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Supporting Data FY 2011 Budget Estimate
Submitted to OSD – February 2010

DESCRIPTIVE SUMMARIES OF THE



**RESEARCH, DEVELOPMENT, TEST AND EVALUATION
Army Appropriation, Budget Activity 2**

Department of the Army
Office of the Secretary of the Army (Financial Management and Comptroller)

Persuasive in Peace, Invincible in War

VOLUME II

UNCLASSIFIED

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**DESCRIPTIVE SUMMARIES FOR PROGRAM ELEMENTS
OF THE
RESEARCH, DEVELOPMENT, TEST AND
EVALUATION, ARMY
FY 2011
BUDGET ESTIMATE SUBMISSION
FEBRUARY 2010**

**VOLUME II
Budget Activities 2**

**Department of the Army
Office of the Assistant Secretary of the Army (Financial Management and Comptroller)**

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**FY 2011 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), R-4A (Schedule Profile Detail) and R-5 (Termination Liability Funding for MDAPs) Exhibits, which provide narrative information on all RDT&E program elements and projects for FY 2009 through FY 2011.

2. Relationship of the FY 2011 Budget Submitted to Congress to the FY 2010 Budget Submitted to Congress. This paragraph provides a list of program elements restructured, transitioned, or established to provide specific program identification.

A. Program Element Restructures. Explanations for these changes can be found in the narrative sections of the Program Element R-2A Exhibits.

| <u>OLD</u> <u>PE/PROJECT</u> | <u>NEW PROJECT TITLE</u> | <u>NEW</u> <u>PE/PROJECT</u> |
|---|---|---|
| 0603308A/978 | Long Endurance Multi-Intelligence Vehicle | 0305205A/LE4 |
| 0604270A/L16 | TROJAN – RH12-MIP | 0303032A/RH5 |
| 0604802A/S23 | SLAMRAAM | 0605455A/S35 |
| 0604805A/589 | Joint Battle Command – Platform (JBC-P) | 0604805A/593 |
| 0604869A/M06 | PAC-3/MSE Missile | 0605456A/PA3 |
| 0303140/5PM | Biometrics Enabled Intelligence – MIP | 0307665A/BI7 |
| 0303140/5PM | Intelligence Support to Cyber (ISC) – MIP | 0203347A/CY7 |
| 0305204A/114 | RQ-7 Shadow UAV | 0305233A/RQ7 |
| 0305204A/D10 | RQ-11 Raven (MIP) | 0305232A/RA7 |
| 0307207A/024 | Aerial Common Sensor – SDD | 0605626A/AC5 |

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B. Developmental Transitions. Explanations for these changes can be found in the narrative sections of the Program Element R-2/R-3 Exhibits.

| <u>OLD</u> <u>PE/PROJECT</u> | <u>NEW PROJECT TITLE</u> | <u>NEW</u> <u>PE/PROJECT</u> |
|---|--------------------------------------|---|
| 0305204A/D09 | ER/MP Unmanned Aircraft System (MIP) | 0604276A/TU1 |
| 0307207A/024 | Aerial Common Sensor (ACS) | 0605626A/AC5 |

C. Establishment of New FY 2011 Program Elements/Projects. There are no major system new starts.

| <u>TITLE</u> | <u>PE/PROJECT</u> |
|--|--------------------------|
| Aerial Common Sensor – SDD | 0605626A/AC5 |
| Armed Scout Helicopter | 0604220A/53Z |
| Army Integrated Air and Missile Defense (AIAMD) | 0605457A/S40 |
| Army Integrated Military Human Resources System (A-IRMS) | 0605018A/HR5 |
| Biometrics Enabled Intelligence – MIP | 0307665A/BI7 |
| ER/MP Unmanned Aircraft System (MIP) | 0604276A/TU1 |
| Intelligence Support to Cyber (ISC) – MIP | 0203347A/CY7 |
| Joint Battle Command - Platform (JBC-P) | 0604805A/593 |
| Long Endurance Multi-Intelligence Vehicle | 0305205A/LE4 |
| MQ-1 Sky Warrior – Army UAV (MIP) | 0305219A/MQ1 |
| PAC-3/MSE Missile | 0605456A/PA3 |
| RQ-7 Shadow UAV | 0305233A/RQ7 |
| RQ-11 Raven (MIP) | 0305232A/RA7 |
| SLAMRAAM | 0605455A/S35 |
| Suicide Prevention/Mitigation | 0602787A/VJ4 |
| TROJAN – RH12-MIP | 0303032A/RH5 |
| Advanced Geospatial Intelligence (AGI) | 0304348A/NI7 |

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D. FY 2011 programs for which funding existed in the FY 2010 President's Budget Submit (May 2009), but which are no longer funded in the FY 2011 President's Budget Submit.

| <u>PE/PROJECT</u> | <u>TITLE</u> | <u>BRIEF EXPLANATION</u> |
|--------------------------|--|---|
| 0603004A/L94 | Electric Gun System Demo | Program restructured |
| 0604270A/L12 | Signals Warfare Development (MIP) | Program moved to a separate MIP PE |
| 0604270A/L16 | TROJAN Development (MIP) | Program moved to a separate MIP PE |
| 0604666A/FC7 | FCS – Spin Out Technology/Capability Integration | Terminated |
| 0604802A/S23 | Surface Launched Advanced Medium Range Air-to-Air Missile (SLAMRAAM) | Program moved to a separate missile defense PE |
| 0604818A/C15 | Mounted Battle Command On-The-Move (MBCOTM) | Terminated |
| 0604818A/C39 | Tactical Operations Center (TOCs) | Terminated |
| 0303142A/562 | Multi-band Integrated Satellite Terminal (MIST) | Terminated |
| 0307207A/024 | Aerial Common Sensor (MIP) | Program transitioned to BA 5 for proper execution |

3. Classification. This document contains no classified data. Classified/Special Access Programs that are submitted offline are listed below.

| | | |
|------------------|--------------|----------|
| 0203801A/DF8/DF9 | 0603005A/C66 | 0604328A |
| 0203808A | 0603006A/DF7 | |
| 0301359A | 0603009A | |
| 0304348A | 0603020A | |
| 0602122A | 0603322A | |

4. Performance Metrics. Performance metrics used in the preparation of this justification book may be found in the FY 2010 Army Performance Budget Justification Book, dated March 2009.

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 FY 2011 RDT&E Program
 President's Budget FY 2011

Exhibit R-1

01-Feb-2010

Summary

| <u>Summary Recap of Budget Activities</u> | Thousands of Dollars | | | | |
|---|----------------------|-------------------|-------------------|----------------|-------------------|
| | FY2009 | FY2010 | FY2011 | FY2011 OCO | FY2011 Total |
| Basic research | 422,136 | 431,777 | 406,873 | 0 | 406,873 |
| Applied Research | 1,224,889 | 1,337,114 | 841,364 | 0 | 841,364 |
| Advanced technology development | 1,438,797 | 1,373,609 | 696,592 | 0 | 696,592 |
| Advanced Component Development and Prototypes | 1,010,485 | 932,004 | 746,248 | 57,900 | 804,148 |
| System Development and Demonstration | 5,025,850 | 4,454,743 | 5,021,546 | 13,500 | 5,035,046 |
| Management support | 1,470,157 | 1,196,744 | 1,142,383 | 0 | 1,142,383 |
| Operational system development | 1,482,756 | 1,823,380 | 1,473,939 | 79,506 | 1,553,445 |
| Total RDT&E, Army | 12,075,070 | 11,549,371 | 10,328,945 | 150,906 | 10,479,851 |

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 Department of the Army
 FY 2011 RDT&E Program
 President's Budget FY 2011

Exhibit R-1

Appropriation: 2040 A RDT&E, Army

01-Feb-2010

| Program | | | | Thousands of Dollars | | | | |
|---------------------|----------------|-----|--|----------------------|---------|---------|------------|--------------|
| Line No | Element Number | Act | Item | FY2009 | FY2010 | FY2011 | FY2011 OCO | FY2011 Total |
| Basic research | | | | | | | | |
| 1 | 0601101A | 01 | IN-HOUSE LABORATORY INDEPENDENT RESEARCH | 19,357 | 19,568 | 21,780 | | 21,780 |
| 2 | 0601102A | 01 | DEFENSE RESEARCH SCIENCES | 193,968 | 197,471 | 195,845 | | 195,845 |
| 3 | 0601103A | 01 | UNIVERSITY RESEARCH INITIATIVES | 87,485 | 99,400 | 91,161 | | 91,161 |
| 4 | 0601104A | 01 | UNIVERSITY AND INDUSTRY RESEARCH CENTERS | 121,326 | 115,338 | 98,087 | | 98,087 |
| Tota Basic research | | | | 422,136 | 431,777 | 406,873 | 0 | 406,873 |
| Applied Research | | | | | | | | |
| 5 | 0602105A | 02 | MATERIALS TECHNOLOGY | 80,686 | 99,447 | 29,882 | | 29,882 |
| 6 | 0602120A | 02 | SENSORS AND ELECTRONIC SURVIVABILITY | 76,213 | 70,272 | 48,929 | | 48,929 |
| 7 | 0602122A | 02 | TRACTOR HIP | 17,659 | 14,250 | 14,624 | | 14,624 |
| 8 | 0602211A | 02 | AVIATION TECHNOLOGY | 46,232 | 49,273 | 43,476 | | 43,476 |
| 9 | 0602270A | 02 | ELECTRONIC WARFARE TECHNOLOGY | 20,058 | 22,303 | 17,330 | | 17,330 |
| 10 | 0602303A | 02 | MISSILE TECHNOLOGY | 57,502 | 70,924 | 49,525 | | 49,525 |
| 11 | 0602307A | 02 | ADVANCED WEAPONS TECHNOLOGY | 22,638 | 21,964 | 18,190 | | 18,190 |
| 12 | 0602308A | 02 | ADVANCED CONCEPTS AND SIMULATION | 18,205 | 27,330 | 20,582 | | 20,582 |
| 13 | 0602601A | 02 | COMBAT VEHICLE AND AUTOMOTIVE TECHNOLOGY | 84,436 | 78,923 | 64,740 | | 64,740 |
| 14 | 0602618A | 02 | BALLISTICS TECHNOLOGY | 84,827 | 78,034 | 60,342 | | 60,342 |
| 15 | 0602622A | 02 | CHEMICAL, SMOKE AND EQUIPMENT DEFEATING TECHNOLOGY | 8,873 | 13,622 | 5,324 | | 5,324 |
| 16 | 0602623A | 02 | JOINT SERVICE SMALL ARMS PROGRAM | 9,165 | 7,634 | 7,893 | | 7,893 |
| 17 | 0602624A | 02 | WEAPONS AND MUNITIONS TECHNOLOGY | 106,253 | 144,864 | 42,645 | | 42,645 |
| 18 | 0602705A | 02 | ELECTRONICS AND ELECTRONIC DEVICES | 99,118 | 134,532 | 60,859 | | 60,859 |
| 19 | 0602709A | 02 | NIGHT VISION TECHNOLOGY | 45,329 | 50,877 | 40,228 | | 40,228 |
| 20 | 0602712A | 02 | COUNTERMINE SYSTEMS | 27,827 | 23,621 | 19,118 | | 19,118 |
| 21 | 0602716A | 02 | HUMAN FACTORS ENGINEERING TECHNOLOGY | 42,208 | 30,446 | 21,042 | | 21,042 |
| 22 | 0602720A | 02 | ENVIRONMENTAL QUALITY TECHNOLOGY | 15,786 | 25,469 | 18,364 | | 18,364 |
| 23 | 0602782A | 02 | COMMAND, CONTROL, COMMUNICATIONS TECHNOLOGY | 45,350 | 30,036 | 25,573 | | 25,573 |
| 24 | 0602783A | 02 | COMPUTER AND SOFTWARE TECHNOLOGY | 7,786 | 5,609 | 6,768 | | 6,768 |
| 25 | 0602784A | 02 | MILITARY ENGINEERING TECHNOLOGY | 58,671 | 60,779 | 79,189 | | 79,189 |
| 26 | 0602785A | 02 | MANPOWER/PERSONNEL/TRAINING TECHNOLOGY | 16,096 | 16,614 | 22,198 | | 22,198 |
| 27 | 0602786A | 02 | WARFIGHTER TECHNOLOGY | 35,866 | 38,347 | 27,746 | | 27,746 |

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 FY 2011 RDT&E Program
 President's Budget FY 2011

Exhibit R-1

Appropriation: 2040 A RDT&E, Army 01-Feb-2010

| Program | | | | Thousands of Dollars | | | | |
|--------------------------------------|----------------|-----|--|----------------------|-----------|---------|------------|--------------|
| Line No | Element Number | Act | Item | FY2009 | FY2010 | FY2011 | FY2011 OCO | FY2011 Total |
| Basic research | | | | | | | | |
| 28 | 0602787A | 02 | MEDICAL TECHNOLOGY | 198,105 | 221,944 | 96,797 | | 96,797 |
| Tota Applied Research | | | | 1,224,889 | 1,337,114 | 841,364 | 0 | 841,364 |
| Advanced technology development | | | | | | | | |
| 29 | 0603001A | 03 | WARFIGHTER ADVANCED TECHNOLOGY | 72,271 | 54,290 | 37,364 | | 37,364 |
| 30 | 0603002A | 03 | MEDICAL ADVANCED TECHNOLOGY | 329,258 | 339,752 | 71,510 | | 71,510 |
| 31 | 0603003A | 03 | AVIATION ADVANCED TECHNOLOGY | 102,207 | 112,388 | 57,454 | | 57,454 |
| 32 | 0603004A | 03 | WEAPONS AND MUNITIONS ADVANCED TECHNOLOGY | 112,544 | 89,861 | 64,438 | | 64,438 |
| 33 | 0603005A | 03 | COMBAT VEHICLE AND AUTOMOTIVE ADVANCED TECHNOLOGY | 270,195 | 240,190 | 89,499 | | 89,499 |
| 34 | 0603006A | 03 | COMMAND, CONTROL, COMMUNICATIONS ADVANCED TECHNOLOGY | 11,307 | 12,352 | 8,102 | | 8,102 |
| 35 | 0603007A | 03 | MANPOWER, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY | 6,725 | 7,371 | 7,921 | | 7,921 |
| 36 | 0603008A | 03 | ELECTRONIC WARFARE ADVANCED TECHNOLOGY | 61,192 | 57,199 | 50,359 | | 50,359 |
| 37 | 0603009A | 03 | TRACTOR HIKE | 14,157 | 11,270 | 8,015 | | 8,015 |
| 38 | 0603015A | 03 | NEXT GENERATION TRAINING & SIMULATION SYSTEMS | 24,769 | 25,362 | 15,334 | | 15,334 |
| 39 | 0603020A | 03 | TRACTOR ROSE | 11,216 | 14,493 | 12,309 | | 12,309 |
| 40 | 0603103A | 03 | EXPLOSIVES DEMILITARIZATION TECHNOLOGY | 17,213 | 12,495 | | | |
| 41 | 0603105A | 03 | MILITARY HIV RESEARCH | 14,867 | 29,502 | 6,688 | | 6,688 |
| 42 | 0603125A | 03 | COMBATING TERRORISM - TECHNOLOGY DEVELOPMENT | 12,656 | 11,927 | 10,550 | | 10,550 |
| 43 | 0603270A | 03 | ELECTRONIC WARFARE TECHNOLOGY | 32,544 | 21,877 | 18,350 | | 18,350 |
| 44 | 0603313A | 03 | MISSILE AND ROCKET ADVANCED TECHNOLOGY | 74,967 | 86,559 | 84,553 | | 84,553 |
| 45 | 0603322A | 03 | TRACTOR CAGE | 12,037 | 12,090 | 9,986 | | 9,986 |
| 46 | 0603606A | 03 | LANDMINE WARFARE AND BARRIER ADVANCED TECHNOLOGY | 36,883 | 34,855 | 26,953 | | 26,953 |
| 47 | 0603607A | 03 | JOINT SERVICE SMALL ARMS PROGRAM | 8,568 | 8,949 | 9,151 | | 9,151 |
| 48 | 0603710A | 03 | NIGHT VISION ADVANCED TECHNOLOGY | 69,778 | 72,250 | 39,912 | | 39,912 |
| 49 | 0603728A | 03 | ENVIRONMENTAL QUALITY TECHNOLOGY DEMONSTRATIONS | 16,782 | 16,121 | 15,878 | | 15,878 |
| 50 | 0603734A | 03 | MILITARY ENGINEERING ADVANCED TECHNOLOGY | 34,935 | 45,394 | 27,393 | | 27,393 |
| 51 | 0603772A | 03 | ADVANCED TACTICAL COMPUTER SCIENCE AND SENSOR TECHNOLOGY | 91,726 | 57,062 | 24,873 | | 24,873 |
| Tota Advanced technology development | | | | 1,438,797 | 1,373,609 | 696,592 | 0 | 696,592 |

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 Department of the Army
 FY 2011 RDT&E Program
 President's Budget FY 2011

Exhibit R-1

Appropriation: 2040 A RDT&E, Army 01-Feb-2010

| Program | | | | Thousands of Dollars | | | | |
|--|----------------|-----|---|----------------------|---------|---------|------------|--------------|
| Line No | Element Number | Act | Item | FY2009 | FY2010 | FY2011 | FY2011 OCO | FY2011 Total |
| Basic research | | | | | | | | |
| Advanced Component Development and Prototypes | | | | | | | | |
| 52 | 0603024A | 04 | UNIQUE ITEM IDENTIFICATION (UID) | 628 | 1,990 | | | |
| 53 | 0603305A | 04 | ARMY MISSILE DEFENSE SYSTEMS INTEGRATION | 90,552 | 71,788 | 11,455 | | 11,455 |
| 54 | 0603308A | 04 | ARMY SPACE SYSTEMS INTEGRATION | 53,416 | 118,610 | 27,551 | | 27,551 |
| 55 | 0603327A | 04 | AIR AND MISSILE DEFENSE SYSTEMS ENGINEERING | 115,567 | 166,061 | | | |
| 56 | 0603619A | 04 | LANDMINE WARFARE AND BARRIER - ADV DEV | 13,789 | 17,445 | 15,596 | | 15,596 |
| 57 | 0603627A | 04 | SMOKE, OBSCURANT AND TARGET DEFEATING SYS-ADV DEV | 3,721 | 4,894 | 2,425 | | 2,425 |
| 58 | 0603639A | 04 | TANK AND MEDIUM CALIBER AMMUNITION | 39,590 | 33,757 | 42,183 | | 42,183 |
| 59 | 0603653A | 04 | ADVANCED TANK ARMAMENT SYSTEM (ATAS) | 76,072 | 89,828 | 136,302 | | 136,302 |
| 60 | 0603747A | 04 | SOLDIER SUPPORT AND SURVIVABILITY | 18,058 | 33,178 | 18,556 | 57,900 | 76,456 |
| 61 | 0603766A | 04 | TACTICAL ELECTRONIC SURVEILLANCE SYSTEM - ADV DEV | 12,235 | 12,164 | 17,962 | | 17,962 |
| 62 | 0603774A | 04 | NIGHT VISION SYSTEMS ADVANCED DEVELOPMENT | 2,508 | | | | |
| 63 | 0603779A | 04 | ENVIRONMENTAL QUALITY TECHNOLOGY - DEM/VAL | 20,443 | 18,374 | 4,695 | | 4,695 |
| 64 | 0603782A | 04 | WARFIGHTER INFORMATION NETWORK-TACTICAL - DEM/VAL | 392,138 | 169,783 | 190,903 | | 190,903 |
| 65 | 0603790A | 04 | NATO RESEARCH AND DEVELOPMENT | 4,883 | 5,022 | 5,060 | | 5,060 |
| 66 | 0603801A | 04 | AVIATION - ADV DEV | 26,507 | 8,492 | 8,355 | | 8,355 |
| 67 | 0603804A | 04 | LOGISTICS AND ENGINEER EQUIPMENT - ADV DEV | 42,939 | 59,662 | 80,490 | | 80,490 |
| 68 | 0603805A | 04 | COMBAT SERVICE SUPPORT CONTROL SYSTEM EVALUATION AN | 17,267 | 9,817 | 14,290 | | 14,290 |
| 69 | 0603807A | 04 | MEDICAL SYSTEMS - ADV DEV | 29,572 | 35,886 | 28,132 | | 28,132 |
| 70 | 0603827A | 04 | SOLDIER SYSTEMS - ADVANCED DEVELOPMENT | 41,599 | 73,785 | 48,323 | | 48,323 |
| 71 | 0603850A | 04 | INTEGRATED BROADCAST SERVICE | 9,001 | 1,468 | 970 | | 970 |
| 72 | 0305205A | 04 | ENDURANCE UAVS | | | 93,000 | | 93,000 |
| Tota Advanced Component Development and Prototypes | | | | 1,010,485 | 932,004 | 746,248 | 57,900 | 804,148 |
| System Development and Demonstration | | | | | | | | |
| 73 | 0604201A | 05 | AIRCRAFT AVIONICS | 60,781 | 89,508 | 89,210 | | 89,210 |
| 74 | 0604220A | 05 | ARMED, DEPLOYABLE HELOS | 63,017 | 66,169 | 72,550 | | 72,550 |
| 75 | 0604270A | 05 | ELECTRONIC WARFARE DEVELOPMENT | 38,256 | 281,570 | 172,269 | 5,400 | 177,669 |
| 76 | 0604280A | 05 | JOINT TACTICAL RADIO | | | 784 | | 784 |
| 77 | 0604321A | 05 | ALL SOURCE ANALYSIS SYSTEM | 13,211 | 13,039 | 22,574 | 8,100 | 30,674 |

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 President's Budget FY 2011

Exhibit R-1

Appropriation: 2040 A RDT&E, Army

01-Feb-2010

| Program | | | | Thousands of Dollars | | | | |
|----------------|----------|-----|---|----------------------|---------|---------|------------|--------------|
| Line | Element | Act | Item | FY2009 | FY2010 | FY2011 | FY2011 OCO | FY2011 Total |
| Basic research | | | | | | | | |
| 78 | 0604328A | 05 | TRACTOR CAGE | 16,300 | 16,201 | 23,194 | | 23,194 |
| 79 | 0604601A | 05 | INFANTRY SUPPORT WEAPONS | 57,677 | 83,178 | 80,337 | | 80,337 |
| 80 | 0604604A | 05 | MEDIUM TACTICAL VEHICLES | 2,169 | 5,653 | 3,710 | | 3,710 |
| 81 | 0604609A | 05 | SMOKE, OBSCURANT AND TARGET DEFEATING SYS - ENG DEV | 5,428 | 973 | 5,335 | | 5,335 |
| 82 | 0604611A | 05 | JAVELIN | | | 9,999 | | 9,999 |
| 83 | 0604622A | 05 | FAMILY OF HEAVY TACTICAL VEHICLES | 4,550 | 9,826 | 3,519 | | 3,519 |
| 84 | 0604633A | 05 | AIR TRAFFIC CONTROL | 16,092 | 7,538 | 9,892 | | 9,892 |
| 85 | 0604642A | 05 | LIGHT TACTICAL WHEELED VEHICLES | | | 1,990 | | 1,990 |
| 86 | 0604646A | 05 | NON-LINE OF SIGHT LAUNCH SYSTEM | 253,684 | 91,223 | 81,247 | | 81,247 |
| 87 | 0604647A | 05 | NON-LINE OF SIGHT CANNON | 87,038 | 47,964 | | | |
| 88 | 0604660A | 05 | FCS MANNED GRD VEHICLES & COMMON GRD VEHICLE | 760,744 | 275,116 | | | |
| 89 | 0604661A | 05 | FCS SYSTEMS OF SYSTEMS ENGR & PROGRAM MGMT | 1,022,165 | 912,399 | 568,711 | | 568,711 |
| 90 | 0604662A | 05 | FCS RECONNAISSANCE (UAV) PLATFORMS | 55,923 | 75,107 | 50,304 | | 50,304 |
| 91 | 0604663A | 05 | FCS UNMANNED GROUND VEHICLES | 104,571 | 124,962 | 249,948 | | 249,948 |
| 92 | 0604664A | 05 | FCS UNATTENDED GROUND SENSORS | 20,135 | 26,778 | 7,515 | | 7,515 |
| 93 | 0604665A | 05 | FCS SUSTAINMENT & TRAINING R&D | 819,721 | 655,745 | 610,389 | | 610,389 |
| 94 | 0604666A | 05 | SPIN OUT TECHNOLOGY/CAPABILITY INSERTION | 122,788 | | | | |
| 95 | 0604710A | 05 | NIGHT VISION SYSTEMS - ENG DEV | 96,678 | 57,111 | 52,549 | | 52,549 |
| 96 | 0604713A | 05 | COMBAT FEEDING, CLOTHING, AND EQUIPMENT | 2,422 | 2,081 | 2,118 | | 2,118 |
| 97 | 0604715A | 05 | NON-SYSTEM TRAINING DEVICES - ENG DEV | 36,826 | 30,052 | 27,756 | | 27,756 |
| 98 | 0604741A | 05 | AIR DEFENSE COMMAND, CONTROL AND INTELLIGENCE - ENG D | 21,737 | 28,785 | 34,209 | | 34,209 |
| 99 | 0604742A | 05 | CONSTRUCTIVE SIMULATION SYSTEMS DEVELOPMENT | 25,095 | 33,039 | 30,291 | | 30,291 |
| 100 | 0604746A | 05 | AUTOMATIC TEST EQUIPMENT DEVELOPMENT | 17,020 | 15,240 | 14,041 | | 14,041 |
| 101 | 0604760A | 05 | DISTRIBUTIVE INTERACTIVE SIMULATIONS (DIS) - ENG DEV | 18,999 | 15,645 | 15,547 | | 15,547 |
| 102 | 0604778A | 05 | POSITIONING SYSTEMS DEVELOPMENT (SPACE) | | 9,396 | | | |
| 103 | 0604780A | 05 | COMBINED ARMS TACTICAL TRAINER (CATT) CORE | 32,541 | 26,107 | 27,670 | | 27,670 |
| 104 | 0604783A | 05 | JOINT NETWORK MANAGEMENT SYSTEM | 659 | | | | |
| 105 | 0604802A | 05 | WEAPONS AND MUNITIONS - ENG DEV | 101,823 | 87,022 | 24,345 | | 24,345 |
| 106 | 0604804A | 05 | LOGISTICS AND ENGINEER EQUIPMENT - ENG DEV | 29,884 | 37,023 | 41,039 | | 41,039 |
| 107 | 0604805A | 05 | COMMAND, CONTROL, COMMUNICATIONS SYSTEMS - ENG DEV | 9,489 | 58,688 | 90,736 | | 90,736 |
| 108 | 0604807A | 05 | MEDICAL MATERIEL/MEDICAL BIOLOGICAL DEFENSE EQUIPMENT | 41,081 | 41,794 | 34,474 | | 34,474 |
| 109 | 0604808A | 05 | LANDMINE WARFARE/BARRIER - ENG DEV | 113,590 | 72,380 | 95,577 | | 95,577 |
| 110 | 0604814A | 05 | ARTILLERY MUNITIONS - EMD | 70,008 | 42,230 | 26,371 | | 26,371 |
| 111 | 0604817A | 05 | COMBAT IDENTIFICATION | 8,967 | 10,018 | 29,884 | | 29,884 |

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 Department of the Army
 FY 2011 RDT&E Program
 President's Budget FY 2011

Exhibit R-1

Appropriation: 2040 A RDT&E, Army 01-Feb-2010

| Program | | | | Thousands of Dollars | | | | |
|---|----------|-----|---|----------------------|-----------|-----------|------------|--------------|
| Line | Element | Act | Item | FY2009 | FY2010 | FY2011 | FY2011 OCO | FY2011 Total |
| Basic research | | | | | | | | |
| 112 | 0604818A | 05 | ARMY TACTICAL COMMAND & CONTROL HARDWARE & SOFTWARE | 63,552 | 79,448 | 60,970 | | 60,970 |
| 113 | 0604822A | 05 | GENERAL FUND ENTERPRISE BUSINESS SYSTEM (GFEBS) | 50,308 | 23,777 | 13,576 | | 13,576 |
| 114 | 0604823A | 05 | FIREFINDER | 64,834 | 20,227 | 24,736 | | 24,736 |
| 115 | 0604827A | 05 | SOLDIER SYSTEMS - WARRIOR DEM/VAL | 20,086 | 19,683 | 20,886 | | 20,886 |
| 116 | 0604854A | 05 | ARTILLERY SYSTEMS - EMD | 32,261 | 115,811 | 53,624 | | 53,624 |
| 117 | 0604869A | 05 | PATRIOT/MEADS COMBINED AGGREGATE PROGRAM (CAP) | 454,665 | 566,215 | 467,139 | | 467,139 |
| 118 | 0604870A | 05 | NUCLEAR ARMS CONTROL MONITORING SENSOR NETWORK | 6,064 | 7,103 | 7,276 | | 7,276 |
| 119 | 0605013A | 05 | INFORMATION TECHNOLOGY DEVELOPMENT | 68,194 | 66,561 | 23,957 | | 23,957 |
| 120 | 0605018A | 05 | ARMY INTEGRATED MILITARY HUMAN RESOURCES SYSTEM (A-IMHRS) | | | 100,500 | | 100,500 |
| 121 | 0605450A | 05 | JOINT AIR-TO-GROUND MISSILE (JAGM) | 114,817 | 126,775 | 130,340 | | 130,340 |
| 122 | 0605455A | 05 | SLAMRAAM | | | 23,700 | | 23,700 |
| 123 | 0605456A | 05 | PAC-3/MSE MISSILE | | | 62,500 | | 62,500 |
| 124 | 0605457A | 05 | ARMY INTEGRATED AIR AND MISSILE DEFENSE (AIAMD) | | | 251,124 | | 251,124 |
| 125 | 0605625A | 05 | MANNED GROUND VEHICLE | | 79,583 | 934,366 | | 934,366 |
| 126 | 0605626A | 05 | AERIAL COMMON SENSOR | | | 211,500 | | 211,500 |
| 127 | 0303032A | 05 | TROJAN - RH12 | | | 3,697 | | 3,697 |
| 128 | 0304270A | 05 | ELECTRONIC WARFARE DEVELOPMENT | | | 21,571 | | 21,571 |
| Tota System Development and Demonstration | | | | 5,025,850 | 4,454,743 | 5,021,546 | 13,500 | 5,035,046 |
| Management support | | | | | | | | |
| 129 | 0604256A | 06 | THREAT SIMULATOR DEVELOPMENT | 22,015 | 25,091 | 26,158 | | 26,158 |
| 130 | 0604258A | 06 | TARGET SYSTEMS DEVELOPMENT | 13,124 | 13,544 | 8,614 | | 8,614 |
| 131 | 0604759A | 06 | MAJOR T&E INVESTMENT | 62,699 | 51,576 | 42,102 | | 42,102 |
| 132 | 0605103A | 06 | RAND ARROYO CENTER | 19,817 | 17,812 | 20,492 | | 20,492 |
| 133 | 0605301A | 06 | ARMY KWAJALEIN ATOLL | 169,367 | 162,662 | 163,788 | | 163,788 |
| 134 | 0605326A | 06 | CONCEPTS EXPERIMENTATION PROGRAM | 33,178 | 26,407 | 17,704 | | 17,704 |
| 135 | 0605502A | 06 | SMALL BUSINESS INNOVATIVE RESEARCH | 297,531 | | | | |
| 136 | 0605601A | 06 | ARMY TEST RANGES AND FACILITIES | 356,720 | 352,845 | 393,937 | | 393,937 |
| 137 | 0605602A | 06 | ARMY TECHNICAL TEST INSTRUMENTATION AND TARGETS | 84,905 | 84,389 | 59,040 | | 59,040 |
| 138 | 0605604A | 06 | SURVIVABILITY/LETHALITY ANALYSIS | 40,037 | 44,782 | 41,812 | | 41,812 |
| 139 | 0605605A | 06 | DOD HIGH ENERGY LASER TEST FACILITY | 6,772 | 7,352 | 4,710 | | 4,710 |

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 Department of the Army
 FY 2011 RDT&E Program
 President's Budget FY 2011

Exhibit R-1

Appropriation: 2040 A RDT&E, Army 01-Feb-2010

| Program | | | | Thousands of Dollars | | | | |
|--------------------------------|----------|-----|---|----------------------|-----------|-----------|------------|--------------|
| Line | Element | Act | Item | FY2009 | FY2010 | FY2011 | FY2011 OCO | FY2011 Total |
| Basic research | | | | | | | | |
| 140 | 0605606A | 06 | AIRCRAFT CERTIFICATION | 5,001 | 3,746 | 5,055 | | 5,055 |
| 141 | 0605702A | 06 | METEOROLOGICAL SUPPORT TO RDT&E ACTIVITIES | 8,120 | 8,347 | 7,185 | | 7,185 |
| 142 | 0605706A | 06 | MATERIEL SYSTEMS ANALYSIS | 17,472 | 19,864 | 18,078 | | 18,078 |
| 143 | 0605709A | 06 | EXPLOITATION OF FOREIGN ITEMS | 3,908 | 5,403 | 5,460 | | 5,460 |
| 144 | 0605712A | 06 | SUPPORT OF OPERATIONAL TESTING | 76,231 | 77,471 | 68,191 | | 68,191 |
| 145 | 0605716A | 06 | ARMY EVALUATION CENTER | 61,461 | 67,555 | 61,450 | | 61,450 |
| 146 | 0605718A | 06 | ARMY MODELING & SIM X-CMD COLLABORATION & INTEG | 5,159 | 5,328 | 3,926 | | 3,926 |
| 147 | 0605801A | 06 | PROGRAMWIDE ACTIVITIES | 72,659 | 77,419 | 73,685 | | 73,685 |
| 148 | 0605803A | 06 | TECHNICAL INFORMATION ACTIVITIES | 44,051 | 51,351 | 48,309 | | 48,309 |
| 149 | 0605805A | 06 | MUNITIONS STANDARDIZATION, EFFECTIVENESS AND SAFETY | 44,326 | 72,851 | 53,338 | | 53,338 |
| 150 | 0605857A | 06 | ENVIRONMENTAL QUALITY TECHNOLOGY MGMT SUPPORT | 9,966 | 5,165 | 3,195 | | 3,195 |
| 151 | 0605898A | 06 | MANAGEMENT HQ - R&D | 15,586 | 15,784 | 16,154 | | 16,154 |
| 152 | 0909999A | 06 | FINANCING FOR CANCELLED ACCOUNT ADJUSTMENTS | 52 | | | | |
| Tota Management support | | | | 1,470,157 | 1,196,744 | 1,142,383 | 0 | 1,142,383 |
| Operational system development | | | | | | | | |
| 153 | 0603778A | 07 | MLRS PRODUCT IMPROVEMENT PROGRAM | 53,954 | 27,549 | 51,619 | | 51,619 |
| 154 | 0102419A | 07 | AEROSTAT JOINT PROJECT OFFICE | 344,850 | 328,356 | 372,493 | | 372,493 |
| 155 | 0203347A | 07 | INTELLIGENCE SUPPORT TO CYBER (ISC) MIP | | | 2,360 | | 2,360 |
| 156 | 0203726A | 07 | ADV FIELD ARTILLERY TACTICAL DATA SYSTEM | 16,200 | 29,174 | 24,622 | | 24,622 |
| 157 | 0203735A | 07 | COMBAT VEHICLE IMPROVEMENT PROGRAMS | 139,100 | 196,393 | 204,481 | | 204,481 |
| 158 | 0203740A | 07 | MANEUVER CONTROL SYSTEM | 36,072 | 21,283 | 25,540 | | 25,540 |
| 159 | 0203744A | 07 | AIRCRAFT MODIFICATIONS/PRODUCT IMPROVEMENT PROGRAM | 298,640 | 231,792 | 134,999 | | 134,999 |
| 160 | 0203752A | 07 | AIRCRAFT ENGINE COMPONENT IMPROVEMENT PROGRAM | 326 | 788 | 710 | | 710 |
| 161 | 0203758A | 07 | DIGITIZATION | 7,835 | 10,636 | 6,329 | | 6,329 |
| 162 | 0203759A | 07 | FORCE XXI BATTLE COMMAND, BRIGADE AND BELOW (FBCB2) | 22,688 | | 3,935 | | 3,935 |
| 163 | 0203801A | 07 | MISSILE/AIR DEFENSE PRODUCT IMPROVEMENT PROGRAM | 34,189 | 39,068 | 24,280 | | 24,280 |
| 164 | 0203802A | 07 | OTHER MISSILE PRODUCT IMPROVEMENT PROGRAMS | 5,167 | 3,979 | | | |
| 165 | 0203808A | 07 | TRACTOR CARD | 15,818 | 19,930 | 14,870 | | 14,870 |
| 166 | 0208010A | 07 | JOINT TACTICAL COMMUNICATIONS PROGRAM (TRI-TAC) | 892 | | | | |
| 167 | 0208053A | 07 | JOINT TACTICAL GROUND SYSTEM | 1,949 | 36,005 | 12,403 | | 12,403 |

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 Department of the Army
 FY 2011 RDT&E Program
 President's Budget FY 2011

Exhibit R-1

Appropriation: 2040 A RDT&E, Army 01-Feb-2010

| Program | | | | Thousands of Dollars | | | | |
|-------------------------------------|----------|-----|---|----------------------|------------|------------|------------|--------------|
| Line | Element | Act | Item | FY2009 | FY2010 | FY2011 | FY2011 OCO | FY2011 Total |
| Basic research | | | | | | | | |
| 168 | 0208058A | 07 | JOINT HIGH SPEED VESSEL (JHSV) | 2,986 | 3,066 | 3,153 | | 3,153 |
| 169 | 0301359A | 07 | SPECIAL ARMY PROGRAM | | | | | |
| 170 | 0303028A | 07 | SECURITY AND INTELLIGENCE ACTIVITIES | 3,189 | 9,777 | | | |
| 171 | 0303140A | 07 | INFORMATION SYSTEMS SECURITY PROGRAM | 39,679 | 60,866 | 54,784 | 63,306 | 118,090 |
| 172 | 0303141A | 07 | GLOBAL COMBAT SUPPORT SYSTEM | 107,693 | 143,979 | 125,569 | | 125,569 |
| 173 | 0303142A | 07 | SATCOM GROUND ENVIRONMENT (SPACE) | 46,799 | 39,889 | 33,694 | | 33,694 |
| 174 | 0303150A | 07 | WWMCCS/GLOBAL COMMAND AND CONTROL SYSTEM | 12,599 | 11,972 | 13,024 | | 13,024 |
| 175 | 0303158A | 07 | JOINT COMMAND AND CONTROL PROGRAM (JC2) | 13,228 | | | | |
| 176 | 0305204A | 07 | TACTICAL UNMANNED AERIAL VEHICLES | 100,454 | 202,116 | 54,300 | | 54,300 |
| 177 | 0305208A | 07 | DISTRIBUTED COMMON GROUND/SURFACE SYSTEMS | 88,483 | 188,465 | 103,002 | 16,200 | 119,202 |
| 178 | 0305219A | 07 | MQ-1 SKY WARRIOR A UAV | | | 123,156 | | 123,156 |
| 179 | 0305232A | 07 | RQ-11 UAV | | | 1,599 | | 1,599 |
| 180 | 0305233A | 07 | RQ-7 UAV | | | 7,805 | | 7,805 |
| 181 | 0307207A | 07 | AERIAL COMMON SENSOR (ACS) | | 115,430 | | | |
| 182 | 0307665A | 07 | BIOMETRICS ENABLED INTELLIGENCE | | | 14,114 | | 14,114 |
| 183 | 0702239A | 07 | AVIONICS COMPONENT IMPROVEMENT PROGRAM | 991 | | | | |
| 184 | 0708045A | 07 | END ITEM INDUSTRIAL PREPAREDNESS ACTIVITIES | 88,975 | 102,867 | 61,098 | | 61,098 |
| Tota Operational system development | | | | 1,482,756 | 1,823,380 | 1,473,939 | 79,506 | 1,553,445 |
| Total: RDT&E, Army | | | | 12,075,070 | 11,549,371 | 10,328,945 | 150,906 | 10,479,851 |

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| 2 | 0601102A | DEFENSE RESEARCH SCIENCES | 23 |
| 3 | 0601103A | University Research Initiatives | 165 |
| 4 | 0601104A | University and Industry Research Centers | 187 |
| 5 | 0602105A | MATERIALS TECHNOLOGY | 271 |
| 6 | 0602120A | Sensors and Electronic Survivability | 309 |
| 8 | 0602211A | AVIATION TECHNOLOGY | 354 |
| 9 | 0602270A | Electronic Warfare Technology | 375 |
| 10 | 0602303A | MISSILE TECHNOLOGY | 393 |
| 11 | 0602307A | ADVANCED WEAPONS TECHNOLOGY | 416 |
| 12 | 0602308A | Advanced Concepts and Simulation | 428 |
| 13 | 0602601A | Combat Vehicle and Automotive Technology | 444 |
| 14 | 0602618A | BALLISTICS TECHNOLOGY | 482 |
| 15 | 0602622A | Chemical, Smoke and Equipment Defeating Technology | 508 |
| 16 | 0602623A | JOINT SERVICE SMALL ARMS PROGRAM | 518 |
| 17 | 0602624A | Weapons and Munitions Technology | 525 |
| 18 | 0602705A | ELECTRONICS AND ELECTRONIC DEVICES | 578 |
| 19 | 0602709A | NIGHT VISION TECHNOLOGY | 636 |
| 20 | 0602712A | Countermine Systems | 656 |
| 21 | 0602716A | HUMAN FACTORS ENGINEERING TECHNOLOGY | 672 |
| 22 | 0602720A | Environmental Quality Technology | 683 |
| 23 | 0602782A | Command, Control, Communications Technology | 705 |
| 24 | 0602783A | COMPUTER AND SOFTWARE TECHNOLOGY | 729 |
| 25 | 0602784A | MILITARY ENGINEERING TECHNOLOGY | 740 |
| 26 | 0602785A | Manpower/Personnel/Training Technology | 780 |
| 27 | 0602786A | Warfighter Technology | 787 |

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| 31 | 0603003A | AVIATION ADVANCED TECHNOLOGY | 1125 |
| 8 | 0602211A | AVIATION TECHNOLOGY | 354 |
| 12 | 0602308A | Advanced Concepts and Simulation | 428 |
| 51 | 0603772A | Advanced Tactical Computer Science and Sensor Technology | 1510 |
| 14 | 0602618A | BALLISTICS TECHNOLOGY | 482 |
| 24 | 0602783A | COMPUTER AND SOFTWARE TECHNOLOGY | 729 |
| 15 | 0602622A | Chemical, Smoke and Equipment Defeating Technology | 508 |
| 33 | 0603005A | Combat Vehicle and Automotive Advanced Technology | 1209 |
| 13 | 0602601A | Combat Vehicle and Automotive Technology | 444 |
| 42 | 0603125A | Combating Terrorism - Technology Development | 1375 |
| 34 | 0603006A | Command, Control, Communications Advanced Technology | 1299 |
| 23 | 0602782A | Command, Control, Communications Technology | 705 |
| 20 | 0602712A | Countermine Systems | 656 |
| 2 | 0601102A | DEFENSE RESEARCH SCIENCES | 23 |
| 18 | 0602705A | ELECTRONICS AND ELECTRONIC DEVICES | 578 |
| 36 | 0603008A | Electronic Warfare Advanced Technology | 1314 |
| 43 | 0603270A | Electronic Warfare Technology | 1380 |
| 9 | 0602270A | Electronic Warfare Technology | 375 |
| 22 | 0602720A | Environmental Quality Technology | 683 |
| 49 | 0603728A | Environmental Quality Technology Demonstrations | 1472 |
| 40 | 0603103A | Explosives Demilitarization Technology | 1356 |
| 21 | 0602716A | HUMAN FACTORS ENGINEERING TECHNOLOGY | 672 |
| 1 | 0601101A | In-House Laboratory Independent Research | 1 |
| 47 | 0603607A | JOINT SERVICE SMALL ARMS PROGRAM | 1442 |
| 16 | 0602623A | JOINT SERVICE SMALL ARMS PROGRAM | 518 |

| | | | |
|----|----------|--|------|
| 46 | 0603606A | Landmine Warfare and Barrier Advanced Technology | 1430 |
| 5 | 0602105A | MATERIALS TECHNOLOGY | 271 |
| 30 | 0603002A | MEDICAL ADVANCED TECHNOLOGY | 963 |
| 28 | 0602787A | MEDICAL TECHNOLOGY | 816 |
| 25 | 0602784A | MILITARY ENGINEERING TECHNOLOGY | 740 |
| 41 | 0603105A | MILITARY HIV RESEARCH | 1368 |
| 10 | 0602303A | MISSILE TECHNOLOGY | 393 |
| 35 | 0603007A | Manpower, Personnel and Training Advanced Technology | 1309 |
| 26 | 0602785A | Manpower/Personnel/Training Technology | 780 |
| 50 | 0603734A | Military Engineering Advanced Technology | 1486 |
| 44 | 0603313A | Missile and Rocket Advanced Technology | 1398 |
| 48 | 0603710A | NIGHT VISION ADVANCED TECHNOLOGY | 1447 |
| 19 | 0602709A | NIGHT VISION TECHNOLOGY | 636 |
| 38 | 0603015A | Next Generation Training & Simulation Systems | 1336 |
| 6 | 0602120A | Sensors and Electronic Survivability | 309 |
| 3 | 0601103A | University Research Initiatives | 165 |
| 4 | 0601104A | University and Industry Research Centers | 187 |
| 29 | 0603001A | Warfighter Advanced Technology | 928 |
| 27 | 0602786A | Warfighter Technology | 787 |
| 32 | 0603004A | Weapons and Munitions Advanced Technology | 1168 |
| 17 | 0602624A | Weapons and Munitions Technology | 525 |

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Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification **DATE:** February 2010

| | |
|--|--|
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602105A: <i>MATERIALS TECHNOLOGY</i> |
|--|--|

| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
|---|-------------------|---------------------|-----------------------------|----------------------------|------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|------------|
| Total Program Element | 80.686 | 99.447 | 29.882 | 0.000 | 29.882 | 30.155 | 32.422 | 35.165 | 38.670 | 0 | 376.309 |
| H7B: <i>Advanced Materials Initiatives (CA)</i> | 56.036 | 72.383 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| H7G: <i>NANOMATERIALS APPLIED RESEARCH</i> | 4.881 | 5.112 | 5.238 | 0.000 | 5.238 | 5.299 | 5.411 | 5.509 | 5.602 | Continuing | Continuing |
| H84: <i>MATERIALS</i> | 19.769 | 21.952 | 24.644 | 0.000 | 24.644 | 24.856 | 27.011 | 29.656 | 33.068 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

The objective of this program element (PE) is to provide materials for lighter weight and more survivable armor and more lethal armaments. This PE supports the design, development, and evaluation of nanostructure materials (project H7G); design, development and evaluation of materials for more survivable and lighter weight armor and armaments (project H84). Project H7B funds congressional special interest items. 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. The work is related to and fully coordinated with efforts in PE 0602618A (Ballistics Technology), PE 0602601A (Combat Vehicle and Automotive Technology), PE 0602782A (Command, Control, Communications Technology), PE 0602786A (Warfighter Technology), PE 0603001A (Warfighter Advanced Technology), PE 0603004A (Weapons and Munitions Advanced Technology), PE 0603005A (Combat Vehicle Advanced Technology), PE 0603008A (Command, Control, Communications 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.

