blood Loss	1.592	-	-
Title: Regenerative Medicine Research ***Description:*** This is a Congressional Interest Item.	1.592	-	-

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
FY 2010 Accomplishments: Regenerative Medicine Research			
Title: Research to Develop Strategies to Improve Prognosis of Soldiers Suffering Abdominal Trauma ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Research to Develop Strategies to Improve Prognosis of Soldiers Suffering Abdominal Trauma	1.592	-	-
Title: Research to Treat Cancerous Brain Tumors using Neural Stem Cells ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Research to Treat Cancerous Brain Tumors using Neural Stem Cells	1.592	-	-
Title: Lightweight Medical Devices ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Lightweight Medical Devices	1.592	-	-
Title: Epigenetic Disease Research ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Epigenetic Disease Research	1.592	-	-
Title: Neuroprosthetics and BioMEMS Development Project ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Neuroprosthetics and BioMEMS Development Project	1.592	-	-
Title: Minimizing Shock in Battlefield Injuries ***Description:*** This is a Congressional Interest Item.	1.892	-	-

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
FY 2010 Accomplishments: Minimizing Shock in Battlefield Injuries			
Title: Jackson Health System Military Trauma Training Enhancement Initiative ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Jackson Health System Military Trauma Training Enhancement Initiative	1.989	-	-
Title: Operating Room of the Future ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Operating Room of the Future	1.990	-	-
Title: School of Nursing Advancement ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** School of Nursing Advancement	1.990	-	-
Title: Identification of New Drug Targets in Multi-Drug Resistant Bacterial Infections ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Identification of New Drug Targets in Multi-Drug Resistant Bacterial Infections	1.990	-	-
Title: Long-term Pain and Infection Management for Combat Casualty Care ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Long-term Pain and Infection Management for Combat Casualty Care	2.308	-	-
Title: Florida Trauma Rehabilitation Institute for Returning Military Personnel ***Description:*** This is a Congressional Interest Item.	2.386	-	-

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
FY 2010 Accomplishments: Florida Trauma Rehabilitation Institute for Returning Military Personnel			
Title: Framework for Electronic Health Record-Linked Predictive Models ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Framework for Electronic Health Record-Linked Predictive Models	2.386	-	-
Title: SupportNet for Frontline Providers ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** SupportNet for Frontline Providers	2.387	-	-
Title: Center for Respiratory Biodefense ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Center for Respiratory Biodefense	2.387	-	-
Title: Advanced Bioengineering for Enhancement of Solider Survivability ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Advanced Bioengineering for Enhancement of Solider Survivability	2.487	-	-
Title: Online Health Services Optimization ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Online Health Services Optimization	3.104	-	-
Title: Imp Soldier Recovery from Catastrophic Bone Injury ***Description:*** This is a Congressional Interest Item.	3.183	-	-

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
FY 2010 Accomplishments: Improved Soldier Recovery from Catastrophic Bone Injury			
Title: Center for Advanced Emergency Response ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Center for Advanced Emergency Response	3.979	-	-
Title: Plant-Based Vaccine Research ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Research vaccines produced from plants.	1.990	-	-
Title: Northern Illinois Proton Treatment and Research Center ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Funded research on cancer treatment using proton therapy.	2.784	-	-
Title: Center for Ophthalmic Innovation ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Funded the Center for Ophthalmic Innovation.	2.387	-	-
Title: Vision Integrating Strategies in Opthamology and Neurochemistry (VISION) ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Researched causes and effects of visual damage resulting from both ocular injuries and eye exposure to the elements during combat operations.	3.183	-	-
Title: Plug-In Architecture for DoD Medical Imaging	1.194	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Continued the development of a plug-in architecture that will make medical imaging hardware and software compatible.			
Title: Military Family Coping Patterns ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Researched the effects of Post Traumatic Stree Disorder on military families.	0.398	-	-
Title: Carbon Nanotube Production ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Researched carbon-based nanoparticles in order to develop a dramatically improved nanocenter for use in patients.	1.592	-	-
Title: Hadron Particle Therapy ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Research cancer treatment using hadron particle therapy.	1.592	-	-
Accomplishments/Planned Programs Subtotals	125.821	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