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602105A: <i>MATERIALS TECHNOLOGY</i> |
|--|--|

B. Program Change Summary (\$ in Millions)

| | <u>FY 2009</u> | <u>FY 2010</u> | <u>FY 2011 Base</u> | <u>FY 2011 OCO</u> | <u>FY 2011 Total</u> |
|-------------------------------------|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 80.937 | 27.206 | 29.812 | 0.000 | 29.812 |
| Current President's Budget | 80.686 | 99.447 | 29.882 | 0.000 | 29.882 |
| Total Adjustments | -0.251 | 72.241 | 0.070 | 0.000 | 0.070 |
| • Congressional General Reductions | | -0.519 | | | |
| • Congressional Directed Reductions | | | | | |
| • Congressional Rescissions | | 0.000 | | | |
| • Congressional Adds | | 72.760 | | | |
| • Congressional Directed Transfers | | | | | |
| • Reprogrammings | 1.571 | 0.000 | | | |
| • SBIR/STTR Transfer | -1.822 | 0.000 | | | |
| • Adjustments to Budget Years | 0.000 | 0.000 | 0.070 | 0.000 | 0.070 |

Change Summary Explanation

FY10 Congressionally directed increases.

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
|---|----------------|------------------|-----------------------|-----------------------------------|------------------------|------------------|------------------|--|------------------|------------------|---------------|
| APPROPRIATION/BUDGET ACTIVITY | | | | R-1 ITEM NOMENCLATURE | | | | PROJECT | | | |
| 2040: Research, Development, Test & Evaluation, Army BA 2: Applied Research | | | | PE 0602105A: MATERIALS TECHNOLOGY | | | | H7B: Advanced Materials Initiatives (CA) | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| H7B: Advanced Materials Initiatives (CA) | 56.036 | 72.383 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| A. Mission Description and Budget Item Justification | | | | | | | | | | | |
| Congressional Interest Item funding provided for Advanced Materials Initiatives. | | | | | | | | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | | | | |
| | | | | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #1 Future Affordable Multi-Utility Materials for the Army Future Combat Systems. In FY09 this Congressional Interest Item developed a rapid composite manufacturing process for vehicle materials, UAVs and prosthetics fabrication. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | 6.379 | 7.162 | 0.000 | 0.000 | 0.000 |
| Program #2 | | | | | | | 0.498 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602105A: <i>MATERIALS TECHNOLOGY</i> | | PROJECT H7B: <i>Advanced Materials Initiatives (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Control System for Laser Powder Deposition. This Congressional Interest Item developed a model-driven, feed-forward control system algorithm for form part fabrication during laser powder deposition that minimizes post process residual stresses and optimizes manufacturing turnaround times.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #3</p> <p>Improvised Explosive Device Simulation in Different Soils. This Congressional Interest Item investigated the effects of different types of soils and soil conditions on the blast output of shallow buried explosives.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> | | | | 0.498 | 0.000 | 0.000 | 0.000 | 0.000 |

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|--|--|---|----------------------------|---------------------|--------------------|----------------------|
| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602105A: <i>MATERIALS TECHNOLOGY</i> | PROJECT H7B: <i>Advanced Materials Initiatives (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #4 Nanomanufacturing of Multifunctional Sensors. In FY09 this Congressional Interest Item developed materials and process methodologies for affordably producing nano- to micro- scale multifunctional chemical/biological warfare agent sensors and structural health monitoring sensors. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.997 | 3.979 | 0.000 | 0.000 | 0.000 |
| Program #5 Nickel Boron Coating-Technology for Army Weapons. This Congressional Interest Item explored the feasibility of the Nickel-Boron (UltraCem) coating technology to improve combatant craft and tactical vehicles' operational reliability and availability. <i>FY 2009 Accomplishments:</i> FY 2009 | | 2.392 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602105A: <i>MATERIALS TECHNOLOGY</i> | PROJECT H7B: <i>Advanced Materials Initiatives (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #6 Novel Extremity Body Armor. This Congressional Interest Item developed and characterized both penetration and blast effects on extremity armor and head gear systems, with a special emphasis on highly novel methods for secondary protection and mitigation of resulting impacts and effects of primary adverse loads. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.598 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #7 | | 1.196 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602105A: <i>MATERIALS TECHNOLOGY</i> | PROJECT H7B: <i>Advanced Materials Initiatives (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Project Kryptolite. This Congressional Interest Item developed blast protection coatings and infrared enhanced coatings for the range of military applications.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #8</p> <p>Ultra-Endurance Coating. This Congressional Interest Item upgraded and enhanced technological coating processes and scaled-up its coating systems capabilities to enable a broader and larger range of components to be viable candidates for advanced coatings solutions.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> | | 3.589 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602105A: <i>MATERIALS TECHNOLOGY</i> | PROJECT H7B: <i>Advanced Materials Initiatives (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #9 One-Step JP-8 Bio Diesel Fuel. In FY09 this Congressional Interest Item researched and developed a means for producing JP-8 biodiesel in a single step using enzymatic or chemical methods from northern climate plants to provide reliable, safe, cost-effective, and energy efficient fuel source for the US armed forces. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 1.595 | 1.592 | 0.000 | 0.000 | 0.000 |
| Program #10 Composite Applied Research and Technology for FCS and Tactical Vehicle Survivability. In FY09, this Congressional Interest Item added to promising research, which has a potential to assist in the future development of advanced lightweight multifunctional composites for combat, tactical and air manned and unmanned vehicles and individual soldier systems for the Future Force. <i>FY 2009 Accomplishments:</i> FY 2009 | | 2.990 | 3.182 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602105A: <i>MATERIALS TECHNOLOGY</i> | PROJECT H7B: <i>Advanced Materials Initiatives (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #11 Capability Expansion of Spinel Transparent Armor Manufacturing. In FY09 this Congressional Interest Item produced a 12" by 12", low cost magnesium aluminate (MgAl2O4) spinel transparent armor plate for potential application to future lightweight tactical vehicles. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 5.103 | 1.591 | 0.000 | 0.000 | 0.000 |
| Program #12 | | 1.195 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602105A: <i>MATERIALS TECHNOLOGY</i> | PROJECT H7B: <i>Advanced Materials Initiatives (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Ultrasonic Consolidation for Armor Applications. This Congressional Interest Item manufactured intermetallic hybrid laminates using ultrasonic consolidation fabrication for development of Ti/TiAl3/Al laminated blast kits with performance superior to that of titanium.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #13</p> <p>Ultrasonic Impact Technology. In FY09 this Congressional Interest Item tested and evaluated a portable device that uses ultrasonic impact technology to restore residual comprehensive stresses in materials.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> | | 1.195 | 1.990 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602105A: <i>MATERIALS TECHNOLOGY</i> | PROJECT H7B: <i>Advanced Materials Initiatives (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #14 Lightweight Transparent Armor for Force Protection. This Congressional Interest Item investigated novel urethane polymer materials for advanced ballistic performance. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 1.994 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #15 Next Generation Protective Seat. This Congressional Interest Item explored next generation seat concepts to mitigate the multiple shock events that are prevalent during warfare. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 | | 2.392 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602105A: <i>MATERIALS TECHNOLOGY</i> | PROJECT H7B: <i>Advanced Materials Initiatives (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #16 Dual Stage Variable Energy Absorber. In FY09 this Congressional Interest Item investigated energy absorbing technologies capable of managing the blast energy and subsequently the loads and accelerations sustained by occupants traveling in ground vehicles subjected to mine and IED blast. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 2.392 | 2.388 | 0.000 | 0.000 | 0.000 |
| Program #17 Unmanned Ground Vehicle Advanced Technology Development. This Congressional Interest Item developed advanced lightweight materials, modified, hardened, and made production-ready payloads, to include extendable lift systems and robotic manipulators, that could operate as stand-alone systems or be integrated on unmanned | | 2.492 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602105A: <i>MATERIALS TECHNOLOGY</i> | PROJECT H7B: <i>Advanced Materials Initiatives (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| platforms to help develop the next generation payloads for increased reliability and provide insights on production ready units at an affordable cost. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #18 Modeling and Testing of Next Generation Body Armor. In FY09 this Congressional Interest Item developed multi-scale modeling capabilities related to personnel protective materials that enable fundamental understanding of high-rate interactions between lightweight protective materials and the body. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base | | 1.994 | 1.990 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602105A: <i>MATERIALS TECHNOLOGY</i> | PROJECT H7B: <i>Advanced Materials Initiatives (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #19 Development of Improved Lighter-Weight IED/EFM Armor Solutions. In FY09 this Congressional Interest Item used a novel 25 kiloton press to form an integrated armor system consisting of metals and composites that could potentially be used to meet ballistic performance criteria of lightweight tactical vehicles. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.997 | 1.592 | 0.000 | 0.000 | 0.000 |
| Program #20 Advanced Conductivity Program (ACP). In FY09 this Congressional Interest Item fabricated transparent,conductive coatings that reflect in the infrared. Evaluated coatings for durability in transparent composites and tailored for optimum performance. <i>FY 2009 Accomplishments:</i> FY 2009 | | 3.489 | 0.995 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602105A: <i>MATERIALS TECHNOLOGY</i> | PROJECT H7B: <i>Advanced Materials Initiatives (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #21 Affordable Light-Weight Metal Matrix Composite Armor. In FY09 this Congressional Interest Item established an affordable and scalable lightweight metal matrix composite (MMC) production facility to manufacture MMC ingot, and large scale rolled & squeeze cast Al MMC plates for potential use in vehicular armor solutions and accelerates the production of MMCs for other commercial industries. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 1.595 | 2.487 | 0.000 | 0.000 | 0.000 |
| Program #22 | | 3.189 | 3.183 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602105A: <i>MATERIALS TECHNOLOGY</i> | PROJECT H7B: <i>Advanced Materials Initiatives (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Ballistic Armor Research. In FY09 this Congressional Interest Item conducted collaborative research to incorporate polyurethanes and select other polymeric materials into advanced lightweight multifunctional composites for combat, tactical vehicles and other damage-tolerant applications for individual soldier systems for the Future Force.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #23</p> <p>Lattice Block Structures for AM2 Matting Replacement. In FY09 this Congressional Interest Item developed a lightweight, strong and easy to install replacement for AM-2 matting which has the potential to enable rapid expansion of parking aprons, taxiways and runways for austere airfields</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> | | 2.492 | 1.592 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602105A: <i>MATERIALS TECHNOLOGY</i> | PROJECT H7B: <i>Advanced Materials Initiatives (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #24 Lightweight Anti-Ballistic Protection for Aircraft. This Congressional Interest Item investigated the use of silicon carbide and boron carbide shaped-insert components for National Institute of Justice Level III armor systems derived from Kennon's material systems that are used to enhance the usability and performance of thermoacoustic insulation for rotorcraft. These composite constructions should be readily adaptable to various military aviation needs, as well as other applications where lightweight deployable structures are required. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.399 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #25 Moldable Fabric Armor. In FY09 this Congressional Interest Item developed moldable fabric technology, a thermoplastic polypropylene fabric, for prospective high-performance ballistic armor applications that | | 1.197 | 2.228 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602105A: <i>MATERIALS TECHNOLOGY</i> | PROJECT H7B: <i>Advanced Materials Initiatives (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>complemented the Army's efforts to enhance the survivability of lightweight tactical vehicles and weapons systems.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #26</p> <p>Renewable Jet Fuel from Lignocellulosic Feedstocks. In FY09 this Congressional Interest Item developed an economically efficient bio-oil production process using lignocellulosic materials as the raw feed through the use of ionic liquid pretreatment/processing and fast pyrolysis. The bio-oil has the potential to then be converted into JP-8, diesel, and gasoline using known refining processes.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> | | 3.189 | 2.388 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602105A: <i>MATERIALS TECHNOLOGY</i> | PROJECT H7B: <i>Advanced Materials Initiatives (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #27 Dev, Opt, & Trf of Reliable Test Tech for Materials Designed to Protect WF Agnst Toxic Chem Agents. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 0.478 | 0.000 | 0.000 | 0.000 |
| Program #28 Ultra Lightweight Metallic Armor. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 | | 0.000 | 0.796 | 0.000 | 0.000 | 0.000 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602105A: <i>MATERIALS TECHNOLOGY</i> | PROJECT H7B: <i>Advanced Materials Initiatives (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #29 Aluminum Armor Project. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 0.836 | 0.000 | 0.000 | 0.000 |
| Program #30 Smart Integrated Systems: Materials, Manufacturing Methods, and Structures. This is a Congressional Interest Item. | | 0.000 | 0.995 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602105A: <i>MATERIALS TECHNOLOGY</i> | PROJECT H7B: <i>Advanced Materials Initiatives (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #31 Reactive Materials. This is a Congressional Interest Item. | | 0.000 | 1.194 | 0.000 | 0.000 | 0.000 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #32 | | 0.000 | 1.194 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602105A: <i>MATERIALS TECHNOLOGY</i> | PROJECT H7B: <i>Advanced Materials Initiatives (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Large-Scale Manufacturing of Revolutionary Nanostructured Materials. This is a Congressional Interest Item.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #33</p> <p>Next Generation Lightweight Electric Drive Systems for Army Weapons. This is a Congressional Interest Item.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | 0.000 | 1.592 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602105A: <i>MATERIALS TECHNOLOGY</i> | PROJECT H7B: <i>Advanced Materials Initiatives (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #34 Next Generation High Strength Glass Fibers for Ballistic Armor Applications. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 1.592 | 0.000 | 0.000 | 0.000 |
| Program #35 High Strength Glass Production and Qualification for Armor Applications. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base | | 0.000 | 1.592 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602105A: <i>MATERIALS TECHNOLOGY</i> | PROJECT H7B: <i>Advanced Materials Initiatives (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #36 Advanced Nanocomposite Materials for Lightweight Integrated Armor Systems. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 1.592 | 0.000 | 0.000 | 0.000 |
| Program #37 Materials Technology for LED Lighting Applications. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 | | 0.000 | 2.388 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602105A: <i>MATERIALS TECHNOLOGY</i> | PROJECT H7B: <i>Advanced Materials Initiatives (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #38 Distributed, Networked, Unmanned Ground Systems for Enhanced RSTA. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 3.183 | 0.000 | 0.000 | 0.000 |
| Program #39 Fused Silica for Large-Format Transparent Armor. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 | | 0.000 | 3.183 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602105A: <i>MATERIALS TECHNOLOGY</i> | PROJECT H7B: <i>Advanced Materials Initiatives (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #40 Lightweight Metal Alloy Foam for Armor. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 3.183 | 0.000 | 0.000 | 0.000 |
| Program #41 Advanced Composite Research for Vehicles. This is a Congressional Interest Item. | | 0.000 | 3.979 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602105A: <i>MATERIALS TECHNOLOGY</i> | PROJECT H7B: <i>Advanced Materials Initiatives (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #42 Nanoelectronic Memory, Sensor and Energy Devices. This is a Congressional Interest Item. | | 0.000 | 6.267 | 0.000 | 0.000 | 0.000 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Accomplishments/Planned Programs Subtotals | | 56.036 | 72.383 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | DATE: February 2010 |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602105A: <i>MATERIALS TECHNOLOGY</i> | PROJECT H7B: <i>Advanced Materials Initiatives (CA)</i> |
| 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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602105A: <i>MATERIALS TECHNOLOGY</i> | | | | PROJECT H7G: <i>NANOMATERIALS APPLIED RESEARCH</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| H7G: <i>NANOMATERIALS APPLIED RESEARCH</i> | 4.881 | 5.112 | 5.238 | 0.000 | 5.238 | 5.299 | 5.411 | 5.509 | 5.602 | Continuing | Continuing |

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, lethality, and sustainability. 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 Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Nanomaterials Applied Research: Devise and validate improved, physics-based, materials property models, and concepts for multifunctional, lightweight and responsive hierarchical material technologies, and 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 conducted internally by ARL and externally through a collaborative effort with ISN and ISN industry partners. In FY09, validated performance enhancements (survivability, lethality, sustainability) enabled through insertion of nanomaterials constituents in scalable processes. In FY10, examine concepts for the absorption of energy in personnel protection applications. In FY11, will research novel materials and hybridization of materials for personnel protection in ballistic environments. <i>FY 2009 Accomplishments:</i> FY 2009 | 4.881 | 4.994 | 5.238 | 0.000 | 5.238 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602105A: <i>MATERIALS TECHNOLOGY</i> | PROJECT H7G: <i>NANOMATERIALS APPLIED RESEARCH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #2 Small Business Innovative Research/Small Business Technology Transfer Programs <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 0.118 | 0.000 | 0.000 | 0.000 |
| Accomplishments/Planned Programs Subtotals | | 4.881 | 5.112 | 5.238 | 0.000 | 5.238 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | DATE: February 2010 |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602105A: <i>MATERIALS TECHNOLOGY</i> | PROJECT H7G: <i>NANOMATERIALS APPLIED RESEARCH</i> |
| 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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602105A: <i>MATERIALS TECHNOLOGY</i> | | | | PROJECT H84: <i>MATERIALS</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| H84: <i>MATERIALS</i> | 19.769 | 21.952 | 24.644 | 0.000 | 24.644 | 24.856 | 27.011 | 29.656 | 33.068 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

The objective of this project is to support the design, development and evaluation of materials for more survivable and lighter weight armor and armaments. This project provides the technical foundation for materials technology in metals, ceramics, polymers, and composites. This project will address the needs 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. Overarching goals of this material 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 Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Structural Armor: Optimize lightweight armor materials/structures, processing methodology, and modeling and simulation tools to enable formulation of lightweight, frontal, and structural armors. In FY09, evaluated transparent armors and multi-layer/hybrid materials options against current and emerging threats; provided computational models and simulations of lightweight air supported structures that allow for improved planning, and reduce the number of test coupons needed to develop new lightweight highly mobile medical tent systems. In FY10, optimize glass-ceramic laminate transparent composite materials at reduced weight; and examine interlaminar properties of multilaminar materials to optimize performance and reduce weight. In FY11, will determine candidate materials and configurations for ceramic only transparent armor solutions; and characterize materials properties and microstructures to determine optimal configurations for ballistic protection. | 5.002 | 5.225 | 5.913 | 0.000 | 5.913 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | |
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| APPROPRIATION/BUDGET ACTIVITY | R-1 ITEM NOMENCLATURE | PROJECT | | | |
| 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | PE 0602105A: <i>MATERIALS TECHNOLOGY</i> | H84: <i>MATERIALS</i> | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | |
| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | |
| Program #2 Soldier Borne Armor: 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. In FY09, increased fidelity of simulation capability and transitioned second generation protection/lethality concepts to development community. In FY10, develop and formulate materials that allow for optimal ballistic performance from low, intermediate, and high velocity impacts and blast waves and refine three dimensional reinforcement concepts for composite materials. In FY11, will develop new, mass-efficient, protection materials and technologies to mitigate energy from both ballistic and blast events. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 | 2.730 | 2.779 | 3.150 | 0.000 | 3.150 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602105A: <i>MATERIALS TECHNOLOGY</i> | PROJECT H84: <i>MATERIALS</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #3 Composites: Design, validate, and optimize advanced materials (ceramic, composite, polymers, lightweight and high-strength metals) and processing techniques for smaller but more lethal penetrators/warheads and affordable, lightweight high performance armaments for revolutionary weapons effectiveness in urban and irregular operations. In FY09, designed material system to provide the desired multi-functional capability to enhance damage on relevant targets and conducted benchmark testing with that material system. In FY10, develop novel nano-micro-structures in metallic materials; characterize microstructures and high and low rate properties; and identify effect of parameters leading to shear in plastically deformed metals. In FY11, will 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 scale processing approach and produce samples of sufficient size to permit sub-scale ballistic evaluation. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 4.198 | 4.118 | 4.533 | 0.000 | 4.533 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602105A: <i>MATERIALS TECHNOLOGY</i> | | PROJECT H84: <i>MATERIALS</i> | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #4 | <p>Electronic Materials: Design and optimize electro-ceramic materials and processing techniques for integration by the Communications and 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. In FY09, developed unique growth process science to achieve compositionally graded ferroelectric oxide thin film materials and integrated the material into a specialized device structure. In FY10, develop methodologies to enable low defect synthesis of ferroelectric oxide thin film materials for high quality factor/low insertion loss devices; evaluate and develop methodologies to enable materials for Complementary Metal-Oxide Semiconductor (CMOS) compatible low cost integration; and employ theoretical formalisms to aid the design of materials for tunable device components. In FY11, will advance optimization methodologies to enable low defect synthesis of ferroelectric oxide thin film materials; and will perform optimization of low temperature synthesis of ferroelectric oxide thin film materials for CMOS compatibility and integration.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | 0.500 | 0.497 | 0.500 | 0.000 | 0.500 |
| Program #5 | <p>Nanomaterials: Mature and scale-up nanomaterials processes, fabrication, characterization and performance measures to enable revolutionary concepts for future force lethality and survivability beyond those addressed</p> | 1.346 | 1.390 | 1.486 | 0.000 | 1.486 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602105A: <i>MATERIALS TECHNOLOGY</i> | PROJECT H84: <i>MATERIALS</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>for individual Soldier protection in project H7G. In FY09, scaled-up the process methodology for fabricating fully-dense, boron carbide plates; performed microstructural and mechanical property characterization. In FY10, develop relationships between scaled-up processing of nanoscale materials and processing; characterize reactive materials and provide feedback to model developers. In FY11, will develop new reactive structural material compositions and optimize microstructures based on models and testing; and will characterize nanoscale structures using analytical microscopy tools.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #6</p> <p>Multifunctional Armor: 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). In FY09, investigated composite ceramic materials to increase body armor performance while reducing weight. For ground combat and tactical wheeled vehicles, designed and assessed materials for reactive armor effectors to reduce fratricide and increase performance. For electromagnetic armors: developed materials capabilities for better coils and field adaptability to reduce weight and increase performance. Designed and developed multifunctional materials for hybrid armor systems that provide dual threat protection capability against kinetic energy and chemical energy threats. In</p> | | 5.993 | 7.746 | 9.062 | 0.000 | 9.062 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602105A: <i>MATERIALS TECHNOLOGY</i> | PROJECT H84: <i>MATERIALS</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>FY10, characterize ceramic materials for high strain rate/shock properties; examine the tradeoff of stiffness versus damage tolerance in materials systems by quantifying constitutive property behaviors; and complete investigation/design of material properties for reactive armor effectors and electromagnetic armors coils. In FY11, will perform failure mode characterization of passive and active armor materials; will determine propagation fracture toughness in ceramics and measure and model residual stress in metal matrix composite armor materials; will develop scale up processes for multi-modal materials microstructures; will examine novel metallic structures to reduce weight and manage ballistic impact loads.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #7 Small Business Innovative Research/Small Business Technology Transfer Programs</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> | | 0.000 | 0.197 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602105A: <i>MATERIALS TECHNOLOGY</i> | | PROJECT H84: <i>MATERIALS</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Accomplishments/Planned Programs Subtotals | | | | 19.769 | 21.952 | 24.644 | 0.000 | 24.644 |
| 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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Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification **DATE:** February 2010

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602120A: <i>Sensors and Electronic Survivability</i> |
|--|--|

| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
|---|----------------|------------------|-----------------------|----------------------|------------------------|------------------|------------------|------------------|------------------|------------------|------------|
| Total Program Element | 76.213 | 70.272 | 48.929 | 0.000 | 48.929 | 50.543 | 55.582 | 62.063 | 68.331 | 0 | 480.862 |
| 140: <i>HI-POWER MICROWAVE TEC</i> | 6.087 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| H15: <i>GROUND COMBAT ID TECH</i> | 12.669 | 7.798 | 7.874 | 0.000 | 7.874 | 8.015 | 8.670 | 11.816 | 12.954 | Continuing | Continuing |
| H16: <i>S3I TECHNOLOGY</i> | 19.388 | 19.465 | 17.910 | 0.000 | 17.910 | 18.990 | 21.935 | 23.357 | 24.781 | Continuing | Continuing |
| SA1: <i>Sensors and Electronic Initiatives (CA)</i> | 30.900 | 18.304 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| SA2: <i>BIOTECHNOLOGY APPLIED RESEARCH</i> | 5.584 | 5.769 | 5.884 | 0.000 | 5.884 | 5.985 | 6.295 | 6.703 | 7.306 | Continuing | Continuing |
| TS1: <i>TACTICAL SPACE RESEARCH</i> | 1.585 | 1.652 | 1.695 | 0.000 | 1.695 | 1.725 | 2.757 | 3.787 | 4.815 | Continuing | Continuing |
| TS2: <i>ROBOTICS TECHNOLOGY</i> | 0.000 | 15.693 | 15.566 | 0.000 | 15.566 | 15.828 | 15.925 | 16.400 | 18.475 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

The focus of this program element (PE) is to provide research and evaluation of sensors and electronic technologies that enhance survivability, lethality, deployability, and sustainability capabilities. Focus is on research that provides high-power electronic components and technologies for compact, light-weight power and energy storage, conversion, and conditioning, and radio frequency (RF)/microwave directed energy (DE) weapons (Project 140 - moves to PE 0602705A in FY10 and FY11); 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 sensor, signal, and information processing technology for advanced reconnaissance, surveillance, and target acquisition (RSTA) (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) is related to and 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 Computer Science and Sensor Technology), PE 0603006A (Command, Control, Communications Advanced Technology), and PE 0603008A (Command Electronic Warfare Advanced Technology). The cited work is consistent with the Director, Defense Research and Engineering Strategic

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| 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. | | | | | |
| <u>B. Program Change Summary (\$ in Millions)</u> | | | | | |
| | <u>FY 2009</u> | <u>FY 2010</u> | <u>FY 2011 Base</u> | <u>FY 2011 OCO</u> | <u>FY 2011 Total</u> |
| Previous President's Budget | 75.299 | 50.641 | 50.836 | 0.000 | 50.836 |
| Current President's Budget | 76.213 | 70.272 | 48.929 | 0.000 | 48.929 |
| Total Adjustments | 0.914 | 19.631 | -1.907 | 0.000 | -1.907 |
| • Congressional General Reductions | | -0.369 | | | |
| • Congressional Directed Reductions | | | | | |
| • Congressional Rescissions | | 0.000 | | | |
| • Congressional Adds | | 20.000 | | | |
| • Congressional Directed Transfers | | | | | |
| • Reprogrammings | 2.417 | 0.000 | | | |
| • SBIR/STTR Transfer | -1.503 | 0.000 | | | |
| • Adjustments to Budget Years | 0.000 | 0.000 | -1.907 | 0.000 | -1.907 |
| <u>Change Summary Explanation</u> | | | | | |
| FY10 Congressionally directed increases. | | | | | |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602120A: <i>Sensors and Electronic Survivability</i> | | | | PROJECT 140: <i>HI-POWER MICROWAVE TEC</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| 140: <i>HI-POWER MICROWAVE TEC</i> | 6.087 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

IN FY10, THIS EFFORT WAS MOVED TO PE 0602705A/PROJECT EM8. The objective of this project is to 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, and conditioning, radio frequency (RF)/microwave directed energy (DE) weapons, and traditional and non-traditional RF and laser electronic attack. This includes traditional jammers, RF Directed Energy Weapon (DEW) technology as well as the high power components that will significantly enhance the survivability and lethality of Army platforms and related systems. The DEW effort studies both RF microwave and laser system capabilities and effects against various threats such as off- and on-route mines and electronically guided and fuzed missiles and munitions. Required power system components include power generation and storage, high-temperature/high power devices, power converters, and power conditioning. The ongoing DE effects and power component work is coordinated with and, as appropriate, leveraged by DEW and power and 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). 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 Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 High Power Devices: Research and evaluate materials and component structures that provide the higher energy density required by next generation Army systems such as electromagnetic armor, hybrid-vehicle propulsion electronics, directed energy sources, pulse power for future force systems, small unattended ground sensors, and Soldier systems. In FY09, developed Silicon Carbide (SiC) power modules that operate at high temperature for power conversion levels >350 kW. Evaluated gallium nitride (GaN) and diamond materials for use as direct energy converter in extended life batteries for unattended sensor and prognostics and diagnostics applications. | 2.232 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602120A: <i>Sensors and Electronic Survivability</i> | PROJECT 140: <i>HI-POWER MICROWAVE TEC</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #2 High Energy Laser: Research novel solid-state laser concepts, architectures, and design components enabling High Energy Laser (HEL) technology for Army specific DEW applications. Exploit breakthroughs in laser technology and photonics basic research. Conduct applied research in close collaboration with domestic ceramic (and other) material vendors, university researchers, and major laser diode manufacturers. In FY09, validated a new approach to developing highly power-scalable, eye-safe, fiber laser based on significant minimization of heat deposition into Erbium (Er) - doped fiber amplifier. This new approach significantly increased laser performance. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base | | 2.434 | 0.000 | 0.000 | 0.000 | 0.000 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| <p>Program #3</p> <p>Directed Energy: Research and evaluate technologies related to DEW technology, electronic warfare (EW) survivability/lethality, and associated high power components to enhance survivability/lethality of Army platforms. In FY09, designed a counter electronic system and conducted lab test to evaluate the capability. Investigated feasibility of using RF DE to electronically attack air threats of interest to the Air Defense Artillery Center and AMRDEC for Enhanced Area Air Defense. Identified and acquired critical components of Unmanned Aerial Vehicles and evaluated failure levels. Transitioned data and system design to AMRDEC for further evaluation. Investigated EW interoperability issues between EW devices and communication systems.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | 1.421 | 0.000 | 0.000 | 0.000 | 0.000 |
| <p>Program #4</p> <p>Small Business Innovative Research/Small Business Technology Transfer Programs</p> | | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602120A: <i>Sensors and Electronic Survivability</i> | | PROJECT 140: <i>HI-POWER MICROWAVE TEC</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Accomplishments/Planned Programs Subtotals | | | | 6.087 | 0.000 | 0.000 | 0.000 | 0.000 |
| 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. | | | | | | | | |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602120A: <i>Sensors and Electronic Survivability</i> | | | | PROJECT H15: <i>GROUND COMBAT ID TECH</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| H15: <i>GROUND COMBAT ID TECH</i> | 12.669 | 7.798 | 7.874 | 0.000 | 7.874 | 8.015 | 8.670 | 11.816 | 12.954 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

Efforts in this project research and investigate 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 demonstrate 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 coordinated with 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 Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Combat Identification (CID) Technologies: 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. In FY09, developed an integrated approach for a network enabled architecture to provide CID capability to Soldiers and close air support/strike aircraft; investigated embedding CID waveforms in the Joint Tactical Radio Systems; investigated non-cooperative technologies for foe and neutral identification in a battlefield environment; investigated radio frequency (RF) tags for air to ground Situational Awareness (SA) applications; developed a consolidated target identification and SA data display. In FY10, assess technologies for incorporation into a universal/multi-platform CID capability. Candidate technologies include the Soldier Radio Waveform (SRW), Laser/RF Time Difference of Arrival (TDOA), and Geometric Pairing techniques at point of detection/response; demonstrate CID/SA data display. In FY11, will model fusion algorithms for improved battlespace awareness to include geolocation and target identification algorithms utilizing blue force emitter information to resolve current radar warning receiver sensor ambiguities; will link to Distributed Common Ground System-Army | 7.602 | 4.124 | 4.557 | 0.000 | 4.557 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602120A: <i>Sensors and Electronic Survivability</i> | PROJECT H15: <i>GROUND COMBAT ID TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>(DCGS)-A Enterprise for initial evaluation/User Jury to obtain user community feedback and recommendations for algorithm improvements; will perform communication and network modeling and simulation. Related work is also accomplished under PE 0603270A/project K16.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| Program #2 | Multi-Intelligence Data Fusion and Targeting: 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 (ISR) planning and execution at the task force/battalion level through troop-level as well as efforts that enable the enterprise to identify, fuse, trace/track specific human targets in an asymmetric environment. In FY10, develop, integrate and demonstrate a multi-Intelligence sensor manager and planner into Distributed Common Ground System-Army (DCGS)-A and Tactical Ground Reporting Network (TiGRNet); functionally map battle command mission tasks with the needed intelligence and geospatial data and collection opportunities; develop data extraction tools to incorporate political military economic social information infrastructure and behavior modeling data DCGS-A compliant multi-intelligence correlation service and integrate imagery and video data products for additional fidelity; develop a video-based tracker service | 0.000 | 3.485 | 3.317 | 0.000 | 3.317 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602120A: <i>Sensors and Electronic Survivability</i> | | PROJECT H15: <i>GROUND COMBAT ID TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>for real-time and forensic viewing and analysis. In FY11, will associate Intel requirements, Geolocation data needs and collection opportunities with operational mission tasks for Intel and BC communities; will mature common architecture and framework to provide a portable software environment, storage and access for Intel and Operations communities. Related work is also being accomplished under PE 0602270A/project 906.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #3</p> <p>Combat Identification (CID) for Light Weight Tactical Vehicles: This effort researches the miniaturization of real time NATO interoperable CID technologies for current force light weight tactical vehicles that will have potential for Soldier CID. In FY09, investigated technologies to reduce the size, weight, cost, and power consumption of the processor, transceiver, and antenna components for the NATO interoperable Battlefield Target Identification Device (BTID) system for implementation on High Mobility Multi-Wheeled Vehicles; investigated large capacity field programmable gate arrays to reduce the processor and transceiver sizes; developed and demonstrated novel millimeter wave (mmW) antenna designs to achieve required antenna pattern with a smaller, lower profile configuration; and investigated approaches for target ID correlation. Related work is also accomplished under PE 0603270A/project K15.</p> | | | | 5.067 | 0.000 | 0.000 | 0.000 | 0.000 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #4 Small Business Innovative Research/Small Business Technology Transfer Programs | | 0.000 | 0.189 | 0.000 | 0.000 | 0.000 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Accomplishments/Planned Programs Subtotals | | 12.669 | 7.798 | 7.874 | 0.000 | 7.874 |

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| 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: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602120A: <i>Sensors and Electronic Survivability</i> | | | | PROJECT H16: <i>S3I TECHNOLOGY</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| H16: <i>S3I TECHNOLOGY</i> | 19.388 | 19.465 | 17.910 | 0.000 | 17.910 | 18.990 | 21.935 | 23.357 | 24.781 | Continuing | Continuing |

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, etc. 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 diverse sensors such as acoustic, seismic, 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 and track battlefield targets such as personnel, heavy/light vehicles, helicopters, etc., and locate gun fire; improved signal-to-noise ratio (SNR) and noise mitigation devices and algorithms; sensor technologies for the detection, tracking, and assessment of humans, especially in urban terrain; high performance multi-function radio frequency (RF) systems that allow target acquisition, combat identification (ID), active protection, surveillance, and communications systems consolidated into a single system, reducing system cost, and size; 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; aided/automatic target recognition (ATR) allowing sensors to autonomously locate and identify targets; Ultra-violet (UV) opto-electronics for battlefield sensors; 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; advanced information processing methods to provide automatic information technologies that utilize widely dispersed sensor and legacy information sources; sensor and eye protection against laser threats, and algorithms for acoustic sensors mounted on a Soldier's helmet to localize source of gunfire. The work in this project is 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. Work in this area is performed by the Army Research Laboratory (ARL), Adelphi, MD.

B. Accomplishments/Planned Program (\$ in Millions)

| | | | | | |
|------------|----------------|----------------|---------------------|--------------------|----------------------|
| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #1 | 4.696 | 4.762 | 6.042 | 0.000 | 6.042 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602120A: <i>Sensors and Electronic Survivability</i> | PROJECT H16: <i>S3I TECHNOLOGY</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Unattended Ground Sensors (UGS): Develop technologies for low-cost UGS to enhance persistent sensing capabilities. Research focus is based on opportunities and feedback from UGS used in Operation Iraqi Freedom and other theaters. A key focus is on detecting people. Investigate fusion algorithms using multi-modal sensing phenomenology including acoustic, seismic, magnetic, electric field (E-field), passive IR, and RF to increase probability of target detection and reduce false alarms. In FY09, evaluated the combination of advanced imaging sensor types for ATR such as polarimetric FLIR with LADAR; extended autonomous acoustic sensing and processing algorithms to new platforms; investigated use of magnetic and E-field sensors on vehicles. In FY10, along with the United States Marine Corps and others, advance the Family of UGS concept to develop standard protocols and communications, implement acoustic wind and flow mitigation techniques on moving and airborne systems; expand transient classification capabilities; enhance MEMS magnetic sensor sensitivity and detection algorithms; evaluate non-erasable magnetic memory; implement E-field sensor system to conduct target detection and subsurface imaging. In FY11, will implement family of UGS concepts with multiple UGS vendors; will enhance acoustic localization accuracy through meteorological correction of solution vectors; will exploit acoustic, seismic, magnetic, and electric fields for locating, reliable target characterization, and classification; and will implement airborne multimodal sensing of targets.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| Program #2 | | 2.072 | 4.515 | 4.722 | 0.000 | 4.722 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602120A: <i>Sensors and Electronic Survivability</i> | PROJECT H16: <i>S3I TECHNOLOGY</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Sensor and Data Fusion: Investigate and devise hyper-modal sensor data fusion for detecting and classifying human infrastructure in urban operations, such as personnel, vehicles, machinery, RF emissions, chemicals, and computers in hidden and confined spaces such as tunnels, caves, sewers, and buildings. In FY09, investigated the application of sensor fusion algorithms and sensor networks to new Army applications, such as force protection and hostile fire defeat (sniper detection/defeat), and homeland security applications, and investigate feasibility of a solar-blind 280-nanometer (nm) avalanche photodiode for Soldier protection. In FY10, transition sensor fusion research from the US-UK International Technology Alliance to support Coalition Warfare Programs; implement diverse modality sensor and information fusion for enhanced situational awareness for hostile fire defeat; experimentally validate optical, acoustic, E-field, RF, IR, retroreflection and other threat-detection sensors and fusion algorithms on UGS, man-wearable, vehicles, robotic, and other airborne systems. Assess low-cost implementations of solar blind avalanche detector. In FY11, will implement novel fusion methodologies, and decentralized and distributed data fusion using heterogeneous sensor systems, platforms, and networks to perform enhanced detection, tracking, and classification of threats, exploit multi-modal sensing and fusion concepts to characterize underground facilities, materiel and tunnels, and develop new policy-based sensor information algorithms for robust communication up to coalition level. Will implement new computationally efficient anomaly detection algorithms for imaging target recognition.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Program #3</p> <p>Tagging Tracking and Locating (TTL):Conduct applied research to support advances in state-of-the-art clandestine TTL for non-traditional hostile forces and non-cooperative targets. Specific technical objectives, products, and deliverables related to this effort are classified. This effort will directly support Communication-Electronics Research, Development, and Engineering Center's (CERDEC) advanced research in clandestine TTL. In FY09, researched extremely wide ranging technologies that are applicable to clandestine TTL. In FY10, identify technologies that have the potential to achieve the goals of clandestine TTL and conduct research to mature these areas. In FY11, will design, fabricate, and evaluate TTL devices for transition to CERDEC.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | 1.397 | 0.985 | 1.028 | 0.000 | 1.028 |
| <p>Program #4</p> <p>Sensor Protection:Research, develop, and validate electro-optical techniques and components to protect sensors and eyes from threat laser sources on the battlefield; explore redesign of optical devices and new nonlinear optical materials for enhanced protection. In FY09, developed and evaluated demonstrator protection devices across the visible spectrum.</p> | | 2.652 | 0.000 | 0.000 | 0.000 | 0.000 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #5 Ultra Wideband Radar: 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. Characterize target and clutter scattering behavior in support of advanced image formation and detection algorithm development. Transfer predictions and algorithms to landmine detection, STTW, and robotic perception programs. In FY09, devised radar concepts and supporting algorithms to enable Army ground vehicles to survey the forward looking hemisphere for concealed targets, including hidden personnel and large arms caches in buildings and various mine deployments. In FY10, implement effective target/clutter discrimination algorithms using advanced signal processing techniques including change detection. Devise rough-ground models to compute radar backscatter over UHF and L-band and compare to radar forward-looking measurements over road surfaces. Devise realistic computer-aided-design (CAD) models for rooms of high complexity, including plumbing, heating ventilation, air-conditioning (HVAC) systems, wiring, etc.; compute radar images over typical STTW frequency band and compare the exact solution with approximate solver (Xpatch) to quantify approximations. In FY11, will | | 3.680 | 3.310 | 2.271 | 0.000 | 2.271 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| investigate advanced Improvised Explosive Device (IED)-discrimination algorithms that exploit physics-based features to reduce false alarms in low-artifact radar imagery. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #6 Multi Function Radio Frequency System (MFRFS): 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 and for photoluminescent detection of biological threats. In FY09, evaluated methods for classifying dismounted Soldiers using biometric signatures. Developed waveforms and algorithms for implementing biometric techniques in an unattended compact radar. Researched high-power 280-nm light-emitting-diode (LED) sources for UV opto-electronic applications. In FY10, develop algorithms to extract RF biometric signatures for CERDEC All-terrain Radar for Tactical Exploitation of Moving target indicator (MTI) and Imaging Surveillance (ARTEMIS) - Program and explore sub-millimeter Wave (mmW) phenomenology for application to human-borne IED detection. Pursue high-efficiency 280-nm LED sources. In FY11, will apply RF biometric algorithms to an unattended compact radar for perimeter watching as part of a | | 2.286 | 3.365 | 1.236 | 0.000 | 1.236 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>larger Unmanned Ground System network and establish baseline designs of a sub-mmW imager for human-borne IED detection. Extend UV source research to 250-nm optical source.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #7</p> <p>Information Fusion: 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. In FY09, conducted lab experiments to establish a baseline for evaluating the effectiveness of bio-inspired asset management for providing persistent surveillance for detecting and monitoring activity within a limited activity dynamic urban scene. From this baseline, devised and developed algorithms to scale to more complex scenes. In FY10, conduct 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). In FY11, will 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.</p> | | 2.605 | 2.392 | 2.611 | 0.000 | 2.611 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #8 Small Business Innovative Research/Small Business Technology Transfer Programs | | 0.000 | 0.136 | 0.000 | 0.000 | 0.000 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Accomplishments/Planned Programs Subtotals | | 19.388 | 19.465 | 17.910 | 0.000 | 17.910 |

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| 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: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | R-1 ITEM NOMENCLATURE PE 0602120A: <i>Sensors and Electronic Survivability</i> | | | | | PROJECT SA1: <i>Sensors and Electronic Initiatives (CA)</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| SA1: <i>Sensors and Electronic Initiatives (CA)</i> | 30.900 | 18.304 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| A. Mission Description and Budget Item Justification | | | | | | | | | | | |
| Congressional Interest Item funding provided for Sensors and Electronic Initiatives. | | | | | | | | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | | | | |
| | | | | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #1 Advanced Detection of Explosives Program. In FY09 this Congressional Interest Item accelerated development of an innovative remote sensor monitoring technology designed to lead to a mobile test bed for advanced stand-off detection of explosives. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | 2.392 | 1.591 | 0.000 | 0.000 | 0.000 |
| Program #2 | | | | | | | 0.797 | 0.796 | 0.000 | 0.000 | 0.000 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Wearable Video Capture System. In FY09 this Congressional Interest Item developed wearable video capturing technology for soldier applications. The program improved on optical designs and electronics to better meet Army applications.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #3</p> <p>Terahertz Spectrometer Technology. This Congressional Interest Item developed a system demonstrator that improves signal to noise ratio and lessens scan time for more rapid spectrum acquisition.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> | | 0.797 | 0.000 | 0.000 | 0.000 | 0.000 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602120A: <i>Sensors and Electronic Survivability</i> | PROJECT SA1: <i>Sensors and Electronic Initiatives (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #4 Semi-Autonomous or Unattended PsychOp and Recon Tool (SUPORT). This Congressional Interest Item developed open architecture software that can autonomously control unattended ground sensors and various Psy-Op tools. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 2.392 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #5 Self-Deploying Autonomous Sensor Platforms for Situational Awareness. This Congressional Interest Item conducted research and development of nanotechnology useful for defining novel sensors and confirmers that were applicable to the development of a point bio-aerosol detection system that combined a high-confidence IR trigger, sample collector and immunoassay-based identifier in a single integrated unit responsive to the Joint Biological Tactical Detection System (JBTDs) program and the basic framework for integrating the next-generation CB sensors on a mobile platform that is capable of addressing the requirements of the Chemical Biological Distributed Early Warning System (CBEWS) program. | | 3.987 | 0.000 | 0.000 | 0.000 | 0.000 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #6 Adaptive Infrastructure for SOF Experimentation. This Congressional Interest Item researched capitalization of the emerging wireless networks with various Unmanned Vehicles (UV's) and other battlefield equipment allowed increased capability to our warfighters. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 2.392 | 0.000 | 0.000 | 0.000 | 0.000 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #7 Wearable Gyro-Compensated Personnel Tracking During GPS Interference. This Congressional Interest Item developed initial prototypes for testing, conducted operational evaluations, and delivered a number of final systems for formal Army testing and evaluation. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.797 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #8 Lookout Small Scale Radar Program. This Congressional Interest Item developed the Lookout Small Scale Radar (LSSR) which ultimately is to be mounted on a Special Operations Craft-Riverine where it detects Small Arms Fire (up to 50 caliber rounds) and provided the location of the shooter to the crew. Use of Radio Frequency (RF) Reflector Tags enabled Identification Friend or Foe functionality and a basic research effort investigating the feasibility of a hybrid RF/Acoustic system that is more robust than either sensor alone shall also be undertaken. <i>FY 2009 Accomplishments:</i> FY 2009 | | 1.993 | 0.000 | 0.000 | 0.000 | 0.000 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #9 Intelligent Fault Protected Laser Diodes. This Congressional Interest Item developed integrated power circuits and innovative cooling systems for high power laser diodes. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.797 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #10 Large Aluminum Nitride Crystals for Effective Deep Ultraviolet Sources. This Congressional Interest Item developed growth of UV light emitting devices on bulk aluminum nitride substrates. | | 0.797 | 0.000 | 0.000 | 0.000 | 0.000 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #11 Advanced Magnetic Nanosensors for Defense Applications. This Congressional Interest Item developed nanosensors with unprecedented sensitivity, reduced noise, optimal compatibility with electronic systems, and the capability to detect explosives, chemicals and motion. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 4.784 | 0.000 | 0.000 | 0.000 | 0.000 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #12 Advanced UV Light Diode Sensor Development. In FY09 this Congressional Interest Item developed and implemented strategies for improvement of wall plug efficiency in deep UV sources. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 1.595 | 0.796 | 0.000 | 0.000 | 0.000 |
| Program #13 Hydrogen Batteries for the Warfighter. This Congressional Interest Item developed a high accuracy, reliable, inexpensive and rugged, distributed nanosensor system for protecting U.S. forces from nuclear, chemical, and biological weapon threats concealed in buildings, cargo containers, trucks, and other vehicles in a conventional theater of war. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 | | 2.990 | 0.000 | 0.000 | 0.000 | 0.000 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #14 Single Crystal Chemical Vapor Deposition Diamond Lens Elements for High-Energy Lasers. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 0.795 | 0.000 | 0.000 | 0.000 |
| Program #15 Surveillance Augmentation Vehicle. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 | | 0.000 | 1.194 | 0.000 | 0.000 | 0.000 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #16 Nanophotonic Devices. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 1.592 | 0.000 | 0.000 | 0.000 |
| Program #17 Terahertz Sensing and Imaging Technology. This is a Congressional Interest Item. | | 0.000 | 1.592 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602120A: <i>Sensors and Electronic Survivability</i> | PROJECT SA1: <i>Sensors and Electronic Initiatives (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #18 Electronic Keel. This is a Congressional Interest Item. | | 0.000 | 1.592 | 0.000 | 0.000 | 0.000 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #19 | | 0.000 | 1.990 | 0.000 | 0.000 | 0.000 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602120A: <i>Sensors and Electronic Survivability</i> | PROJECT SA1: <i>Sensors and Electronic Initiatives (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Advanced Bonded Diamond for Optical Applications. This is a Congressional Interest Item. | | | | | | |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #20 | Advanced Composite Nickel-Manganese-Cobalt Lithium Ion Battery. This is a Congressional Interest Item. | 0.000 | 2.387 | 0.000 | 0.000 | 0.000 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602120A: <i>Sensors and Electronic Survivability</i> | PROJECT SA1: <i>Sensors and Electronic Initiatives (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #21 Advanced Communications for Mobile Networks. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 3.183 | 0.000 | 0.000 | 0.000 |
| Program #22 Advanced Tactical Laser Flashlight Devices. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 1.201 | 0.796 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602120A: <i>Sensors and Electronic Survivability</i> | PROJECT SA1: <i>Sensors and Electronic Initiatives (CA)</i> | | | | |
| <u>B. Accomplishments/Planned Program (\$ in Millions)</u> | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #23 | | 3.189 | 0.000 | 0.000 | 0.000 | 0.000 |
| Boston University Photonics Center | | | | | | |
| <i>FY 2009 Accomplishments:</i> | | | | | | |
| FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> | | | | | | |
| FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> | | | | | | |
| FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> | | | | | | |
| FY 2011 OCO | | | | | | |
| Accomplishments/Planned Programs Subtotals | | 30.900 | 18.304 | 0.000 | 0.000 | 0.000 |
| <u>C. Other Program Funding Summary (\$ in Millions)</u> | | | | | | |
| N/A | | | | | | |
| <u>D. Acquisition Strategy</u> | | | | | | |
| N/A | | | | | | |
| <u>E. Performance Metrics</u> | | | | | | |
| 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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602120A: <i>Sensors and Electronic Survivability</i> | | | | PROJECT SA2: <i>BIOTECHNOLOGY APPLIED RESEARCH</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| SA2: <i>BIOTECHNOLOGY APPLIED RESEARCH</i> | 5.584 | 5.769 | 5.884 | 0.000 | 5.884 | 5.985 | 6.295 | 6.703 | 7.306 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

The objective of this project is to provide funding for 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 (ARL) and other Army laboratories, including the Natick Soldier Research, Development, and Engineering Center (NSRDEC) and Edgewood Chemical Biological Center (ECBC), 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 Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 ICB: In FY09, optimized the design of biologically-based and inspired sensors and materials and investigated incorporation of biologically-inspired control systems and networks, investigated bioelectronic properties of biologically-derived conductive nano-fibers. Established supporting infrastructure to select Molecular Recognition Elements (MREs) using novel micro-fluidic system. Designed and fabricated novel materials for uncooled thermal imagers to reduce cost and power consumption. Optimized protein system for conversion | 5.584 | 5.619 | 5.884 | 0.000 | 5.884 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602120A: <i>Sensors and Electronic Survivability</i> | PROJECT SA2: <i>BIOTECHNOLOGY APPLIED RESEARCH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>of methane to methanol for fuels to reduce logistics burden. Optimized bio-inspired control system for data collection from networks to optimize information flow to users. Fabricated reversible adhesive pads based on gecko-inspired design and design integration with small robots for covert robotic surveillance. Transitioned MRE selection devices to ECBC and NSRDEC. In FY10, fabricate and evaluate uncooled thermal detector materials, investigate scale-up of proteins for methane to methanol conversion, evaluate algorithms for optimized collection of data from sensor networks, and characterize reversible adhesive pads based on gecko-inspired design. In FY11, will 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, will experimentally validate surface-enhanced Raman spectroscopic detection of explosives in open-channel microfluidic devices, and will implement bio-inspired flocking (mass grouping of algorithms) and search algorithms for unmanned vehicles in GeoTrack system.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| Program #2 | | 0.000 | 0.150 | 0.000 | 0.000 | 0.000 |
| Small Business Innovative Research/Small Business Technology Transfer Programs | | | | | | |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602120A: <i>Sensors and Electronic Survivability</i> | | PROJECT SA2: <i>BIOTECHNOLOGY APPLIED RESEARCH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Accomplishments/Planned Programs Subtotals | | | | 5.584 | 5.769 | 5.884 | 0.000 | 5.884 |
| 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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602120A: <i>Sensors and Electronic Survivability</i> | | | | PROJECT TS1: <i>TACTICAL SPACE RESEARCH</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| TS1: <i>TACTICAL SPACE RESEARCH</i> | 1.585 | 1.652 | 1.695 | 0.000 | 1.695 | 1.725 | 2.757 | 3.787 | 4.815 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

Efforts in this project research and investigate technologies with the potential for space-based and high altitude 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. The applied research and technology evaluation 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 Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Tactical Space Research: This effort designs, develops, and evaluates space-based technologies and components that lead to smaller, lighter, and more responsive payloads with plug and play interface standardization. These technologies allow for the rapid integration and development of tactical satellites in support of responsive space and high altitude environments. In FY09, continued investigation of a small on-station digitally reprogrammable radio for insertion into a tactical radio relay payload for high altitude and/or space environments; conducted a Joint Space Experiment (JSE) with the US Air Force to measure illumination of the ground. In FY10, investigate multi-nano-satellite architectures and integration of multi-spectral and hyper-spectral bands for imaging sensors operating in high altitude and space environments; investigate use of multiple waveforms on single tactical radio relay payloads operating in high altitude and space environments; continue to conduct the JSE for measurement of ground illumination. In FY11, will 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; will investigate protection technologies for uplinks, downlinks, and cross-links of space and high | 1.585 | 1.606 | 1.695 | 0.000 | 1.695 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602120A: <i>Sensors and Electronic Survivability</i> | PROJECT TS1: <i>TACTICAL SPACE RESEARCH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| altitude assets; will 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. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #2 Small Business Innovative Research / Small Business Technology Transfer Programs <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 0.046 | 0.000 | 0.000 | 0.000 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602120A: <i>Sensors and Electronic Survivability</i> | | PROJECT TS1: <i>TACTICAL SPACE RESEARCH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Accomplishments/Planned Programs Subtotals | | | | 1.585 | 1.652 | 1.695 | 0.000 | 1.695 |
| 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: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602120A: <i>Sensors and Electronic Survivability</i> | | | | PROJECT TS2: <i>ROBOTICS TECHNOLOGY</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| TS2: <i>ROBOTICS TECHNOLOGY</i> | 0.000 | 15.693 | 15.566 | 0.000 | 15.566 | 15.828 | 15.925 | 16.400 | 18.475 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

The objective of this project is to provide 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 provides the basis for the Collaborative Technology Alliance (CTA) in robotics, 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), Aberdeen Proving Ground, MD.

B. Accomplishments/Planned Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Robotics CTA: Conduct research to provide 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 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. In FY10, investigate ways to improve understanding of urban scenes and activities to promote enhanced autonomous situational awareness for safe, | 0.000 | 6.652 | 6.895 | 0.000 | 6.895 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602120A: <i>Sensors and Electronic Survivability</i> | PROJECT TS2: <i>ROBOTICS TECHNOLOGY</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>effective operations and survivability, to enhance techniques to plan and execute missions in uncertain and dynamic environments, and to examine concepts for dexterous manipulation. In FY11, will 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.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #2</p> <p>Perception and Intelligent Control: 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 Advanced Technology) project 515 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. In FY10, investigate perception and control algorithms for safe operations in dynamic urban environments. In FY11, will investigate tactical behavior appropriate to military missions in "urban-like" environments.</p> | | 0.000 | 4.853 | 4.828 | 0.000 | 4.828 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602120A: <i>Sensors and Electronic Survivability</i> | | PROJECT TS2: <i>ROBOTICS TECHNOLOGY</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #3</p> <p>Autonomous Robotics Integration: Integrate technology on unmanned ground vehicle test beds and conduct extensive field testing 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 testing 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. In FY10, evaluate ability to safely operate in mixed, dynamic, urban-like environments. In FY11, will evaluate the ability of unmanned systems to maneuver intelligently and autonomously in urban-like environments.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> | | | | 0.000 | 3.749 | 3.843 | 0.000 | 3.843 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #4 SBIR/STTR <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 0.439 | 0.000 | 0.000 | 0.000 |
| Accomplishments/Planned Programs Subtotals | | 0.000 | 15.693 | 15.566 | 0.000 | 15.566 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602120A: <i>Sensors and Electronic Survivability</i> | PROJECT TS2: <i>ROBOTICS TECHNOLOGY</i> |
| 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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Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification **DATE:** February 2010

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602211A: <i>AVIATION TECHNOLOGY</i> |
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| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
|--|-------------------|---------------------|-----------------------------|----------------------------|------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|------------|
| Total Program Element | 46.232 | 49.273 | 43.476 | 0.000 | 43.476 | 42.598 | 44.305 | 47.821 | 49.765 | 0 | 366.946 |
| 47A: <i>AERON & ACFT WPNS TECH</i> | 36.970 | 36.859 | 38.028 | 0.000 | 38.028 | 38.027 | 39.634 | 43.059 | 44.909 | Continuing | Continuing |
| 47B: <i>VEH PROP & STRUCT TECH</i> | 4.238 | 4.256 | 5.448 | 0.000 | 5.448 | 4.571 | 4.671 | 4.762 | 4.856 | Continuing | Continuing |
| 47C: <i>ROTORCRAFT COMPONENT TECHNOLOGIES (CA)</i> | 5.024 | 8.158 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 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.

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602211A: <i>AVIATION TECHNOLOGY</i> |
|--|---|

B. Program Change Summary (\$ in Millions)

| | <u>FY 2009</u> | <u>FY 2010</u> | <u>FY 2011 Base</u> | <u>FY 2011 OCO</u> | <u>FY 2011 Total</u> |
|-------------------------------------|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 46.898 | 41.332 | 42.329 | 0.000 | 42.329 |
| Current President's Budget | 46.232 | 49.273 | 43.476 | 0.000 | 43.476 |
| Total Adjustments | -0.666 | 7.941 | 1.147 | 0.000 | 1.147 |
| • Congressional General Reductions | | -0.259 | | | |
| • Congressional Directed Reductions | | | | | |
| • Congressional Rescissions | | 0.000 | | | |
| • Congressional Adds | | 8.200 | | | |
| • Congressional Directed Transfers | | | | | |
| • Reprogrammings | -0.141 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.525 | 0.000 | | | |
| • Adjustments to Budget Years | 0.000 | 0.000 | 1.147 | 0.000 | 1.147 |

Change Summary Explanation

FY10 congressionally directed increases.

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602211A: <i>AVIATION TECHNOLOGY</i> | | | | PROJECT 47A: <i>AERON & ACFT WPNS TECH</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| 47A: <i>AERON & ACFT WPNS TECH</i> | 36.970 | 36.859 | 38.028 | 0.000 | 38.028 | 38.027 | 39.634 | 43.059 | 44.909 | 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 063003A (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 Aeroflightdynamics 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 Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 National Rotorcraft Technology Center (NRTC): 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 preeminence in rotorcraft capabilities. In FY09, performed bird strike and head impact simulations to improve rotorcraft crashworthiness and survivability. Conducted certification testing and probabilistic analysis to evaluate damage tolerance methodologies. Tested advanced drive system designs for noise and wear characteristics. Evaluated an active crash protection system for application to rotary wing unmanned aerial systems. In FY10, conduct whirl tower testing of aero-morphing rotor system. Demonstrate composite material technology that provides up to a 25% reduction in component weight and a 40% reduction in recurring | 8.466 | 7.763 | 8.091 | 0.000 | 8.091 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602211A: <i>AVIATION TECHNOLOGY</i> | | PROJECT 47A: <i>AERON & ACFT WPNS TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>manufacturing costs compared to a conventional metallic structure. Correlate nonlinear aeroelasticity analysis results with wind tunnel and flight test data to improve understanding and predictive capability for rotor stall flutter. In FY11, will evaluate metal matrix composite structural elements as replacements for titanium elements. Will 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. Will validate physics-based analysis methodology predictions for hub drag reductions with available test data.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #2</p> <p>Rotor Technology: Evaluate performance enhancements gained from advanced rotor technologies, including on-blade controls. In FY09, acquired validation test data for highly instrumented, full-scale conventional UH-60 rotor, and validated advanced modeling and simulation methods for active rotor controls using previously acquired test data. In FY10, evaluate rotor aeromechanics issues for high speed configurations using high fidelity analyses. Validate methods for UH-60 and active rotor tests. Fabricate Active Elevon Rotor (AER) and modify test stand to avoid dynamic instabilities. In FY11, will acquire high quality interactional aerodynamics measurements for a high speed active flow control rotor configuration. Will execute active on-blade control test.</p> | | | | 3.234 | 3.339 | 3.185 | 0.000 | 3.185 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602211A: <i>AVIATION TECHNOLOGY</i> | | PROJECT 47A: <i>AERON & ACFT WPNS TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Will utilize high quality UH-60 rotor measurements to assess rotorcraft modeling and simulation tools for rotor structural loads, deflections and flowfield measurements.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #3</p> <p>Aircrew Survivability Technologies: Investigate advanced technologies to reduce susceptibility and vulnerability of aircraft to damage from threats or accidents and technologies to defeat small arms, rocket and missile threats. In FY09, developed updated structural design guidelines based on emerging criteria. Developed and tested innovative techniques for reducing detection of propeller and rotor driven aircraft by threat systems. Developed analytical tools required to evaluate material behaviors during both ballistic and high energy impact events. In FY10, complete conventional ballistic protection and advanced crew protection efforts and transition knowledge gained to ballistic protection and advanced crew protection technology maturation in PE 0603003A. Develop remote Optical Parametric Oscillators (OPOs) to tune laser countermeasure wavelengths to desired threat bands for effective InfraRed (IR) jamming of man-portable missiles. In FY11, will fabricate crashworthy systems/subsystems, conduct testing, and correlate test results with models previously developed. Will 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 test on a threat range.</p> | | | | 7.038 | 7.424 | 8.993 | 0.000 | 8.993 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602211A: <i>AVIATION TECHNOLOGY</i> | PROJECT 47A: <i>AERON & ACFT WPNS TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #4 Rotorcraft Airframe Technology: Develop new rotorcraft structure technologies to improve structural performance while reducing fabrication, operating, and support costs. In FY09, conducted laboratory testing to validate strain-allowable integrity design approach, emerging platform concepts and modeling fidelity. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.984 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602211A: <i>AVIATION TECHNOLOGY</i> | PROJECT 47A: <i>AERON & ACFT WPNS TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #5 Advanced Engines: Design and develop advanced turboshaft engine component technologies to support goals of reduced fuel consumption, engine size, weight, and cost, and improved reliability, maintainability and survivability. In FY09, for cargo sized aircraft, completed design of an advanced gas generator turbine that improves engine performance and durability. For utility/attack sized aircraft, completed fabrication of an advanced compressor for improved performance and reduced weight, and conducted an advanced combustor rig-test to validate improved performance and structural life. In FY10, for utility/attack sized aircraft, complete the design of an advanced compressor and conduct laboratory rig test. For cargo sized aircraft, complete fabrication of a gas generator turbine. In FY11, for a cargo sized aircraft, will complete advanced combustor design for improved engine performance and structural life; will complete fabrication of advanced compressor for improved engine performance and reduced weight; and will complete rig testing of gas generator turbine to validate improved engine performance and durability. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 2.015 | 1.975 | 2.551 | 0.000 | 2.551 |
| Program #6 System Concepts Studies: Enables new rotorcraft configurations by evaluating critical advanced technology using design and analysis methods with greater modeling fidelity. Introduces high fidelity methodology for | | 2.435 | 2.353 | 2.315 | 0.000 | 2.315 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602211A: <i>AVIATION TECHNOLOGY</i> | PROJECT 47A: <i>AERON & ACFT WPNS TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>improved performance and design predictions earlier in the acquisition process. In FY09, analyzed advanced tiltrotor configurations in maneuver flight conditions using comprehensive analysis. Analyzed an advanced tiltrotor fuselage and wing using computational fluid dynamics (CFD) in cruise. Evaluated the handling qualities of an advanced tiltrotor in hover. Completed investigation of rotorcraft handling qualities and met requirements in piloted simulation. Developed aerodynamic analysis and parametric evaluation capability for slowed rotor compound helicopter configurations. Documented analysis interfaces to allow inclusion of other new and emerging technical capabilities and rotorcraft configurations. In FY10, extend the CFD flight conditions for transition and maneuver flight. Continue 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. In FY11, will enhance/extend the fidelity of the integrated analysis and design environment to increase prediction accuracy and will investigate techniques for rigorous optimization of the rotorcraft design in full flight envelope simulation.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| Program #7 | | 4.691 | 5.061 | 5.444 | 0.000 | 5.444 |
| Network Operations and System Integration: Perform feasibility, operations and concept studies and Analysis of Alternatives to identify promising candidate technologies that can be evaluated as options for improved or | | | | | | |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602211A: <i>AVIATION TECHNOLOGY</i> | PROJECT 47A: <i>AERON & ACFT WPNS TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>new platform capabilities. Digital Situational Awareness Testbed: In FY09, investigated supervisory control techniques for control of multiple Unmanned Aircraft Systems (UAS). In FY10, demonstrate UAS supervisory techniques in flight. In FY11, will investigate use of UAS supervisory techniques in Manned-Unmanned Teaming flight test. Advanced Rotary Wing Concepts: In FY09, conducted flight test experiments using various sensors and weapons systems to gauge precision expected from rotary wing UAS in varying flight modes, i.e., high and low hover and firing on the move, against moving and stationary targets. In FY11, will integrate Reconnaissance, Surveillance, and Target Acquisition (RSTA) and pilotage improvements onto a rotary or fixed wing UAS and demonstrate in a simulated environment. Will evaluate improvements in target detection, geolocation and pilotage. Advanced Rotary Wing Weapons Integration Concepts: In FY10, demonstrate geo-location improvements and lightweight sensors utilizing advanced image stabilization techniques incorporated to provide hemispherical situational awareness for improved pilotage. Pursue UAS/weaponization demonstration initiatives with the other Services. In FY11, will integrate a lightweight, distributed sensor array into a UAS testbed platform to evaluate autonomous pilotage and collision avoidance techniques. Will develop/evaluate virtual interface technologies for rapid virtual immersion of UAS operators into UAS operating environment. Will extend supervisory control techniques to airborne control station applications.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| Program #8 | | 3.042 | 3.490 | 2.603 | 0.000 | 2.603 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602211A: <i>AVIATION TECHNOLOGY</i> | PROJECT 47A: <i>AERON & ACFT WPNS TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Intelligent and Active Control: Perform feasibility, operations and concept studies and Analysis of Alternatives to identify promising candidate technologies that can be evaluated as options for improved or new platform capabilities. In FY09, expanded handling quality requirements and flight control systems for legacy upgrades, multi-role and future rotorcraft. In FY10, develop handling quality criteria for legacy upgrades and future rotorcraft. Develop the Rotorcraft Air Crew Systems Concepts Airborne Laboratory (RASCAL, a JUH-60A Black Hawk helicopter) into a variable-stability in-flight simulator. Flight demonstrate increased-agility, obstacle field navigation and landing algorithms for unmanned platforms. Investigate geo-location improvements and lightweight sensors incorporating advanced image stabilization techniques to provide hemispherical situational awareness for improved pilotage. In FY11, will define control system architectures for emerging rotorcraft configurations based on initial dynamic simulation models and in-flight simulation experiments.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #9</p> <p>Durability and Sustainment Technologies: Develop prognostic and system health assessment technologies to enable transition to a Condition Based Maintenance supportability structure. In FY09, performed rig-testing of engine prognostic algorithms. Began bench testing of automatic trim tab actuators. Initiated development of prognostic algorithms for structural components. Assessed structural corrosion and damage detection algorithms.</p> | | 5.065 | 5.088 | 4.846 | 0.000 | 4.846 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Evaluated sensor and load monitoring feedback methods for structural diagnostics/prognostics and reduction of uncertainty in probabilistic methods for life management. In FY10, perform bench testing to demonstrate the accuracy and robustness of developed prognostic and diagnostic technologies. Bench test the physics of failure models for electronics, as well as validate prognostic reasoner to predict failures. Integrate a corrosion monitoring system into the Health and Usage Monitoring System and demonstrate on an airframe structural component. In FY11, will develop prognostic capabilities for more chaotic, nonlinear dynamic failure modes for mechanical systems. Will develop improved probabilistic methods for prediction of failure initiation and progression. Will evaluate nano-sensing technology for real-time integrity monitoring. Will implement improved design and analysis criteria.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #10 Small Business Innovative Research/Small Business Technology Transfer Programs</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> | | 0.000 | 0.366 | 0.000 | 0.000 | 0.000 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602211A: <i>AVIATION TECHNOLOGY</i> | PROJECT 47A: <i>AERON & ACFT WPNS TECH</i> | | | | |
| <u>B. Accomplishments/Planned Program (\$ in Millions)</u> | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Accomplishments/Planned Programs Subtotals | | 36.970 | 36.859 | 38.028 | 0.000 | 38.028 |
| <u>C. Other Program Funding Summary (\$ in Millions)</u> N/A | | | | | | |
| <u>D. Acquisition Strategy</u> N/A | | | | | | |
| <u>E. Performance Metrics</u> 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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| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| 47B: <i>VEH PROP & STRUCT TECH</i> | 4.238 | 4.256 | 5.448 | 0.000 | 5.448 | 4.571 | 4.671 | 4.762 | 4.856 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

This project investigates 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 is related to and 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) located at facilities at the NASA Glenn Research Center, Cleveland, OH, and the NASA Langley Research Center, Hampton, VA.

B. Accomplishments/Planned Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Rotor and Structure Technology: 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. In FY09, evaluated new multi-function structural concepts based on biological systems that are key enablers for future microsystems development. In FY10, conduct wind-tunnel test on a conceptual active rotor system to improve performance. In FY11, will perform a series of analytical and validation studies, including in-flight evaluations conducted jointly with the Federal Aviation Administration (FAA) and other Research, Development and Engineering Center (RDEC) field elements, to enhance analytical tools and methodologies for structural damage detection and condition-based maintenance of key structural components. Will fabricate six 1/4-scale high-performance active-twist rotor blades based on Apache baseline performance characteristics. Will conduct parametric wind-tunnel evaluations of two sets of advanced active-twist rotor configurations, one of which has been optimized for rotor performance improvements. Will complete analytical comparison study with data validation to document benefits of high-performance active designs. <i>FY 2009 Accomplishments:</i> FY 2009 | 0.841 | 0.898 | 2.010 | 0.000 | 2.010 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602211A: <i>AVIATION TECHNOLOGY</i> | | PROJECT 47B: <i>VEH PROP & STRUCT TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #2</p> <p>Propulsion and Drive Train Technology: 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. In FY09, assessed the durability of advanced environmental barrier coatings to improve the design of hot section engine components and validated variable speed transmission sub-scale components to enable improvements in rotorcraft maneuverability and noise reduction. In FY10, assess the feasibility of fabricating sub-elements of hollow and solid turbine blades from monolithic ceramic/composite hybrid materials to reduce engine weight. Design sand injection facility to enable the development of improved inlet particle separators. In FY11, will develop joining technologies to enable the fabrication and integration of ceramic fuel injectors for improved combustion process design, and will develop a coupled engine and drive train dynamic model that will enhance the accuracy of mechanical behavior predictions.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> | | | | 3.397 | 3.328 | 3.438 | 0.000 | 3.438 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602211A: <i>AVIATION TECHNOLOGY</i> | | PROJECT 47B: <i>VEH PROP & STRUCT TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Program #3 Small Business Innovative Research/Small Business Technology Transfer Programs | | | | 0.000 | 0.030 | 0.000 | 0.000 | 0.000 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Accomplishments/Planned Programs Subtotals | | | | 4.238 | 4.256 | 5.448 | 0.000 | 5.448 |
| C. Other Program Funding Summary (\$ in Millions) | | | | | | N/A | | |
| D. Acquisition Strategy | | | | | | N/A | | |

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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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
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| APPROPRIATION/BUDGET ACTIVITY | | | | R-1 ITEM NOMENCLATURE | | | | PROJECT | | | |
| 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | PE 0602211A: <i>AVIATION TECHNOLOGY</i> | | | | 47C: <i>ROTORCRAFT COMPONENT TECHNOLOGIES (CA)</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| 47C: <i>ROTORCRAFT COMPONENT TECHNOLOGIES (CA)</i> | 5.024 | 8.158 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| A. Mission Description and Budget Item Justification | | | | | | | | | | | |
| Congressional Interest Item funding provided for Rotorcraft Component Technologies. | | | | | | | | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | | | | |
| | | | | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #1 | | | | | | | 1.595 | 2.984 | 0.000 | 0.000 | 0.000 |
| Composite Small Main Rotor Blades : In FY09 this Congressional Interest Item developed innovative rotor design and fabrication processes that reduced the time and cost of a typical metal blade to composite blade conversion program | | | | | | | | | | | |
| <i>FY 2009 Accomplishments:</i> | | | | | | | | | | | |
| FY 2009 | | | | | | | | | | | |
| <i>FY 2010 Plans:</i> | | | | | | | | | | | |
| FY 2010 | | | | | | | | | | | |
| <i>Base FY 2011 Plans:</i> | | | | | | | | | | | |
| FY 2011 Base | | | | | | | | | | | |
| <i>OCO FY 2011 Plans:</i> | | | | | | | | | | | |
| FY 2011 OCO | | | | | | | | | | | |
| Program #2 | | | | | | | 1.595 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602211A: <i>AVIATION TECHNOLOGY</i> | PROJECT 47C: <i>ROTORCRAFT COMPONENT TECHNOLOGIES (CA)</i> | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | |
| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Aircraft Structural Condition Monitoring (ASCM) for Diagnostics and Prognostics: This Congressional Interest Item derived requirements to implement technology concepts to detect leading structural deformations, i.e. corrosion, erosion, cracks, de-lamination, stress/strain, then assess usable remaining life (prognostics) and schedule replacement parts or repair .</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | |
| <p>Program #3</p> <p>Intensive Quenching for Advanced Weapons Systems: In FY09 this Congressional Interest Item developed an advanced heat treating process that improved the performance, and cost of high strength steel components such as helicopter gears and gun barrels.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> | 0.957 | 1.194 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602211A: <i>AVIATION TECHNOLOGY</i> | | PROJECT 47C: <i>ROTORCRAFT COMPONENT TECHNOLOGIES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Program #4 Helicopter Reliability and Failure Analysis Center. This Congressional Interest Item established a reliability and failure analysis center that provided technical insight on component failure modes that could ultimately result in more reliable and maintainable aviation systems. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | 0.877 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #5 Technologies for Military Equipment Replenishment. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 | | | | 0.000 | 1.592 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602211A: <i>AVIATION TECHNOLOGY</i> | | PROJECT 47C: <i>ROTORCRAFT COMPONENT TECHNOLOGIES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Program #6 OMNI Active Vibration Control System. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | 0.000 | 2.388 | 0.000 | 0.000 | 0.000 |
| Accomplishments/Planned Programs Subtotals | | | | 5.024 | 8.158 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | DATE: February 2010 |
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| 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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| Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification | | | | | | | | | | DATE: February 2010 | |
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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602270A: <i>Electronic Warfare Technology</i> | | | | | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| Total Program Element | 20.058 | 22.303 | 17.330 | 0.000 | 17.330 | 17.806 | 18.175 | 18.518 | 21.855 | 0 | 153.375 |
| 442: <i>TACTICAL EW TECHNOLOGY</i> | 9.389 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 475: <i>ELECTRONIC WARFARE COMPONENT TECHNOLOGIES (CA)</i> | 3.587 | 6.268 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| 906: <i>Tactical Electronic Warfare Applied Research</i> | 7.082 | 16.035 | 17.330 | 0.000 | 17.330 | 17.806 | 18.175 | 18.518 | 21.855 | Continuing | Continuing |

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. This PE 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. This PE 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. Project 475 funds congressional special interest items. Since the current PE 0602270A, project 442 efforts are complementary to those funded from PE 0602270A, project 906, all efforts funded and executed from project 442 are being transferred to project 906 in FY10 and beyond, to reduce administrative burden. Work in this PE is related to and fully coordinated with PE 0603270A (EW Technology), PE 0602120A (Sensors and Electronic Survivability), and PE 0603772A (Advanced Tactical Computer Science and Sensor 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.

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602270A: <i>Electronic Warfare Technology</i> |
|--|---|

B. Program Change Summary (\$ in Millions)

| | <u>FY 2009</u> | <u>FY 2010</u> | <u>FY 2011 Base</u> | <u>FY 2011 OCO</u> | <u>FY 2011 Total</u> |
|-------------------------------------|-----------------------|-----------------------|----------------------------|---------------------------|-----------------------------|
| Previous President's Budget | 21.739 | 16.119 | 17.292 | 0.000 | 17.292 |
| Current President's Budget | 20.058 | 22.303 | 17.330 | 0.000 | 17.330 |
| Total Adjustments | -1.681 | 6.184 | 0.038 | 0.000 | 0.038 |
| • Congressional General Reductions | | -0.116 | | | |
| • Congressional Directed Reductions | | | | | |
| • Congressional Rescissions | | 0.000 | | | |
| • Congressional Adds | | 6.300 | | | |
| • Congressional Directed Transfers | | | | | |
| • Reprogrammings | -1.449 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.232 | 0.000 | | | |
| • Adjustments to Budget Years | 0.000 | 0.000 | 0.038 | 0.000 | 0.038 |

Change Summary Explanation

FY10 Congressionally directed increases.

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602270A: <i>Electronic Warfare Technology</i> | | | | PROJECT 442: <i>TACTICAL EW TECHNOLOGY</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| 442: <i>TACTICAL EW TECHNOLOGY</i> | 9.389 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

This objective of this project is to design, develop, and apply electronic warfare technologies to enhance the survivability capabilities of ground combat vehicles, aircraft, and the dismounted Soldier. The survivability approach provides detection avoidance through signature management and hit avoidance using warning receivers and electronic countermeasures. 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, 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. The ability to neutralize booby traps is pursued, and this project will investigate Electronic Support (ES) technologies used against non-communications signals for targeting and tactical situational awareness. Since the current PE 0602270A, project 442 efforts are complementary to those funded from PE 0602270A, project 906, all efforts funded and executed from project 442 have transferred to project 906 in FY10 and beyond, to reduce administrative burden. 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.

B. Accomplishments/Planned Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Networked Electronic Warfare: This effort provides autonomous detection, classification, correlation, and geo-location capability against modern wireless emitters and other threats in battlefield and urban environments. In FY09, integrated digital wideband receiver capabilities into a net-centric solution that combines detection and jamming, location, and neutralization capabilities; completed fabrication of adaptive processing arrays; completed algorithm development and validation testing; transitioned advanced RF detection capabilities to existing electronic countermeasure systems. Related work is also being accomplished under PE 0602270A/project 906, PE 0603270A/project K15, and PE 0603270A/project K16. <i>FY 2009 Accomplishments:</i> FY 2009 | 1.956 | 0.000 | 0.000 | 0.000 | 0.000 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602270A: <i>Electronic Warfare Technology</i> | PROJECT 442: <i>TACTICAL EW TECHNOLOGY</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #2 Cueing Sensor: This effort develops low cost infrared sensors that detect rocket propelled grenades, anti-tank guided missiles, and tank fired kinetic energy and high energy anti-tank rounds and then cue active protection system for Army vehicles. In FY09, completed focal plane array design; evaluated software algorithms for on the move detection capability. Related work effort is also being accomplished under PE 0603270A/project K16. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.099 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #3 | | 2.963 | 0.000 | 0.000 | 0.000 | 0.000 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602270A: <i>Electronic Warfare Technology</i> | PROJECT 442: <i>TACTICAL EW TECHNOLOGY</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Multispectral Threat Warning: This effort develops affordable electro-optic/infrared (EO/IR) countermeasure system concepts with multispectral detectors, multiband laser, and advanced countermeasure architectures. It develops advanced EO/IR countermeasure techniques to exploit signals in background clutter to increase detection, identification, and threat classification capabilities against laser guided munitions, surface-to-air, air-to-air, and anti-tank threats. In FY09, developed and evaluated new algorithm techniques to exploit signals in background clutter to increase detection, identification, and threat classification capabilities. In FY10 and beyond funding for this effort was transferred to PE 0602270A/project 906 under same title.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #4</p> <p>Advanced Tactical Electronic Support Measures: This effort investigates passive and active techniques and software algorithm development for three dimensional (3D) detection, identification, and precision geolocation of next-generation wireless communication threats and improved situational awareness (SA) under the constraint of operating in the presence of Force Protection jamming systems. Development will also address operational conditions such as dense, co-channel, and multipath radio frequency (RF) environments. In FY09, developed an integrated suite of optimal detection, de-interleaving (arranging received signal components in the appropriate order) and tracking techniques with a goal of full spectrum coverage for all waveform classes in a dense signal</p> | | 2.963 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602270A: <i>Electronic Warfare Technology</i> | PROJECT 442: <i>TACTICAL EW TECHNOLOGY</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>environment. In FY10 and beyond funding for this effort was transferred to PE 0602270A/project 906 under the title Passive and Active Targeting Techniques.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #5</p> <p>Low Cost RF Situational Awareness and Countermeasures: This effort provides the electronic countermeasures, signal coherency, power, spectral energy efficiency, and jamming capability to protect friendly airborne and surface platforms from wideband threat weapon systems that use advanced radar processing techniques. In FY09, developed new hardware and software modules with the capability to neutralize the enemy's ability to locate, classify, and engage our forces with radar-based air defense and targeting radars common to both air and ground platforms.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> | | 1.408 | 0.000 | 0.000 | 0.000 | 0.000 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Accomplishments/Planned Programs Subtotals | | 9.389 | 0.000 | 0.000 | 0.000 | 0.000 |
| 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. | | | | | | |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
|---|-----------------------|-------------------------|------------------------------|---|-------------------------------|-------------------------|-------------------------|--|-------------------------|-------------------------|----------------------|
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602270A: <i>Electronic Warfare Technology</i> | | | | PROJECT 475: <i>ELECTRONIC WARFARE COMPONENT TECHNOLOGIES (CA)</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| 475: <i>ELECTRONIC WARFARE COMPONENT TECHNOLOGIES (CA)</i> | 3.587 | 6.268 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| A. Mission Description and Budget Item Justification | | | | | | | | | | | |
| Congressional Interest Item funding for Electronic Warfare technology applied research. | | | | | | | | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | | | | |
| | | | | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #1 | | | | | | | 1.594 | 0.000 | 0.000 | 0.000 | 0.000 |
| Battlefield Connectivity, Multi-Level Secure Network: In FY09 this Congressional Interest Item supported the Cross Domain Intelligence release (CDIR) program which is a consolidated, multi-level/domain management secure information system. | | | | | | | | | | | |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | | | | |
| Program #2 | | | | | | | 1.993 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602270A: <i>Electronic Warfare Technology</i> | PROJECT 475: <i>ELECTRONIC WARFARE COMPONENT TECHNOLOGIES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Counter-IED Force Protection Program: In FY09 this Congressional Interest Item developed and optimized antennas, signal detection and processing hardware/software and algorithms suitable for employment in tactical environments.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #3</p> <p>Hostile Fire Indicator for Aircraft. This is a Congressional Interest Item.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> | | 0.000 | 1.492 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602270A: <i>Electronic Warfare Technology</i> | PROJECT 475: <i>ELECTRONIC WARFARE COMPONENT TECHNOLOGIES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #4 Silver Fox Unmanned Aerial Vehicle - Army. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 1.592 | 0.000 | 0.000 | 0.000 |
| Program #5 Integrated Information Technology Policy Analyses Research. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 | | 0.000 | 3.184 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602270A: <i>Electronic Warfare Technology</i> | | PROJECT 475: <i>ELECTRONIC WARFARE COMPONENT TECHNOLOGIES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Accomplishments/Planned Programs Subtotals | | | | 3.587 | 6.268 | 0.000 | 0.000 | 0.000 |
| 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. | | | | | | | | |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602270A: <i>Electronic Warfare Technology</i> | | | | PROJECT 906: <i>Tactical Electronic Warfare Applied Research</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| 906: <i>Tactical Electronic Warfare Applied Research</i> | 7.082 | 16.035 | 17.330 | 0.000 | 17.330 | 17.806 | 18.175 | 18.518 | 21.855 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

Efforts in this project design, develop, and apply 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, 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, the ability to neutralize booby traps is also pursued. 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, other research areas include fusion (automated assimilation and synthesis) of battlefield intelligence data to enable interpretation of current and future enemy activities and allowing development of courses of action in time to act decisively and in a pre-emptive manner. Since the current PE 0602270A, project 442 efforts are complementary to those funded from PE 0602270A, project 906, all efforts funded and executed from project 442 are being transferred to project 906 in FY10 and beyond, to reduce administrative burden. 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 Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Multi-Intelligence Data Fusion and Targeting: This effort investigates and develops software technologies for advanced Intelligence/Battle Command enterprise collaboration that enable the enterprise to identify, fuse, trace/track specific human targets in an asymmetric environment. In FY10, develop advanced data ingestion (throughput of high volume and non-traditional data types), data alignment/conversion (normalization), and correlation and data engineering management techniques. In FY11, will integrate additional fusion algorithms, data, sensor and message types, temporal enhancements, as well as integrated extraction, visualization, and | 0.000 | 5.484 | 6.915 | 0.000 | 6.915 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602270A: <i>Electronic Warfare Technology</i> | PROJECT 906: <i>Tactical Electronic Warfare Applied Research</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>conceptualization tools into a fusion & exploitation framework for improved target tracking and identification; investigate biometric data matching and fusion algorithms for use in non-cooperative intelligence collection environment. Related work is also being accomplished under PE 0602120A/project H15.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #2</p> <p>Offensive Information Operations Technologies: 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. In FY10, define distributed communications to allow the technologies to communicate and migrate between nodes; begin development of interception and countermeasure capabilities against network traffic flows of interest; develop Network Operations techniques against relevant high priority protocols; research methods to link this Computer Network Operations (CNO) framework to previously developed Electronic Warfare (EW) frameworks. In FY11, will develop capability for identification and capture of protocols of interest; will implement algorithms to allow for surgical and coordinated exploitation amongst nodes; will develop traffic analysis techniques to discriminate amongst individual data sessions; will prototype communication and coordination capabilities between CNO and EW systems.</p> | | 0.000 | 3.692 | 3.770 | 0.000 | 3.770 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602270A: <i>Electronic Warfare Technology</i> | PROJECT 906: <i>Tactical Electronic Warfare Applied Research</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #3 Multispectral Threat Warning: This effort investigates the benefits of augmenting the currently fielded Ultra-Violet (UV)-based Common Missile Warning System (CMWS) threat detection capability with infrared (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. In FY10, investigate integration of acoustic signals into UV-based hostile fire indication (HFI) algorithms; evaluate acoustic array hardware concepts with regard to algorithm design and begin correlation of acoustic and UV based HFI data based on hardware integration concepts. In FY11, will finalize IR and UV sensor integration algorithms; will demonstrate integration concept of these multispectral sensors and their affect on detection and false alarm in a laboratory environment; will demonstrate effectiveness of acoustic sensor in enhancing HFI algorithms. <i>FY 2009 Accomplishments:</i> FY 2009 | | 0.000 | 3.191 | 3.068 | 0.000 | 3.068 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602270A: <i>Electronic Warfare Technology</i> | PROJECT 906: <i>Tactical Electronic Warfare Applied Research</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #4 Passive and Active Targeting Techniques: This effort investigates passive and active techniques and software algorithm development for three dimensional (3D) detection, identification, and precision geolocation of next-generation wireless communication threats and improved situational awareness (SA). Development will also address operational conditions such as dense, co-channel, and multipath radio frequency (RF) environments. In FY10, evaluate and select precision geolocation techniques and analyze performance results in the presence of jamming and under varying environmental conditions; design software to implement selected techniques on commercial based software defined radio representative hardware; evaluate techniques for feasibility of implementation on representative hardware. In FY11, will enhance geolocation techniques based on results of representative hardware testing; will perform additional simulation and laboratory validation testing of these enhancements utilizing synthesized and outdoor wireless RF data collected in relevant field environments; will 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. <i>FY 2009 Accomplishments:</i> FY 2009 | | 0.000 | 3.411 | 3.577 | 0.000 | 3.577 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602270A: <i>Electronic Warfare Technology</i> | PROJECT 906: <i>Tactical Electronic Warfare Applied Research</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #5</p> <p>Networked Electronic Warfare: This effort provides autonomous detection, classification, correlation, and geo-location capability against modern wireless emitters and other threats in battlefield and urban environments. In FY09, investigated and developed techniques to engage emergent communications technologies for inclusion into Information Operations (IO) techniques database; refined IO techniques database for access and use by other users including Joint Service and other members of intelligence community. Related work is also being accomplished under PE 0602270A/project 442; PE 0603270A/project K15, and PE 0603270A/project K16.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | 4.091 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602270A: <i>Electronic Warfare Technology</i> | PROJECT 906: <i>Tactical Electronic Warfare Applied Research</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #6 Fusion Based Technologies: This effort develops an advanced knowledge generation capability to answer warfighting commanders' priority intelligence requirements (PIR) for the future force. These answers provide actionable intelligence enabling timely decision-making by commanders and timely action by Soldiers in the execution of operations. In FY09, developed final set of representations for different types of enemy tactics to handle more complex and asymmetric behaviors such as ambushes, vehicle-borne explosive devices, and sniper attacks; demonstrated capabilities to automatically identify and link human-specified critical entities and activities to PIRs and reveal emerging actionable intelligence; developed and demonstrated an intelligence, surveillance, and reconnaissance planning/re-planning toolset with capabilities for evaluating and selecting the most capable and relevant collection assets given PIRs and contextual information. Related work is also being accomplished under PE 0602270A/project 442 and PE 0603772A/project 243. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 2.991 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #7 Small Business Innovative Research/Small Business Technology Transfer Programs | | 0.000 | 0.257 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602270A: <i>Electronic Warfare Technology</i> | | PROJECT 906: <i>Tactical Electronic Warfare Applied Research</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Accomplishments/Planned Programs Subtotals | | | | 7.082 | 16.035 | 17.330 | 0.000 | 17.330 |
| 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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Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification **DATE:** February 2010

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602303A: <i>MISSILE TECHNOLOGY</i> |
|--|--|

| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
|---|----------------|------------------|-----------------------|----------------------|------------------------|------------------|------------------|------------------|------------------|------------------|------------|
| Total Program Element | 57.502 | 70.924 | 49.525 | 0.000 | 49.525 | 45.426 | 44.982 | 45.299 | 49.034 | 0 | 412.217 |
| 214: <i>MISSILE TECHNOLOGY</i> | 47.220 | 50.452 | 49.525 | 0.000 | 49.525 | 45.426 | 44.982 | 45.299 | 49.034 | Continuing | Continuing |
| 223: <i>AERO-PROPULSION TECHNOLOGY</i> | 4.785 | 7.560 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| G04: <i>AIR DEFENSE TECHNOLOGIES (CA)</i> | 2.552 | 10.425 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| G05: <i>MISSILE TECHNOLOGY INITIATIVES (CA)</i> | 2.945 | 2.487 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

This program element (PE) designs and develops advanced component technologies for missiles, rockets, and their launch systems in order to increase the lethality, precision, and effectiveness of tactical missiles and guided munitions under adverse battlefield conditions while reducing system cost, size and weight, enhance the survivability of launch systems and forward operating bases, increase kill probabilities against diverse targets, and provide advanced simulation and virtual prototyping analysis tools. Projects 223, G03, and G05 fund congressional special interest items. The work in this PE is related to, and fully coordinated with, with PE 0603313A (Missile and Rocket Advanced Technology), PE 0602624A (Weapons and Munitions Technology), PE 0603004A (Weapons and Munitions Advanced Technology), and PE 0602618A (Ballistics Technology, Robotics 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 PE is performed by the Aviation and Missile Research, Development, and Engineering Center (AMRDEC), Huntsville, AL.

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602303A: <i>MISSILE TECHNOLOGY</i> |
|--|--|

B. Program Change Summary (\$ in Millions)

| | <u>FY 2009</u> | <u>FY 2010</u> | <u>FY 2011 Base</u> | <u>FY 2011 OCO</u> | <u>FY 2011 Total</u> |
|-------------------------------------|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 56.747 | 50.716 | 49.403 | 0.000 | 49.403 |
| Current President's Budget | 57.502 | 70.924 | 49.525 | 0.000 | 49.525 |
| Total Adjustments | 0.755 | 20.208 | 0.122 | 0.000 | 0.122 |
| • Congressional General Reductions | | -0.372 | | | |
| • Congressional Directed Reductions | | | | | |
| • Congressional Rescissions | | 0.000 | | | |
| • Congressional Adds | | 20.580 | | | |
| • Congressional Directed Transfers | | | | | |
| • Reprogrammings | 1.794 | 0.000 | | | |
| • SBIR/STTR Transfer | -1.039 | 0.000 | | | |
| • Adjustments to Budget Years | 0.000 | 0.000 | 0.122 | 0.000 | 0.122 |

Change Summary Explanation

FY10 congressionally directed increases.