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APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602787A: *MEDICAL TECHNOLOGY*	PROJECT VB4: *SYSTEM BIOLOGY AND NETWORK SCIENCE TECHNOLOGY*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
VB4: *SYSTEM BIOLOGY AND NETWORK SCIENCE TECHNOLOGY*	1.130	1.177	4.748	-	4.748	4.850	4.887	4.905	4.989	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project supports applied research in systems biology to provide a highly effective mechanism to integrate iterative biological tests, computer simulations, and animal studies. Such developmental efforts using systems biology could ultimately reduce the time and effort invested in medical product development.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this project is performed by the US Army Medical Research and Materiel Command, Fort Detrick, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Systems Biology	1.130	1.177	4.748
Description: This project supports multidisciplinary applied research in systems biology designed to integrate animal studies, computational simulations, and biologics (products derived from living organisms). ***FY 2010 Accomplishments:*** Established animal models and protocols for multidisciplinary investigations of heat stroke-caused multi-organ failure. ***FY 2011 Plans:*** Refine experimental model systems, identify markers for prediction of multi-organ failure resulting from heat injury, and develop supporting computational models of regulatory systems of heat injury. ***FY 2012 Plans:*** Refine experimental systems for assessment and enhancement of computational models for identifying pharmacological interventions for heat stroke-caused multi-organ failure.			
Accomplishments/Planned Programs Subtotals	1.130	1.177	4.748

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602787A: *MEDICAL TECHNOLOGY*	PROJECT VB4: *SYSTEM BIOLOGY AND NETWORK SCIENCE TECHNOLOGY*

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602787A: *MEDICAL TECHNOLOGY*	PROJECT VJ4: *SUICIDE PREVENTION/MITIGATION*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
VJ4: *SUICIDE PREVENTION/ MITIGATION*	10.000	10.000	10.000	-	10.000	10.000	10.000	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project funds research over a planned five (5) year period to examine the mental and behavioral health of Soldiers to counter suicidal behavior. This work will focus on advancing understanding of the multiple determinants of suicidal behavior, psychopathology (study of the causes and nature of abnormal behavior), psychological resilience, and role functioning. A significant thrust area will focus on the development of better methods for preventing and mitigating suicidal behavior as well as to improve the overall mental health and behavioral function of Army personnel during and after their military service.

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work on this project is performed by The National Institute of Mental Health (NIMH) through extramural cooperative research grants in collaboration with the Department of the Army.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Suicide Prevention/Mitigation	10.000	10.000	10.000
Description: This effort conducts research to better understand the apparent increase in suicide deaths and nonfatal attempts among Active Duty Soldiers. Improved prevention/intervention methods to be identified for individuals at risk for suicide based on data-driven recommendations. The efforts would be utilized to decrease suicide rates in both military populations as well as in the general public.			
FY 2010 Accomplishments: Completed initial analyses of blood and biomarker data collected from historical records of Army recruits; initiated a biomarker pilot study to investigate depression in soldiers; initiated research efforts designed to enhance screening, prevention, and intervention strategies for suicide prevention.			
FY 2011 Plans: Continue to conduct research to better understand the apparent increase in suicide deaths and nonfatal attempts among active duty Soldiers; continue epidemiological (population-based) studies to identify determinants of suicidal behaviors and potential modifiable risk factors; continue to develop better methods for preventing suicidal behaviors based on data driven recommendations to mitigate or prevent suicidal behaviors.			
FY 2012 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602787A: *MEDICAL TECHNOLOGY*	PROJECT VJ4: *SUICIDE PREVENTION/MITIGATION*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Will continue epidemiological (population-based) studies to further identify determinants of suicidal behavior as well as potential modifiable risk factors; will collect data for suicide-death case control study; will conduct research efforts to assist in improved identification of individuals at greatest risk for suicide as well as to validate screening measures and enhance prevention/ intervention methods.			
Accomplishments/Planned Programs Subtotals	10.000	10.000	10.000

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.