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602303A: <i>MISSILE TECHNOLOGY</i> | | | | PROJECT 214: <i>MISSILE TECHNOLOGY</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| 214: <i>MISSILE TECHNOLOGY</i> | 47.220 | 50.452 | 49.525 | 0.000 | 49.525 | 45.426 | 44.982 | 45.299 | 49.034 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

This project designs and develops missile and rocket component technologies that support demonstration of 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; and missile propulsion including research to help solve the insensitive munitions requirements. A theme embedded throughout the efforts in this project is developing 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 Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Embedded Deeply Integrated Guidance & Navigation Unit (eDIGNU) Technology Advancements: This effort builds on previous High-G micro-electromechanical systems (MEMS) Inertial Measurement Unit (IMU) and DIGNU research. The Embedded DIGNU incorporates the following: a next generation Selective Availability Anti-Spoofing Module (SAASM); enhanced anti-jam (A/J) capability; full system-on-a-chip (SOC) technology for processor and memory to reduce DIGNU size; more robust deep integration algorithms; and improved inertial performance. This task is conducted in Phases A and B in order to enable the first generation (Phase A) technology to be tested while the second generation (Phase B) design is matured. In FY09, fabricated and tested gyro and accelerometer sensors, tested different platforms, dynamics, and mission envelopes; conducted test flight scenarios with hardware-in-the-loop; successfully conducted government test of Phase A deliverable IMUs and DIGNUs delivered under the High-G MEMS effort (FY06-08) and ensured requirements were met for inertial sensor, deep integration algorithms, A/J capability, Global Positioning System (GPS) receiver, and their interaction. In FY10, complete testing of the final inertial sensor assembly design and the Phase B integrated eDIGNU to verify requirements are met. Twelve additional IMU deliverables that include new gyro | 6.466 | 7.324 | 0.000 | 0.000 | 0.000 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602303A: <i>MISSILE TECHNOLOGY</i> | | PROJECT 214: <i>MISSILE TECHNOLOGY</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>and accelerometer sensors, electronics iteration improvements, and packaging improvements. Eight eDIGNU Phase B deliverables that include a full SOC module; increased A/J capability; updated software for the new inertial sensor assembly; and deep integration and Kalman Filter algorithm improvements.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #2</p> <p>Smaller, Lighter, Cheaper (SLC) Tactical Missile Technologies: This effort designs and develops innovative smaller, lighter, and cheaper component technologies and 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. In FY09, leveraged latest in nano/advanced technology composite materials for analysis of lighter and stronger missile components; began development of advanced image-based stabilization and people tracking algorithms; and assessed light-weight insensitive munition (IM) compliant propulsion solutions. Conducted trade studies, built sample electronics packaging designs to achieve small, light, missile form factors and tested smaller, more efficient circuit board interconnects. In FY10, develop designs for nano/advanced composite mounting brackets to reduce missile component weight; conduct requirements definition and trade studies for a small height of burst sensor (HOBS) design that provides lethality against soft targets; continue electronics packaging development; evaluate common Electronic Safe and Arm Device (ESAD) architecture for small</p> | | | | 5.365 | 7.750 | 8.548 | 0.000 | 8.548 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>lightweight precision munitions; and complete initial designs and testing for high performance insensitive munition compliant motor. In FY11, will develop, fabricate, and test sample composite mounting brackets to reduce missile component weight with integrated electrical conductivity and strength at reduced weight ; tailor Common ESAD design for upgrades to TOW and Javelin; complete small ESAD design, fabricate and component test; develop and test candidate small HOBS and single chip inertial sensor designs.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #3</p> <p>Target Classification Sensors, Advanced Fuzing Technology and Warhead Integration: This effort designs and develops 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 modify the warhead effect to optimize effectiveness for target class. The determination of the different target classifications will be derived from the collaborative Multi-Mode, Multi-Effect (MMME) warhead effort, PE 0602624A Weapons and Munitions Technology. In FY10, complete the design and fabrication of the second generation target classifying sensor and integrate with miniaturized electronics. Evaluate the inertial sensors ability to identify three different target material classes (heavy armor, light armor, and sand) through lab testing and begin preliminary design and fabrication of the improved sensors that can identify six different target classes. Develop an integrated fuze design and bench test</p> | | | | 0.000 | 5.270 | 3.815 | 0.000 | 3.815 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>equipment for sensor test against target materials; conduct preliminary fuze-level safety tests in preparation for warhead integration tests; perform static tests with warheads to assess fuze performance; and perform inert tests with air gun or similar test equipment to demonstrate sensor function. In FY11, will determine the ability of the third generation target classification sensor to identify the six target classes defined in collaboration with the MMME effort. Will 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 fuze technology and test in the lab and with explosively driven reverse ballistic hardware and/or an air gun.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #4</p> <p>Missile Guidance Systems and Seeker Technology: This effort is focused on the design and development of missile seekers and sensors; guidance, navigation, and control technologies and software; and information and signal processing. Beginning in FY11, this effort will be captured in the "Missile Seeker Technology" and "Missile Guidance and Controls Technologies" tasks. In FY09, incorporated threat target and environment simulation scenes for infrared (IR) and millimeter wave (MMW) multi-mode seeker algorithm, tracker, and Aided Target Acquisition/Recognition (ATA/R) development, data fusion, and transitioned ATA/R and Synthetic</p> | | | | 12.350 | 11.511 | 0.000 | 0.000 | 0.000 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Aperture Radar (SAR) image resolution to unmanned aviation system and missile developers. Fabricated an IR seeker with electronically stabilized imager. Completed initial design and fabrication of target material classifying sensor based on lab testing. In FY10, initiate the development of IR and MMW target acquisition and tracking data fusion algorithms that combine imagery and image feature data. Complete the SAR design and begin testing; and design and develop the Image Gyro system which develops an independent navigation solution using camera imagery and terrain databases to provide geo-location data when GPS navigation data is not available.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #5</p> <p>Missile Seeker Technology: This effort is focused on the design and development of missile seekers, sensors, and software. In FY11, will develop and mature affordable phased array and next-generation imaging seeker components to enable affordable all-weather missile fire control sensors, tactical seekers and data links; will develop technologies to monitor missile system health extending missile life; and will validate low cost synthetic aperture radar seeker test results.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> | | 0.000 | 0.000 | 9.952 | 0.000 | 9.952 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #6 Missile Guidance and Controls Technologies: This effort designs and develops guidance, navigation, and control systems and software and information and signal processing systems for rocket and missile applications. In FY11, will develop image gyro system using camera imagery and terrain databases to provide a navigation solution when data is not available from the global positioning system; develops miniaturized guidance electronics; and will simulate imagery and image feature data combination for infrared and millimeter wave multi-mode seeker algorithm development. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 0.000 | 6.961 | 0.000 | 6.961 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #7 | <p>High Fidelity System Level Simulations and Aerodynamics: This effort designs and develops advanced simulation and aerodynamics tools to increase missile performance and reduce size, weight, and cost in missile systems. In FY09, completed initial spectral and optics designs and began infrared radiation component development for solar exposure simulation to evaluate infrared (IR) missile seeker performance due to solar effects in or out of the field-of-view and performed testing. Extended Hardware-in-the-Loop (HWIL) simulation control software to improve user capabilities and began extension of aerodynamic prediction techniques to address fully turbulent, short correlation length, unsteady air flows. In FY10, transition initial solar infrared simulator components to PE 0603313A, Missile Simulation Technology, for system level development. Continue extension of aerodynamic prediction codes and initiate an effort to develop improved methods for missile subsonic airfoil design and characterization. In FY11, will continue improving methods for subsonic airfoil design and characterization and will complete updates to aerodynamic prediction codes. Will collect wind tunnel data on multiple airframe designs to validate and improve aerodynamic prediction models and techniques. Will develop advanced simulation technologies to enable missile component trade studies and will develop technologies to enable more reliable micro-electromechanical missile components.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | 3.288 | 1.924 | 2.933 | 0.000 | 2.933 |
| Program #8 | | 6.973 | 5.568 | 4.965 | 0.000 | 4.965 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Smart, Stealthy, and Smokeless Missile Propulsion, Smart Structures and Enhanced Lethality: This effort is developing enabling technologies to advance missile propulsion including reducing launch signatures, increased lethality, and improving 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. In FY09, developed propellant candidates designed to operate efficiently in extreme temperature ranges in coordination with PE 0602624A. Investigated scalable warhead characteristics using multi-point initiation concepts to control the energy deposited on the target; and variable yield warhead technologies to vary the effects on target and minimize collateral damage. Developed logic to integrate with target classification sensor for selectable multi-point firing control. In FY10, demonstrate and validate missile control thruster analysis tools and design concepts for small diameter applications and fabricate multi-point initiation warheads and conduct tests to determine the energy deposition effect of the warhead. In FY11, will perform a flight test of a variable yield warhead against a representative concrete target, and transition to Guided Multiple Launch Rocket System. Will investigate feasibility of using existing and new propellant ingredients in missile and rocket propulsion to regain performance while maintaining insensitive munitions compliance.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| Program #9 | | 1.073 | 0.000 | 0.000 | 0.000 | 0.000 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Insensitive Munitions (IM) Research: This effort is developing missile propellant formulations and explosive mitigating technologies to enable missiles to meet IM requirements. In FY09, demonstrated IM response of a minimum smoke motor with new propellant formulation and integrated venting passed 0.50 Caliber and 7.62mm bullet impact, low velocity fragment impact, and slow cook off test environments. Demonstrated improved IM response to thermal threats of high performance motor with new propellant formulation and integrated venting and evaluated endothermic barrier materials.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #10</p> <p>Defense against Rockets, Artillery and Mortars (RAM) - Interceptor Development: This effort designs and develops enabling missile component technologies to transition to the Defense against Rockets, Artillery, and Mortars effort in PE 0603313A. In FY09, began bench level testing of component technologies and integration into RAM interceptor design and updated interceptor error budgets and system level simulations with results. Exercised the simulations to evaluate interceptor performance in expected operational scenarios. In FY10, complete bench level testing and integration of component technologies and perform Hardware-in-the-Loop testing and develop and integrate flight guidance and control software into RAM interceptor in support of planned live fire testing under PE 0603313A.</p> | | 6.828 | 2.927 | 0.000 | 0.000 | 0.000 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #11</p> <p>Multi-Role Missile Component Design: This effort focuses on critical technology and component design to provide a diverse and versatile mix of fires for force protection and overwhelming defeat of conventional and asymmetrical threats in all environments. Successful technologies developed will transition to system development activities in PE 603313A project 263. In FY09, designed and developed new ground target and air defense missile concepts based on the integration of novel component tests. Demonstrated critical underlying component technologies (e.g., seeker, propulsion, and lethal mechanisms) in laboratory test environments. In FY10, investigate, design and develop component technologies to: enable miniaturization/packaging of sensors, guidance packages and electronics; develop more efficient, advanced propulsion; and explore advanced warhead integration and lethal effects and non-lethal payload options. Perform 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. In FY11, will refine, fabricate and evaluate components and subsystems (miniaturization/packaging of sensors, guidance and electronics; more efficient, advanced propulsion; warhead integration and lethal effects; and non-lethal payload options) to determine best designs for various missions. Will perform trade studies to determine the component technologies to support improved precision fire engagements.</p> | | | | 4.877 | 7.316 | 9.533 | 0.000 | 9.533 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #12 Swarming Missile Technology: This effort evaluates advanced sensors, guidance and control, and command and control components for employing low-cost swarming missile concepts against individual and large arrays of air and ground targets. In FY11, will define swarming missile mission concepts to derive and define key performance parameters for these missions. Will identify key component technologies for development and demonstration. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base | | 0.000 | 0.000 | 1.710 | 0.000 | 1.710 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #13 Structural Electronics: This effort investigates innovative processes to embed electrical connections into the missile case structure for use in smaller missile designs. In FY11, will investigate mechanical and electrical properties of emerging approaches to embedding electrical connections in curved forms regarding their applicability to missile structure and component design. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 0.000 | 1.108 | 0.000 | 1.108 |
| Program #14 Small Business Innovative Research/Small Business Technology Transfer Programs In FY11, will investigate mechanical and electrical properties of emerging approaches to embedding electrical connections in curved forms regarding their applicability to missile structure and component design. <i>FY 2009 Accomplishments:</i> FY 2009 | | 0.000 | 0.862 | 0.000 | 0.000 | 0.000 |

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| <u>B. Accomplishments/Planned Program (\$ in Millions)</u> | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Accomplishments/Planned Programs Subtotals | | 47.220 | 50.452 | 49.525 | 0.000 | 49.525 |
| <u>C. Other Program Funding Summary (\$ in Millions)</u> N/A | | | | | | |
| <u>D. Acquisition Strategy</u> N/A | | | | | | |
| <u>E. Performance Metrics</u> 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: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602303A: <i>MISSILE TECHNOLOGY</i> | | | | PROJECT 223: <i>AERO-PROPULSION TECHNOLOGY</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| 223: <i>AERO-PROPULSION TECHNOLOGY</i> | 4.785 | 7.560 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| A. Mission Description and Budget Item Justification | | | | | | | | | | | |
| Congressional Interest Item funding provided for Aero-Propulsion Technology. | | | | | | | | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | | | | |
| | | | | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #1 Mariah II Hypersonic Wind Tunnel Development Program: In FY09 this Congressional Interest Item supported development of a hypersonic wind tunnel capable of a full 60 seconds of operation at fully duplicated flight conditions. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | 3.190 | 7.560 | 0.000 | 0.000 | 0.000 |
| Program #2 | | | | | | | 1.595 | 0.000 | 0.000 | 0.000 | 0.000 |

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| <u>B. Accomplishments/Planned Program (\$ in Millions)</u> | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>LENS XX Hypervelocity Ground Testing Development: In FY09, this Congressional Interest Item supported design, fabrication, and validation on an expansion tunnel for very high Mach number ground testing.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| Accomplishments/Planned Programs Subtotals | | | | 4.785 | 7.560 | 0.000 | 0.000 | 0.000 |
| <u>C. Other Program Funding Summary (\$ in Millions)</u> | | | | | | | | |
| N/A | | | | | | | | |
| <u>D. Acquisition Strategy</u> | | | | | | | | |
| N/A | | | | | | | | |
| <u>E. Performance Metrics</u> | | | | | | | | |
| 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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
|--|-----------------------|-------------------------|------------------------------|--|-------------------------------|-------------------------|-------------------------|---|-------------------------|-------------------------|-------------------|
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602303A: <i>MISSILE TECHNOLOGY</i> | | | | PROJECT G04: <i>AIR DEFENSE TECHNOLOGIES (CA)</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| G04: <i>AIR DEFENSE TECHNOLOGIES (CA)</i> | 2.552 | 10.425 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| A. Mission Description and Budget Item Justification | | | | | | | | | | | |
| Congressional Interest Item funding provided for Air Defense Technologies. | | | | | | | | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | | | | |
| | | | | | | | | | | | |
| Program #1 | 2.552 | 5.969 | 0.000 | 0.000 | 0.000 | | | | | | |
| D-NET: Electrically Charged Mesh (ECM) Defense Net Troop Protection System: In FY09 this Congressional Interest Item supported development of a helicopter active protection system concept consisting of a launchable net to intercept incoming threats and defeat via mechanical and/or electrical discharge | | | | | | | | | | | |
| <i>FY 2009 Accomplishments:</i> | | | | | | | | | | | |
| FY 2009 | | | | | | | | | | | |
| <i>FY 2010 Plans:</i> | | | | | | | | | | | |
| FY 2010 | | | | | | | | | | | |
| <i>Base FY 2011 Plans:</i> | | | | | | | | | | | |
| FY 2011 Base | | | | | | | | | | | |
| <i>OCO FY 2011 Plans:</i> | | | | | | | | | | | |
| FY 2011 OCO | | | | | | | | | | | |
| Program #2 | 0.000 | 2.069 | 0.000 | 0.000 | 0.000 | | | | | | |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602303A: <i>MISSILE TECHNOLOGY</i> | PROJECT G04: <i>AIR DEFENSE TECHNOLOGIES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Portable Sensor for Toxic Gas Detection. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #3 Swarms Defense System. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 2.387 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | DATE: February 2010 |
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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602303A: <i>MISSILE TECHNOLOGY</i> | PROJECT G04: <i>AIR DEFENSE TECHNOLOGIES (CA)</i> |
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|--|----------------|----------------|---------------------|--------------------|----------------------|
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | |
| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Accomplishments/Planned Programs Subtotals | 2.552 | 10.425 | 0.000 | 0.000 | 0.000 |

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.

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
|---|-----------------------|-------------------------|------------------------------|--|-------------------------------|-------------------------|-------------------------|---|-------------------------|-------------------------|----------------------|
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602303A: <i>MISSILE TECHNOLOGY</i> | | | | PROJECT G05: <i>MISSILE TECHNOLOGY INITIATIVES (CA)</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| G05: <i>MISSILE TECHNOLOGY INITIATIVES (CA)</i> | 2.945 | 2.487 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| A. Mission Description and Budget Item Justification | | | | | | | | | | | |
| Congressional Interest Item funding provided for Missile Technologies Initiatives applied research. | | | | | | | | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | | | | |
| | | | | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #1 Materials Applications Research Center: This Congressional Interest Item supported application of low cost and improved thermoplastic composites and metal casting to missiles. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | 0.782 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #2 | | | | | | | 0.583 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602303A: <i>MISSILE TECHNOLOGY</i> | PROJECT G05: <i>MISSILE TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Center of Excellence in Integrated Sensor Systems (CEISS): This Congressional Interest Item supported the advancement of the state of knowledge in areas of sensor and data fusion, contextual detection and classification, future sensor systems and architectures for missile defense, and other homeland security applications.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #3</p> <p>Novel Lightweight Armor Material for Insensitive Munitions Protection of Tactical Missiles. This is a Congressional Interest Item.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> | | 0.000 | 2.487 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602303A: <i>MISSILE TECHNOLOGY</i> | PROJECT G05: <i>MISSILE TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #4 <i>Extreme Light Sources. University of Florida. This is a Congressional Interest Item.</i> | | 1.580 | 0.000 | 0.000 | 0.000 | 0.000 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Accomplishments/Planned Programs Subtotals | | 2.945 | 2.487 | 0.000 | 0.000 | 0.000 |
| 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. | | | | | | |

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Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification **DATE:** February 2010

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602307A: <i>ADVANCED WEAPONS TECHNOLOGY</i> |
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| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
|--|-------------------|---------------------|-----------------------------|----------------------------|------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|------------|
| Total Program Element | 22.638 | 21.964 | 18.190 | 0.000 | 18.190 | 20.034 | 22.377 | 24.730 | 26.059 | 0 | 174.182 |
| 042: <i>HIGH ENERGY LASER TECHNOLOGY</i> | 19.050 | 19.576 | 18.190 | 0.000 | 18.190 | 20.034 | 22.377 | 24.730 | 26.059 | Continuing | Continuing |
| NA5: <i>Advanced Weapons Components (CA)</i> | 3.588 | 2.388 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

This program element (PE) investigates enabling technologies for High Energy Laser (HEL) weapons. The major efforts under this PE develop 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 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. 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.

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| Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification | DATE: February 2010 |
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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602307A: <i>ADVANCED WEAPONS TECHNOLOGY</i> |
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B. Program Change Summary (\$ in Millions)

| | <u>FY 2009</u> | <u>FY 2010</u> | <u>FY 2011 Base</u> | <u>FY 2011 OCO</u> | <u>FY 2011 Total</u> |
|-------------------------------------|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 23.187 | 19.678 | 20.690 | 0.000 | 20.690 |
| Current President's Budget | 22.638 | 21.964 | 18.190 | 0.000 | 18.190 |
| Total Adjustments | -0.549 | 2.286 | -2.500 | 0.000 | -2.500 |
| • Congressional General Reductions | | -0.114 | | | |
| • Congressional Directed Reductions | | | | | |
| • Congressional Rescissions | | 0.000 | | | |
| • Congressional Adds | | 2.400 | | | |
| • Congressional Directed Transfers | | | | | |
| • Reprogrammings | 0.101 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.650 | 0.000 | | | |
| • Adjustments to Budget Years | 0.000 | 0.000 | -2.500 | 0.000 | -2.500 |

Change Summary Explanation

FY10 Congressionally directed increases. FY11 funding realigned to higher priority efforts.

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602307A: <i>ADVANCED WEAPONS TECHNOLOGY</i> | | | | PROJECT 042: <i>HIGH ENERGY LASER TECHNOLOGY</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| 042: <i>HIGH ENERGY LASER TECHNOLOGY</i> | 19.050 | 19.576 | 18.190 | 0.000 | 18.190 | 20.034 | 22.377 | 24.730 | 26.059 | 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 Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Solid State Laser (SSL) Effects: This effort provides the underlying data required to support system engineering designs for laser weapon systems. In FY09, continued assessing the effectiveness of SSLs against Rocket, Artillery, and Mortar (RAM) warheads and fuses and began expanding the program to emphasize targets other than RAM, such as Unmanned Aerial System (UAS) components, Man Portable Air Defense Systems (MANPADS), Anti-Tank Guided Missiles, and Rocket Propelled Grenades (RPGs). Used results to improve and validate the target vulnerability models for use in Army engagement simulation codes such as Extended Air Defense Simulation (EADSIM), Interactive Distributed Early Entry Analysis Simulation (IDEEAS), and other distributed interactive simulation tools. In FY10, conduct expanded full scale static SSL lethality testing | 1.453 | 2.456 | 2.925 | 0.000 | 2.925 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602307A: <i>ADVANCED WEAPONS TECHNOLOGY</i> | PROJECT 042: <i>HIGH ENERGY LASER TECHNOLOGY</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>against RAM targets, UASs, and other high priority threats to determine the laser energy required to defeat them under various engagement ranges. In FY11, will determine SSL effectiveness against targets of interest in both static and dynamic test scenarios to assess a broad spectrum of mission applications and validate Modeling and Simulation (M&S) tools that support analysis of alternatives, HEL power levels, and associated ranges across multiple mission sets.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| Program #2 | <p>Solid State Laser (SSL) Development, Phase 3 - 100 kW: 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. In FY09, leveraging joint and other Service funding: 1) completed integration and performance testing of two 100 kW SSL devices; 2) selected the most promising laser and component technologies for use in the High Energy Laser Technology Demonstrator (HEL TD) risk reduction activities; 3) supported systems engineering of the selected SSL Phase 3 technology for use on the mobile HEL TD platform; and 4) began integration of one of the down-selected devices with an existing beam control subsystem (BCS) at HELSTF to evaluate high power SSL performance at tactical ranges of interest. In FY10, complete integration of the selected laser device with the existing BCS and begin evaluation</p> | 11.784 | 4.601 | 1.950 | 0.000 | 1.950 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602307A: <i>ADVANCED WEAPONS TECHNOLOGY</i> | PROJECT 042: <i>HIGH ENERGY LASER TECHNOLOGY</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>of high power SSL performance against a variety of target types at tactical ranges of interest as a risk reduction activity for the HEL TD. In FY11, a 100kW SSL will be integrated with the mobile HEL TD BCS to demonstrate potential mission applications, including Counter-RAM (CRAM), and explore performance of the HEL TD BCS.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #3</p> <p>Advanced Beam Control Component Development: 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. In FY09, researched and demonstrated beam control components suitable for integration into an existing beam control system. This includes development and field testing of adaptive optics (AO) consisting of deformable mirrors (DMs) with high stroke and bandwidth to overcome ground-level atmospheric degradation. In FY10, design advanced architectures for beam control systems and develop component technologies that improve compactness, pointing accuracy, and agility of beam directors for improved compatibility with future all-electric tactical platforms. This includes AO to engage threats at longer ranges and low-absorbing HEL windows, shared aperture optics, and mirror coatings to minimize system losses. In FY11, will begin fabrication and assembly of advanced beam control components that can be integrated into the HEL TD beam control system, such as AO, to increase the effective range of the system.</p> | | 4.844 | 4.991 | 2.620 | 0.000 | 2.620 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602307A: <i>ADVANCED WEAPONS TECHNOLOGY</i> | PROJECT 042: <i>HIGH ENERGY LASER TECHNOLOGY</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #4</p> <p>High Efficiency Laser Development: 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. In FY09, initiated design of components, such as diode arrays, high throughput optical elements, and fiber optic/ceramic slab gain media, for developing high efficiency (greater than 30% wall-plug efficiency) SSLs. In FY10, in cooperation with the HEL JTO and other Services, continue 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 begin to explore thermal management technologies. In FY11, in continued partnership with the HEL JTO and other Services,: 1) will begin assembly and integration of two 25 kW high efficiency breadboards using alternative technical approaches; 2) will begin the design of a 100 kW class high efficiency device based on the most promising approach; 3) will initiate the development of multiple eye-safe laboratory demonstrations with greater than 30% efficiency; and 4) will continue to develop thermal management technologies specific to high efficiency lasers that minimize thermal distortions, alignment errors, and beam quality degradation.</p> | | 0.969 | 6.558 | 9.720 | 0.000 | 9.720 |

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R-1 Line Item #11

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602307A: <i>ADVANCED WEAPONS TECHNOLOGY</i> | PROJECT 042: <i>HIGH ENERGY LASER TECHNOLOGY</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #5 HEL Research and Development Laboratory: This effort focuses on developing in-house expertise through SSL assessments. In FY10, in cooperation with the AMRDEC, conduct low-to-medium power studies on a 600-meter test range to investigate SSL atmospheric propagation and target interaction phenomenology. Initiate data analysis and model development to support atmospheric correction algorithm development and to provide validated inputs for wargaming modeling and simulation efforts. In FY11, will investigate new deformable mirror designs to identify those with lower cost and sufficient performance; will investigate causes of poor beam quality in SSLs to determine where investments can advance the technology for Army applications. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 | | 0.000 | 0.489 | 0.975 | 0.000 | 0.975 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602307A: <i>ADVANCED WEAPONS TECHNOLOGY</i> | | PROJECT 042: <i>HIGH ENERGY LASER TECHNOLOGY</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Program #6 Small Business Innovative Research/Small Business Technology Transfer Programs | | | | 0.000 | 0.481 | 0.000 | 0.000 | 0.000 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Accomplishments/Planned Programs Subtotals | | | | 19.050 | 19.576 | 18.190 | 0.000 | 18.190 |
| C. Other Program Funding Summary (\$ in Millions) | | | | | | N/A | | |
| D. Acquisition Strategy | | | | | | N/A | | |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | DATE: February 2010 |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602307A: <i>ADVANCED WEAPONS TECHNOLOGY</i> | PROJECT 042: <i>HIGH ENERGY LASER TECHNOLOGY</i> |

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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602307A: <i>ADVANCED WEAPONS TECHNOLOGY</i> | | | | PROJECT NA5: <i>Advanced Weapons Components (CA)</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| NA5: <i>Advanced Weapons Components (CA)</i> | 3.588 | 2.388 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| A. Mission Description and Budget Item Justification | | | | | | | | | | | |
| Congressional Interest Item funding provided for Advanced Weapons Components applied research. | | | | | | | | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | | | | |
| | | | | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #1 Army Missile and Space Technology Initiative: In FY09, completed an architecture study for an Intelligence, Surveillance, and Reconnaissance (ISR) test-bed aboard an airship and development of an associated payload utilizing previously developed sensors. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | 1.595 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #2 | | | | | | | 1.993 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602307A: <i>ADVANCED WEAPONS TECHNOLOGY</i> | PROJECT NA5: <i>Advanced Weapons Components (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Remote Video Weapon Sight, USSOCOM Phase III: In FY09, developed a weapon sight that provides video images to remote locations.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #3</p> <p>Integrated Family of Test Equipment V6 Product Improvement Program: This is a Congressional Interest Item.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | 0.000 | 2.388 | 0.000 | 0.000 | 0.000 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602307A: <i>ADVANCED WEAPONS TECHNOLOGY</i> | | PROJECT NA5: <i>Advanced Weapons Components (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Accomplishments/Planned Programs Subtotals | | | | 3.588 | 2.388 | 0.000 | 0.000 | 0.000 |
| 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. | | | | | | | | |

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Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification **DATE:** February 2010

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602308A: <i>Advanced Concepts and Simulation</i> |
|--|--|

| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
|---|-------------------|---------------------|-----------------------------|----------------------------|------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|------------|
| Total Program Element | 18.205 | 27.330 | 20.582 | 0.000 | 20.582 | 18.128 | 18.481 | 18.814 | 21.135 | 0 | 163.257 |
| C90: <i>Advanced Distributed Simulation</i> | 10.867 | 11.405 | 14.503 | 0.000 | 14.503 | 11.931 | 12.168 | 12.390 | 14.607 | Continuing | Continuing |
| D01: <i>PHOTONICS RESEARCH</i> | 0.000 | 4.775 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| D02: <i>MODELING & SIMULATION FOR TRAINING AND DESIGN</i> | 5.743 | 5.977 | 6.079 | 0.000 | 6.079 | 6.197 | 6.313 | 6.424 | 6.528 | Continuing | Continuing |
| D14: <i>Advanced Modeling and Simulation Initiatives (CA)</i> | 1.595 | 5.173 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

Efforts in this program element (PE) design and develop 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 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 is related to and fully coordinated with efforts in PE 0601104A (University and Industry Research Centers), PE 0602785 (Manpower/Personnel/Training Technology), PE 0602787A (Medical Technology), PE 0603007A (Manpower, Personnel and Training Advance Technology), and PE 0603015A (Next Generation Training & Simulation 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. Work in this PE is performed by the Research, Development, and Engineering Command (RDECOM), Simulation and Training Technology Center (STTC), Orlando, FL.

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602308A: <i>Advanced Concepts and Simulation</i> |
|--|--|

B. Program Change Summary (\$ in Millions)

| | <u>FY 2009</u> | <u>FY 2010</u> | <u>FY 2011 Base</u> | <u>FY 2011 OCO</u> | <u>FY 2011 Total</u> |
|-------------------------------------|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 21.778 | 17.473 | 17.753 | 0.000 | 17.753 |
| Current President's Budget | 18.205 | 27.330 | 20.582 | 0.000 | 20.582 |
| Total Adjustments | -3.573 | 9.857 | 2.829 | 0.000 | 2.829 |
| • Congressional General Reductions | | -0.143 | | | |
| • Congressional Directed Reductions | | | | | |
| • Congressional Rescissions | | 0.000 | | | |
| • Congressional Adds | | 10.000 | | | |
| • Congressional Directed Transfers | | | | | |
| • Reprogrammings | -3.056 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.517 | 0.000 | | | |
| • Adjustments to Budget Years | 0.000 | 0.000 | 2.829 | 0.000 | 2.829 |

Change Summary Explanation

FY09 funding decrease is due to reprogramming of congressional interest item for proper execution.FY10 Congressionally directed increases.FY11 funding increases for Distributive Training technology efforts.

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602308A: <i>Advanced Concepts and Simulation</i> | | | | PROJECT C90: <i>Advanced Distributed Simulation</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| <i>C90: Advanced Distributed Simulation</i> | 10.867 | 11.405 | 14.503 | 0.000 | 14.503 | 11.931 | 12.168 | 12.390 | 14.607 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

Efforts in this project develop 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 provide. The efforts in this project leverage and are coordinated with work at the Army Research Institute, the Army Research Laboratory, 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), Simulation and Training Technology Center (STTC), Orlando, FL.

B. Accomplishments/Planned Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Live, Virtual, Constructive (LVC) Simulations: 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. In FY09, developed physics-based real-time dynamic situations for LVC training to provide realistic environments (lethality, causality assessment, mobility, etc.) by integrating live sensor components to enable live training and a virtual/constructive mission rehearsal capability onto both Soldier and combat vehicle embedded training devices; conducted laboratory experiments in an operational environment with an embedded training device to develop display technology for combat vehicle embedded training. In FY10, investigate use of predictive technologies and artificial intelligence in constructive training to provide behaviors and reasoning for computer-generated forces in asymmetric warfare simulations; continue technology improvements of sensor components for physics-based real-time dynamic environments for LVC training. In FY11, will continue investigations in predictive technologies for behaviors and reasoning of | 4.711 | 3.130 | 3.716 | 0.000 | 3.716 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602308A: <i>Advanced Concepts and Simulation</i> | PROJECT C90: <i>Advanced Distributed Simulation</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>computer generated forces; will 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.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #2</p> <p>Modeling and Simulation Training Technologies: 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. In FY09, conducted tests with patient trauma demonstrators to assess Army medical training effectiveness; designed and developed a mobile immersive training environment that included the appropriate combination of man-worn systems, locomotion systems, intelligent tutors, human computer interfaces, and the ability to control autonomous systems for team training. In FY10, investigate methods and technologies to increase medical simulation capabilities for surgical training to include initial designs for a surgical simulator; develop simulations to support the safe operations of unmanned systems in complex environments. In FY11, will investigate methods and technologies to emulate live tissue replacement and conduct experiments to assess training effectiveness; will initiate structured research and conduct testing with medical holograms and virtual patients; will develop low-cost, rugged man-worn immersive systems for dismounted soldier training as well as tracking systems and hand-held devices to support dismounted training exercises.</p> | | 3.903 | 3.887 | 3.969 | 0.000 | 3.969 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602308A: <i>Advanced Concepts and Simulation</i> | PROJECT C90: <i>Advanced Distributed Simulation</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #3 Collaborative and Immersive Environment Technologies: This effort investigates adaptive learning environments with social simulations to conduct non-kinetic asymmetric warfare training. In FY09, conducted experiments utilizing game-based technologies to evaluate training methods and mission planning/rehearsal tools in a Joint, Interagency, Intergovernmental, Multi-National (JIIM) simulation environment; expanded multi-sensory capabilities in adaptive learning environments to enable virtual human and intelligent decision components to incorporate awareness of trainee actions; expanded training development tools to rapidly portray additional representative cultures; and expanded non-kinetic simulation capability to squad/team level for training. In FY10, continue development of JIIM environment for squad team level training using distributed simulations and after action reviews; develop immersive environments to support infantry training and mission rehearsal; investigate the algorithms and methodologies to enhance the realism of simulation environments for battle command training and decision making. In FY11, will continue development of infantry immersive simulation and learning environments to include intelligent tutoring feedback; will develop the enhanced realism of simulation environment to support the battle command training and decision making; will validate algorithms and methodologies through user assessments; will investigate and develop virtual world and gaming technologies | | 2.253 | 4.158 | 6.818 | 0.000 | 6.818 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602308A: <i>Advanced Concepts and Simulation</i> | PROJECT C90: <i>Advanced Distributed Simulation</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| to accomplish multi-player, large scale, distributed training and learning; will evaluate the technologies and the impact on human performance. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #4 Small Business Innovative Research/Small Business Technology Transfer Programs <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 0.230 | 0.000 | 0.000 | 0.000 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Accomplishments/Planned Programs Subtotals | | | | 10.867 | 11.405 | 14.503 | 0.000 | 14.503 |
| 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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602308A: <i>Advanced Concepts and Simulation</i> | | | | PROJECT D01: <i>PHOTONICS RESEARCH</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| D01: <i>PHOTONICS RESEARCH</i> | 0.000 | 4.775 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| A. Mission Description and Budget Item Justification | | | | | | | | | | | |
| Congressional Interest Item funding for applied research in Photonics. | | | | | | | | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | | | | |
| | | | | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #1 Compact Biothreat Rapid Analysis Concept. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | 0.000 | 4.775 | 0.000 | 0.000 | 0.000 |
| Accomplishments/Planned Programs Subtotals | | | | | | | 0.000 | 4.775 | 0.000 | 0.000 | 0.000 |

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| 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: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602308A: <i>Advanced Concepts and Simulation</i> | | | | PROJECT D02: <i>MODELING & SIMULATION FOR TRAINING AND DESIGN</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| D02: <i>MODELING & SIMULATION FOR TRAINING AND DESIGN</i> | 5.743 | 5.977 | 6.079 | 0.000 | 6.079 | 6.197 | 6.313 | 6.424 | 6.528 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

Efforts in this project develop training applications that 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 and then assess techniques and methods 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), Simulation and Training Technology Center (STTC), Orlando, FL.

B. Accomplishments/Planned Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Immersive Technology Environments: 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 (consist of physical elements you can touch and feel (such as walls and obstacles) combined with virtual imagery). Developed technologies and techniques are transitioned for maturation and demonstration to PE 0603015A/project S28. In FY09, created a mixed-reality immersive environment that uses sensors to provide near real-time perspective of the surrounding real world allowing a user and the world model to share a common view of the environment for high fidelity training environments; designed and developed new and flexible display technologies for development of new training environments. In FY10, design and develop approaches for rapidly inserting virtual content into large-scale, real-world training environments that can be rapidly reconfigured. In FY11, will investigate technologies to make mixed reality training (combines real and imagined images) environments more portable and affordable. | 2.700 | 2.710 | 2.916 | 0.000 | 2.916 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602308A: <i>Advanced Concepts and Simulation</i> | | PROJECT D02: <i>MODELING & SIMULATION FOR TRAINING AND DESIGN</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #2</p> <p>Immersive Technology Techniques: This effort develops tools, techniques and technologies for improving the immersion of human senses within simulation environments, creating enhanced realism. In FY09, explored techniques for developing distributed asymmetric warfare tutoring and coaching methods to support team training, performance assessment, and team after-action reviews; and investigated/developed methods and technologies to expand single student tutoring capabilities to distributed multi-student team assessments and after action reviews. In FY10, develop 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. In FY11, will investigate and develop technologies and techniques to implement high-quality video and interactive experiences on mobile hand-held devices; will evaluate developed research technologies and components for supporting interactive learning.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> | | | | 3.043 | 3.100 | 3.163 | 0.000 | 3.163 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602308A: <i>Advanced Concepts and Simulation</i> | PROJECT D02: <i>MODELING & SIMULATION FOR TRAINING AND DESIGN</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #3 Small Business Innovative Research/Small Business Technology Transfer Programs <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 0.167 | 0.000 | 0.000 | 0.000 |
| Accomplishments/Planned Programs Subtotals | | 5.743 | 5.977 | 6.079 | 0.000 | 6.079 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | DATE: February 2010 |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602308A: <i>Advanced Concepts and Simulation</i> | PROJECT D02: <i>MODELING & SIMULATION FOR TRAINING AND DESIGN</i> |
| 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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602308A: <i>Advanced Concepts and Simulation</i> | | | | PROJECT D14: <i>Advanced Modeling and Simulation Initiatives (CA)</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| D14: <i>Advanced Modeling and Simulation Initiatives (CA)</i> | 1.595 | 5.173 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| A. Mission Description and Budget Item Justification | | | | | | | | | | | |
| Congressional Interest Item funding for applied research in Advanced Modeling and Simulation. | | | | | | | | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | | | | |
| | | | | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #1 Advanced Live, Virtual and Constructive (LWC) Training Systems. In FY09, evaluated different algorithms for geometric pairing using a cave environment and the use of intelligent tutoring to accelerate the scenario generation for live, virtual and constructive experimentation. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | 1.595 | 2.785 | 0.000 | 0.000 | 0.000 |
| Program #2 | | | | | | | 0.000 | 0.796 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602308A: <i>Advanced Concepts and Simulation</i> | | PROJECT D14: <i>Advanced Modeling and Simulation Initiatives (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Protective Gear Development through Man-In-Stimulant-Test Chamber. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Program #3 Cognitive Based Modeling and Simulation for Tactical Decision Support. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | 0.000 | 1.592 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602308A: <i>Advanced Concepts and Simulation</i> | | PROJECT D14: <i>Advanced Modeling and Simulation Initiatives (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Accomplishments/Planned Programs Subtotals | | | | 1.595 | 5.173 | 0.000 | 0.000 | 0.000 |
| 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. | | | | | | | | |

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Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification **DATE:** February 2010

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602601A: <i>Combat Vehicle and Automotive Technology</i> |
|--|--|

| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
|---|-------------------|---------------------|-----------------------------|----------------------------|------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|------------|
| Total Program Element | 84.436 | 78.923 | 64.740 | 0.000 | 64.740 | 62.571 | 67.212 | 71.936 | 79.652 | 0 | 574.210 |
| C05: <i>ARMOR APPLIED RESEARCH</i> | 15.050 | 19.698 | 25.660 | 0.000 | 25.660 | 23.379 | 25.120 | 27.030 | 30.921 | Continuing | Continuing |
| H77: <i>National Automotive Center</i> | 14.002 | 14.465 | 16.515 | 0.000 | 16.515 | 15.144 | 15.489 | 15.785 | 16.082 | Continuing | Continuing |
| H91: <i>Ground Vehicle Technology</i> | 25.382 | 21.482 | 22.565 | 0.000 | 22.565 | 24.048 | 26.603 | 29.121 | 32.649 | Continuing | Continuing |
| T26: <i>Ground Vehicle Technologies (CA)</i> | 26.812 | 21.687 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| T31: <i>NAT'L AUTO CENTER APP RES INIT (CA)</i> | 3.190 | 1.591 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

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, 0602105A (Materials Technology), and PE 0602705A (Electronics and Electronic Devices). 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.

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| Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification | DATE: February 2010 |
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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602601A: <i>Combat Vehicle and Automotive Technology</i> |
|--|--|

B. Program Change Summary (\$ in Millions)

| | <u>FY 2009</u> | <u>FY 2010</u> | <u>FY 2011 Base</u> | <u>FY 2011 OCO</u> | <u>FY 2011 Total</u> |
|-------------------------------------|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 89.036 | 55.937 | 62.831 | 0.000 | 62.831 |
| Current President's Budget | 84.436 | 78.923 | 64.740 | 0.000 | 64.740 |
| Total Adjustments | -4.600 | 22.986 | 1.909 | 0.000 | 1.909 |
| • Congressional General Reductions | | -0.414 | | | |
| • Congressional Directed Reductions | | | | | |
| • Congressional Rescissions | | 0.000 | | | |
| • Congressional Adds | | 23.400 | | | |
| • Congressional Directed Transfers | | | | | |
| • Reprogrammings | -3.031 | 0.000 | | | |
| • SBIR/STTR Transfer | -1.569 | 0.000 | | | |
| • Adjustments to Budget Years | 0.000 | 0.000 | 1.909 | 0.000 | 1.909 |

Change Summary Explanation

FY10 Congressional directed increases.

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602601A: <i>Combat Vehicle and Automotive Technology</i> | | | | PROJECT C05: <i>ARMOR APPLIED RESEARCH</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| C05: <i>ARMOR APPLIED RESEARCH</i> | 15.050 | 19.698 | 25.660 | 0.000 | 25.660 | 23.379 | 25.120 | 27.030 | 30.921 | 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 down select of technologies entering 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 Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Vehicle Armor Protection for Lightweight Combat Systems: This effort designs, fabricates, and investigates add-on lightweight armor packages to protect combat systems against projectiles, warheads, penetrators and blast fragments. In FY09, developed enhancements to ground vehicle armor and third generation mine kits to reduce weight and meet objective and emerging threats; conducted and reported armor space and weight trade studies to support design of next generation add-on armor solutions; assessed blast modeling and simulation tool(s) capability for full level simulation, including impact on crew; and performed material and hull design attachment analysis and developed non-destructive inspection techniques. In FY10, perform initial testing of ground vehicle armor and third generation mine kits to meet emerging threats; analyze and evaluate material/recipes performance for various armor/mine protection areas; and provide initial characterization of next generation armor materials to identify risks for maturation; and mature improved ballistic performance armor with embedded health monitoring. In FY11, will perform armor recipe optimization to establish armor efficiency; will complete ballistic testing of selected armor systems to validate the armor design; will downselect materials/armor systems for entire vehicle protection and procure long lead items for future demonstration builds; and will mature and validate performance | 8.916 | 9.703 | 10.881 | 0.000 | 10.881 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602601A: <i>Combat Vehicle and Automotive Technology</i> | PROJECT C05: <i>ARMOR APPLIED RESEARCH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>of multifunctional armor. This work is done in conjunction with program elements 0602105A, 0602618A, and 0603005A.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #2</p> <p>Armor for Tactical Vehicle Survivability: The objective of this effort is to develop structural and add-on armors for tactical vehicles and investigate and characterize effects of mine blasts on lightweight vehicles through modeling and simulation. In FY09, conducted final armor assessments of potential candidates such as Reliability, Availability, Maintainability (RAM) analysis, and thermal modeling for maturation and transition using demonstration vehicles; integrated test bed to assess the survivability suite by conducting analysis of the operational effectiveness modeling. Conducted electrical bench tests to study electrical integration impacts such as electromagnetic (EM) compatibility and interference caused by integration of survivability suite(s) onto vehicles.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> | | 0.631 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602601A: <i>Combat Vehicle and Automotive Technology</i> | | PROJECT C05: <i>ARMOR APPLIED RESEARCH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #3</p> <p>Advanced Armor Development: 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. In FY09, assessed reactive armor and electromagnetic armor concepts developed under PE 0602618/ Project H80 for defeat of emerging CE and KE threats. Investigated tools and techniques for non destructive evaluation (NDE)/non destructive inspection (NDI) of dissimilar composite armor material joints. Assessed and validated modeling and simulation tools for vehicle level analysis of combat vehicles in collisions and blast threats. In FY10, continue investigation and maturation of candidate reactive and passive armor concepts for single emerging threat(s) (KE) and downselect solutions for maturation with respect to capability, weight, and ease of integration. In FY11, will validate advanced armor designs at the panel level while reducing armor weight; will improve armor recipe to meet threshold areal density while defeating threshold threat. This work is done in conjunction with program elements 0602105A, 0602618A and 0603005A.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> | | | | 5.503 | 4.583 | 8.772 | 0.000 | 8.772 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602601A: <i>Combat Vehicle and Automotive Technology</i> | PROJECT C05: <i>ARMOR APPLIED RESEARCH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #4 Blast Mitigation: This effort matures modeling and simulation (M&S) tools and blast mitigation technologies to improve ground vehicle structural performance against blast threats. Tests are conducted to validate the M&S tools. In FY10, develop advanced crew protection technologies for land mine/explosive events; investigate potential techniques for 3-dimensional vehicle models and crew protection methods for land mine/explosive events; validate survivability enhancements of integral fuel tanks against objective threats; begin development of external fire suppression methods to address fuel, track, and stowage fire vulnerabilities for combat vehicles; and improve blast tolerance of automatic fire extinguishing systems. In FY11, will develop techniques for complete vehicle structure design and crew protection methods for landmine/explosive events; will investigate performance and integration of extinguishing mechanisms; will enhance fire M&S tools to incorporate new extinguishing agents, delivery systems, and predictive capabilities for ballistic events; and will increase cook-off resistance of small arms ammunition via improved stowage without compromising accessibility. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base | | 0.000 | 4.861 | 6.007 | 0.000 | 6.007 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602601A: <i>Combat Vehicle and Automotive Technology</i> | PROJECT C05: <i>ARMOR APPLIED RESEARCH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #5 Small Business Innovative Research/Small Business Technology Transfer Programs. | | 0.000 | 0.551 | 0.000 | 0.000 | 0.000 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Accomplishments/Planned Programs Subtotals | | 15.050 | 19.698 | 25.660 | 0.000 | 25.660 |
| 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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602601A: <i>Combat Vehicle and Automotive Technology</i> | | | | PROJECT H77: <i>National Automotive Center</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| <i>H77: National Automotive Center</i> | 14.002 | 14.465 | 16.515 | 0.000 | 16.515 | 15.144 | 15.489 | 15.785 | 16.082 | 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 Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| <p>Program #2</p> <p>Alternative Energy: This effort leverages opportunities from industry to develop alternative energy technologies for Army applications. In FY09, investigated thermoelectric power modules on Tactical Wheeled Vehicle (TWV) platforms; continued to conduct experiments for alternative fuels qualification program for ground vehicle systems; expanded mobile micro-grid technology development program with large scale technology experiments; evaluated dual-use advanced automotive technologies on ultra-light, light, medium, and heavy tactical vehicles. Leveraged developments in 3D terrain topology modeling and verification of vehicle design tools in support of a distributed simulation capability. In FY10, investigate waste to energy technologies for application in power generation devices; pursue dual-use power and energy component development; investigate vehicle platform with high output power capabilities tied to power grid and the modeling tools needed to understand this interaction; expand development and commercialization of dual-use simulation-based tools that incorporate 3D terrain topology modeling for validation and verification of vehicle designs; and design and develop an energy storage system on hybrid electric vehicles for forward operations applications utilizing renewable energy sources and/or generator set(s).In FY11, will continue development of waste to energy technologies to reduce fuel consumption in power generation; will continue to conduct experiments with synthetic and renewable fuel blends for alternative</p> | 8.401 | 8.494 | 8.859 | 0.000 | 8.859 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602601A: <i>Combat Vehicle and Automotive Technology</i> | | PROJECT H77: <i>National Automotive Center</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| fuels qualification program for ground vehicle systems; will 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. This work is done in conjunction with program element 0602705A. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Program #3 Conditioned Based Maintenance (CBM) and Intelligent Systems: 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. In FY09, continued crash modeling and safety design for TWV's; developed and evaluated dual-use condition-based maintenance/intelligent systems M&S tools. Investigated new data collection and analysis methods for ground vehicles as systems of systems with an emphasis on robustness and focusing on creation of comprehensive vehicle CBM M&S tools. In FY10, continue to develop and evaluate dual-use CBM tools by conducting lithium-ion and lead acid battery characterization experiments and thermo electric power unit studies. In FY11, will 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 | | | | 2.100 | 2.170 | 2.212 | 0.000 | 2.212 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602601A: <i>Combat Vehicle and Automotive Technology</i> | PROJECT H77: <i>National Automotive Center</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #4 Power, Energy and Mobility: This effort investigates dual use power, energy, and mobility technologies. In FY09, conducted detailed technology investigation of fuel cell Auxiliary Power Unit (APU); conducted military specification comparison of micro-grid hardware and software; expanded energy capacity range of mobile micro-grid power control module; pursued dual-use power and energy component development including motor and generator concepts; and developed a vehicle platform with high output power capabilities tied to power grid with new vehicle based output controller strategy. Expanded development and commercialization of high-density diesel engine and vehicle thermal management Modeling & Simulation (M&S) tools and investigated new energy conversion options and propulsion system architectures. In FY10, investigate 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; develop 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 continue M&S efforts by modeling advanced diesel and hybrid powertrains by developing predictive M&S tools and validating methodologies. In FY11, will develop dual-use automotive subsystems and components that can be modified for application to military platforms and alternative chassis structures; will pursue power and energy component development; | | 3.501 | 3.616 | 3.690 | 0.000 | 3.690 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602601A: <i>Combat Vehicle and Automotive Technology</i> | PROJECT H77: <i>National Automotive Center</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>will design high-yield renewable energy generation technology architecture and prepare distributed generation transition criteria for PM Mobile Electric Power, and will expand development of methodologies to validate and explore true potential of proposed advanced engine technologies.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #5</p> <p>Joint Recovery and Distribution System (JRaDS): In FY11, funding for DoD Joint Recovery and Distribution System (JRaDS) Joint Capability Technology Demonstration (JCTD) will reduce risk by enabling the purchase of additional prototype trailer systems and support the broader scoped Operational Military Utility Assessment.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> | | 0.000 | 0.000 | 1.754 | 0.000 | 1.754 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602601A: <i>Combat Vehicle and Automotive Technology</i> | | PROJECT H77: <i>National Automotive Center</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Program #6 Small Business Innovative Research/Small Business Technology Transfer Programs. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | 0.000 | 0.185 | 0.000 | 0.000 | 0.000 |
| Accomplishments/Planned Programs Subtotals | | | | 14.002 | 14.465 | 16.515 | 0.000 | 16.515 |
| C. Other Program Funding Summary (\$ in Millions) | | | | | | | | |
| N/A | | | | | | | | |
| D. Acquisition Strategy | | | | | | | | |
| N/A | | | | | | | | |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | DATE: February 2010 |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602601A: <i>Combat Vehicle and Automotive Technology</i> | PROJECT H77: <i>National Automotive Center</i> |

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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602601A: <i>Combat Vehicle and Automotive Technology</i> | | | | PROJECT H91: <i>Ground Vehicle Technology</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| H91: <i>Ground Vehicle Technology</i> | 25.382 | 21.482 | 22.565 | 0.000 | 22.565 | 24.048 | 26.603 | 29.121 | 32.649 | 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 Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Pulse Power: This effort focuses on developing technology for compact, high frequency/high energy/high power density components and devices, which are enablers for several advanced electric-based weapon systems. In FY09, evaluated pulse switches, power converters, power and energy storage, and evaluated Si-based Super Gate Turn-Off (SGTO) versus SiC-based thyristors for capability to meet power density and switching speeds required for directed energy weapons. In FY10, design and develop improved gate and bus structure design for high power applications; design and develop SGTO switch technology using SiC for high power applications. In FY11, will investigate full up Si and SiC based SGTO applications such as high power microwaves, electrified armors, and directed energy weapons applications. <i>FY 2009 Accomplishments:</i> FY 2009 | 3.276 | 6.549 | 6.123 | 0.000 | 6.123 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602601A: <i>Combat Vehicle and Automotive Technology</i> | | PROJECT H91: <i>Ground Vehicle Technology</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #2</p> <p>JP-8 Reformation for Military Fuel Cells: 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. In FY09, completed integration of fuel reformer for JP-8; conducted endurance and environmental experiments on a JP-8 reformer connected to fuel cell to produce power suitable for auxiliary and light robotic platform propulsion requirements. In FY10, begin tracking sulfur handling capacity and operational temperatures of JP-8 reformer, desulfurization devices, and fuel cell system; and begin design and development on all major reformer fuel cell system components to determine functionality within the claim space limitations. In FY11, will begin maturing major JP-8 reforming fuel cell system components performance and interoperability; will 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 0603005A.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> | | | | 2.404 | 2.065 | 2.104 | 0.000 | 2.104 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602601A: <i>Combat Vehicle and Automotive Technology</i> | | PROJECT H91: <i>Ground Vehicle Technology</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #3</p> <p>Propulsion-Prime Power: 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. In FY09, matured hybrid electric power components for tactical wheeled vehicles; optimized control strategy for higher system power density engine design. In FY10, investigate the performance of modified commercial diesel engines with a control strategy to enable JP-8 fuel operation; and assess compact, high power density hybrid electric components performance. In FY11, will complete common rail fuel pump development and conduct durability experiments with JP-8; will complete the design and fabrication of closed-loop fuel injection system; will conduct initial fuel injection system performance tests; will begin advanced drivetrain efficiency design and development; and will advance powertrain noise abatement technology development.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | 2.032 | 2.018 | 1.834 | 0.000 | 1.834 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602601A: <i>Combat Vehicle and Automotive Technology</i> | PROJECT H91: <i>Ground Vehicle Technology</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Program #4</p> <p>Non-primary Power System (NPS): This effort investigates component technologies for energy storage and generation. In FY09, investigated strategy combining energy storage and power generation components into a non-primary power system. In FY10, develop system controls for advanced power and energy system demonstrator; investigate strategies to reduce non-primary power generation system exhaust noise; and develop techniques to mitigate safety challenges for advanced energy storage devices on vehicles. This effort is done in coordination with efforts in 0603005A.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | 4.384 | 2.605 | 0.000 | 0.000 | 0.000 |
| <p>Program #5</p> <p>Power & Thermal Management: 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. In FY09, developed, verified, and validated power and thermal management models and simulations; designed and developed intelligent power and thermal components; and generated test and evaluation methods for intelligent power and thermal management. In FY10, develop combined power and thermal management system level architecture from modeling and simulation toolset; design and develop integrated electronic power and thermal management device/component level technology; and investigate</p> | | 4.507 | 3.094 | 6.295 | 0.000 | 6.295 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602601A: <i>Combat Vehicle and Automotive Technology</i> | PROJECT H91: <i>Ground Vehicle Technology</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>advanced intelligent (learning and adaptive) power management control algorithms using artificial intelligence techniques. In FY11, will develop advanced intelligent (learning and adaptive) control architecture to control multiple vehicular power sources and loads; will 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.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #6</p> <p>Mobility: 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. In FY09, reformulated, modeled, redesigned, and fabricated high performance track bushings; baselined the improved bushings on standard Abrams track; and initiated laboratory testing of high performance track bushings. In FY10, validate high performance bushings on a standard Abrams track through simulated endurance testing.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> | | 1.870 | 1.015 | 0.000 | 0.000 | 0.000 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602601A: <i>Combat Vehicle and Automotive Technology</i> | PROJECT H91: <i>Ground Vehicle Technology</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #7 Force Projection: This effort focuses on reducing the logistics footprint by developing water generation, recovery, and purification technologies. In FY09, investigated a water from air prototype system on a mobile platform; assessed in-line and hand-held water monitoring technology to determine the capability to monitor biological and chemical contaminants; formulated and prepared single lubricant product and conducted laboratory assessment of key properties; and created fire resistant fuel formulation for JP-8 with an antimist agent and developed laboratory methods to assess key fire resistant fuel properties. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 2.605 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602601A: <i>Combat Vehicle and Automotive Technology</i> | | PROJECT H91: <i>Ground Vehicle Technology</i> | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #8 | <p>Intelligent Systems Technology Research: This effort assesses improved operations of manned platforms through the application of sensing and autonomy technologies developed for unmanned systems. In FY10, determine the sensor data required to allow for safe unmanned system operations in an urban environment; develop embedded real-time dynamic mobility models that predict manned and unmanned vehicle responses and prevent unsafe mobility situations while under robotic control. In FY11, will analyze the integration of robotic sensor data into a network communication model to validate accurate vehicle operations; will develop algorithms from the fused sensor data that will allow more accurate and precise vehicle manipulation within various virtual environments and predict vehicle payload effects; will develop and evaluate approaches to enhance the capabilities for unmanned systems to work in a dynamic environment; and will develop interoperability profiles and architectures to facilitate command and control of the unmanned systems from a common warfighter machine interface.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | 0.000 | 2.894 | 4.628 | 0.000 | 4.628 |
| Program #9 | <p>Diagnostics/Prognostics for Condition Based Maintenance: 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. In FY09, developed diagnostic and prognostics</p> | 4.304 | 1.242 | 1.581 | 0.000 | 1.581 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602601A: <i>Combat Vehicle and Automotive Technology</i> | | PROJECT H91: <i>Ground Vehicle Technology</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>systems capabilities to monitor and anticipate component and system failures and faults; identified root-cause of failures for critical power train components on Abrams and Bradley engine and transmission; and identified and evaluated commercial monitoring sensor capabilities. Investigated capability to integrate sensors to provide more accurate diagnostics/prognostics as well as architecture to integrate into wireless networks to enable remote monitoring capability. In FY10, develop and evaluate engine and transmission algorithms to determine component and system state of health; and develop and assess engine and transmission algorithms to predict failures and report remaining useful life. In FY11, will 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.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| Accomplishments/Planned Programs Subtotals | | | | 25.382 | 21.482 | 22.565 | 0.000 | 22.565 |
| C. Other Program Funding Summary (\$ in Millions) N/A | | | | | | | | |
| D. Acquisition Strategy N/A | | | | | | | | |

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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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | R-1 ITEM NOMENCLATURE PE 0602601A: <i>Combat Vehicle and Automotive Technology</i> | | | | | PROJECT T26: <i>Ground Vehicle Technologies (CA)</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| T26: <i>Ground Vehicle Technologies (CA)</i> | 26.812 | 21.687 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| A. Mission Description and Budget Item Justification | | | | | | | | | | | |
| Congressional Interest Item funding for Ground Vehicle Technology applied research. | | | | | | | | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | | | | |
| | | | | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #1 Institute for Advanced Materials and Manufacturing Strategies (IAMMS): This Congressional Interest Item conducted research to develop advanced manufacturing methods and materials and produced innovative products for potential use by the military. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | 1.196 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #2 | | | | | | | 1.595 | 0.000 | 0.000 | 0.000 | 0.000 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602601A: <i>Combat Vehicle and Automotive Technology</i> | PROJECT T26: <i>Ground Vehicle Technologies (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>DoD Hydrogen PEM Fuel Cell Medium/Heavy Duty Vehicle Demonstration Program: This one-year Congressional Add conducted root cause failure analysis of the fuel cells powering six transit buses nationwide.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #3</p> <p>Rapid Up-Armor Synthesis and Crashworthiness Design for Improved Soldier Survivability: This Congressional Interest Item developed numerical tools to design multi-scale materials for structural applications, and investigated new computational design methodologies for improved soldier survivability.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> | | 1.196 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602601A: <i>Combat Vehicle and Automotive Technology</i> | PROJECT T26: <i>Ground Vehicle Technologies (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #4 Nanofluids for Advanced Military Mobility: In FY09 this Congressional Interest Item investigated military grade petroleum, lubricant and oil products with nanoparticles for improvements to properties. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.797 | 0.497 | 0.000 | 0.000 | 0.000 |
| Program #5 HEV Battery System for Future Combat System: This Congressional Interest Item investigated reduced weight and volume Li-Ion batteries. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 | | 1.595 | 0.000 | 0.000 | 0.000 | 0.000 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #6 Condition Based Maintenance and Mission Assuredness for Ground Vehicles: This Congressional Interest Item developed neural network based simulation models for condition based management. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 2.392 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #7 Improved EFP & IED Prot, Testing, Modeling & Proving Using Lithia Alumina Silica (LAS) Glass Ceramics: This Congressional Interest Item developed lightweight ceramic crystallite-reinforced glass for lighter weight, lower cost ballistic windows to protect against IEDs and EFPs. | | 2.392 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602601A: <i>Combat Vehicle and Automotive Technology</i> | PROJECT T26: <i>Ground Vehicle Technologies (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #8 Remote Unmanned Vehicle Checkpoint System: This Congressional Interest Item developed a system to exploit ultra-wideband technology to provide tracking and autonomous robotic vehicle navigation in enclosed spaces. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.997 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #9 | | 2.492 | 3.183 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602601A: <i>Combat Vehicle and Automotive Technology</i> | PROJECT T26: <i>Ground Vehicle Technologies (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Turbo Fuel Cell Engine: In FY09 this Congressional Interest Item investigated a turbo that uses the exhaust heat from the fuel cell to improve fuel cell engine performance.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #10</p> <p>Integrated Vehicle Health Monitoring System: This Congressional Interest Item investigated an embedded sensor integration module to collect performance data with the capability host prognostic/diagnostic algorithms.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> | | 1.595 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602601A: <i>Combat Vehicle and Automotive Technology</i> | PROJECT T26: <i>Ground Vehicle Technologies (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #11 Automotive Tribology Center. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 1.592 | 0.000 | 0.000 | 0.000 |
| Program #12 Smart Oil Sensor. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 | | 0.000 | 2.388 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602601A: <i>Combat Vehicle and Automotive Technology</i> | | PROJECT T26: <i>Ground Vehicle Technologies (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Program #13 Automotive Technology Tactical Metal Fabrication System. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | 0.000 | 2.487 | 0.000 | 0.000 | 0.000 |
| Program #14 Advanced Composite Materials Research for Air and Ground Vehicles. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 | | | | 0.000 | 2.785 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602601A: <i>Combat Vehicle and Automotive Technology</i> | PROJECT T26: <i>Ground Vehicle Technologies (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #15 Vehicle Systems Engineering and Integration Activities. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 7.959 | 0.000 | 0.000 | 0.000 |
| Program #16 Center for Advanced Vehicle Design and Simulation. This is a Congressional Interest Item. | | 0.797 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602601A: <i>Combat Vehicle and Automotive Technology</i> | PROJECT T26: <i>Ground Vehicle Technologies (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #17 Center for Advanced Vehicle Technology and Fuel Development: This Congressional Interest Item developed new materials to be used in Li-ion batteries focused on advanced material chemistry. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.797 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #18 | | 0.997 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602601A: <i>Combat Vehicle and Automotive Technology</i> | PROJECT T26: <i>Ground Vehicle Technologies (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Extended Lifecycle Management Environment: This Congressional Interest Item extended the existing Data Management (DM) capabilities within the TARDEC Advanced Collaborative Environment (ACE), by providing enhanced program data management of requirements documents.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #19</p> <p>Globally Accessible Manufacturing Activity (GAMMA) for Military Repair Parts. This is a Congressional Interest Item.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> | | 1.595 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602601A: <i>Combat Vehicle and Automotive Technology</i> | PROJECT T26: <i>Ground Vehicle Technologies (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #20 Tactical Metal Fabrication System (TacFab): In FY09, this Congressional Interest Item researched the possibility of casting parts in the field faster by reverse engineering broken parts into a 3D model needed to create a new part. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 1.993 | 0.796 | 0.000 | 0.000 | 0.000 |
| Program #21 Illinois Center for Defense Manufacturing: This Congressional Interest Item researched and developed advanced manufacturing processes and technologies for Army benefit. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 | | 1.994 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602601A: <i>Combat Vehicle and Automotive Technology</i> | PROJECT T26: <i>Ground Vehicle Technologies (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #22 Advanced Manufacture of Lightweight Materials and Components: This Congressional Interest Item researched and developed manufacturing processes for lightweight, self-healing and self-lubricating materials for potential Army vehicle applications. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 2.392 | 0.000 | 0.000 | 0.000 | 0.000 |
| Accomplishments/Planned Programs Subtotals | | 26.812 | 21.687 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | DATE: February 2010 |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602601A: <i>Combat Vehicle and Automotive Technology</i> | PROJECT T26: <i>Ground Vehicle Technologies (CA)</i> |
| 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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | R-1 ITEM NOMENCLATURE PE 0602601A: <i>Combat Vehicle and Automotive Technology</i> | | | | PROJECT T31: <i>NAT'L AUTO CENTER APP RES INIT (CA)</i> | | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| T31: <i>NAT'L AUTO CENTER APP RES INIT (CA)</i> | 3.190 | 1.591 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| A. Mission Description and Budget Item Justification | | | | | | | | | | | |
| Congressional Interest Item funding for National Automotive Center applied research. | | | | | | | | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | | | | |
| | | | | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #1 | | | | | | | 1.595 | 0.000 | 0.000 | 0.000 | 0.000 |
| Military Fuels Research: In FY09, this Congressional Interest Item researched technology for production of military fuels from non-petroleum sources and employing Fischer-Tropsch (FT). <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | | | | |
| Program #2 | | | | | | | 1.595 | 1.591 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602601A: <i>Combat Vehicle and Automotive Technology</i> | PROJECT T31: <i>NAT'L AUTO CENTER APP RES INIT (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Ultra Light Weight Transmission for FCS: In FY09, this Congressional Interest Item investigated an ultra light weight transmission for combat vehicles.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| Accomplishments/Planned Programs Subtotals | | 3.190 | 1.591 | 0.000 | 0.000 | 0.000 |
| 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. | | | | | | |

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Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification **DATE:** February 2010

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602618A: <i>BALLISTICS TECHNOLOGY</i> |
|--|---|

| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
|---|-------------------|---------------------|-----------------------------|----------------------------|------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|------------|
| Total Program Element | 84.827 | 78.034 | 60.342 | 0.000 | 60.342 | 59.623 | 62.176 | 65.816 | 70.640 | 0 | 541.800 |
| H03: <i>ROBOTICS TECHNOLOGY</i> | 15.929 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| H75: <i>ELECTRIC GUN TECHNOLOGY</i> | 4.465 | 4.065 | 0.032 | 0.000 | 0.032 | 0.045 | 0.065 | 0.072 | 0.092 | Continuing | Continuing |
| H80: <i>Survivability and Lethality Technology</i> | 50.367 | 57.456 | 60.310 | 0.000 | 60.310 | 59.578 | 62.111 | 65.744 | 70.548 | Continuing | Continuing |
| HB1: <i>SURVIVABILITY AND LETHALITY TECHNOLOGIES (CA)</i> | 14.066 | 16.513 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

This program element (PE) provides ballistic technologies required for armaments and armor that will enable enhanced lethality and survivability for the Soldier. The PE supports applied research on autonomous mobility technology for future land combat systems (project H03); applied research on technologies for electric armaments and penetrators that offer the potential to achieve leap-ahead lethality capability by providing hypervelocity and hyper-energy launch well above the ability of the conventional cannon (project H75); and applied research on lightweight armors and structures for the Soldier and vehicles, kinetic energy active protection, crew and component protection from ballistic shock and mine-blast, insensitive propellants/munitions, novel multi-function warhead concepts, affordable precision munitions technologies, and physics-based techniques, methodologies, and models to analyze combat effectiveness of future technologies (project H80). Project HB1 funds congressional special interest items. Work in this PE is related to and 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 0602782A (Command, Control, Communications Technology), PE 0603004A (Weapons and Munitions Advanced Technology), and PE 0603005A (Combat Vehicle 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 Laboratory (ARL), Aberdeen Proving Ground, MD and Hampton, VA.

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| Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification | DATE: February 2010 |
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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602618A: <i>BALLISTICS TECHNOLOGY</i> |
|--|---|

B. Program Change Summary (\$ in Millions)

| | <u>FY 2009</u> | <u>FY 2010</u> | <u>FY 2011 Base</u> | <u>FY 2011 OCO</u> | <u>FY 2011 Total</u> |
|-------------------------------------|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 87.960 | 61.843 | 62.140 | 0.000 | 62.140 |
| Current President's Budget | 84.827 | 78.034 | 60.342 | 0.000 | 60.342 |
| Total Adjustments | -3.133 | 16.191 | -1.798 | 0.000 | -1.798 |
| • Congressional General Reductions | | -0.409 | | | |
| • Congressional Directed Reductions | | | | | |
| • Congressional Rescissions | | 0.000 | | | |
| • Congressional Adds | | 16.600 | | | |
| • Congressional Directed Transfers | | | | | |
| • Reprogrammings | -1.610 | 0.000 | | | |
| • SBIR/STTR Transfer | -1.523 | 0.000 | | | |
| • Adjustments to Budget Years | 0.000 | 0.000 | -1.798 | 0.000 | -1.798 |

Change Summary Explanation

FY10 Congressional directed increases.

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602618A: <i>BALLISTICS TECHNOLOGY</i> | | | | PROJECT H03: <i>ROBOTICS TECHNOLOGY</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| H03: <i>ROBOTICS TECHNOLOGY</i> | 15.929 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

THIS PROJECT MOVED TO PE 0602120A/PROJECT TS2 BEGINNING IN FY10. This project funds applied research on autonomous mobility. The research focuses on investigation of advanced perception for autonomous ground mobility, intelligent vehicle control and behaviors; and human supervision of unmanned ground systems. Research results will enable both semi-autonomous and near autonomous unmanned ground vehicles (UGVs) with products transitioning to advanced development efforts. The work within this project provides the basis for the Collaborative Technology Alliance (CTA) in robotics. 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 Robotics Program and each of the Services. Work in this PE is related to and fully coordinated with efforts in PE 0603005A (Combat Vehicle 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), Aberdeen Proving Ground, MD and Hampton, VA.

B. Accomplishments/Planned Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 CTA: Execute CTA for advanced perception, control/behavior, and man-machine interface technology required for high-speed mobility (including robotic-follower operations) and basic tactical behaviors common to multiple military missions. 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, and development of human-robot interaction (HRI) scalable, intuitive, multi-modal control interfaces that will minimize the additional cognitive workload for Soldiers controlling unmanned assets. In FY09, developed technology for scene understanding and autonomous tactical behavior in the context of reconnaissance mission scenarios. | 7.220 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602618A: <i>BALLISTICS TECHNOLOGY</i> | PROJECT H03: <i>ROBOTICS TECHNOLOGY</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #2 Perception and Intelligent Control: Develop perception and intelligent control technologies required to meet objective capabilities for the armed robotic vehicles and to transition this technology to advanced development programs being conducted under PE 0603005A (Combat Vehicle Advanced Technology) project 515 for integration into test bed systems. Leverage Defense Advanced Research Projects Agency (DARPA) sponsored research for control of collaborating agents to enable mixed teams (manned/unmanned) to conduct military missions. In FY09, developed robotics technology that will permit unmanned vehicles to adapt to dynamic situations found in tactical environments. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 | | 4.722 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602618A: <i>BALLISTICS TECHNOLOGY</i> | | PROJECT H03: <i>ROBOTICS TECHNOLOGY</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #3</p> <p>UGV Integration: Integrate technology on unmanned ground vehicle (UGV) test beds and conduct extensive field testing 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 testing at Ft. Indiantown Gap, PA, and other military facilities that will test the technology in complex environments. The results of the tests will be used 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. In FY09, evaluated the ability of unmanned ground vehicles to autonomously adapt to dynamic tactical environments.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | 3.987 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602618A: <i>BALLISTICS TECHNOLOGY</i> | | PROJECT H03: <i>ROBOTICS TECHNOLOGY</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Accomplishments/Planned Programs Subtotals | | | | 15.929 | 0.000 | 0.000 | 0.000 | 0.000 |
| 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. | | | | | | | | |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602618A: <i>BALLISTICS TECHNOLOGY</i> | | | | PROJECT H75: <i>ELECTRIC GUN TECHNOLOGY</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| H75: <i>ELECTRIC GUN TECHNOLOGY</i> | 4.465 | 4.065 | 0.032 | 0.000 | 0.032 | 0.045 | 0.065 | 0.072 | 0.092 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

This project conducts applied research for Electromagnetic (EM) Guns. This project builds upon the EM Gun technology transitioned from PE 0601104A/Project H62 (Institute for Advanced Technology) and evaluates the potential of EM guns to provide such leap-ahead armaments capabilities that are fully integrated with electric propulsion and electromagnetic armor systems to provide the efficient, highly mobile, and deployable armored force. Focus is placed on addressing advanced materials for pulsed power; robust, compact, and lightweight launchers; full-scale, hypervelocity utility of novel kinetic energy penetrators (NKEPs) against a range of present and future threats; and efficient high energy launch packages. The results are transitioned to the Armament Research, Development, and Engineering Center (ARDEC), Picatinny Arsenal, New Jersey. In FY10 and beyond, applied research for EM Gun technology is redirected to conduct research to determine the effect of velocity and novel penetrator design on lethality, advanced propulsion concepts to achieve velocities above current ordnance velocities, and advanced energetics to increase penetrator performance. In FY11, this research will be funded under PE 0602618, Project H80. 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 Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 EM Pulse Power: Evolve the high strength composite materials critical for compact pulsed alternators. In FY09, studied advanced materials (bandings, conductors, and switches) to reduce pulsed alternator size and mass. In FY10, investigate advanced propulsion concepts. In FY11, research effort transitions to PE 626128, Project H80. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 | 1.742 | 1.880 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602618A: <i>BALLISTICS TECHNOLOGY</i> | PROJECT H75: <i>ELECTRIC GUN TECHNOLOGY</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #2 Launcher/Projectile: 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. In FY09, demonstrated large-caliber (>5 MJ) kinetic energy and multipurpose projectiles launched from an EM gun. In FY10, investigate advanced energetics to increase projectile performance, perform analysis of novel penetrator effects on advanced targets. In FY11, research effort transitions to PE 62618, Project H80. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 1.400 | 1.601 | 0.000 | 0.000 | 0.000 |
| Program #3 | | 0.850 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602618A: <i>BALLISTICS TECHNOLOGY</i> | PROJECT H75: <i>ELECTRIC GUN TECHNOLOGY</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Full-Scale Hypervelocity Lethality: In FY09, demonstrated full scale (>5MJ muzzle energy) reactive materials (RM) warhead and transitioned to ARDEC.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #4</p> <p>EM Gun Analysis: In FY09, defined the guidance and control parameters needed to increase hypervelocity hit probability. In FY10, analyze and document the EM armament system technical barriers. In FY11, research effort transitions to PE 62618, Project H80.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> | | 0.473 | 0.509 | 0.032 | 0.000 | 0.032 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602618A: <i>BALLISTICS TECHNOLOGY</i> | PROJECT H75: <i>ELECTRIC GUN TECHNOLOGY</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #5 Small Business Innovative Research/Small Business Technology Transfer Programs | | 0.000 | 0.075 | 0.000 | 0.000 | 0.000 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Accomplishments/Planned Programs Subtotals | | 4.465 | 4.065 | 0.032 | 0.000 | 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. | | | | | | |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602618A: <i>BALLISTICS TECHNOLOGY</i> | | | | PROJECT H80: <i>Survivability and Lethality Technology</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| H80: <i>Survivability and Lethality Technology</i> | 50.367 | 57.456 | 60.310 | 0.000 | 60.310 | 59.578 | 62.111 | 65.744 | 70.548 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

This project provides materials and armor/anti-armor terminal ballistic mechanisms that will provide better armor and armaments. Specific technology thrusts include: lightweight armors (Soldier/vehicle) and structures; active protection systems (APS); crew and component protection from ballistic shock, 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 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 is related to and 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 Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Structural Armor: Optimize advanced lightweight structural, ceramic, and electromagnetic armor technologies for transition to current and future tactical and combat vehicle designers. In FY09, proved performance of passive armor designs (second generation) that defeat future tactical vehicle threats with further density reductions; validated objective threat defeat at goal vehicle weights; coupled modeling and simulation with ballistic characterization to validate third generation armor concepts for future threats. In FY10, confirm 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. Validate Electrical Protection System (EPS) performance for tactical vehicles, both computationally and with tests in relevant environment. In FY11, will validate the | 11.808 | 12.128 | 12.890 | 0.000 | 12.890 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602618A: <i>BALLISTICS TECHNOLOGY</i> | | PROJECT H80: <i>Survivability and Lethality Technology</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>performance of third generation armor concepts under realistic environmental conditions through testing coupled with modeling and simulation.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #2</p> <p>Mine Blast Protection: 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. In FY09, devised models for mine protection using advanced-electromagnetic armor (A-EMA) and support validation of A-EMA mine kits; proved full-scale explosive loading with test apparatus to simulate vehicle borne or roadside blast fragment loading; transitioned second generation flexible protection equipment for individual Soldier development community. In FY10, analyze the ballistic shock effects of objective threat defeat on future vehicles. Computationally address the interaction of blast waves from objective blast threat with magnetic plate materials investigated in PE 0602105A/project H84. In FY11, will test and computationally validate advanced mine protection concepts at goal weights for threshold threat defeat and will prove performance under relevant environmental conditions.</p> | | | | 3.550 | 4.012 | 3.844 | 0.000 | 3.844 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602618A: <i>BALLISTICS TECHNOLOGY</i> | | PROJECT H80: <i>Survivability and Lethality Technology</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #3</p> <p>Precision Munitions: 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 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). In FY09, addressed technology that enables precision fires for small unit MOUT operations. In FY10, validate reduced state GN&C methods that will significantly reduce cost of precision munitions. Validate low cost robust actuator technology for indirect fire application. In FY11, will show feasibility of non-GPS guidance technologies. Will provide technology assessment of precision hit technology across munition size and domain.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> | | | | 4.200 | 4.456 | 4.488 | 0.000 | 4.488 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602618A: <i>BALLISTICS TECHNOLOGY</i> | | PROJECT H80: <i>Survivability and Lethality Technology</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #4</p> <p>Energetics: Develop propulsion and energetics technologies. Evaluate, select, and validate novel/nanostructural insensitive energetic materials concepts that exploit managed energy release and are required for improving the effectiveness and reducing the vulnerability of future gun/missile systems and warheads. In FY09, applied ballistic modeling and simulation to evaluate low-vulnerability propulsion charge configurations at reduced caliber for MOUT and gun launched rockets; applied reactive materials and nano-structured materials to enhance energy output with less propellant and explosive material; derived and applied chemical and physical mechanisms to reduce erosion via dynamic nitriding; determined the effects of physical modification and compartment packing design of munitions on the vulnerability of propellants and explosives to fast and slow cook-off, bullet and fragment impact, shaped charge jet impact; evaluated performance of advanced enhanced blast explosive formulations and munitions. In FY10, provide technology assessment of reactive material as structural components for Army munition systems. Incorporate reactive materials into structural components for Army munition systems and test the performance of the system. Transition hypergolic rocket motor and understanding to RDECs. In FY11, will study green energetic material formulation and will study feasibility of replacing Hexahydro-Trinitro-Triazine (RDX).</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> | | | | 4.450 | 4.606 | 4.650 | 0.000 | 4.650 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602618A: <i>BALLISTICS TECHNOLOGY</i> | PROJECT H80: <i>Survivability and Lethality Technology</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #5 Advanced Munitions: 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. In FY09, proved integrated scalable warhead technology for blast, fragmentation, and penetration effects in urban environments. In FY10, research advanced scalability concepts for medium and large caliber projectiles and missiles. In FY11, will conduct tests and document advances in scalable effects on targets. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 3.575 | 3.863 | 3.800 | 0.000 | 3.800 |
| Program #6 | | 6.810 | 7.602 | 5.350 | 0.000 | 5.350 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602618A: <i>BALLISTICS TECHNOLOGY</i> | PROJECT H80: <i>Survivability and Lethality Technology</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Survivability/Lethality Analyses: Devise state-of-the-art survivability/lethality/vulnerability (SLV) methodologies to dynamically model the interaction of conventional ballistic threats versus future systems. In FY09, developed novel blast and combined-effects methodologies for non-traditional, emerging synergistic threats; demonstrated an early Modular UNIX-based Vulnerability Estimation Suite (MUVES) 3 analysis capability, and delivered advanced crew-casualty metrics for assessing body armor. In FY10, investigate alignment of methodology development to the coupling of emerging and predicted threats with advancing armor materials/recipes and medical community inputs. In FY11, will 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.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #7</p> <p>Armor Formulations: In FY09, researched and investigated composite ceramic materials (from PE 0602105A/ project H84) to increase body armor performance while reducing weight. For ground combat vehicles, designed and developed reactive armor and electromagnetic armor solutions for defeat of emerging kinetic energy (KE)</p> | | 15.974 | 20.048 | 21.203 | 0.000 | 21.203 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602618A: <i>BALLISTICS TECHNOLOGY</i> | | PROJECT H80: <i>Survivability and Lethality Technology</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>and chemical energy (CE) threats. Assessed new explosive materials for reactive armors (RA) with modeling, simulation, and tests to characterize performance as well as sensitivity. Conducted modeling and simulation and experiments of lightweight brass board electromagnetic (EM) armor solutions using advanced materials to include hybrid armor designs that provided dual threat protection capability. In FY10, continue composite ceramic materials investigations for personnel protection applications; conduct tests with candidate single and dual-threat (CE & KE) defeat armor components (RA and EM) to design vehicle armor concepts; conduct first proof of principle test with hybrid armor components (combines RA and EM technologies) for dual threat defeat; develop new test methodologies, diagnostics, and modeling and simulation tools to better support active and hybrid armor development. In FY11, will determine and refine candidate dual threat defeat armor solution candidates for maturation in PE 0602601A/project C05; will validate the testing 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 testing in relevant environments. Personal protection concepts will utilize material technologies from PE 0602105A/projects H84/H7G and will be assessed and refined in PE 0602786A/project H98. Reactive armor and electromagnetic armor design solutions will utilize material technologies from PE 0602105A/project H84 and be assessed and refined in PE 0602601A/project C05.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| Program #8 | | | | 0.000 | 0.000 | 4.085 | 0.000 | 4.085 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602618A: <i>BALLISTICS TECHNOLOGY</i> | PROJECT H80: <i>Survivability and Lethality Technology</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Penetrator Lethality research. This research effort is transitioned from PE62618 Project H75. In FY11, will validate effects on lethality of velocity - ranging from ordnance velocity to hypervelocity - and also the effect of novel penetrator designs. Will complete validation and assessment of benefits of novel penetrator effects at ordnance velocity, will conduct initial validation of most promising novel penetrator designs at hypervelocity, and will improve penetration and lethality models based on novel penetrator data. Will investigate advanced propulsion system concepts to achieve velocities above current ordnance velocities.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #9 Small Business Innovative Research/Small Business Technology Transfer Programs</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> | | 0.000 | 0.741 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602618A: <i>BALLISTICS TECHNOLOGY</i> | | PROJECT H80: <i>Survivability and Lethality Technology</i> | | | | | |
| <u>B. Accomplishments/Planned Program (\$ in Millions)</u> | | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | | |
| Accomplishments/Planned Programs Subtotals | | | | 50.367 | 57.456 | 60.310 | 0.000 | 60.310 | |
| <u>C. Other Program Funding Summary (\$ in Millions)</u> | | | | | | | | | |
| N/A | | | | | | | | | |
| <u>D. Acquisition Strategy</u> | | | | | | | | | |
| N/A | | | | | | | | | |
| <u>E. Performance Metrics</u> | | | | | | | | | |
| 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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602618A: <i>BALLISTICS TECHNOLOGY</i> | | | | PROJECT HB1: <i>SURVIVABILITY AND LETHALITY TECHNOLOGIES (CA)</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| HB1: <i>SURVIVABILITY AND LETHALITY TECHNOLOGIES (CA)</i> | 14.066 | 16.513 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| A. Mission Description and Budget Item Justification | | | | | | | | | | | |
| These are Congressional Interest Items | | | | | | | | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | | | | |
| | | | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 | |
| Program #1 | | | | | | 3.989 | 0.000 | 0.000 | 0.000 | 0.000 | |
| Laser Based Explosives and Chem/Bio Standoff and Point Detector. This Congressional Interest Item Investigated laser-based approach for detection of unknown substances in the field for military and First Responder applications | | | | | | | | | | | |
| <i>FY 2009 Accomplishments:</i> | | | | | | | | | | | |
| FY 2009 | | | | | | | | | | | |
| <i>FY 2010 Plans:</i> | | | | | | | | | | | |
| FY 2010 | | | | | | | | | | | |
| <i>Base FY 2011 Plans:</i> | | | | | | | | | | | |
| FY 2011 Base | | | | | | | | | | | |
| <i>OCO FY 2011 Plans:</i> | | | | | | | | | | | |
| FY 2011 OCO | | | | | | | | | | | |
| Program #2 | | | | | | 0.797 | 0.795 | 0.000 | 0.000 | 0.000 | |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602618A: <i>BALLISTICS TECHNOLOGY</i> | PROJECT HB1: <i>SURVIVABILITY AND LETHALITY TECHNOLOGIES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Beneficial Infrastructure for Rotorcraft Risk Reduction Demonstrations (BIRRRD). In FY09, Investigated Vehicle Management System (VMS) to support combat medic unmanned aerial vehicle applications</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #3</p> <p>Small Unmanned Aerial Vehicles (UAVs) and Sensors. In FY09, this Congressional Interest Item investigated vehicle technology that can be used to support Reconnaissance, Intelligence, Surveillance, and Target Acquisition on small military Unmanned Aerial Vehicles, using penetrating radar to search buildings and structures.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> | | 0.498 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602618A: <i>BALLISTICS TECHNOLOGY</i> | PROJECT HB1: <i>SURVIVABILITY AND LETHALITY TECHNOLOGIES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #4 Super High Accuracy Range Kit - 105mm Artillery Technology. In FY09, this Congressional Interest Item investigated an accuracy improvement technology for application to artillery ammunition through the use of GPS and an electro-mechanical control actuation system. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 3.592 | 3.979 | 0.000 | 0.000 | 0.000 |
| Program #5 Advanced Composite Armor For Force Protection. In FY09, this Congressional Interest Item investigated advanced composite materials tailored to defeat evolving ballistic and IED fragmentation threats. <i>FY 2009 Accomplishments:</i> FY 2009 | | 1.597 | 1.592 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | |
|---|---|---|----------------------------|--------------------|----------------------|
| APPROPRIATION/BUDGET ACTIVITY | R-1 ITEM NOMENCLATURE | PROJECT | | | |
| 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | PE 0602618A: <i>BALLISTICS TECHNOLOGY</i> | HB1: <i>SURVIVABILITY AND LETHALITY TECHNOLOGIES (CA)</i> | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | |
| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | |
| Program #6 Next Generation Lightweight Electric Drive Systems for Army Weapons. In FY09, this Congressional Interest Item developed software for the analysis of the electric drive and transitioned it to Dakota Power. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | 1.597 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #7 Eye-Safe Standoff Fusion Detection of CBE Threats. In FY09, this Congressional Interest Item researched eye-safe standoff detection approaches for chemical, biological, and explosive threats. | 1.996 | 1.990 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602618A: <i>BALLISTICS TECHNOLOGY</i> | PROJECT HB1: <i>SURVIVABILITY AND LETHALITY TECHNOLOGIES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #8 5.56mm Aluminum Cartridge Case, Lake City Army Ammunition Plant. This is a Congressional Interest Item. | | 0.000 | 1.592 | 0.000 | 0.000 | 0.000 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #9 | | 0.000 | 0.796 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602618A: <i>BALLISTICS TECHNOLOGY</i> | PROJECT HB1: <i>SURVIVABILITY AND LETHALITY TECHNOLOGIES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Flexible Solar Cell for Man Portable Power Generator. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #10 Direct Carbon Fuel Cell. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 2.785 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602618A: <i>BALLISTICS TECHNOLOGY</i> | PROJECT HB1: <i>SURVIVABILITY AND LETHALITY TECHNOLOGIES (CA)</i> | | | | |
| <u>B. Accomplishments/Planned Program (\$ in Millions)</u> | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #11 Enabling Optimization of Reactive Armor. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 2.984 | 0.000 | 0.000 | 0.000 |
| Accomplishments/Planned Programs Subtotals | | 14.066 | 16.513 | 0.000 | 0.000 | 0.000 |
| <u>C. Other Program Funding Summary (\$ in Millions)</u> N/A | | | | | | |
| <u>D. Acquisition Strategy</u> N/A | | | | | | |
| <u>E. Performance Metrics</u> 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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Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification **DATE:** February 2010

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602622A: <i>Chemical, Smoke and Equipment Defeating Technology</i> |
|--|--|

| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
|--|----------------|------------------|-----------------------|----------------------|------------------------|------------------|------------------|------------------|------------------|------------------|------------|
| Total Program Element | 8.873 | 13.622 | 5.324 | 0.000 | 5.324 | 4.877 | 5.434 | 6.476 | 7.535 | 0 | 57.465 |
| 552: <i>SMOKE/NOVEL EFFECT MUN</i> | 2.256 | 5.266 | 5.324 | 0.000 | 5.324 | 4.877 | 5.434 | 6.476 | 7.535 | Continuing | Continuing |
| BA1: <i>Protection Technologies (CA)</i> | 6.617 | 8.356 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

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 (Countermines & 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)

| | <u>FY 2009</u> | <u>FY 2010</u> | <u>FY 2011 Base</u> | <u>FY 2011 OCO</u> | <u>FY 2011 Total</u> |
|-------------------------------------|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 8.906 | 5.293 | 5.311 | 0.000 | 5.311 |
| Current President's Budget | 8.873 | 13.622 | 5.324 | 0.000 | 5.324 |
| Total Adjustments | -0.033 | 8.329 | 0.013 | 0.000 | 0.013 |
| • Congressional General Reductions | | -0.071 | | | |
| • Congressional Directed Reductions | | | | | |
| • Congressional Rescissions | | 0.000 | | | |
| • Congressional Adds | | 8.400 | | | |
| • Congressional Directed Transfers | | | | | |
| • Reprogrammings | 0.185 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.218 | 0.000 | | | |
| • Adjustments to Budget Years | 0.000 | 0.000 | 0.013 | 0.000 | 0.013 |

Change Summary Explanation

FY10 Congressionally directed increases.

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R-1 Line Item #15

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Exhibit R-2A, PB 2011 Army RDT&E Project Justification **DATE:** February 2010

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602622A: <i>Chemical, Smoke and Equipment Defeating Technology</i> | PROJECT 552: <i>SMOKE/NOVEL EFFECT MUN</i> |
|--|--|--|

| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
|------------------------------------|----------------|------------------|-----------------------|----------------------|------------------------|------------------|------------------|------------------|------------------|------------------|------------|
| 552: <i>SMOKE/NOVEL EFFECT MUN</i> | 2.256 | 5.266 | 5.324 | 0.000 | 5.324 | 4.877 | 5.434 | 6.476 | 7.535 | 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 Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|--|---------|---------|--------------|-------------|---------------|
| Program #1 Advanced Obscurants: This effort investigates technologies which enable safe, effective screening of personnel and equipment. In FY09, expanded existing theory for advanced obscurants across the entire spectrum of interest (visual, IR and microwave regions); examined alternate theoretical approaches; determined particle characteristics based upon theory; and initiated investigation of new high performing, low toxicity visual obscurants. Conducted studies of bi-spectral (visual thru Far IR) obscurant concepts. In FY10, investigate, through chamber and field evaluation, bi-spectral packaging and dissemination concepts to improve overall obscuration performance. In FY11, will develop, refine and optimize bi-spectral packaging and dissemination concepts through testing and modifications to make them suitable for weaponization. <i>FY 2009 Accomplishments:</i> FY 2009 | 1.381 | 1.424 | 1.400 | 0.000 | 1.400 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602622A: <i>Chemical, Smoke and Equipment</i> <i>Defeating Technology</i> | | PROJECT 552: <i>SMOKE/NOVEL EFFECT MUN</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #2</p> <p>Obscurant Enabling Technology: This effort investigates distribution technologies for various obscurants. In FY09, conducted studies of dissemination techniques for low toxicity bi-spectral obscurants and new bi-spectral obscurants. In FY10, conduct modeling and chamber evaluation studies to examine performance improvements possible for low hazard visual obscurants. In FY11, will conduct studies of dissemination techniques for low hazard visual obscurants to increase their obscuration performance and to make them suitable for weaponization.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | 0.875 | 0.845 | 0.904 | 0.000 | 0.904 |
| <p>Program #3</p> | | | | 0.000 | 2.882 | 3.020 | 0.000 | 3.020 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602622A: <i>Chemical, Smoke and Equipment</i> <i>Defeating Technology</i> | PROJECT 552: <i>SMOKE/NOVEL EFFECT MUN</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Forensic Analysis of Explosive Signatures: This effort investigates the detection and chemical analysis of explosive material signatures. In FY10, will conduct experiments to determine the surface/vapor characterization of military high explosives (HEs); and common materials used in homemade explosives (HMEs); will determine the signatures required to provide improved point, proximity, and stand-off detection of explosives and precursor materials; will investigate the environmental persistence, fate and transport of explosives relevant to counter HE and HME sensing operations; will conduct experiments to develop novel forensic methods that determine the components in HMEs. In FY11, will establish and validate forensic sampling protocols for sensing explosives on surfaces; will identify the differences in instrumentation used in theater and within continental United States (CONUS) based laboratories; will continue fate and transport studies of trace energetics and chemical components focusing on surface residues; will evaluate and determine decomposition patterns and pathways to provide additional signature markers; will identify chemical signatures for sensing, leveraging data from DARPA Portable Open Source Security Elements (POSSE) Program; will investigate the ability to combine chemical and explosive hazard detection; and will utilize findings to help guide detector/detection specifications. Will transition technologies to PE (0603004A/Project L97 (Smoke and Obscurants Advanced Technology).</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| Program #4 | | 0.000 | 0.115 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602622A: <i>Chemical, Smoke and Equipment</i> <i>Defeating Technology</i> | PROJECT 552: <i>SMOKE/NOVEL EFFECT MUN</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Small Business Innovative Research/Small Business Technology Transfer Programs | | | | | | |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Accomplishments/Planned Programs Subtotals | | 2.256 | 5.266 | 5.324 | 0.000 | 5.324 |
| 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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602622A: <i>Chemical, Smoke and Equipment Defeating Technology</i> | | | | PROJECT BA1: <i>Protection Technologies (CA)</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| BA1: <i>Protection Technologies (CA)</i> | 6.617 | 8.356 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| A. Mission Description and Budget Item Justification | | | | | | | | | | | |
| Congressional Interest Item funding for Protection Technologies applied research. | | | | | | | | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | | | | |
| | | | | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #1 Systems Biology Biomarker Molecular Toxicology Initiative: This Congressional Interest Item investigated specific diagnostic markers necessary to quickly indicate diseased states in the event of a chemical or biological terrorist attack or exposure to such agents. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | 2.631 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #2 | | | | | | | 1.594 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602622A: <i>Chemical, Smoke and Equipment Defeating Technology</i> | | PROJECT BA1: <i>Protection Technologies (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Rapid and Accurate Pathogen Identification/Detection (RAPID) Program: This Congressional Interest Item developed a sensitive and specific detection platform for biological agents that employed micropatterned arrays of unique chemotactic signaling compounds specific for each target threat.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #3</p> <p>Enhanced Vapor Aeration Capabilities (EVAC): This Congressional Interest Item investigated the utilization of thermal enhancement of gaseous decontamination systems to lift chemical and biological agents from a surface in order to decontaminate more quickly and effectively than current capabilities.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> | | | | 2.392 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602622A: <i>Chemical, Smoke and Equipment</i> <i>Defeating Technology</i> | PROJECT BA1: <i>Protection Technologies (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #4 Highlander Electro-Optical Sensors. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 1.591 | 0.000 | 0.000 | 0.000 |
| Program #5 Missouri Multi-Threat Detection Initiative (M2TDI). This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 | | 0.000 | 1.990 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602622A: <i>Chemical, Smoke and Equipment</i> <i>Defeating Technology</i> | PROJECT BA1: <i>Protection Technologies (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #6 Locating and Tracking Explosive Threats with Wireless Sensors and Networks. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 4.775 | 0.000 | 0.000 | 0.000 |
| Accomplishments/Planned Programs Subtotals | | 6.617 | 8.356 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | DATE: February 2010 |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602622A: <i>Chemical, Smoke and Equipment</i> <i>Defeating Technology</i> | PROJECT BA1: <i>Protection Technologies (CA)</i> |
| 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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Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification **DATE:** February 2010

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602623A: <i>JOINT SERVICE SMALL ARMS PROGRAM</i> |
|--|--|

| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
|--|-------------------|---------------------|-----------------------------|----------------------------|------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|------------|
| Total Program Element | 9.165 | 7.634 | 7.893 | 0.000 | 7.893 | 8.244 | 8.604 | 8.758 | 8.906 | 0 | 67.097 |
| H21: <i>JT SVC SA PROG (JSSAP)</i> | 7.326 | 7.634 | 7.893 | 0.000 | 7.893 | 8.244 | 8.604 | 8.758 | 8.906 | Continuing | Continuing |
| S50: <i>SMALL ARMS APPLIED RESEARCH (CA)</i> | 1.839 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

The objective of this program element is to design and develop 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) and PE 0603607A (Joint Service Small Arms 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. This program is managed by the US Army Armament Research, Development, and Engineering Center (ARDEC), Picatinny Arsenal, NJ.

B. Program Change Summary (\$ in Millions)

| | <u>FY 2009</u> | <u>FY 2010</u> | <u>FY 2011 Base</u> | <u>FY 2011 OCO</u> | <u>FY 2011 Total</u> |
|-------------------------------------|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 9.102 | 7.674 | 7.874 | 0.000 | 7.874 |
| Current President's Budget | 9.165 | 7.634 | 7.893 | 0.000 | 7.893 |
| Total Adjustments | 0.063 | -0.040 | 0.019 | 0.000 | 0.019 |
| • Congressional General Reductions | | -0.040 | | | |
| • Congressional Directed Reductions | | | | | |
| • Congressional Rescissions | | 0.000 | | | |
| • Congressional Adds | | 0.000 | | | |
| • Congressional Directed Transfers | | | | | |
| • Reprogrammings | 0.288 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.225 | 0.000 | | | |
| • Adjustments to Budget Years | 0.000 | 0.000 | 0.019 | 0.000 | 0.019 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602623A: <i>JOINT SERVICE SMALL ARMS PROGRAM</i> | | | | PROJECT H21: <i>JT SVC SA PROG (JSSAP)</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| H21: <i>JT SVC SA PROG (JSSAP)</i> | 7.326 | 7.634 | 7.893 | 0.000 | 7.893 | 8.244 | 8.604 | 8.758 | 8.906 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

This project designs and develops individual and crew-served weapon 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). 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 Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| <p>Program #1</p> <p>Advanced Lethal Armament Technology for Small Arms: This effort addresses terminal effects and launch aspects of small arms weapon systems. In FY09, designed improvements and assessed trajectory correction and drag compensation sensors for 40 mm and 25 mm ammo; analyzed and confirmed projectile terminal effectiveness in laboratory environment; confirmed proof of principle recoil reduction concepts with recoil kinematic modeling. In FY10, fabricate and evaluate 2 advanced small caliber payload/warheads in laboratory; assess microelectromechanical systems (MEMs) setback generator critical components in lab environment; design ammo breadboard to demonstrate launch survivability, assess recoil reduction to multiple variation in loads and confirm with model. In FY11, will assess optimum small caliber payloads, fire control and fuzing through component demonstrations confirming critical characteristics, (such as flight dynamics) in a wind tunnel and will confirm results with modeling and simulation; will develop target-orientation sensors for small caliber payloads designs.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> | 3.815 | 3.745 | 3.267 | 0.000 | 3.267 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602623A: <i>JOINT SERVICE SMALL ARMS PROGRAM</i> | | PROJECT H21: <i>JT SVC SA PROG (JSSAP)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #2</p> <p>Advanced Fire Control Technology for Small Arms: This effort addresses advanced fire control technologies to reduce miss distance of small arms weapon systems. In FY09, evaluated improved ranging accuracy technologies mounted on individual weapons and used against moving targets; developed concepts to consolidate energy supply to multiple devices, such as sights and rangefinders, mounted on the rail systems; assessed the improvements in automated target location correction for very short time target exposures; and assessed increase in effectiveness with modeling and simulation tools. In FY10, will develop modeling and simulation tools to evaluate the soldier-small arms interface to determine factors influencing loss of accuracy in aiming; will design and fabricate advanced modular rail components; will evaluate weapon aiming concepts using target testbed components; will demonstrate critical gun barrel reference sensor components. In FY11, will evaluate capability of critical components to engage defilade and covered targets ; will design weapon-aiming components improving timeline and target centroid location to increase effectiveness; will perform critical lab advanced-aiming assessments; will conduct evaluation of tradeoffs resulting from the incorporation of enhancements to small arms critical components.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> | | | | 3.511 | 3.705 | 4.626 | 0.000 | 4.626 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602623A: <i>JOINT SERVICE SMALL ARMS PROGRAM</i> | PROJECT H21: <i>JT SVC SA PROG (JSSAP)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #3 Small Business Innovative Research/Small Business Technology Transfer Programs <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 0.184 | 0.000 | 0.000 | 0.000 |
| Accomplishments/Planned Programs Subtotals | | 7.326 | 7.634 | 7.893 | 0.000 | 7.893 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | DATE: February 2010 |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602623A: <i>JOINT SERVICE SMALL ARMS PROGRAM</i> | PROJECT H21: <i>JT SVC SA PROG (JSSAP)</i> |
| 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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602623A: <i>JOINT SERVICE SMALL ARMS PROGRAM</i> | | | | PROJECT S50: <i>SMALL ARMS APPLIED RESEARCH (CA)</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| S50: <i>SMALL ARMS APPLIED RESEARCH (CA)</i> | 1.839 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| A. Mission Description and Budget Item Justification | | | | | | | | | | | |
| Congressional Interest Item funding for Small Arms Applied Research. | | | | | | | | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | | | | |
| | | | | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #1 Hybrid Luminescent Ammunition. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | 1.012 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #2 5.56mm Aluminum Cartridge Case, Lake City Army Ammunition Plant. This is a Congressional Interest Item. | | | | | | | 0.827 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602623A: <i>JOINT SERVICE SMALL ARMS PROGRAM</i> | PROJECT S50: <i>SMALL ARMS APPLIED RESEARCH (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Accomplishments/Planned Programs Subtotals | | 1.839 | 0.000 | 0.000 | 0.000 | 0.000 |
| 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. | | | | | | |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> |
|--|--|

| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
|---|----------------|------------------|-----------------------|----------------------|------------------------|------------------|------------------|------------------|------------------|------------------|------------|
| Total Program Element | 106.253 | 144.864 | 42.645 | 0.000 | 42.645 | 39.459 | 39.802 | 43.140 | 47.223 | 0 | 506.031 |
| H18: <i>Weapons & Munitions Technologies</i> | 13.363 | 17.190 | 19.300 | 0.000 | 19.300 | 18.198 | 15.881 | 17.688 | 19.282 | Continuing | Continuing |
| H19: <i>ASYMMETRIC & COUNTER MEASURE TECHNOLOGIES</i> | 7.091 | 12.196 | 11.781 | 0.000 | 11.781 | 9.524 | 11.043 | 12.347 | 13.576 | Continuing | Continuing |
| H1A: <i>WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE</i> | 74.853 | 103.994 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| H28: <i>WARHEADS/ ENERGETICS TECHNOLOGIES</i> | 10.946 | 11.484 | 11.564 | 0.000 | 11.564 | 11.737 | 12.878 | 13.105 | 14.365 | 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.

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> |
|--|--|

B. Program Change Summary (\$ in Millions)

| | <u>FY 2009</u> | <u>FY 2010</u> | <u>FY 2011 Base</u> | <u>FY 2011 OCO</u> | <u>FY 2011 Total</u> |
|-------------------------------------|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 102.339 | 41.085 | 42.589 | 0.000 | 42.589 |
| Current President's Budget | 106.253 | 144.864 | 42.645 | 0.000 | 42.645 |
| Total Adjustments | 3.914 | 103.779 | 0.056 | 0.000 | 0.056 |
| • Congressional General Reductions | | -0.761 | | | |
| • Congressional Directed Reductions | | | | | |
| • Congressional Rescissions | | 0.000 | | | |
| • Congressional Adds | | 104.540 | | | |
| • Congressional Directed Transfers | | | | | |
| • Reprogrammings | 6.401 | 0.000 | | | |
| • SBIR/STTR Transfer | -2.487 | 0.000 | | | |
| • Adjustments to Budget Years | 0.000 | 0.000 | 0.056 | 0.000 | 0.056 |

Change Summary Explanation

FY10 Congressionally directed increases.

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | PROJECT H18: <i>Weapons & Munitions Technologies</i> |
|--|--|--|

| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
|--|----------------|------------------|-----------------------|----------------------|------------------------|------------------|------------------|------------------|------------------|------------------|------------|
| H18: <i>Weapons & Munitions Technologies</i> | 13.363 | 17.190 | 19.300 | 0.000 | 19.300 | 18.198 | 15.881 | 17.688 | 19.282 | 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 and provide increased lethality 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 Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|---|---------|---------|--------------|-------------|---------------|
| Program #1 Insensitive Munitions (IM) Technologies Initiatives: This effort focuses on identifying, maturing, and applying technologies that reduce unplanned, accidental, and/or sympathetic detonation of munitions in order to meet IM requirements. In FY09, completed sympathetic detonation (SD)/bullet impact (BI) modeling of the Precision Attack Missile (PAM) warhead after IM techniques had been added to the rounds. In FY10, the funding for this effort has been moved to PE 0602624A/Project H28. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 | 0.249 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | | PROJECT H18: <i>Weapons & Munitions Technologies</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #2</p> <p>High Power Microwave (HPM) - Anti-Materiel Munitions: This effort designs and develops HPM technology for use in non-lethal (NL) munitions. In FY09, began integration of individual components; performed analysis of the system's ability to generate power while in flight and operated in a gun launch environment; and began laboratory effects testing of an integrated laboratory demonstrator against relevant simulated targets. In FY10, develop non-fragment producing materials for carriers to achieve NL effects; develop, test and integrate demonstrator technology to obtain higher energy density, high voltage, nano-second discharge times, and solid state switches for nano-second discharge rates; identify 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. In FY11, will develop, test and integrate frequency adjusting technology components for graduated effects on multiple targets. In addition, target set frequency vulnerabilities will be bounded through use of susceptibility analysis and modeling to enable optimization of antenna, radio frequency source, power conditioning, and prime power; will explore ability to create graduated target effects through geometry variations, dielectric and magnetic material choices, and antenna gain design; and will integrate components to determine performance improvements and insure repeatable results.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> | | | | 6.730 | 3.802 | 3.247 | 0.000 | 3.247 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | | PROJECT H18: <i>Weapons & Munitions Technologies</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #3</p> <p>Novel Propulsion Technology for the Future: This effort develops propellant technologies for advanced gun launch and thrusters including those that deliver a broad spectrum of effects. In FY09, fabricated novel igniters and demonstrated them against current baseline igniters; optimized propulsion technologies at the component level for integration into scalable and adaptive response munitions; and developed modeling and simulation (M&S) tools for scalable and adaptive propulsion prediction capabilities across the full range of munition applications. In FY10, fabricate and test propellants and igniters in component tests; begin integration with the objective munition designs (30mm medium caliber cartridge and 105mm artillery shell); develop, verify, and utilize M&S to predict performance in components. In FY11, will fabricate more propellant for objective demonstrations and will complete integration with objective munition designs; will characterize performance in live fire tests; will 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.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> | | | | 2.019 | 1.850 | 1.658 | 0.000 | 1.658 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | PROJECT H18: <i>Weapons & Munitions Technologies</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| <p>Program #4</p> <p>Advanced Munition Components: This effort designs and develops individual components in the firing chain for gun launched munitions. In FY10, focus on designing and developing scalable adaptable munition components; evaluate various munition components and determine options to modify components to support scalable munition development; evaluate performance through M&S tools and select a caliber to design the initial scalable munition round and initiate design. In FY11, will complete design of scalable adaptable munition and will begin fabrication of the laboratory demonstrators; will test and evaluate the performance of laboratory demonstrator munitions in selected system configurations against a spectrum of targets to determine performance and effectiveness.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | 0.000 | 2.576 | 3.568 | 0.000 | 3.568 |
| <p>Program #5</p> <p>Pulsed Laser technologies: This effort investigates directed energy (DE) technologies such as the laser induced plasma channel (LIPC) to generate a cavity in the air in which high powered microwaves (HPM) are channeled to produce tailored effects on targets. In FY09, performed LIPC M&S to define the optimum filament geometries</p> | | 2.965 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | PROJECT H18: <i>Weapons & Munitions Technologies</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>for effective energy transmission; investigated the interaction of radio frequency fields in custom waveguides for HPM applications; conducted verification tests for components of a laser induced channel coupled with HPM waveforms that provided insight to expected increase in performance when compared to standard waveguide transmission. Efforts described here are consolidated in FY10 into PE 0602624A/Project H19 and are coordinated and complimentary to related efforts in PE 0603004A/Project 232.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #6</p> <p>Fuze Technology: This effort was funded through a mid-year reprogramming action to investigate several advanced fuze technologies. This effort establishes initial design concepts for a high reliability fuze architecture for gun-fired cluster munitions that conforms to the June 2008 Secretary of Defense policy. In FY09, evaluated microelectromechanical (MEMS), conventional electro-mechanical and miniature electronic safe and arming device (ESAD) concepts; evaluated potential safety environments for arming; evaluated initial target sensing (proximity, impact) mechanisms; independently reviewed reliability and safety architecture; and developed initial power budget and identified candidate architecture. Analysis determined that a wafer-level packaging approach is essential to realize low costs for higher volumes of MEMS-based fuzes; designed and integrated MEMS fuze</p> | | 1.400 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | | PROJECT H18: <i>Weapons & Munitions Technologies</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>components into wafer-level packaging; applied packaging processing technologies to MEMS fuze chips; and integrated MEMS fuze with master/slave fuzing approach in laboratory prototype.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #7</p> <p>Advanced Munition Payloads: This effort develops novel payloads and related components for integration into gun-fired munitions and missiles. In FY10, assess advanced fuze technologies capable of either detonating or deflagrating submunitions such as Dual-Purpose Improved Conventional Munitions (DPICM) in selected environments; conduct 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. In FY11, will develop and validate M&S tools for deflagrating munitions; will perform trade studies to evaluate submunition component technologies; and will conduct initial tests to verify deflagration models. Efforts described here are coordinated and complimentary to related efforts in PE 0603004A/Project 232.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> | | | | 0.000 | 4.682 | 5.205 | 0.000 | 5.205 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | | PROJECT H18: <i>Weapons & Munitions Technologies</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #8</p> <p>Advanced Weapons Technology: This effort investigates innovative weapon technologies for future medium caliber direct fire systems that provide similar or greater lethality than current systems. In FY10, assess detailed designs of distributive technologies for new weapon delivery effects; conduct 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 develop critical design factors for launch survivability, component reliability, and recoil energy management. In FY11, will 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 will optimize selected technologies based on their ability to defeat the widest variety of targets.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> | | | | 0.000 | 3.085 | 3.608 | 0.000 | 3.608 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | PROJECT H18: <i>Weapons & Munitions Technologies</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| <p>Program #9</p> <p>Affordable Precision Technology: This effort develops and incorporates technologies to provide affordable precision to the full spectrum of gun calibers. In FY10, identify technologies that can potentially increase delivery accuracy and lethal performance of weapons. In FY11, will sort most promising technologies by applicable caliber size and will prioritize by greatest capability increase and cost to implement; and will 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.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | 0.000 | 0.890 | 2.014 | 0.000 | 2.014 |
| <p>Program #10</p> <p>Small Business Innovative Research/Small Business Technology Transfer Programs</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> | | 0.000 | 0.305 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | | PROJECT H18: <i>Weapons & Munitions Technologies</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Accomplishments/Planned Programs Subtotals | | | | 13.363 | 17.190 | 19.300 | 0.000 | 19.300 |
| 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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | | | | PROJECT H19: <i>ASYMMETRIC & COUNTER MEASURE TECHNOLOGIES</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| H19: <i>ASYMMETRIC & COUNTER MEASURE TECHNOLOGIES</i> | 7.091 | 12.196 | 11.781 | 0.000 | 11.781 | 9.524 | 11.043 | 12.347 | 13.576 | 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 Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Near Autonomous Unmanned Systems (NAUS): This effort designs and evaluates a remote weapon station optimized for high-reliability on an unmanned vehicle and addresses the safe operation of weapons on robotic vehicles. In FY09, fabricated and integrated critical sub-systems; and conducted baseline system level tests. Efforts described here are coordinated and complimentary to related efforts in PE 0602601A/Project H91; PE 0602618A/Project H03; PE 0602120A/Project H16; and PE 0603005A/Project 515. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 | 1.985 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | PROJECT H19: <i>ASYMMETRIC & COUNTER MEASURE TECHNOLOGIES</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #2 Pulsed Laser Component Technologies: This effort develops and miniaturizes key DE technology components to enable a LIPC capability. The LIPC effect uses a short pulse laser to generate a cavity in the air in which high powered microwaves (HPM) and/or high voltage bursts are channeled to defeat different targets at stand-off. In FY09, characterized and optimized high voltage discharges and HPM waveforms to produce multiple target effects on buried or surface threats. In FY10, mature model of critical components of LIPC system for optimal interaction of laser induced channel and high voltage waveforms; conduct studies of LIPC subsystems parameters to enhance transmission of the high voltage waveform required for desired range and target effects; and initiate design of advanced high quality critical subcomponents for a LIPC system. In FY11, will develop LIPC system design based upon results of parametric studies and modeling efforts; and will continue to mature and integrate subsystem components towards fieldable requirements, i.e. volume, weight, ruggedness. Efforts are coordinated and complimentary to related efforts in PE 0602624A/Project H18 and PE 0603004A/Project 232. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base | | 2.062 | 3.801 | 3.615 | 0.000 | 3.615 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
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| APPROPRIATION/BUDGET ACTIVITY | R-1 ITEM NOMENCLATURE | PROJECT | | | | |
| 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | PE 0602624A: <i>Weapons and Munitions Technology</i> | H19: <i>ASYMMETRIC & COUNTER MEASURE TECHNOLOGIES</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #3 Ground Based Munitions Technologies: This effort optimizes smart ground based munitions for the urban and complex fight. In FY09, evaluated urban technologies for ground based munitions for use with the intelligent munitions system (IMS) (PE 0654808A/D016); optimized a set of sensor suites for the urban environment and evaluated merging sensor modalities; and evaluated target engagement approaches from a ground based munition that can engage both personnel and light vehicles while minimizing collateral damage. Efforts described here are coordinated and complimentary to related efforts in PE 0603004A/Project 232, and PE 0603606A/Project 683. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 3.044 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #4 Novel Battlefield Effectors: 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. In FY10, select 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) | | 0.000 | 3.780 | 2.073 | 0.000 | 2.073 |

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|--|--|---|--------------|---------------------|---------------|
| APPROPRIATION/BUDGET ACTIVITY | R-1 ITEM NOMENCLATURE | PROJECT | | | |
| 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | PE 0602624A: <i>Weapons and Munitions Technology</i> | H19: <i>ASYMMETRIC & COUNTER MEASURE TECHNOLOGIES</i> | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | |
| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>missions; develop the technologies into a breadboard system and begin target effectiveness studies; and conduct trade studies to determine the proper power, size, and weight to achieve required lethal effects on various targets. In FY11, will complete full target effectiveness testing with the bread board system and will design a brassboard to demonstrate novel battlefield effects for direct and indirect fire platforms.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | |
| <p>Program #5</p> <p>Active Denial Technologies: This effort develops compact non-lethal, counter-personnel DE technologies. In FY11, will complete design of brassboard to determine scalability for different platforms; will 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.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> | 0.000 | 0.000 | 2.500 | 0.000 | 2.500 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #6</p> <p>Counter Countermeasure (CCM) Technologies for weapons and munitions: 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. Technology areas being investigated include reducing radar cross section of gun-fired rounds and increasing performance of warheads. In FY10, conduct systems effectiveness analysis to determine which weapons/rounds are most susceptible to countermeasures; investigate potential counter-countermeasure techniques/technologies and identify the most promising that reduce the effectiveness of threat countermeasure technologies. In FY11, will prioritize and down select CCM technologies and will begin design and fabrication of breadboard components to demonstrate superior counter-countermeasure technologies with respect to current systems.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | 0.000 | 4.315 | 3.593 | 0.000 | 3.593 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | PROJECT H19: <i>ASYMMETRIC & COUNTER MEASURE TECHNOLOGIES</i> | | | | |
| <u>B. Accomplishments/Planned Program (\$ in Millions)</u> | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #7 Small Business Innovative Research/Small Business Technology Transfer Programs <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 0.300 | 0.000 | 0.000 | 0.000 |
| Accomplishments/Planned Programs Subtotals | | 7.091 | 12.196 | 11.781 | 0.000 | 11.781 |
| <u>C. Other Program Funding Summary (\$ in Millions)</u> N/A | | | | | | |
| <u>D. Acquisition Strategy</u> N/A | | | | | | |
| <u>E. Performance Metrics</u> 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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | | | | | PROJECT H1A: <i>WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| H1A: <i>WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE</i> | 74.853 | 103.994 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| A. Mission Description and Budget Item Justification | | | | | | | | | | | |
| Congressional Interest Item funding for Weapons and Munitions Technology applied research. | | | | | | | | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | | | | |
| | | | | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #1 Green Armaments/Range Safe. This Congressional Interest Item developed environmentally compatible products and processes to ensure environmental compliance while supporting our troops during training and other battlefield operations. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | 2.392 | 1.592 | 0.000 | 0.000 | 0.000 |
| Program #2 | | | | | | | 2.392 | 3.183 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | | PROJECT H1A: <i>WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Advanced Materials & Process for Armament Structures (AMPAS). This Congressional Interest Item supported the development of technologies in atmospheric furnace control, material handling, titanium chip processing, and rolling in order to improve titanium productivity.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #3</p> <p>Armament System Engineering and Integration Initiative (ASEI2). This Congressional Interest Item developed technology advancements for systems engineering for acquisition programs.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> | | | | 3.189 | 1.592 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | PROJECT H1A: <i>WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #4 Electroconversion of Energetic Materials. This Congressional Interest Item explored the feasibility of direct conversion of energetics to electrical energy in fuel cells using the advancements made in nanotechnology. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 3.588 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #5 Army Center of Excellence in Acoustics: This Congressional Interest Item provided acoustics technology to support specific applications such as acoustic sensors for aerostats deployed near the Baghdad airport, improved algorithms for sniper and mortar detection, and fielded machine guns on Humvees which automatically swiveled towards gunfire based acoustics. <i>FY 2009 Accomplishments:</i> FY 2009 | | 4.386 | 3.979 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | PROJECT H1A: <i>WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #6 Developmental Mission Integration: This Congressional Interest Item built upon ARDEC's extensive technology development efforts and network of strategic partnerships and provided the necessary flexibility to identify and mature armaments and munitions technologies. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 3.987 | 5.571 | 0.000 | 0.000 | 0.000 |
| Program #7 | | 4.984 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | PROJECT H1A: <i>WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Remotely Operated Weapons and Sensor Technology: This Congressional Interest Item accelerated the development and fielding of critical Remotely Operated Weapon Systems technologies on DOD platforms.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #8</p> <p>Electrolytic Super-Capacitor: This Congressional Interest Item developed devices capable of power delivery rates significantly faster than standard supercapacitors.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> | | 0.797 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | PROJECT H1A: <i>WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #9 Ripsaw Unmanned Ground Vehicle Weaponization: In FY09 this Congressional Interest Item integrated Remote Weapon Systems Armaments onto the Ripsaw Unmanned Ground Vehicle. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 1.195 | 1.990 | 0.000 | 0.000 | 0.000 |
| Program #10 Advanced Rarefaction Weapon Engineered System : This Congressional Interest Item developed rarefaction wave gun technology. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 | | 2.392 | 3.183 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | PROJECT H1A: <i>WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #11 Hospital Emergency Planning and Integration (HEPI) Letterkenny Army Depot and Chambersburg Hospital: This Congressional Interest Item developed a coordinated approach in the event of a need for a Federal/DOD response involving a requirement for emergency response healthcare. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.797 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #12 Effects Based Operations Decision Support Services (EBODSS) : 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. | | 7.974 | 1.592 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | PROJECT H1A: <i>WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #13 Mitigation of Energetics Single Point Failures: This Congressional Interest Item investigated potential Single Point Failures (SPFs) within the Munitions Industrial Base in order to understand the key performance factors, physical and chemical properties and manufacturing process parameters, quality acceptance requirements as well as safety and potential environmental impact and then developed/evaluated/proposed effective mitigation strategies. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base | | 2.392 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | PROJECT H1A: <i>WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #14 Rapid Response Force Protection System (Remote Weapons Platform). This Congressional Interest Item integrated 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. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 2.392 | 1.592 | 0.000 | 0.000 | 0.000 |
| Program #15 Center for Borane Technology: This Congressional Interest Item established a Borane Technology Center at the University of Missouri-Columbia which synthesized and tested materials based on polyhedral borane chemistry for use in highly energetic explosives and propellants. <i>FY 2009 Accomplishments:</i> FY 2009 | | 1.994 | 1.990 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | PROJECT H1A: <i>WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #16 Exploding Foils Initiators with Nanomaterial-based Circuits: 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. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 1.595 | 2.387 | 0.000 | 0.000 | 0.000 |
| Program #17 | | 2.492 | 2.387 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | | PROJECT H1A: <i>WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Research for Army Cannon Systems: This Congressional Interest Item supported a simulated stress loading/ ballistic environment to produce the initial fatigue cracking which could result in time and cost savings when testing the next generation of Army cannon systems.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #18</p> <p>Wyoming Valley Integrated Command Operations Program (ICOP)): This Congressional Interest Item enabled ICOP to support Homeland Defense and Civil Support by establishing a flexible Command and Control architecture at the lower tiers of the response hierarchy, which was tied to the Project National Shield Emergency Operations Center at US Army ARDEC where the Army C2 architectures were available to rapidly provide intelligence between all entities.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> | | | | 1.595 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | PROJECT H1A: <i>WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #19 MATRIC- Project National Shield Integration Center : This Congressional Interest Item established 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. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 1.994 | 1.194 | 0.000 | 0.000 | 0.000 |
| Program #20 Specialized Compact Automated Mechanical Clearance Platform: This Congressional Interest Item developed technology to avoid many of the pitfalls of previous de-mining machinery by utilizing an innovation called | | 1.595 | 3.183 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | PROJECT H1A: <i>WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>"Reactive Ground Pressure" that increases the effectiveness of pressure-based de-mining systems while simultaneously reducing their weight.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #21</p> <p>Kinetic Energy Enhanced Lethality and Protection Materials: This Congressional Interest Item investigated ways to translate the leading approaches studied into actual testing and evaluation in order to determine whether tungsten could be a viable alternative or should depleted uranium (DU) be removed from kinetic energy penetrators in response to growing international concerns.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> | | 1.994 | 1.990 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | PROJECT H1A: <i>WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #22 Regional Integrated Command Center (RICC)): This Congressional Interest Item supported RICC, a Homeland Defense and Security program that demonstrated interoperable communications and the ability to quickly assess and mobilize assets, while establishing situational awareness, which are all essential aspects of mitigating incidents and conducting proactive defensive operations. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.797 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #23 Advanced Technologies Energy and Manufacturing Science: This Congressional Interest Item developed enabling technologies to support the US Army ARDEC Core Competencies of Energetics, Advanced Materials and Manufacturing Sciences, and Laser Vulnerability against Weapons and Munition Systems. | | 4.984 | 6.963 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | | PROJECT H1A: <i>WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Program #24 Northern Ohio Integrated Command Operations Program: This Congressional Interest Item supported Ohio Homeland Defense, and established a flexible Command and Control (C2) architecture at the lower tiers of the response hierarchy, which in turn was tied to the Project National Shield Emergency Operations Center at US Army ARDEC where the Army C2 architectures were available to rapidly provide intelligence between all entities. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | 1.595 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
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| APPROPRIATION/BUDGET ACTIVITY | R-1 ITEM NOMENCLATURE | PROJECT | | | | |
| 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | PE 0602624A: <i>Weapons and Munitions Technology</i> | H1A: <i>WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #25 Threat Detection and Neutralization Project: This Congressional Interest Item designed and implemented a comprehensive threat detection and neutralization system for autonomous air, water, and ground devices. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 3.189 | 3.183 | 0.000 | 0.000 | 0.000 |
| Program #26 Heavy Metals Total Life-Cycle Initiative: This Congressional Interest Item researched environmental issues associated with testing and deploying ammunition made from heavy metals such as depleted uranium, tungsten, and lead. <i>FY 2009 Accomplishments:</i> FY 2009 | | 0.797 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | PROJECT H1A: <i>WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #27 Munitions Evaluation for Composite Electric Armor: This Congressional Interest Item developed Composite Electric Armor (utilizing explosives that are safe (inert) until activated by an electrical pulse) for defeat of rocket propelled grenades and improvised explosive devices. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 1.195 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #28 | | 0.000 | 0.796 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | PROJECT H1A: <i>WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Defense Support for Civil Authorities (DSCA) for Key Resource Protection. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #29 SLEUTH Tungsten Heavy Alloy Pen/Warhead Dev. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 1.194 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | PROJECT H1A: <i>WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #30 Acoustic Gun Detection System for Tracked Combat Vehicles. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 1.592 | 0.000 | 0.000 | 0.000 |
| Program #31 Building a Unified Information Framework. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 1.592 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | PROJECT H1A: <i>WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #32 Multifunctional Nanomaterials for Homeland Defense, Counter-Terrorism and Dual-Use Applications. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 1.990 | 0.000 | 0.000 | 0.000 |
| Program #33 Highly Integrated Production for Expediting RESET. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base | | 0.000 | 1.990 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | PROJECT H1A: <i>WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #34 Laser-Guided Energy (LGE) Demonstrator. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 2.228 | 0.000 | 0.000 | 0.000 |
| Program #35 Air Drop Mortar Guided Munition for the Tactical UAV. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 | | 0.000 | 2.387 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
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| APPROPRIATION/BUDGET ACTIVITY | R-1 ITEM NOMENCLATURE | PROJECT | | | | |
| 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | PE 0602624A: <i>Weapons and Munitions Technology</i> | H1A: <i>WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #36 Rare Earth Mining Separation and Metal Production. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 2.387 | 0.000 | 0.000 | 0.000 |
| Program #37 Projectile Unmanned Aerial Systems. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 | | 0.000 | 2.387 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
|--|--|---|----------------|----------------------------|--------------------|----------------------|
| APPROPRIATION/BUDGET ACTIVITY | R-1 ITEM NOMENCLATURE | PROJECT | | | | |
| 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | PE 0602624A: <i>Weapons and Munitions Technology</i> | H1A: <i>WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #38 Armaments Academy. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 2.984 | 0.000 | 0.000 | 0.000 |
| Program #39 Mortar Anti-Personnell/Anti-Materiel Technology. This is a Congressional Interest Item. | | 0.000 | 3.183 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | PROJECT H1A: <i>WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #40 Highly Integrated Lethality Systems Development. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 3.970 | 0.000 | 0.000 | 0.000 |
| Program #41 | | 0.000 | 3.979 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | | PROJECT H1A: <i>WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Scaleable Efficient Power for Armament Systems and Vehicles Dual Use. This is a Congressional Interest Item.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #42</p> <p>Perimeter Security Systems. This is a Congressional Interest Item.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | 0.000 | 4.479 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | PROJECT H1A: <i>WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #43 Reliability and Affordability Enhancement for Precision Guided Munition Systems. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 4.775 | 0.000 | 0.000 | 0.000 |
| Program #44 Tamper Proof Organic Packaging as Applied to Remote Armament Systems. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base | | 0.000 | 4.775 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | | PROJECT H1A: <i>WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE</i> | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #45 Nanotechnology Enterprise Consortium (NTEC). This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 4.977 | 0.000 | 0.000 | 0.000 |
| Program #46 SOCOM Lightweight Unmanned Ground Robot. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 | | 1.595 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | PROJECT H1A: <i>WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #47 Ink-based Desktop Electronic Material Technology. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 1.595 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #48 Titanium Extraction Mining and Process Engineering Research (TEMPER). This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 | | 2.990 | 4.778 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | | PROJECT H1A: <i>WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Accomplishments/Planned Programs Subtotals | | | | 74.853 | 103.994 | 0.000 | 0.000 | 0.000 |
| 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. | | | | | | | | |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | | | | PROJECT H28: <i>WARHEADS/ ENERGETICS TECHNOLOGIES</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| H28: <i>WARHEADS/ ENERGETICS TECHNOLOGIES</i> | 10.946 | 11.484 | 11.564 | 0.000 | 11.564 | 11.737 | 12.878 | 13.105 | 14.365 | 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 Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Future Force Gun and Munition Technology (Nanotechnologies for Future Force Armaments & Munitions): This effort is investigating nanoscale and nanostructured multifunctional materials for armament applications. In FY09, optimized process parameters to fabricate large quantities of nanostructured and nano-scale tungsten powders; developed wet milling technology to fabricate nano-scale/nanostructured tungsten powders and compared results to those powders obtained using dry milling technology; developed powder consolidation technology to fabricate nanostructured bulk materials; and conducted metallurgical characterization/mechanical property evaluations of bulk nanostructured materials. <i>FY 2009 Accomplishments:</i> FY 2009 | 2.543 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | | PROJECT H28: <i>WARHEADS/ ENERGETICS TECHNOLOGIES</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #2</p> <p>Kinetic Energy Active Protection System (KEAPS) Warhead: This effort investigates and validates a warhead designed by the Army Research Laboratory (ARL) for use in an active protection system (APS) designed to defeat tank-fired rounds. In FY09, finalized design of warhead/fuze safe and arm (S&A) demonstrator integrated with the KEAPS interceptor; evaluated warhead and fuze S&A demonstrator against the primary threat class and used modeling and simulation (M&S) to evaluate performance against remaining classes of threats. Efforts described here are coordinated and complimentary to related efforts in PE 0603004A/Project 232 and are developed and collaborated with efforts in PE 0603005A/Project 221 and PE 0603313A/Project 550.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> | | | | 3.755 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | PROJECT H28: <i>WARHEADS/ ENERGETICS TECHNOLOGIES</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| <p>Program #3</p> <p>G-Hardened Sensors Technology for Munitions: This effort develops ground sensors hardened to resist the forces of gun-launch and ground impact. In FY09, refined integrated design approach and G-hardened packaging; investigated survivability of individual and integrated component technologies in > 30kG environment and investigated (through live fire of munitions) the remote deployment of fully integrated sensors packaged into mortars and 40mm grenades; and implemented an architecture for distributed, power efficient decentralized network fusion of data from multiple G-hardened sensor nodes to enable target localization.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | 1.899 | 0.000 | 0.000 | 0.000 | 0.000 |
| <p>Program #4</p> <p>Scalable Warhead Technology: 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. In FY09, conducted M&S studies of warhead concepts for baseline performance against multiple target set configurations. In FY10, design and develop enhanced fragmentation,</p> | | 2.749 | 7.570 | 8.016 | 0.000 | 8.016 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | PROJECT H28: <i>WARHEADS/ ENERGETICS TECHNOLOGIES</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>reactive materials technologies, multipurpose explosives, and initiation trains for warheads and scalable and adaptive munitions; compare performance of designs against predictive models, simulations, and baselines; and fabricate, test and evaluate component technologies in static munition tests. In FY11, will fabricate and investigate scalable and adaptive munitions; and will test and evaluate warheads and munitions to determine characteristics and performance. Efforts described here are coordinated and complimentary to related efforts in PE 0602624A/Project H18 and PE 0603004A/Project 232.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #5</p> <p>Energetic Materials and Warheads: This effort designs energetic materials with controlled energy release for precision munition and counter-munition applications. In FY10, investigate 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-select promising ingredient materials for fabrication and characterization studies; and fabricate ingredient materials. In FY11, will verify/validate model predications of the pyrotechnic formulations with the selected ingredient materials; will conduct fabrication studies for integrating promising formulations into high efficiency energetic materials; will fabricate energetic formulations for laboratory scale testing and model validation; and will model use of energetic</p> | | 0.000 | 3.180 | 2.898 | 0.000 | 2.898 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | | PROJECT H28: <i>WARHEADS/ ENERGETICS TECHNOLOGIES</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>promising formulations in enhanced warheads. Efforts described here are coordinated and complimentary to related efforts in PE 0602624A/Project H18 and PE 0603004A/Project 232 and PE 0602618A/Project H80.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #6</p> <p>Insensitve Munitions Multi-Scale Reactive Modeling (IM-MSRM): The IM-MSRM effort designs and develops new M&S tools for the design and development of insensitive munitions. In FY10, evaluate the structure and density predictions for insensitive energetic materials resulting from the M&S analysis. In FY11, will design models of detonation products based on predictions obtained at the insensitive energetic material atomic and micro levels.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> | | | | 0.000 | 0.587 | 0.650 | 0.000 | 0.650 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | PROJECT H28: <i>WARHEADS/ ENERGETICS TECHNOLOGIES</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #7 Small Business Innovative Research/Small Business Technology Transfer Programs | | 0.000 | 0.147 | 0.000 | 0.000 | 0.000 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Accomplishments/Planned Programs Subtotals | | 10.946 | 11.484 | 11.564 | 0.000 | 11.564 |
| C. Other Program Funding Summary (\$ in Millions) | | | | | | |
| N/A | | | | | | |
| D. Acquisition Strategy | | | | | | |
| N/A | | | | | | |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | DATE: February 2010 |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602624A: <i>Weapons and Munitions Technology</i> | PROJECT H28: <i>WARHEADS/ ENERGETICS TECHNOLOGIES</i> |
| 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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| Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification | | | | | | | | | | DATE: February 2010 | |
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| APPROPRIATION/BUDGET ACTIVITY | | | | R-1 ITEM NOMENCLATURE | | | | | | | |
| 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | | | | | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| Total Program Element | 99.118 | 134.532 | 60.859 | 0.000 | 60.859 | 62.285 | 65.652 | 70.934 | 79.738 | 0 | 633.977 |
| EM4: <i>Electric Component Technologies (CA)</i> | 21.828 | 33.994 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| EM6: <i>HEATING AND COOLING TECHNOLOGIES (CA)</i> | 6.378 | 5.571 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| EM7: <i>POWER AND ENERGY COMPONENT TECHNOLOGIES (CA)</i> | 26.354 | 38.857 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| EM8: <i>High Power and Energy Component Technology</i> | 0.000 | 8.904 | 13.631 | 0.000 | 13.631 | 15.402 | 15.739 | 18.092 | 20.448 | Continuing | Continuing |
| H11: <i>Tactical and Component Power Technology</i> | 12.862 | 12.771 | 11.988 | 0.000 | 11.988 | 10.795 | 11.519 | 12.729 | 14.437 | Continuing | Continuing |
| H17: <i>FLEXIBLE DISPLAY CENTER</i> | 6.361 | 6.971 | 6.974 | 0.000 | 6.974 | 7.008 | 7.133 | 7.244 | 7.376 | Continuing | Continuing |
| H94: <i>ELEC & ELECTRONIC DEV</i> | 25.335 | 27.464 | 28.266 | 0.000 | 28.266 | 29.080 | 31.261 | 32.869 | 37.477 | Continuing | Continuing |
| A. Mission Description and Budget Item Justification | | | | | | | | | | | |
| <p>The objective of 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; provide exceptional all-weather, day or night, theater air defense against advanced enemy missiles and aircraft; and provide 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 (ATR), 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, imaging laser radar (LADAR), magnetic materials, ferroelectrics, microwave and millimeter-wave components, and electromechanical systems (project H94). Projects EM4, EM6, and EM7 fund congressional special interest items. Work in this PE is related to and 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 0603008A (Command,</p> | | | | | | | | | | | |

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| Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification | DATE: February 2010 |
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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> |
|--|--|

Control, Communications Advanced Technology), and PE 0603772A (Advanced Tactical Computer Science and Sensor 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 the Army Communications -Electronics Research, Development, and Engineering Center (CERDEC), Fort Monmouth NJ.

B. Program Change Summary (\$ in Millions)

| | <u>FY 2009</u> | <u>FY 2010</u> | <u>FY 2011 Base</u> | <u>FY 2011 OCO</u> | <u>FY 2011 Total</u> |
|-------------------------------------|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 99.687 | 61.404 | 60.726 | 0.000 | 60.726 |
| Current President's Budget | 99.118 | 134.532 | 60.859 | 0.000 | 60.859 |
| Total Adjustments | -0.569 | 73.128 | 0.133 | 0.000 | 0.133 |
| • Congressional General Reductions | | -5.702 | | | |
| • Congressional Directed Reductions | | | | | |
| • Congressional Rescissions | | 0.000 | | | |
| • Congressional Adds | | 78.830 | | | |
| • Congressional Directed Transfers | | | | | |
| • Reprogrammings | 1.530 | 0.000 | | | |
| • SBIR/STTR Transfer | -2.099 | 0.000 | | | |
| • Adjustments to Budget Years | 0.000 | 0.000 | 0.133 | 0.000 | 0.133 |

Change Summary Explanation

FY10 Congressionally directed increases.

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | | | | PROJECT EM4: <i>Electric Component Technologies (CA)</i> | | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| EM4: <i>Electric Component Technologies (CA)</i> | 21.828 | 33.994 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for Electronic Component applied research.

B. Accomplishments/Planned Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Manufacturing Technology Development of Advanced Components for High Power Solid-State Lasers. In FY09, this Congressional Interest Item investigated manufacturing processes for patented AFB (Adhesive-Free Bond) process for large crystal composites and facilitated demonstration of their utility for high energy laser applications. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | 2.392 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #2 | 2.392 | 2.387 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | | PROJECT EM4: <i>Electric Component Technologies (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Micromachined Switches in Support of Transformational Communications Architecture. In FY09, this Congressional Interest Item investigated packaging of micropackaged micro electro-mechanical systems (MEMS) switches based on metal-metal bonding process</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #3</p> <p>Renewable Energy for Military Applications. In FY09, this Congressional Interest Item Researched novel alkaline membrane electrolyte for potential application in future soldier fuel cell systems.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> | | | | 1.595 | 1.193 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | PROJECT EM4: <i>Electric Component Technologies (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #4 High-Frequency, High-Power Electronic and Optoelectronic Devices on Aluminum Nitride (AlN). In FY09, this Congressional Interest Item researched high frequency, high power electronic and optoelectronic devices. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 3.189 | 3.184 | 0.000 | 0.000 | 0.000 |
| Program #5 Self-Powered, Lightweight, Flexible Display Unit on a Plastic Substrate. In FY09 this Congressional Interest Item developed reflective displays based on novel imprint lithography that will advance manufacturing base, and integrated solar cells with flexible displays. The program worked with the Flexible Display Center (FDC) to leverage the FDC developments. <i>FY 2009 Accomplishments:</i> FY 2009 | | 1.595 | 3.024 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | PROJECT EM4: <i>Electric Component Technologies (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #6 Large Format Li-Ion Battery. In FY09, this Congressional Interest Item researched technology for manufacturing large format Li-ion battery integrated with battery management system. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.797 | 4.934 | 0.000 | 0.000 | 0.000 |
| Program #7 Compact Eyesafe Tactical Laser. In FY09 this Congressional Interest Item researched vehicle-mounted laser devices. | | 1.196 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | PROJECT EM4: <i>Electric Component Technologies (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #8 Extremely High Frequency (EHF) Transmitter for Win-T Satellite Communications. In FY09 this Congressional Interest Item designed a dual band (Ka/Q) millimeter wave power module utilizing a hybrid solid-state and vacuum power booster approach. The small form factor amplifier was built and demonstrated for applicability to DoD satellite communication requirements. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base | | 1.994 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | PROJECT EM4: <i>Electric Component Technologies (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #9 Fuel Cell Power System. In FY09 this Congressional Interest Item investigated hydrogen fuel technology applicable to light weight, high energy portable power systems driven by the hydrogen fuel source. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.797 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #10 Maryland Proof of Concept Alliance for Defense Technologies. In FY09, this Congressional Interest Item fostered the commercialization of technologies in the RF, tube, semiconductor, MEMS, and Nano Electro-Mechanical System, Electro optics, power, energy, acoustic, and biologically derived technologies, working with technology transfer offices and venture development offices. <i>FY 2009 Accomplishments:</i> FY 2009 | | 3.489 | 1.592 | 0.000 | 0.000 | 0.000 |

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R-1 Line Item #18

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | | PROJECT EM4: <i>Electric Component Technologies (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Program #11 Advanced Power Generation Unit for Military Applications. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | 0.000 | 0.647 | 0.000 | 0.000 | 0.000 |
| Program #12 Mid-Infrared Super Continuum Laser. This is a Congressional Interest Item. | | | | 0.000 | 0.796 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | PROJECT EM4: <i>Electric Component Technologies (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #13 Soldier Situation Awareness Wristband. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 1.114 | 0.000 | 0.000 | 0.000 |
| Program #14 | | 0.000 | 1.592 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | PROJECT EM4: <i>Electric Component Technologies (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Printed and Conformal Electronics for Military Applications. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #15 Integrated Lightweight Tracker System. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 1.990 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | PROJECT EM4: <i>Electric Component Technologies (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #16 Eye Safe Laser Range Finder. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 2.388 | 0.000 | 0.000 | 0.000 |
| Program #17 Unmanned System Algorithm Development. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 3.184 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | PROJECT EM4: <i>Electric Component Technologies (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #18 Program Increase - SOF Technology Insertion. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 5.969 | 0.000 | 0.000 | 0.000 |
| Program #19 Direct Methanol Fuel Cell-Battery Recharger Program. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 2.392 | 0.000 | 0.000 | 0.000 | 0.000 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | | PROJECT EM4: <i>Electric Component Technologies (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Accomplishments/Planned Programs Subtotals | | | | 21.828 | 33.994 | 0.000 | 0.000 | 0.000 |
| 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. | | | | | | | | |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
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| APPROPRIATION/BUDGET ACTIVITY | | | R-1 ITEM NOMENCLATURE | | | | | PROJECT | | | |
| 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | | | | | EM6: <i>HEATING AND COOLING TECHNOLOGIES (CA)</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| EM6: <i>HEATING AND COOLING TECHNOLOGIES (CA)</i> | 6.378 | 5.571 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| A. Mission Description and Budget Item Justification | | | | | | | | | | | |
| Congressional Interest Item funding for Heating and Cooling applied research. | | | | | | | | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | | | | |
| | | | | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #1 | | | | | | | 0.797 | 0.000 | 0.000 | 0.000 | 0.000 |
| Miniature Cooling Unit for Electronic Devices: In FY09, this Congressional Interest Item performed research exploring the adaptation of a miniaturized vapor compression cooling system designed for laptops computers, for application to individual soldier cooling. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | | | | |
| Program #2 | | | | | | | 2.393 | 3.183 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | PROJECT EM6: <i>HEATING AND COOLING TECHNOLOGIES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Cogeneration for Enhanced Cooling and Heating of Advanced Tactical Vehicles: In FY09, this Congressional Interest Item researched and evaluated environmentally approved refrigerants and secondary liquid loops to convert generator waste heat into effective space cooling and heat pumping; developed regenerative adsorption technology for the conversion of diesel engine exhaust waste heat into a cooling capability.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #3</p> <p>Advanced Tactical 2KW External Combustion Power Sources for Cogeneration Applications: In FY09, this Congressional Interest Item produced a JP-8/DF 2 fueled 2+ kilowatt demonstrator utilizing an external combustion free-piston Stirling engine.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> | | 2.392 | 2.388 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | PROJECT EM6: <i>HEATING AND COOLING TECHNOLOGIES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #4 Co-Generation of Power and Air Conditioning: In FY09, this Congressional Interest Item researched a co-generation system which would use energy recovery from exhaust waste heat and incorporate a renewable green energy interface. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.796 | 0.000 | 0.000 | 0.000 | 0.000 |
| Accomplishments/Planned Programs Subtotals | | 6.378 | 5.571 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | DATE: February 2010 |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | PROJECT EM6: <i>HEATING AND COOLING TECHNOLOGIES (CA)</i> |
| <u>C. Other Program Funding Summary (\$ in Millions)</u> N/A | | |
| <u>D. Acquisition Strategy</u> N/A | | |
| <u>E. Performance Metrics</u> 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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
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| APPROPRIATION/BUDGET ACTIVITY | | | R-1 ITEM NOMENCLATURE | | | | PROJECT | | | | |
| 2040: Research, Development, Test & Evaluation, Army BA 2: Applied Research | | | PE 0602705A: ELECTRONICS AND ELECTRONIC DEVICES | | | | EM7: POWER AND ENERGY COMPONENT TECHNOLOGIES (CA) | | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| EM7: POWER AND ENERGY COMPONENT TECHNOLOGIES (CA) | 26.354 | 38.857 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| A. Mission Description and Budget Item Justification | | | | | | | | | | | |
| Congressional Interest Item funding Power and Energy Component applied research. | | | | | | | | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | | | | |
| | | | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 | |
| Program #1 | | | | | | 2.392 | 0.000 | 0.000 | 0.000 | 0.000 | |
| Soldier Fuel Cell System: In FY09, this Congressional Interest Item developed a portable hydrogen generator which utilizes the pyrolysis of ammonia borane and integrated with a 20 watt proton exchange membrane fuel cell. | | | | | | | | | | | |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | | | | |
| Program #2 | | | | | | 1.595 | 1.989 | 0.000 | 0.000 | 0.000 | |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | PROJECT EM7: <i>POWER AND ENERGY COMPONENT TECHNOLOGIES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Novel Zinc Air Power Sources for Military Applications: In FY09, this Congressional Interest Item developed fourth generation zinc-air batteries in several form factors, including body-worn, with state-of-charge indicator capability.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #3</p> <p>ONAMI Miniature Tactical Energy Systems Development: In FY09, this Congressional Interest Item demonstrated a 2-5 kilowatt co-generation absorption based heat actuated cooling system.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> | | 2.392 | 2.486 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | PROJECT EM7: <i>POWER AND ENERGY COMPONENT TECHNOLOGIES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #4 Advanced Portable Power Institute (APPI): In FY09, this Congressional Interest Item developed a range of advanced power generation and delivery concepts to support military operations. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 1.595 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #5 Bio-Battery: In FY09, this Congressional Interest Item researched a hybrid biological battery with long run time for low drain applications. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 | | 0.797 | 0.795 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | PROJECT EM7: <i>POWER AND ENERGY COMPONENT TECHNOLOGIES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #6 Ceramic Membrane - 10(X) More Energy for Battery Systems: In FY09, this Congressional Interest Item research optimization of a lithium-air cell and battery technology based on a BA-HALF90 Battery. Cell technology is based on solid state lithium conducting membrane with high conductivity and Oxygen selective membranes to optimize rate capability. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 1.197 | 2.387 | 0.000 | 0.000 | 0.000 |
| Program #7 Enzyme Biofuel Cell (SEBC): In FY09, this Congressional Interest Item investigated a biofuel cell power source technology. | | 0.797 | 1.194 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | PROJECT EM7: <i>POWER AND ENERGY COMPONENT TECHNOLOGIES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #8 Military Jet-Fueled Fuel Cell Generator: In FY09, this Congressional Interest Item designed, fabricated, assembled and tested a 3 kilowatt JP-8 fueled laboratory power generator. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.797 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #9 | | 1.695 | 2.388 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | PROJECT EM7: <i>POWER AND ENERGY COMPONENT TECHNOLOGIES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Soldier Portable Power Pack (SP3) for the 21st Century Warrior: In FY09, this Congressional Interest Item researched a 150-250 watt DC battery charger / generator.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #10</p> <p>Advanced Soldier Portable Power Systems Technologies: In FY09, this Congressional Interest Item investigated a half size rechargeable battery with smart smart power manager that can process energy from multiple sources.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> | | 1.595 | 2.467 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | PROJECT EM7: <i>POWER AND ENERGY COMPONENT TECHNOLOGIES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #11 Highly Reliable, Maintenance Free Remote Solar Power System: In FY09, this Congressional Interest Item delivered a scalable and modular 200-watt solar power supply that with potential for use in loads not connected to a main power grid. This modular portable solar power supply consists of an integrated photovoltaic panel and power converter. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.638 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #12 Advanced Energy Storage Development for Renewable Energy Generation: In FY09, this Congressional Interest Item designed and developed a hybrid valve regulated lead acid battery including a battery monitoring system with potential for use in renewable electric energy storage solutions. <i>FY 2009 Accomplishments:</i> FY 2009 | | 1.197 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | PROJECT EM7: <i>POWER AND ENERGY COMPONENT TECHNOLOGIES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #13 Program Increase: In FY09, investigated methods to increase efficiency of current plastic solar cells using multilayer structures and new materials; investigated methods for improved shelf life and operational temperature range. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 5.581 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #14 | | 1.595 | 0.955 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | PROJECT EM7: <i>POWER AND ENERGY COMPONENT TECHNOLOGIES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Solid Oxide Fuel Cell Powered Tactical Smart Charger: In FY09, this Congressional Interest Item demonstrated a battery charger operating on a JP 8 fueled 500 watt solid oxide fuel cell (SOFC).</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #15</p> <p>Tactical Asset Visibility Enhancement: In FY09, this Congressional Interest Item investigated wireless communication alternatives which may have applicability in environments where communications infrastructure is limited or nonexistent.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> | | 0.498 | 0.796 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | PROJECT EM7: <i>POWER AND ENERGY COMPONENT TECHNOLOGIES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #16 Thermoelectric Power Generation Materials and Devices: In FY09, this Congressional Interest Item examined advances in higher temperature, more efficient thermoelectric devices. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 1.196 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #17 High-Volume Manufacturing Development for Thin-film Lithium Stack Battery Technologies. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 | | 0.000 | 0.796 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | PROJECT EM7: <i>POWER AND ENERGY COMPONENT TECHNOLOGIES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #18 Advanced Wearable Power System Manufacturing. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 1.592 | 0.000 | 0.000 | 0.000 |
| Program #19 Improved Energy Density Battery. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 | | 0.000 | 1.990 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | PROJECT EM7: <i>POWER AND ENERGY COMPONENT TECHNOLOGIES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #20 Military Fuel Cell Genset Technology Demonstration. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 1.990 | 0.000 | 0.000 | 0.000 |
| Program #21 Advanced Flexible Solar Photovoltaic Technologies. This is a Congressional Interest Item. | | 0.000 | 2.388 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | PROJECT EM7: <i>POWER AND ENERGY COMPONENT TECHNOLOGIES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #22 Intelligent Energy Control Systems. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 2.388 | 0.000 | 0.000 | 0.000 |
| Program #23 | | 0.000 | 2.547 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | PROJECT EM7: <i>POWER AND ENERGY COMPONENT TECHNOLOGIES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Internal Base Facility Energy Independence. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #24 Advanced Hybrid Chemistry for Portable Power. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 2.547 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | PROJECT EM7: <i>POWER AND ENERGY COMPONENT TECHNOLOGIES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #25 Multi-Campus Base Facility Energy Independence. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 3.183 | 0.000 | 0.000 | 0.000 |
| Program #26 Market Viable, Dual-Use, Advanced Energy Storage Solutions Development. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base | | 0.000 | 3.979 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | PROJECT EM7: <i>POWER AND ENERGY COMPONENT TECHNOLOGIES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #27 Direct Methanol Fuel Cell Development. This is a Congressional Interest Item. | | 0.797 | 0.000 | 0.000 | 0.000 | 0.000 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Accomplishments/Planned Programs Subtotals | | 26.354 | 38.857 | 0.000 | 0.000 | 0.000 |
| 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. | | | | | | |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | | | | PROJECT EM8: <i>High Power and Energy Component Technology</i> | | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| EM8: <i>High Power and Energy Component Technology</i> | 0.000 | 8.904 | 13.631 | 0.000 | 13.631 | 15.402 | 15.739 | 18.092 | 20.448 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

The objective of this project is to fund research and evaluation of high-power electronic components and technologies. These technologies have application in compact, light-weight power and energy storage, power and energy conversion, and conditioning, radio frequency (RF)/microwave 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 Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 High Power Components: Research and evaluate materials and component structures that provide the higher energy density 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. In FY10, design power sources and antennas for higher frequency and power output. Implement silicon carbide (SiC) high-power density modules for pulse switching levels > 10 Mega Watt (MW). In FY11, will implement system with new sources and antennas for counter electronics applications. Will develop SiC based high-power density modules for switching levels > 25 MW. Will investigate and evaluate pulse power technologies for EM gun applications. | 0.000 | 2.100 | 2.323 | 0.000 | 2.323 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | PROJECT EM8: <i>High Power and Energy Component Technology</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #2</p> <p>High Energy Laser: Research novel solid-state laser concepts, architectures, and design components enabling high energy laser (HEL) 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, and major laser diode manufacturers. In FY10, implement cryogenically-cooled, gain medium to highly scalable, eye-safe, Erbium (Er)-doped lasers based on advanced laser ceramics. In FY11, will investigate power and efficiency scaling potential of resonantly-pumped Ytterbium (Yb)-free Er-doped fiber laser architectures for high power eye-safe DEW applications.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> | | 0.000 | 2.424 | 2.591 | 0.000 | 2.591 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | | PROJECT EM8: <i>High Power and Energy Component Technology</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #3</p> <p>Directed Energy (DE): 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. In FY10, design, develop and implement components to reduce the size and weight of counter Improvised Explosive Device (IED) and mines systems, and continue to conduct lab and field assessments to understand susceptibility level of targets. Investigate RF DE interoperability issues between an RF DE device and Army radios. In FY11, will support ARDEC in demonstrating military utility of payload concept. Also plan to 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. Will transition target effects data and basic design package for RF DE Air Defense System to Center via AMRDEC. Will investigate susceptibility profile for an unmanned aerial vehicle system.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> | | | | 0.000 | 1.558 | 1.724 | 0.000 | 1.724 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | PROJECT EM8: <i>High Power and Energy Component Technology</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #4 Platform Power Components: 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. In FY10, evaluate power components for high-temperature (100 C coolant) 250 kilowatt (kW) traction drive inverter and 150 kW battery-to-bus converter. In FY11, will begin investigation of power components for higher temperature operations (120 C coolant) and smaller circuits for platform upgrade programs. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 1.500 | 3.862 | 0.000 | 3.862 |
| Program #5 Platform Power Integration and Control: 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. In | | 0.000 | 0.446 | 1.482 | 0.000 | 1.482 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | PROJECT EM8: <i>High Power and Energy Component Technology</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>FY10, validate gate control circuitry for high-temperature (100 C coolant) operation. In FY11, will conduct tests with high-temperature, high power density 100 kW battery-to-bus converter.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #6</p> <p>Power Switching for Protective Systems: 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. In FY10, evaluate 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. In FY11, will show component technology that can be implemented into a DC-DC pulse converter at 8 kilowatts/liter (kW/l) and SiC pulse switch die at 4.5 kA with fast rate-of-current-rise.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> | | 0.000 | 0.626 | 1.649 | 0.000 | 1.649 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | PROJECT EM8: <i>High Power and Energy Component Technology</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #7 SBIR/STTR <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 0.250 | 0.000 | 0.000 | 0.000 |
| Accomplishments/Planned Programs Subtotals | | 0.000 | 8.904 | 13.631 | 0.000 | 13.631 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | DATE: February 2010 |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | PROJECT EM8: <i>High Power and Energy Component Technology</i> |
| 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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | | | | PROJECT H11: <i>Tactical and Component Power Technology</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| H11: <i>Tactical and Component Power Technology</i> | 12.862 | 12.771 | 11.988 | 0.000 | 11.988 | 10.795 | 11.519 | 12.729 | 14.437 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

The objective of this applied research project is to identify, advance, and enhance 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 Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Soldier Hybrid Power and Smart Chargers: This effort develops and evaluates hybrid power sources, rapid battery chargers, and power management technologies in order to decrease Soldier load, increase power capabilities, and decrease battery costs. In FY09, demonstrated a Soldier hybrid solid oxide fuel cell; demonstrated man-portable 160 watt JP-8 linear free piston Stirling engine power source weighing less than 10 kilograms; evaluated 250 watt reformed methanol fuel cell for battery charging. In FY10, develop advanced fabrication processes to reproduce lithium air battery cell lab performance in larger scale batches suitable for production, and demonstrate in a laboratory environment with packaged cells; develop a 25W hybrid power source, weighing 1.5 lbs at 1300 Wh/kg, reducing the system size and weight by one third; demonstrate micro-electro mechanical system-based burner for a 150-250W portable power source functioning in a laboratory environment. In FY11, will develop processes and materials required for an integrated safe lithium air battery; will evaluate a disposable Soldier battery (Li/ | 6.550 | 8.973 | 7.736 | 0.000 | 7.736 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | PROJECT H11: <i>Tactical and Component Power Technology</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Air) at 600 Wh/kg in a relevant environment; will demonstrate 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.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #2</p> <p>Silent Mobile Power: This effort investigates component and system level power technologies that provide higher energy, reduced weight, quiet, 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 kilowatt generator sets. In FY09, developed integrated system controls in order to demonstrate breadboard 2 kW solid oxide fuel cell generator and 1-2 kW Stirling engine generator in relevant environments; demonstrated an integrated power/cooling/waste heat recovery system. In FY10, demonstrate in a laboratory environment a waste-heat recovery system and a 500W transitional power source. In FY11, will demonstrate a high mobility multipurpose wheeled vehicle towable 100 kilowatt power unit in a relevant environment; will demonstrate a waste-heat recovery system in a relevant environment.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> | | 3.377 | 3.582 | 4.252 | 0.000 | 4.252 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | PROJECT H11: <i>Tactical and Component Power Technology</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #3 Lithium Air Battery: This effort develops and investigates materials, material processes, and electrochemical components that produce a high energy density (>1,000 Watt-hours/kilogram) lithium air power source for Soldiers. In FY09, developed material and cell fabrication processes to produce high energy density, stable, safe lithium air battery; demonstrated lithium air cells having energy densities greater than 1,000 Watt-hours/kilogram. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 2.935 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #4 | | 0.000 | 0.216 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | PROJECT H11: <i>Tactical and Component Power Technology</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Small Business Innovative Research/Small Business Technology Transfer Programs | | | | | | |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Accomplishments/Planned Programs Subtotals | | 12.862 | 12.771 | 11.988 | 0.000 | 11.988 |
| 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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Exhibit R-2A, PB 2011 Army RDT&E Project Justification **DATE:** February 2010

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | PROJECT H17: <i>FLEXIBLE DISPLAY CENTER</i> |
|--|--|---|

| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
|-------------------------------------|----------------|------------------|-----------------------|----------------------|------------------------|------------------|------------------|------------------|------------------|------------------|------------|
| H17: <i>FLEXIBLE DISPLAY CENTER</i> | 6.361 | 6.971 | 6.974 | 0.000 | 6.974 | 7.008 | 7.133 | 7.244 | 7.376 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

The objective of this project is to fund 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 Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|---|---------|---------|--------------|-------------|---------------|
| Program #1 FDC: The FDC is developing high resolution flexible reflective (electrophoretic) and emissive (organic light emitting diodes) displays. In FY09, developed and delivered 4" diagonal reflective and emissive displays from the research line with increased performance, including color and near-video rate reflective displays. In FY10, the FDC continues full color designs and implements color versions of flexible displays up to 6" diagonal (reflective) and 4" diagonal (emissive). In FY11, the FDC will optimize color reflective displays for size and resolution, and will transition reflective displays up to 6-8" diagonal to PEO Soldier. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 | 4.861 | 5.012 | 5.031 | 0.000 | 5.031 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | | PROJECT H17: <i>FLEXIBLE DISPLAY CENTER</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #2</p> <p>FlexTech Alliance (FTA) (formerly known as U.S. Displays Consortium): Flexible display partnerships funded through the FTA for tools, process, and materials development that directly support the FDC. In FY09, integrated the FTA programs that directly support the FDC and the Army's mission to develop flexible displays and manufacturing technology for those displays. In FY10, testing the integrated programs and identifying new technology gaps for flexible displays. In addition, programs are being 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 are being reviewed and modified to ensure state-of-the-art tools, materials development and materials processes that directly support the goals of the FDC. In FY11, will conduct flexible electronics development to enable emissive displays. The FTA will continue 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.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> | | | | 1.500 | 1.767 | 1.943 | 0.000 | 1.943 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #3 Small Business Innovative Research/Small Business Technology Transfer Programs | | 0.000 | 0.192 | 0.000 | 0.000 | 0.000 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Accomplishments/Planned Programs Subtotals | | 6.361 | 6.971 | 6.974 | 0.000 | 6.974 |
| 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: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | | | | PROJECT H94: <i>ELEC & ELECTRONIC DEV</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| H94: <i>ELEC & ELECTRONIC DEV</i> | 25.335 | 27.464 | 28.266 | 0.000 | 28.266 | 29.080 | 31.261 | 32.869 | 37.477 | Continuing | Continuing |

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 (LADAR) and standoff target acquisition sensors like forward-looking infrared (FLIR); 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 Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Antennas: 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. In FY09, further developed these designs based on measured laboratory data and transitioned the work to Communications-Electronics Research, Development, and Engineering Center (CERDEC). In FY10, develop and assess novel platform based antenna designs. In FY11, will validate and evaluate in-situ antenna performance. <i>FY 2009 Accomplishments:</i> FY 2009 | 2.507 | 1.743 | 1.774 | 0.000 | 1.774 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | | PROJECT H94: <i>ELEC & ELECTRONIC DEV</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #2</p> <p>RF MEMS: 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. In FY09, investigated approaches for a wafer level antenna. Prepared and integrated passive RF electronics with RF MEMS switch fabrication process. In FY10, evaluating beam steering using an integrated piezoelectric MEMS (pPiezoMEMS) enabled wafer level antenna, evaluating an integrated pPiezoMEMS switchable filter combining both low voltage switches with high-Q filters. In FY11, will investigate system-in-package solutions for combining active components with pPiezoMEMS wafer level antenna, pPiezoMEMS switchable filters, and broadband pPiezoMEMS switch matrices.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> | | | | 3.702 | 1.606 | 2.394 | 0.000 | 2.394 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | | PROJECT H94: <i>ELEC & ELECTRONIC DEV</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Program #3 Millimeter Wave Components: Research, design, and investigate new component materials, structures, devices, and electromagnetic issues of millimeter wave (mmWmmw) components and active devices, such as vacuum electronic (VE) devices and millimeter millimeter-wave integrated circuits (MMICs), to achieve higher output power, power-added-efficiency, linearity, and dynamic range for increased operation and detection range. In FY09, designed and fabricated integrated high power integrated circuit package for antenna array. In FY10, design advanced mixed-signal RF integrated circuits, and implement models to investigate new materials and processes for high speed and high power electronic devices. In FY11, will 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. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | 3.205 | 7.290 | 6.499 | 0.000 | 6.499 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | | PROJECT H94: <i>ELEC & ELECTRONIC DEV</i> | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Program #4</p> <p>LADAR: Investigate eye-safe, scanned and scannerless, 3-D imaging laser radar (LADAR) for both long-range reconnaissance and short-range unmanned ground and air vehicle applications. Investigate optical limiter designs with promising nonlinear materials in order to provide passive protection of electro-optic (EO) vision systems from damage from laser threat devices. In FY09, transitioned optimized sacrificial mirrors for to the Tank Automotive Research, Development and Engineering Center for Vision Protection ATO Demonstrators; implemented compact, low-power MEMS- scanned LADAR for robotic autonomous navigation; and investigated phenomenology of optical in an effort to develop an optical augmentation sensor. In FY10, implement broad-aperture fast opto-electronic shutters for optical sights, sensors, and Soldier vision, evaluate 3-D autonomous navigation LADAR integrated onto a small robotic platform (Packbot), and develop an optical augmentationa laser-based sensor. In FY11, will extend opto-electronic sensor protection effort to address jamming threats and ruggedize and harden autonomous navigation LADAR and implement solid-state scannerless LADAR for unmanned ground applications.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | 1.132 | 3.223 | 3.109 | 0.000 | 3.109 |
| Program #5 | | 2.170 | 2.182 | 2.184 | 0.000 | 2.184 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | PROJECT H94: <i>ELEC & ELECTRONIC DEV</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Infrared (IR) Imaging: 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 Quantum Well Infrared Photodector (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. In FY09, decreased defect density of HgCdTe on Si, evaluated dual color C-QWIPs and determined transport properties in SLS structures. Collected radiometrically calibrated signatures for threat events in an effort to design a test sensor and implement modeling of range performance. Exploited IR, narrow-band, and optical augmentation optical sensors for threat detection and evaluated utility for ground vehicle, rotary wing, and dismounted Soldier platforms. In FY10, determine tradeoffs between filter complexity to best exploit high intensity emissions associated with hostile fire via a visible optic sensor. Characterize higher operating temperature HgCdTe devices, evaluate large area dual color C-QWIPs and improve lifetime in SLS detectors. In FY11, will implement an Electro-Optic (EO) based sensor solution to detect threat launches prior to threat arrival. Will determine feasibility of integrating commercially available EO imagers into a threat warning and location sensor system. Will integrate narrow band filters into EO imager optical path to enhance threat signal count. Will evaluate large area dual color Focal Plane Arrays (FPAs) suitable for such applications as persistent surveillance and distributed aperture systems.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> | | | | | | |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | PROJECT H94: <i>ELEC & ELECTRONIC DEV</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #6 Photonics: 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 OE devices with electronics for IR scene projectors. In FY09, assessed recognition elements as alternative biologically-inspired methods to produce advanced photonic and electronic structures; investigated hybrid techniques incorporating novel recognition elements and spectroscopic inspection; extended IR scene generation to more dense arrays and higher thermal resolution. In FY10, evaluating hybrid recognition element/spectroscopy optical assay for hazardous chemical and/or energetics detection from previous down-selected evaluations; investigating detectors for passive IR fuzing. In FY11, will examine luminescence manipulation of hazardous materials using femto-second laser pulse-shaping excitation techniques; will investigate Silicon photonic modulator devices for high bandwidth on-chip interconnects. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 3.956 | 3.307 | 2.685 | 0.000 | 2.685 |
| Program #7 | | 4.148 | 2.072 | 1.570 | 0.000 | 1.570 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | | PROJECT H94: <i>ELEC & ELECTRONIC DEV</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>MEMS: Investigate, design, and fabricate MEMS based components to improve power generation and micro-cooling technology for both the dismounted Soldier and future force systems. In FY09, investigated improved MEMS rotary pumps, MEMS valves, and high flow low power atomizers. In FY10, develop miniature power converters using MEMS passive components. In FY11, will validate low power atomizer integrated with heavy fuel combustors for portable power generators.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #8</p> <p>Prognostics and Diagnostics: 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. In FY09, implemented cross-correlated algorithms in an open architecture P&D system and conducted fault prognostic tests, enhancing algorithms and user interface in an open architecture environment. In FY10, evaluate multi-mode algorithms for diagnostic extension of electronics. In FY11, will design scheme for implementation on electronic subsystems.</p> | | | | 2.954 | 2.773 | 3.013 | 0.000 | 3.013 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602705A: <i>ELECTRONICS AND ELECTRONIC DEVICES</i> | | PROJECT H94: <i>ELEC & ELECTRONIC DEV</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #9</p> <p>Power and Energy: Investigate technology for advanced batteries, fuel reformers, and fuel cells to be used in hybrid power sources for future electromagnetic armor and smart munitions. Investigate silicon carbide (SiC) power module technologies to enable compact high temperature (up to 150 C heat sink temperature) and high power density converters for motor drive and pulse power applications. In FY09, explored higher energy reserve battery materials and higher power lithium (Li)-ion battery materials. Investigated high-temperature (90 - 120 C) SiC power modules for medium power conversion. In FY10, investigate and develop high-temperature (100-130 C) SiC power modules for high-efficiency medium power conversion and implement new gas gettering agents in thermal batteries, investigate and implement heat sources for thermal batteries, and explore higher energy materials for primary batteries. In FY11, will develop high temperature SiC power modules for high-efficiency high power conversion and will develop higher rate cathodes for Li-ion chemistries and investigate and develop materials, components, and devices for thin film and conformal thermal batteries and advanced liquid reserve batteries.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> | | | | 1.561 | 3.094 | 5.038 | 0.000 | 5.038 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #10 Small Business Innovative Research/Small Business Technology Transfer Programs <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 0.174 | 0.000 | 0.000 | 0.000 |
| Accomplishments/Planned Programs Subtotals | | 25.335 | 27.464 | 28.266 | 0.000 | 28.266 |

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| 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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| Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification | | | | | | | | | | DATE: February 2010 | |
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| APPROPRIATION/BUDGET ACTIVITY | | | | R-1 ITEM NOMENCLATURE | | | | | | | |
| 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | PE 0602709A: <i>NIGHT VISION TECHNOLOGY</i> | | | | | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| Total Program Element | 45.329 | 50.877 | 40.228 | 0.000 | 40.228 | 57.438 | 56.521 | 48.075 | 46.640 | 0 | 385.336 |
| H95: <i>Night Vision and Electro-Optic Technology</i> | 25.361 | 26.753 | 40.228 | 0.000 | 40.228 | 57.438 | 56.521 | 48.075 | 46.640 | Continuing | Continuing |
| K90: <i>NIGHT VISION COMPONENT TECHNOLOGY (CA)</i> | 19.968 | 24.124 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| A. Mission Description and Budget Item Justification | | | | | | | | | | | |
| <p>Efforts in this program element (PE) design, and develop 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. Project K90 funds congressional special interest items. In FY11 and beyond investments in advanced IR FPA technologies are increasing to expand research in novel FPA designs to maintain the technological and competitive IR sensor advantage. Work in this PE is related to and fully coordinated with PE 0602705A (Electronics and Electronic Devices), PE 0602712A (Countermeasure 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.</p> | | | | | | | | | | | |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602709A: <i>NIGHT VISION TECHNOLOGY</i> |
|--|---|

B. Program Change Summary (\$ in Millions)

| | <u>FY 2009</u> | <u>FY 2010</u> | <u>FY 2011 Base</u> | <u>FY 2011 OCO</u> | <u>FY 2011 Total</u> |
|-------------------------------------|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 46.691 | 26.893 | 27.659 | 0.000 | 27.659 |
| Current President's Budget | 45.329 | 50.877 | 40.228 | 0.000 | 40.228 |
| Total Adjustments | -1.362 | 23.984 | 12.569 | 0.000 | 12.569 |
| • Congressional General Reductions | | -0.266 | | | |
| • Congressional Directed Reductions | | | | | |
| • Congressional Rescissions | | 0.000 | | | |
| • Congressional Adds | | 24.250 | | | |
| • Congressional Directed Transfers | | | | | |
| • Reprogrammings | -0.569 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.793 | 0.000 | | | |
| • Adjustments to Budget Years | 0.000 | 0.000 | 12.569 | 0.000 | 12.569 |

Change Summary Explanation

FY10 Congressionally directed increases.FY11 funding increased for IR Focal Plane Array technology efforts.

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602709A: <i>NIGHT VISION TECHNOLOGY</i> | | | | PROJECT H95: <i>Night Vision and Electro-Optic Technology</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| H95: <i>Night Vision and Electro-Optic Technology</i> | 25.361 | 26.753 | 40.228 | 0.000 | 40.228 | 57.438 | 56.521 | 48.075 | 46.640 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

Efforts in this project research and develop 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 and beyond investments in advanced IR FPA technologies are increasing to expand research in novel FPA designs to maintain the technological and competitive IR sensor advantage. Work in this project is related to and fully coordinated with PE 0602705A (Electronics and Electronic Devices), PE 0602712A (Countermeasure 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 Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Distributed Aided Target Recognition (AiTR) Evaluation Center of Excellence: This effort researches a Defense-wide virtual/distributed capability to interactively process both real and generated 3-D 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. In FY09, completed data collection and evaluation of roadside threats/explosively formed projectile efforts for assessment of algorithm performance. In FY10, continue testing of fused multiple ground-based sensors; investigate and develop hyperspectral and multi-spectral sensors. | 1.221 | 1.289 | 1.288 | 0.000 | 1.288 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602709A: <i>NIGHT VISION TECHNOLOGY</i> | | PROJECT H95: <i>Night Vision and Electro-Optic Technology</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>In FY11, will 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.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #2</p> <p>Modeling, Measurements and Simulation Applied Research for Sensor Design and Evaluation: This effort develops and investigates supporting engineering models, measurement techniques, and simulations concurrently with the development and transition of core sensor technologies. In FY09, incorporated into the family of models and further studied the ability to predict the range performance benefits of advanced signal processing (turbulence reduction, contrast enhancement, super resolution, compression, dither and image fusion) as new image processing techniques were enhanced or developed; developed and validated model for laser range gated active systems, and short wave infrared passive sensors; began the development of a persistent surveillance model for air to ground systems to predict the guidance system performance parameters, resolution, frame rate, and signal-to-noise ratio for tracking both vehicles and dismounts in visible to infrared (IR) bands. In FY10, complete the development and validation of an air to ground persistent surveillance model; develop and validate sensor performance model improvements to more accurately address the search process to include: moving</p> | | | | 4.987 | 5.082 | 5.054 | 0.000 | 5.054 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>targets, moving observers, and environmental effects such as glint (reflective components), and complex clutter (foliage and urban structures). In FY11, will develop and implement new sensor measurement models to include visible and short wave IR bands and systems with nonlinear image processing; will conduct analysis to define the next generation of cooled IR technology; will begin the development of next generation simulations to support wargames and engineering tradeoff studies; will develop and validate models to represent color or visible electro-optical (EO) IR sensors and distributed aperture systems.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #3</p> <p>Advanced Multifunction Laser Technology: 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. In FY09, developed and validated performance of the laser designator and laser rangefinder components in a relevant environment; tested laser energy, beam quality, pulse duration and timing jitter under relevant temperature range. In FY10, complete component testing and integrate laser components (to include optical receivers and electronics suitable for small unmanned aerial sensors and lightweight Soldier applications) into multi-function brass-board system. In FY11, will evaluate and optimize operation of individual laser segment; will select and optimize best</p> | | | | 3.139 | 3.590 | 4.044 | 0.000 | 4.044 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602709A: <i>NIGHT VISION TECHNOLOGY</i> | PROJECT H95: <i>Night Vision and Electro-Optic Technology</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>technique for fabrication of structure, segmented laser diode stack and segmented output coupler mirror; will evaluate candidate of laser optical bench configuration and components in the laboratory, and determine the key performance parameters of each design. Related work in this technology area is also being performed under a manufacturing technology effort in PE 0708045A</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #4</p> <p>High Performance Small Pixel Uncooled Focal Plane Array (FPA): 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. In FY10, investigate and develop high definition format uncooled FPA material structures enabling greater sensitivity, lower noise and faster time constants than current sensors. In FY11, will develop a 1920 x 1080 pixel read out integrated circuit design; will research and demonstrate the large format focal plane array packaging using an in-house developed capability; will deliver and test the leveraged Defense Advanced Research Project Agency (DARPA) SWIR array electronics; and will investigate the development of recognition and identification ranges for both large format LWIR and large format SWIR focal plane arrays.</p> | | 0.000 | 2.479 | 2.830 | 0.000 | 2.830 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602709A: <i>NIGHT VISION TECHNOLOGY</i> | | PROJECT H95: <i>Night Vision and Electro-Optic Technology</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #5</p> <p>Soldier Sensor Component and Signal Processing: 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. In FY09, completed co-location of sensing and processing resources on same chip allowing for immediate feedback of processing results which enabled real-time clutter rejection for hyperspectral and multispectral applications; completed design and fabricated demonstrator of advanced pixel mosaic, high resolution, low light visible sensor display; fabricated and evaluated brass-board advanced adaptive optics. In FY10, investigate and develop a brass-board sensor, objective lens and monochrome display with field programmable gated array image processing. In FY11, will 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.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> | | | | 7.778 | 6.760 | 6.815 | 0.000 | 6.815 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602709A: <i>NIGHT VISION TECHNOLOGY</i> | PROJECT H95: <i>Night Vision and Electro-Optic Technology</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #6 Advanced Structures for Cooled Infrared (IR) Sensors: 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. In FY09, researched an increase in, the quantum efficiency of a 1k x 1k quantum well, infrared photodetector focal plane array (FPA); investigated dual-band mercury cadmium telluride (HgCdTe) arrays produced on alternative substrates with 99% operability. In FY10, develop and evaluate 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%. In FY11, will 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. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base | | 4.913 | 4.313 | 4.250 | 0.000 | 4.250 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602709A: <i>NIGHT VISION TECHNOLOGY</i> | | PROJECT H95: <i>Night Vision and Electro-Optic Technology</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| <p>Program #7</p> <p>Compact Hyperspectral Imaging (HSI) Component Technology: 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. In FY10, develop 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; investigate and select best HSI configurations for visible, NIR and LWIR HSI, including FPAs. In FY11, will characterize HSI imagers from each modality and waveband of interest to exploit sensor capability and identify targets of military significance in diverse environments; will integrate sensor hardware and software; will conduct tests on the HSI images to assess the sensor capability.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | 0.000 | 3.043 | 3.447 | 0.000 | 3.447 |
| Program #8 | | | | 3.323 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602709A: <i>NIGHT VISION TECHNOLOGY</i> | PROJECT H95: <i>Night Vision and Electro-Optic Technology</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Low Cost High Resolution Focal Plane Arrays (FPA): This effort investigates new infrared focal plane array (IR FPA) technologies for both cooled, high performance IR FPAs and uncooled, low cost IR FPAs. In FY09, integrated and refined sensor development to achieve pixel operability for 2-color midwave/longwave (MWIR/LWIR) sensor arrays on silicon substrates to greater than 95 percent/98 percent respectively; advanced current FPA design to increase image resolution for mini-unmanned air system applications for target identification and tracking at extended ranges.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #9</p> <p>Digital Readout Integrated Circuit (ROIC): This effort investigates and develops new ROIC technology 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. In FY11, will conduct design of small digital ROIC unit cell to meet dynamic range requirements by doing analog to digital conversion within the pixel; will improve digital ROIC sampling noise to meet signal/noise requirements through improved control of parasitic capacitances; will research and investigate innovative on-chip signal processing designs to reduce overall IR sensor size, weight and power.</p> | | 0.000 | 0.000 | 2.600 | 0.000 | 2.600 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #10</p> <p>Enhanced IR Detector ("nBn") Technology: This effort investigates and improves a new detector structure ("nBn") that will enable 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. In FY11, will develop structures to improve the "nBn" detector through varying dopant levels, types and thickness of individual semi-conductors material layers; will investigate the optimal FPA design for smaller pixels, longer wavelength sensitivity and higher operating temperatures to reduce size, weight and power; will perform ("nBn") growth on Gallium Antimonide (GaSb) and/or Gallium Arsenide (GaAs) wafers to reduce defects in the "nBn" FPA.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> | | | | 0.000 | 0.000 | 4.300 | 0.000 | 4.300 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #11 Strained Layer Superlattices (SLS) Technology: 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 will allow multiband IR FPA's to be produced at much lower costs with improved uniformity. In FY11, will improve the performance of SLS detectors through increased sensitivity; will reduce excess noise of SLS longwave infrared detectors levels through novel side-wall passivation materials and techniques and novel diode architectures; will develop lithography suitable for high definition format, small pixel (15 micrometer), multiband SLS FPAs; will 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. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 0.000 | 5.600 | 0.000 | 5.600 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #12 | | 0.000 | 0.197 | 0.000 | 0.000 | 0.000 |
| Small Business Innovative Research/Small Business Technology Transfer Programs | | | | | | |
| <i>FY 2009 Accomplishments:</i> | | | | | | |
| FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> | | | | | | |
| FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> | | | | | | |
| FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> | | | | | | |
| FY 2011 OCO | | | | | | |
| Accomplishments/Planned Programs Subtotals | | 25.361 | 26.753 | 40.228 | 0.000 | 40.228 |
| 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 0602709A: NIGHT VISION TECHNOLOGY | | | | PROJECT K90: NIGHT VISION COMPONENT TECHNOLOGY (CA) | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| K90: NIGHT VISION COMPONENT TECHNOLOGY (CA) | 19.968 | 24.124 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| A. Mission Description and Budget Item Justification | | | | | | | | | | | |
| Congressional Interest Item funding for Night Vision Component Technology applied research. | | | | | | | | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | | | | |
| | | | | | | | | | | | |
| Program #1 | 1.199 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | | |
| Miniaturized Sensors for Small and Tactical Unmanned Aerial Vehicles (MINISENS): In FY09, this Congressional Interest Item investigated cost effective miniaturized sensor technologies for small and tactical Unmanned Aerial Systems. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | | | | |
| Program #2 | 5.592 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | | |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Small Business Infrared Materials Manufacturing - Silicon Alternatives: In FY09, this Congressional Interest Item supported the development of large, low-cost, silicon substrates by a U.S. merchant supplier for the production of advanced low-cost infrared detectors. Developed and continued to refine growth and device processing capabilities that leveraged earlier success with silicon.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #3</p> <p>Next Generation Communications System: In FY09, this Congressional Interest Item developed fiber optic based sensor network into the existing expeditionary sensor platform for persistent surveillance.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> | | 1.199 | 0.795 | 0.000 | 0.000 | 0.000 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602709A: <i>NIGHT VISION TECHNOLOGY</i> | PROJECT K90: <i>NIGHT VISION COMPONENT TECHNOLOGY (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #4 Uncooled Metal-Oxide Semiconductor Field-Effect Transistor (MOSFET) Embedded Micro-cantilevers: In FY09, this Congressional Interest Item investigated an innovative electronic transduction technology for a focal plane array made of a two-dimensional microcantilever array, each element (pixel) of which has an embedded high sensitivity stress sensing MOSFET. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 2.395 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #5 Night Vision Technology Research: In FY09, this Congressional Interest Item developed advanced infrared (IR) focal plane array (FPA) components to improve the capability to rapidly search for targets in clutter and provided wide area persistent surveillance. Developed materials and building blocks for IR FPA product development that | | 9.583 | 8.207 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602709A: <i>NIGHT VISION TECHNOLOGY</i> | PROJECT K90: <i>NIGHT VISION COMPONENT TECHNOLOGY (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>enable cost effective, end-system manufacturing, and sensor material production. Developed an emerging sensor technology, Strained Layer Superlattice (SLS) that may have higher operating temperatures eliminating the need for complex and expensive cryocoolers.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #6 Personal Miniature Thermal Viewer (PMTV). This is a Congressional Interest Item.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> | | 0.000 | 0.796 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602709A: <i>NIGHT VISION TECHNOLOGY</i> | PROJECT K90: <i>NIGHT VISION COMPONENT TECHNOLOGY (CA)</i> | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | |
| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | |
| Program #7 IR-Vascular Facial Fingerprinting. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | |
| | 0.000 | 2.388 | 0.000 | 0.000 | 0.000 |
| Program #8 Standoff Improvised Explosive Device Detection Program. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 | | | | | |
| | 0.000 | 4.775 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602709A: <i>NIGHT VISION TECHNOLOGY</i> | | PROJECT K90: <i>NIGHT VISION COMPONENT TECHNOLOGY (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Program #9 Materials for Infrared Night Vision Equipment. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | 0.000 | 7.163 | 0.000 | 0.000 | 0.000 |
| Accomplishments/Planned Programs Subtotals | | | | 19.968 | 24.124 | 0.000 | 0.000 | 0.000 |
| C. Other Program Funding Summary (\$ in Millions) | | | | | | | | |
| N/A | | | | | | | | |
| D. Acquisition Strategy | | | | | | | | |
| N/A | | | | | | | | |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | DATE: February 2010 |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602709A: <i>NIGHT VISION TECHNOLOGY</i> | PROJECT K90: <i>NIGHT VISION COMPONENT TECHNOLOGY (CA)</i> |

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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Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification **DATE:** February 2010

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602712A: <i>Countermining Systems</i> |
|--|---|

| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
|---|-------------------|---------------------|-----------------------------|----------------------------|------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|------------|
| Total Program Element | 27.827 | 23.621 | 19.118 | 0.000 | 19.118 | 20.480 | 20.878 | 21.257 | 21.621 | 0 | 173.920 |
| H24: <i>COUNTERMINE TECH</i> | 18.471 | 16.000 | 16.242 | 0.000 | 16.242 | 17.548 | 17.888 | 18.213 | 18.525 | Continuing | Continuing |
| H35: <i>CAMOUFLAGE & COUNTER-RECON TECH</i> | 2.778 | 2.846 | 2.876 | 0.000 | 2.876 | 2.932 | 2.990 | 3.044 | 3.096 | Continuing | Continuing |
| HB2: <i>COUNTERMINE COMPONENT TECHNOLOGY (CA)</i> | 6.578 | 4.775 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

This program element (PE) investigates and develops applied technologies to improve countermining, signature management, and counter-sensors capabilities. The focus is on sensor technologies to improve detection of mines and directed energy; ballistic methods to defeat mines; 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 countermining phenomenology of surface and buried mines, and booby traps. This PE advances the state of the art in Countermining Technologies (project H24) and Camouflage and Counter Reconnaissance Technologies (project H35). Countermining 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 0602784A (Military Engineering Technology), PE 0603606A, (Landmine Warfare and Barrier Advanced Technology), PE 0603710A (Night Vision Advanced Technology), and the US Marine Corps. 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; the US Army Corps of Engineers Research and Development Center (ERDC), Vicksburg, MS; and the Armaments Research, Development, and Engineering Center (ARDEC), Picatinny, NJ.

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| Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification | DATE: February 2010 |
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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602712A: <i>Countermine Systems</i> |
|--|---|

B. Program Change Summary (\$ in Millions)

| | <u>FY 2009</u> | <u>FY 2010</u> | <u>FY 2011 Base</u> | <u>FY 2011 OCO</u> | <u>FY 2011 Total</u> |
|-------------------------------------|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 32.308 | 18.945 | 19.071 | 0.000 | 19.071 |
| Current President's Budget | 27.827 | 23.621 | 19.118 | 0.000 | 19.118 |
| Total Adjustments | -4.481 | 4.676 | 0.047 | 0.000 | 0.047 |
| • Congressional General Reductions | | -0.124 | | | |
| • Congressional Directed Reductions | | | | | |
| • Congressional Rescissions | | 0.000 | | | |
| • Congressional Adds | | 4.800 | | | |
| • Congressional Directed Transfers | | | | | |
| • Reprogrammings | -3.691 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.790 | 0.000 | | | |
| • Adjustments to Budget Years | 0.000 | 0.000 | 0.047 | 0.000 | 0.047 |

Change Summary Explanation

FY09 funding decrease due to reprogramming of congressional special interest item for proper execution. FY10 Congressionally directed increases.

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602712A: <i>Countermine Systems</i> | | | | PROJECT H24: <i>COUNTERMINE TECH</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| H24: <i>COUNTERMINE TECH</i> | 18.471 | 16.000 | 16.242 | 0.000 | 16.242 | 17.548 | 17.888 | 18.213 | 18.525 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

Efforts in this project investigate and develop new countermine technologies that use man-portable, ground-vehicular, and airborne platforms for detection, discrimination, and neutralization of individual mines, minefields, and other improvised 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; the US Army Corps of Engineers Research and Development Center (ERDC), Vicksburg, MS; the Armaments Research, Development, and Engineering Center (ARDEC), Picatinny, NJ; and the CERDEC Intelligence and Information Warfare Directorate, Fort Monmouth, NJ, and Night Vision and Electronic Sensors Directorate, Fort Belvoir, VA.

B. Accomplishments/Planned Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Department of Defense Unexploded Ordnance (UXO) Center of Excellence (UXOCOE): 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) UXO detection and clearance. In FY09, reviewed requirements and technologies to identify opportunities for Services/Components to leverage common requirements and/or technologies. In FY10, analyze catalogued detection and clearance requirements, and technologies to determine RDT&E shortfalls and leveraging opportunities. In FY11, will continue the coordination, with the Joint services, for the UXO detection and clearance research, demonstration, test and evaluation program. <i>FY 2009 Accomplishments:</i> FY 2009 | 0.484 | 0.492 | 0.495 | 0.000 | 0.495 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602712A: <i>Countermine Systems</i> | | PROJECT H24: <i>COUNTERMINE TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #2</p> <p>Standoff Mine/Defeat Neutralization Technology: This effort investigates and evaluates the ability to pre-detonate and neutralize mines, and emerging threats at tactically relevant standoff ranges. In FY09, improved standoff capability for threat neutralization by investigating and developing advanced directed energy techniques and explosively formed munitions to achieve increased accuracy with reduced collateral damage and logistics burden. In FY10, develop and evaluate a brassboard for laser drilling technologies and a brassboard for munitions against buried and obscured threats. In FY11, will 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.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> | | | | 7.561 | 7.570 | 7.612 | 0.000 | 7.612 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602712A: <i>Countermine Systems</i> | PROJECT H24: <i>COUNTERMINE TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| <p>Program #3</p> <p>Anti-personnel/Anti-Tank Mine False Alarm Reduction: 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. In FY09, investigated and evaluated low cost sensor products and phenomenologies including multispectral electro-optical sensors/detectors, scalar and vector magnetometers, and ground penetrating radars; selected the best candidates for reducing false alarm rates and improving rate of advance. In FY10, perform a comprehensive evaluation of the candidate sensors to assess the threat detection performance using the processor in a variety of operational conditions; complete the phenomenology study and signal processing algorithm development.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | 4.459 | 4.486 | 0.000 | 0.000 | 0.000 |
| <p>Program #4</p> <p>Standoff Explosive Compound Detection Technology: This effort investigates ground based detection and confirmation technologies of explosives compounds from tactically relevant standoff distances. In FY09,</p> | | 4.004 | 3.104 | 3.307 | 0.000 | 3.307 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602712A: <i>Countermine Systems</i> | PROJECT H24: <i>COUNTERMINE TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>expanded studies in the areas of chemical, nuclear, and biosensors applied to the explosive detection problems; investigated standoff explosive compound detection technologies to selectively detect multiple explosives (RDX, TNT, C4, etc.) in both vehicle- borne and stationary environments; investigated non-contact sensing techniques to extend standoff range. In FY10, perform an explosive compound behavioral study on different surfaces under various environmental conditions; and determine phenomenology of ground based detection systems for spectrum of threats. In FY11, will perform a comprehensive evaluation of the candidate brassboard (such as laser induced breakdown spectroscopy and ultra-violet spectroscopy) for standoff demonstration (standoff range/distance of greater than 30m) and will continue to refine the phenomenology of the ground based and airborne detection systems. Will conduct field evaluations of selected technologies.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #5</p> <p>Phenomenology Sensors: This effort investigates and evaluates the key geo-environmental parameters such as weather conditions, soil composition, soil moisture, soil electromagnetic properties, and ground cover that affect mine/minefield detection and false alarm rates. In FY09, extended synthetic aperture radar (SAR) and the electromagnetic models to full minefield-size images; validated large scale model that includes ground penetrating</p> | | 1.963 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602712A: <i>Countermine Systems</i> | PROJECT H24: <i>COUNTERMINE TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| radar (GPR), SAR, and electro optic infrared (EO/IR) for countermine system performance predictions in a variety of real world environments. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #6 Advanced Electro-Magnetic and Electro Optic (EO) Sensors for Detection Emerging Threats Devices: This effort investigates all-terrain standoff detection using multiple modalities in order to locate mine and emerging threats with minimal false alarms. In FY11, will begin efforts to investigate advanced electromagnetic induction technologies and EO sensors; will 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. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 | | 0.000 | 0.000 | 4.828 | 0.000 | 4.828 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602712A: <i>Countermine Systems</i> | | PROJECT H24: <i>COUNTERMINE TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Program #7 Small Business Innovative Research/Small Business Technology Transfer Programs | | | | 0.000 | 0.348 | 0.000 | 0.000 | 0.000 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Accomplishments/Planned Programs Subtotals | | | | 18.471 | 16.000 | 16.242 | 0.000 | 16.242 |
| C. Other Program Funding Summary (\$ in Millions) | | | | | | N/A | | |
| D. Acquisition Strategy | | | | | | N/A | | |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | DATE: February 2010 |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602712A: <i>Countermine Systems</i> | PROJECT H24: <i>COUNTERMINE TECH</i> |

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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602712A: <i>Countermine Systems</i> | | | | PROJECT H35: <i>CAMOUFLAGE & COUNTER-RECON TECH</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| H35: <i>CAMOUFLAGE & COUNTER-RECON TECH</i> | 2.778 | 2.846 | 2.876 | 0.000 | 2.876 | 2.932 | 2.990 | 3.044 | 3.096 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

Efforts in this project evaluate and develop 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 Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Protection for Third Generation Sensors: The goal of this effort is to design, research, and evaluate advanced signature management and deception technologies for masking friendly force capabilities. In FY09, evaluated and selected an algorithm based upon prior analysis and threat performance. Performed a comprehensive evaluation of the candidates and down selected technologies for investigation and fabrication of a reduced signature third generation Forward Looking Infrared breadboard. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 | 2.294 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602712A: <i>Countermine Systems</i> | PROJECT H35: <i>CAMOUFLAGE & COUNTER-RECON TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #2 Camouflage and Counter-Reconnaissance Technology for Advanced Spectral Sensors: This effort investigates and advances new technologies to reduce susceptibility of sensors and extends camouflage technology. In FY09, generated 3-D camouflage patterns, including visible, near/shortwave infrared, and mid wave /longwave infrared signatures of target; tested in a virtual environment; and continued database development for backgrounds and coatings of 3-D camouflage patterns. In FY10, investigate the advanced signature reduction approaches for uncooled and dual band staring sensors, and other staring sensors; investigate the susceptibility of foreign and friendly systems to hyperspectral detection methods; develop near-term improvements to camouflage paints, coatings, and systems in both the visible and non-visible wavelength regions. In FY11, will continue to develop the optical signature reduction effort; will widen the key sensor waveband coverage and future staring sensors, such as day television and shortwave infrared; will investigate camouflage paints or other systems for hyperspectral signature reduction; and will validate for effectiveness and potential for implementation in operational systems. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base | | 0.484 | 2.781 | 2.876 | 0.000 | 2.876 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602712A: <i>Countermine Systems</i> | PROJECT H35: <i>CAMOUFLAGE & COUNTER-RECON</i> <i>TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #3 Small Business Innovative Research/Small Business Technology Transfer Programs | | 0.000 | 0.065 | 0.000 | 0.000 | 0.000 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Accomplishments/Planned Programs Subtotals | | 2.778 | 2.846 | 2.876 | 0.000 | 2.876 |
| 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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602712A: <i>Countermine Systems</i> | | | | PROJECT HB2: <i>COUNTERMINE COMPONENT TECHNOLOGY (CA)</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| HB2: <i>COUNTERMINE COMPONENT TECHNOLOGY (CA)</i> | 6.578 | 4.775 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| A. Mission Description and Budget Item Justification Congressional Interest Item funding for Countermine Systems applied research. | | | | | | | | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | | | | |
| | | | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 | |
| Program #1 Standoff Improvised Explosive Device Protection Program. In FY09, this Congressional Interest Item pursued ground based detection and confirmation technologies of explosives from standoff distances; investigated reliable solutions for standoff detection of Improvised Explosive Devices (IEDs) /Vehicle-Borne Improvised Explosive Device (VBIEDs) /Explosively Formed Projectiles (EFPs) and bomb-making facilities while on the move. Development focused on emerging non-contact sensing techniques to attain standoff range greater than 30m. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | 4.784 | 0.000 | 0.000 | 0.000 | 0.000 | |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602712A: <i>Countermine Systems</i> | | PROJECT HB2: <i>COUNTERMINE COMPONENT TECHNOLOGY (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Program #2</p> <p>Spectroscopic Materials Identification Center. In FY09, this Congressional Interest Item detected and identified explosive compounds present in trace quantities around improvised explosive devices (IEDs) and landmines; Development focused on non-contact sensing techniques.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | 0.797 | 1.592 | 0.000 | 0.000 | 0.000 |
| <p>Program #3</p> <p>Unexploded Ordnance Detection and Classification in Volcanic Soil Using an Integrated Fully Polametic Ground Penetrating Radar (GPR) and Chemical Sensor Technology. In FY09, this Congressional Interest Item performed detection and classification of UXO in a densely forested area in highly volcanic soils on Oahu with the use of GRP.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> | | | | 0.997 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602712A: <i>Countermine Systems</i> | | PROJECT HB2: <i>COUNTERMINE COMPONENT TECHNOLOGY (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Program #4 Standoff Detection of Explosives and Explosive Devices (IEDs). This is a Congressional Interest Item <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | 0.000 | 3.183 | 0.000 | 0.000 | 0.000 |
| Accomplishments/Planned Programs Subtotals | | | | 6.578 | 4.775 | 0.000 | 0.000 | 0.000 |
| C. Other Program Funding Summary (\$ in Millions) | | | | | | | | |
| N/A | | | | | | | | |
| D. Acquisition Strategy | | | | | | | | |
| N/A | | | | | | | | |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602712A: <i>Countermining Systems</i> | PROJECT HB2: <i>COUNTERMINE COMPONENT TECHNOLOGY (CA)</i> |

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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Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification **DATE:** February 2010

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602716A: <i>HUMAN FACTORS ENGINEERING TECHNOLOGY</i> |
|--|--|

| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
|---|-------------------|---------------------|-----------------------------|----------------------------|------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|------------|
| Total Program Element | 42.208 | 30.446 | 21.042 | 0.000 | 21.042 | 20.001 | 20.459 | 20.887 | 21.312 | 0 | 197.397 |
| H70: <i>HUMAN FACT ENG SYS DEV</i> | 17.290 | 18.508 | 21.042 | 0.000 | 21.042 | 20.001 | 20.459 | 20.887 | 21.312 | Continuing | Continuing |
| J21: <i>HUMAN FACTORS APPLIED RESEARCH CA</i> | 24.918 | 11.938 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

The objective of this program element (PE) is 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). Project J21 funds congressional special interest items. Work in this PE is related to, and 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). 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.

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| Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification | DATE: February 2010 |
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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602716A: <i>HUMAN FACTORS ENGINEERING TECHNOLOGY</i> |
|--|--|

B. Program Change Summary (\$ in Millions)

| | <u>FY 2009</u> | <u>FY 2010</u> | <u>FY 2011 Base</u> | <u>FY 2011 OCO</u> | <u>FY 2011 Total</u> |
|-------------------------------------|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 42.208 | 18.605 | 19.254 | 0.000 | 19.254 |
| Current President's Budget | 42.208 | 30.446 | 21.042 | 0.000 | 21.042 |
| Total Adjustments | 0.000 | 11.841 | 1.788 | 0.000 | 1.788 |
| • Congressional General Reductions | | -0.159 | | | |
| • Congressional Directed Reductions | | | | | |
| • Congressional Rescissions | | 0.000 | | | |
| • Congressional Adds | | 12.000 | | | |
| • Congressional Directed Transfers | | | | | |
| • Reprogrammings | 0.698 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.698 | 0.000 | | | |
| • Adjustments to Budget Years | 0.000 | 0.000 | 1.788 | 0.000 | 1.788 |

Change Summary Explanation

FY10 Congressional directed increases.

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602716A: <i>HUMAN FACTORS</i> <i>ENGINEERING TECHNOLOGY</i> | | | | PROJECT H70: <i>HUMAN FACT ENG SYS DEV</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| H70: <i>HUMAN FACT ENG SYS DEV</i> | 17.290 | 18.508 | 21.042 | 0.000 | 21.042 | 20.001 | 20.459 | 20.887 | 21.312 | Continuing | Continuing |

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 and 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, and supporting information technology to reduce uncertainty and improve decision quality for leaders and 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 and 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 teams (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); 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 Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Adaptive Learning: Identify sources of usability deficiencies and mismatches between Soldier capabilities and 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. In FY09, determined methods to identify and monitor neural and behavioral markers of pending performance drops; considered correlations such as fatigue and system reliability issues. Incorporated these methods into the | 3.855 | 4.479 | 5.003 | 0.000 | 5.003 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602716A: <i>HUMAN FACTORS</i> <i>ENGINEERING TECHNOLOGY</i> | | PROJECT H70: <i>HUMAN FACT ENG SYS DEV</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>cognitive fight-ability model-based evaluation tool for use within the acquisition and system design process as a candidate information system to recommend design modifications before prototypes are developed. In FY10, assess performance of Soldiers executing multiple tasks simultaneously when using integrated technologies under differing conditions of task priority. In FY11, will develop a Soldier-organization-information modeling capability for use in real-time military simulation exercises.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #2</p> <p>Human Performance Modeling: 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. In FY09, verified and distributed linked basic task, cognitive and human motion models to the human systems integration community and platform developers; validated approach to modeling body size increase due to clothing; transitioned data to Army Night Vision and Electronic Sensors Directorate to verify metrics for the evaluation of algorithms for fusing imagery from multiple-waveband sensors. In FY10, link manpower and personnel tradeoff tools such as Improved Performance Research Integration Tool (IMPRINT) with Army/DoD personnel cost tools; develop tradeoff tool for multimodal interface design; evaluate the use of head-mounted displays for sniper localization; quantify differences in human spatial vision sensitivity from</p> | | | | 2.574 | 3.031 | 3.678 | 0.000 | 3.678 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602716A: <i>HUMAN FACTORS</i> <i>ENGINEERING TECHNOLOGY</i> | | PROJECT H70: <i>HUMAN FACT ENG SYS DEV</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>fixation to 30 degrees for incorporation into ACQUIRE target acquisition model simulations. Conduct a series of human-observer studies to characterize the situational-awareness benefits of various dynamic-range algorithms and devices. In FY11, will 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 optics fabricated for: on-chip processing, high-speed video transmission, high resolution, high dynamic range and no-focus digital filtering/closed loop control.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #3</p> <p>Vehicle Mobility Systems: 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- and 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. In FY09, determined Soldier machine interface design recommendations to enable the local area security function and the optimization of performance in mixed</p> | | | | 2.240 | 3.717 | 4.281 | 0.000 | 4.281 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602716A: <i>HUMAN FACTORS</i> <i>ENGINEERING TECHNOLOGY</i> | | PROJECT H70: <i>HUMAN FACT ENG SYS DEV</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>autonomous driving environments. In FY10, devise and conduct an evaluation focused on indirect vision driving and local area security workload; devise guidelines for noise-reduction and cognitive state classification algorithms; advance multi-aspect measurement of Soldier, system, and environment. In FY11, will devise potential designs to enable secure mobility with reduced manning, indirect vision and drive-by-wire systems; will devise techniques for using real-time knowledge of Soldier neuro-cognitive state in optimizing Soldier-system performance; will devise guidelines for Soldier state-based crew station design.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #4</p> <p>Improved Man-Machine Interfaces: 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 and methods to address future warrior performance issues. In FY09, explored advanced technologies to identify improvements in dismounted squad performance; and transitioned the small arms shooter model to the Soldier Program Executive Office. In FY10, examine the effects of information content and information display on individual and team performance in an operational setting. Conduct research to identify assault rifle and optic characteristics that would improve Soldier reflexive firing performance. In FY11,</p> | | | | 4.821 | 4.882 | 5.574 | 0.000 | 5.574 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602716A: <i>HUMAN FACTORS</i> <i>ENGINEERING TECHNOLOGY</i> | PROJECT H70: <i>HUMAN FACT ENG SYS DEV</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>will examine the effects of information management and information flow on individual Soldier performance and team performance in an operational environment.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #5</p> <p>Human-Robotic Interaction (HRI): Develop requirements and technologies for supervision and Soldier intervention for multiple semi-autonomous unmanned vehicles (UVs) in an urban environment. In FY09, devised multimodal and performance based adaptive automation interfaces to control multiple, non-heterogeneous, aerial, and ground robotic systems. In FY10, devise intuitive interface designs for supervising multiple assets; conduct baseline field evaluation for safe robotic operations in urban environments; collect Soldier performance data for marsupial small unattended ground vehicle missions at Ft. Benning. In FY11, will simulate supervisory control using ground and aerial UVs for multiple perspectives for robotic missions. Will perform Soldier robotic controller interface evaluations in realistic venues.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> | | 3.800 | 2.358 | 2.506 | 0.000 | 2.506 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602716A: <i>HUMAN FACTORS</i> <i>ENGINEERING TECHNOLOGY</i> | | PROJECT H70: <i>HUMAN FACT ENG SYS DEV</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Program #6 SBIR/STTR <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | 0.000 | 0.041 | 0.000 | 0.000 | 0.000 |
| Accomplishments/Planned Programs Subtotals | | | | 17.290 | 18.508 | 21.042 | 0.000 | 21.042 |

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| 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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602716A: <i>HUMAN FACTORS</i> <i>ENGINEERING TECHNOLOGY</i> | | | | PROJECT J21: <i>HUMAN FACTORS APPLIED RESEARCH</i> CA | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| J21: <i>HUMAN FACTORS APPLIED RESEARCH CA</i> | 24.918 | 11.938 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for Human Factors applied research.

B. Accomplishments/Planned Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| <p>Program #1</p> <p>Leonard Wood Institute (LWI) Training-Based Collaborative Research. In FY09, this Congressional Interest Item focused on training-related needs at Fort Leonard Wood and Maneuver Support Center (MANSCEN) to increase the pool of organizations that can support MANSCEN in the future, build competence for future MANSCEN collaboration, and bring technology-related deliverables not tied directly to a program manager or program executive office.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | 24.918 | 11.938 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602716A: <i>HUMAN FACTORS</i> <i>ENGINEERING TECHNOLOGY</i> | | PROJECT J21: <i>HUMAN FACTORS APPLIED RESEARCH</i> CA | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Accomplishments/Planned Programs Subtotals | | | | 24.918 | 11.938 | 0.000 | 0.000 | 0.000 |
| 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. | | | | | | | | |

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Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification **DATE:** February 2010

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602720A: <i>Environmental Quality Technology</i> |
|--|--|

| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
|---|----------------|------------------|-----------------------|----------------------|------------------------|------------------|------------------|------------------|------------------|------------------|------------|
| Total Program Element | 15.786 | 25.469 | 18.364 | 0.000 | 18.364 | 15.943 | 16.020 | 16.325 | 16.627 | 0 | 142.898 |
| 048: <i>IND OPER POLL CTRL TEC</i> | 2.991 | 3.112 | 3.186 | 0.000 | 3.186 | 3.259 | 3.332 | 3.396 | 3.477 | Continuing | Continuing |
| 835: <i>MIL MED ENVIRON CRIT</i> | 3.213 | 3.267 | 5.836 | 0.000 | 5.836 | 3.375 | 3.436 | 3.500 | 3.558 | Continuing | Continuing |
| 895: <i>POLLUTION PREVENTION</i> | 3.909 | 3.709 | 3.884 | 0.000 | 3.884 | 3.955 | 4.026 | 4.097 | 4.163 | Continuing | Continuing |
| 896: <i>BASE FAC ENVIRON QUAL</i> | 5.673 | 5.731 | 5.458 | 0.000 | 5.458 | 5.354 | 5.226 | 5.332 | 5.429 | Continuing | Continuing |
| EM5: <i>ENVIRONMENTAL QUALITY APPLIED RSCH - AMC (CA)</i> | 0.000 | 7.660 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| F35: <i>Environmental Quality Applied Research (CA)</i> | 0.000 | 1.990 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

This program element (PE) provides 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; as well as technology to avoid the potential for future hazardous waste problems, by reducing hazardous waste generation through process modification and control, materials recycling and substitution. This program develops technologies to predict and mitigate range and maneuver constraints associated with current and emerging weapon systems, doctrine, and regulations. Research is transitioned to PE 0603728A (Environmental Quality Technology Demonstrations). 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 PE is performed by the US Army Engineer Research and Development Center (ERDC), Vicksburg, MS, the Center for Health Promotion and Preventive Medicine, Aberdeen Proving Ground, MD, and the Army Research Laboratory (ARL), Aberdeen Proving Ground, MD.

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| Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification | DATE: February 2010 |
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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602720A: <i>Environmental Quality Technology</i> |
|--|--|

B. Program Change Summary (\$ in Millions)

| | <u>FY 2009</u> | <u>FY 2010</u> | <u>FY 2011 Base</u> | <u>FY 2011 OCO</u> | <u>FY 2011 Total</u> |
|-------------------------------------|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 19.799 | 15.902 | 15.834 | 0.000 | 15.834 |
| Current President's Budget | 15.786 | 25.469 | 18.364 | 0.000 | 18.364 |
| Total Adjustments | -4.013 | 9.567 | 2.530 | 0.000 | 2.530 |
| • Congressional General Reductions | | -0.133 | | | |
| • Congressional Directed Reductions | | | | | |
| • Congressional Rescissions | | 0.000 | | | |
| • Congressional Adds | | 9.700 | | | |
| • Congressional Directed Transfers | | | | | |
| • Reprogrammings | -3.683 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.330 | 0.000 | | | |
| • Adjustments to Budget Years | 0.000 | 0.000 | 2.530 | 0.000 | 2.530 |

Change Summary Explanation

FY09 decrease is due to reprogramming of congressional special interest item for proper execution. FY10 Congressionally directed increases. FY11 increase for Environmental Nanotechnology research.

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602720A: <i>Environmental Quality Technology</i> | | | | PROJECT 048: <i>IND OPER POLL CTRL TEC</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| 048: <i>IND OPER POLL CTRL TEC</i> | 2.991 | 3.112 | 3.186 | 0.000 | 3.186 | 3.259 | 3.332 | 3.396 | 3.477 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

This project provides 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 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 from sources of industrial pollution such as production facilities, facility contamination, and other waste streams. Efforts abroad include a focus on technologies to provide 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 (ERDC), Vicksburg, MS.

B. Accomplishments/Planned Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Industrial Compliance and Pollution Prevention Readiness: In FY09, developed new sensing modalities using mimicked human physiological responses to detect acutely toxic substances in water. Also, completed development of attenuation functions in frequency and distance using a variety of sound propagation calculation models to reduce the noise footprint and training restrictions on Army ranges. In FY10, develop 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. Complete 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 cycles. Develop modeling approaches to determine noise attenuation in forests | 2.991 | 3.085 | 3.186 | 0.000 | 3.186 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602720A: <i>Environmental Quality Technology</i> | PROJECT 048: <i>IND OPER POLL CTRL TEC</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>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. In FY11, will 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 wild and prescribed fire burns on range and training lands. Will examine ecosystem response to naturally occurring fires and adjust prescribed fire regimes.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #2 Small Business Innovative Research/Small Business Technology Transfer Programs</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> | | 0.000 | 0.027 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602720A: <i>Environmental Quality Technology</i> | | PROJECT 048: <i>IND OPER POLL CTRL TEC</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Accomplishments/Planned Programs Subtotals | | | | 2.991 | 3.112 | 3.186 | 0.000 | 3.186 |
| 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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602720A: <i>Environmental Quality Technology</i> | | | | PROJECT 835: <i>MIL MED ENVIRON CRIT</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| 835: <i>MIL MED ENVIRON CRIT</i> | 3.213 | 3.267 | 5.836 | 0.000 | 5.836 | 3.375 | 3.436 | 3.500 | 3.558 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

This project provides 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 are: (a) determination of acceptable contaminant concentration levels for residual munitions constituents (MCs) and munitions and explosives of concern (MECs) that minimize adverse effects on the environment and human health and (b) 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 (ERDC), Vicksburg, MS.

B. Accomplishments/Planned Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Effects of Munitions Constituents (MC)/Munitions and Explosives of Concern (MEC): In FY09, evaluated in-situ biosensor technologies for direct push wells (installed by pushing or hammering the drive rods as opposed to drilling or augering), finalized protocols for MC residue reduction, advanced the mathematical modeling of biological impacts due to existing MCs and devised computational chemistry methods for the prediction of reactivity and toxicity of explosives and decomposition products dissolved in water. Identified exposure quantification metrics for select representative nanomaterials. Explored a common framework to consolidate tools for comprehensive, multi-stressor range environmental risk assessments. In FY10, establish mathematical biological models forecasting MC toxicology. Complete computational chemistry methods for the prediction of | 3.213 | 3.193 | 3.336 | 0.000 | 3.336 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602720A: <i>Environmental Quality Technology</i> | PROJECT 835: <i>MIL MED ENVIRON CRIT</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>explosives degradation in water and explore methods for predicting MC binding and movement in soil. Establish a nanomaterial periodic table and framework for integrating environmental attributes with nanotechnology development. In FY11, will complete a computational biology tool for predictive toxicology of MCs. Will devise computational chemistry methods relating chemical mechanisms to toxicity in soils. Will complete beta version testing and release of the Training Range Environmental Evaluation and Characterization System for quantitative risk assessments of MC migration from ranges. Will begin developmental methods to incorporate environmental fate and effects into the design of nanomaterials. Will begin analysis of environmental forecasting the environmental toxicology and chemistry for composite nanomaterials used in base sustainment and blast and ballistic protection.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| Program #2 | | 0.000 | 0.000 | 2.500 | 0.000 | 2.500 |
| <p>Nanotechnology-Environmental Effects: In FY11 will begin developmental methods to incorporate fate and effects into the design of nanomaterials from the nano-scale or micro-scale to the macro-scale. Will begin analysis of fate and effects for composite nanomaterials supporting base sustainment and blast and ballistic protection.</p> | | | | | | |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602720A: <i>Environmental Quality Technology</i> | PROJECT 835: <i>MIL MED ENVIRON CRIT</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #3 Small Business Innovative Research/Small Business Technology Transfer Programs | | 0.000 | 0.074 | 0.000 | 0.000 | 0.000 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Accomplishments/Planned Programs Subtotals | | 3.213 | 3.267 | 5.836 | 0.000 | 5.836 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | DATE: February 2010 |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602720A: <i>Environmental Quality Technology</i> | PROJECT 835: <i>MIL MED ENVIRON CRIT</i> |
| 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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602720A: <i>Environmental Quality Technology</i> | | | | PROJECT 895: <i>POLLUTION PREVENTION</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| 895: <i>POLLUTION PREVENTION</i> | 3.909 | 3.709 | 3.884 | 0.000 | 3.884 | 3.955 | 4.026 | 4.097 | 4.163 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

The objective of this project is to develop 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 (DoD) 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 heavy metal reductions from surface finishing processes. The project develops technologies for advanced development under PE 0603728A, project 025. 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 Research, Development, and Engineering Command's (RDECOM) Army Research Laboratory (ARL), Aberdeen Proving Ground, MD, in collaboration with the Armaments Research, Development, and Engineering Center (ARDEC), Picatinny Arsenal, NJ, the Aviation and Missile Research, Development, and Engineering Center (AMRDEC), Huntsville, AL, and the Edgewood Chemical Biological Center (ECBC), Edgewood, MD.

B. Accomplishments/Planned Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Rocket and Missile Propellants: In FY09 optimized and evaluated performance of propellants for insertion into the new none line of sight (NLOS) missile. In FY10, design and model the next generation environmentally benign propellant ingredients. In FY11, will simulate performance of next generation of environmentally benign propellant compositions. Conventional Ammunition: In FY09, modeled performance of new environmentally benign explosive molecules in weapons systems. In FY10, design novel, environmentally benign explosive | 3.909 | 3.605 | 3.884 | 0.000 | 3.884 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602720A: <i>Environmental Quality Technology</i> | PROJECT 895: <i>POLLUTION PREVENTION</i> | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | |
| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>compositions consisting of new molecules. In FY11, will synthesize gram quantities of novel explosive compositions and conduct screening tests to determine most effective compositions. Pyrotechnics: In FY09, investigated environmentally sustainable battle field effects training simulators, military flares, and fuze delays. In FY10, down-select candidate compositions for environmentally friendly obscurant. In FY11, will transition sustainable flare, delay and signal formulation to advanced technology development. Heavy Metal Reduction: In FY10, evaluate chromate/cadmium-free materials and processes in a laboratory environment. In FY11, will mature new processes for demonstration on gun barrels and fasteners. Zero Footprint Camp: In FY10, evaluate technologies in a laboratory environment that reduce base camp energy and water supply demands. In FY11, will refine water re-cycling technologies for demonstration in relevant environment.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | |
| <p>Program #2 Small Business Innovative Research/Small Business Technology Transfer Programs</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> | 0.000 | 0.104 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602720A: <i>Environmental Quality Technology</i> | | PROJECT 895: <i>POLLUTION PREVENTION</i> | | | | |
| <u>B. Accomplishments/Planned Program (\$ in Millions)</u> | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Accomplishments/Planned Programs Subtotals | | | | 3.909 | 3.709 | 3.884 | 0.000 | 3.884 |
| <u>C. Other Program Funding Summary (\$ in Millions)</u> N/A | | | | | | | | |
| <u>D. Acquisition Strategy</u> N/A | | | | | | | | |
| <u>E. Performance Metrics</u> 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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602720A: <i>Environmental Quality Technology</i> | | | | PROJECT 896: <i>BASE FAC ENVIRON QUAL</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| 896: <i>BASE FAC ENVIRON QUAL</i> | 5.673 | 5.731 | 5.458 | 0.000 | 5.458 | 5.354 | 5.226 | 5.332 | 5.429 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

This project will provide environmental risk assessment, analysis, monitoring, modeling, and mitigation technologies to support sustainable use of the Army's 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 provides 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 provides 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 (ERDC), Vicksburg, MS.

B. Accomplishments/Planned Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Threatened and Endangered Species (TES) Management to Reduce Operational Constraints: In FY09, advanced research from high priority species that are listed to research involving a multi-species approach for improved detection of species at risk and predictive synthesis models for effects of military disturbance on species at risk. Developed a multi-species, metapopulation model for species at risk. Advanced Light Detection and Ranging (LIDAR) remote sensing capability for identification of species at risk populations and habitats on Army lands. In FY10, Complete development of detection techniques, multi-species population and risk prediction models and understanding of advanced genetic methods to manage species at risk. This assists the Army in reducing the number of future listed species and their associated constraints on military training. | 2.939 | 1.532 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602720A: <i>Environmental Quality Technology</i> | | PROJECT 896: <i>BASE FAC ENVIRON QUAL</i> | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | |
| | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | |
| <p>Program #2</p> <p>Predictive Risk Assessment and Management for Army Ranges and Training Lands: Technologies developed in this effort are also aimed at minimizing Training Land/Natural Resource Conflicts for Sustained Mission Support. In FY09, initiated analysis of a comprehensive approach to control invasive terrestrial plants focusing on biological control and application of native bridge species as competitors to invasion. In FY10 complete biometric sampling for detecting and assessing species invasiveness on Army ranges and training lands. Develop unified landscape utility metrics for mission and resource condition to maximize landscape resources supporting evolving training doctrine. In FY11, will complete a spatially explicit, multi-objective decision support model for management optimization of multiple invasive species accounting for ecological, economic, and training impacts. Will quantify synergistic and anergic interactions between training/non-military land uses to develop quantitative methods for comparative impact analysis of training and alternative land uses.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> | | | 2.734 | 4.188 | 5.458 | 0.000 | 5.458 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602720A: <i>Environmental Quality Technology</i> | | PROJECT 896: <i>BASE FAC ENVIRON QUAL</i> | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #3 SBIR/STTR <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 0.011 | 0.000 | 0.000 | 0.000 |
| Accomplishments/Planned Programs Subtotals | | 5.673 | 5.731 | 5.458 | 0.000 | 5.458 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | DATE: February 2010 |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602720A: <i>Environmental Quality Technology</i> | PROJECT 896: <i>BASE FAC ENVIRON QUAL</i> |
| 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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602720A: <i>Environmental Quality Technology</i> | | | | PROJECT EM5: <i>ENVIRONMENTAL QUALITY APPLIED</i> RSCH - AMC (CA) | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| EM5: <i>ENVIRONMENTAL QUALITY APPLIED RSCH - AMC (CA)</i> | 0.000 | 7.660 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| A. Mission Description and Budget Item Justification | | | | | | | | | | | |
| Congressional Interest Item funding for Environmental Quality applied research. | | | | | | | | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | | | | |
| | | | | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #1 MLRS Disposal System. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | 0.000 | 2.486 | 0.000 | 0.000 | 0.000 |
| Program #2 Cluster Bomb Unit & Combined Effects Munition Demilitarization. This is a Congressional Interest Item | | | | | | | 0.000 | 0.796 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602720A: <i>Environmental Quality Technology</i> | PROJECT EM5: <i>ENVIRONMENTAL QUALITY APPLIED</i> RSCH - AMC (CA) | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #3 Rocket Motor Contained System. This is a Congressional Interest Item. | | 0.000 | 0.796 | 0.000 | 0.000 | 0.000 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #4 | | 0.000 | 1.592 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602720A: <i>Environmental Quality Technology</i> | PROJECT EM5: <i>ENVIRONMENTAL QUALITY APPLIED</i> RSCH - AMC (CA) | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Navy Gun Ammo Demilitarization & Recycling. This is a Congressional Interest Item.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #5</p> <p>Biowaste-to-Bioenergy Center. This is a Congressional Interest Item.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | 0.000 | 1.990 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602720A: <i>Environmental Quality Technology</i> | | PROJECT EM5: <i>ENVIRONMENTAL QUALITY APPLIED</i> RSCH - AMC (CA) | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Accomplishments/Planned Programs Subtotals | | | | 0.000 | 7.660 | 0.000 | 0.000 | 0.000 |
| 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. | | | | | | | | |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602720A: <i>Environmental Quality Technology</i> | | | | PROJECT F35: <i>Environmental Quality Applied Research (CA)</i> | | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost | |
| <i>F35: Environmental Quality Applied Research (CA)</i> | 0.000 | 1.990 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing | |
| A. Mission Description and Budget Item Justification | | | | | | | | | | | | |
| Congressional Interest Item funding for Environmental Quality applied research. | | | | | | | | | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | | | | | |
| | | | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 | | |
| Program #1 Chemical Materials and Environmental Modeling Project. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | 0.000 | 1.990 | 0.000 | 0.000 | 0.000 | | |
| Accomplishments/Planned Programs Subtotals | | | | | | 0.000 | 1.990 | 0.000 | 0.000 | 0.000 | | |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | DATE: February 2010 |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602720A: <i>Environmental Quality Technology</i> | PROJECT F35: <i>Environmental Quality Applied Research (CA)</i> |
| 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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Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification **DATE:** February 2010

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602782A: <i>Command, Control, Communications Technology</i> |
|--|---|

| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
|--|-------------------|---------------------|-----------------------------|----------------------------|------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|------------|
| Total Program Element | 45.350 | 30.036 | 25.573 | 0.000 | 25.573 | 26.227 | 26.795 | 27.309 | 27.830 | 0 | 234.693 |
| 779: <i>Command, Control and Platform Electronics Tech</i> | 9.441 | 10.004 | 10.583 | 0.000 | 10.583 | 10.870 | 11.112 | 11.328 | 11.549 | Continuing | Continuing |
| H92: <i>Communications Technology</i> | 14.241 | 14.700 | 14.990 | 0.000 | 14.990 | 15.357 | 15.683 | 15.981 | 16.281 | Continuing | Continuing |
| TR9: <i>C3 COMPONENT TECHNOLOGY (CA)</i> | 21.668 | 5.332 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

Efforts in this program element (PE) research and develop 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. This PE 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 779). This PE also supports research in technologies which allow field commanders to communicate on-the-move to/from virtually any location, through a seamless, secure, self-organizing, self-healing, network (project H92). Project TR9 funds congressional special interest efforts. Work in this PE is fully coordinated with PE 0602705A (Electronics and Electronic Devices), PE 0602783A (Computer and Software Technology), PE 0602874A (Advanced Concepts and Simulation), PE 0603008A (Electronic Warfare Advanced Technology), and PE 0603772A (Advanced Tactical Computer Science and Sensor 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 Monmouth, NJ.

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| Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification | DATE: February 2010 |
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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602782A: <i>Command, Control, Communications Technology</i> |
|--|---|

B. Program Change Summary (\$ in Millions)

| | <u>FY 2009</u> | <u>FY 2010</u> | <u>FY 2011 Base</u> | <u>FY 2011 OCO</u> | <u>FY 2011 Total</u> |
|-------------------------------------|-----------------------|-----------------------|----------------------------|---------------------------|-----------------------------|
| Previous President's Budget | 41.218 | 24.833 | 25.510 | 0.000 | 25.510 |
| Current President's Budget | 45.350 | 30.036 | 25.573 | 0.000 | 25.573 |
| Total Adjustments | 4.132 | 5.203 | 0.063 | 0.000 | 0.063 |
| • Congressional General Reductions | | -0.157 | | | |
| • Congressional Directed Reductions | | | | | |
| • Congressional Rescissions | | 0.000 | | | |
| • Congressional Adds | | 5.360 | | | |
| • Congressional Directed Transfers | | | | | |
| • Reprogrammings | 4.868 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.736 | 0.000 | | | |
| • Adjustments to Budget Years | 0.000 | 0.000 | 0.063 | 0.000 | 0.063 |

Change Summary Explanation

FY09 funding increase due to reprogramming of congressional special interest item for proper execution.FY10 Congressionally directed increases.

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602782A: <i>Command, Control, Communications Technology</i> | | | | PROJECT 779: <i>Command, Control and Platform Electronics Tech</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| <i>779: Command, Control and Platform Electronics Tech</i> | 9.441 | 10.004 | 10.583 | 0.000 | 10.583 | 10.870 | 11.112 | 11.328 | 11.549 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

Efforts in this project research technologies that enable commanders at all echelons to have better and more timely information and allows them to 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 and navigation. This project researches technologies that support multi-modal man-machine interactive technology, battle space visualization, positioning and navigation in degraded environments, automated cognitive decision aids, real-time collaborative tactical planning tools, data transfer, distributed data bases, open system architectures, 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 Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Battle Space Awareness and Positioning: This effort investigates positioning, navigation 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. In FY09, identified candidate position/navigation sensors, and developed integration techniques to incorporate radio network algorithms and processes to enable robust position information for enhanced situation awareness in Global Positioning System (GPS) denied, urban, and other complex environments. In FY10, continue development of identified position/navigation sensors, especially those that exploit the synergy between communications and position such as RF ranging and network assisted navigation. In FY11, will test position/navigation and attitude sensors and evaluate integration techniques and radio technologies for enhanced urban and indoor position/navigation performance. Work on this effort is also being accomplished under PE 0603772A/project 101. | 1.721 | 1.776 | 1.800 | 0.000 | 1.800 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602782A: <i>Command, Control, Communications Technology</i> | PROJECT 779: <i>Command, Control and Platform Electronics Tech</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #2 Command and Control (C2) On-The-Move (OTM) Enabling Technologies: This effort investigates and develops technologies to improve the Warfighters ability to access, use, present and understand relevant battle command information. In FY09, investigated digital Operational Order (OPORD) representations to enable software agent based services; researched baseline human cognitive limits for understanding while performing C2 workflows; completed work with Space and Missile Defense Command (SMDC) to further the development of intelligent software agent services with the addition of automatic discovery which enables the software agents to reduce the need for user intervention by automatically searching and retrieving data from other software agent services; applied automatic discovery intelligent software agent technology to help optimize data initialization and information management in all domains; developed, integrated, and evaluated machine language translation tools for the purpose of text-to-text and speech-to-speech translation to provide enhanced communication among Joint coalition forces. <i>FY 2009 Accomplishments:</i> FY 2009 | | 7.720 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602782A: <i>Command, Control, Communications Technology</i> | | PROJECT 779: <i>Command, Control and Platform Electronics Tech</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #3</p> <p>C2 OTM Enabling Technologies (continued FY10): In FY10, develop speech and optical character recognition translation services within a Service Oriented Architecture (SOA) framework to allow Coalition forces the benefit of communicating more efficiently and securely, while providing additional translation options; develop text-to-text machine translation algorithms for low density languages to enable translation capabilities for languages currently not widely used, but are on the Defense Language Agency prioritized language list; investigate unmanned ground vehicle/unmanned aerial system (UGV/UAS) platform behaviors and C2 info knowledge management of unmanned systems to provide capability to manage large numbers of air and ground robots over extended urban areas at scales beyond current robotic inventories; develop benchmarks for decision-making and identify emerging patterns of interaction between individuals, intelligent agents, and teams of agents and humans; based on approved scenarios, develop work flow analyses to identify and assess cognitive processes in decision-making. In FY11, will expand machine translation services to include speech-to-speech translation capabilities; will integrate additional translation engines for increased language coverage; will investigate enhancement of unmanned collaboration and coordination between multiple assets and sensors, more complex UGV/UAS platform behaviors, and urban mission planning to produce technologies capable of accounting for multiple missions and multiple robotic assets temporally and spatially spread over large urban terrain; will investigate workflow analyses to identify and assess human cognitive bottlenecks and evaluate methods to improve info sharing, decision-making, and collaboration in network-enabled operations; will investigate techniques to enable</p> | | | | 0.000 | 8.148 | 8.783 | 0.000 | 8.783 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602782A: <i>Command, Control, Communications Technology</i> | PROJECT 779: <i>Command, Control and Platform Electronics Tech</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>users to share Warfighter composed software via a web-based gallery. Work on this effort transitions to PE 0603772A/project 101.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #4</p> <p>Small Business Innovative Research/Small Business Technology Transfer Programs</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | 0.000 | 0.080 | 0.000 | 0.000 | 0.000 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602782A: <i>Command, Control, Communications Technology</i> | | PROJECT 779: <i>Command, Control and Platform Electronics Tech</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Accomplishments/Planned Programs Subtotals | | | | 9.441 | 10.004 | 10.583 | 0.000 | 10.583 |
| 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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602782A: <i>Command, Control, Communications Technology</i> | | | | PROJECT H92: <i>Communications Technology</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| H92: <i>Communications Technology</i> | 14.241 | 14.700 | 14.990 | 0.000 | 14.990 | 15.357 | 15.683 | 15.981 | 16.281 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

Efforts in this project investigate, develop and apply advanced communications and network technologies; the strategy is based on leveraging and adapting commercial technology to the maximum extent possible and focusing research efforts on emerging technology areas (e.g., mobile radio based infrastructures, information assurance, 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 Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Antenna Technologies: This effort develops low cost, power efficient, directional antenna technologies for terrestrial, airborne, and tactical satellite ground terminals to enable them to operate on the move over multiple frequency bands. In FY09, developed and demonstrated multi-beam low profile electronically steered on-the-move (OTM) satellite communications (SATCOM) antenna components that functions in two frequency bands (Ka/Q); developed and demonstrated Ka and Q band high efficiency power amplifier; developed C/Ku affordable directional antenna brass-board. In FY10, evaluate C/Ku directional antenna and integrate platform feed and evolutionary aperture design to reduce antenna profile and cost; develop multi-beam low profile electronically steered Ka/Q band SATCOM OTM antenna components. In FY11, will complete multi-beam low profile electronically steered SATCOM aperture development; will integrate the SATCOM aperture with a drive and tracking system and Ka and Q band high efficiency power amplifiers for a multi-beam OTM SATCOM terminal; will develop a blue force tracking SATCOM antenna with integrated modem; will investigate meta-materials for miniaturized antennas technologies; will develop conformal antenna systems for ground and air platforms Work on this effort is also being accomplished under PE 0603008A/project TR1. | 6.793 | 4.142 | 5.703 | 0.000 | 5.703 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602782A: <i>Command, Control, Communications Technology</i> | | PROJECT H92: <i>Communications Technology</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Program #2 Encryption Technologies: This effort is a Jointly funded effort with US Navy, Air Force, Marine Corps, to develop high speed, 4-channel, remotely manageable, programmable, embeddable crypto device. In FY09, conducted lab evaluation; conducted the security certification process, and completed the program effort with Certified Engineering Development Module (EDM) delivery. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | 1.501 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602782A: <i>Command, Control, Communications Technology</i> | | PROJECT H92: <i>Communications Technology</i> | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| <p>Program #3</p> <p>Network Designs: This effort investigates and develops technologies to design the next generation mobile ad hoc wireless networks enabling wireless networks to sense network and spectrum conditions and automatically adapt for more efficient use. In FY09, extended the basic network design tool to include distributed reasoning/learning in a mobile Ad Hoc Network environment; developed a comprehensive representation of the internal operation and performance of network data dissemination mechanisms; improved the network traffic characterization model. In FY10, enhance the basic design and perform evaluation on a number of typical military maneuver and network traffic scenarios.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | 3.399 | 3.209 | 0.000 | 0.000 | 0.000 |
| <p>Program #4</p> <p>Wireless Information Assurance (IA): This effort investigates and develops technologies to protect wireless tactical networks against computer network attacks. In FY09, developed a suite of IA technologies to enable tactical battlefield information sharing across multiple security classification domains (i.e., TS/SCI to</p> | | 2.548 | 2.670 | 2.489 | 0.000 | 2.489 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602782A: <i>Command, Control, Communications Technology</i> | PROJECT H92: <i>Communications Technology</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Unclassified), (technologies included cross domain boundary services with trusted labeling and data sanitization to enforce data release restrictions from higher to lower classified domains, smart pull information requests from higher domains, and trusted software (SW) partitioning and kernel technology with controlled interface filtering to enforce push/pull of information across security domains for severely resourced constrained environments); developed and assessed operating system agnostic malicious code detection technology to find vulnerabilities and software flaws via source code analysis and reverse engineering. In FY10, investigate distributed key management concepts 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; evaluate SW cross domain security services providing SW separation of kernel that protect and establish separation of classification levels; investigate adaptive middleware and conduct lab testing. In FY11, will 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. Work on this effort is also being accomplished under PE 0603008A/project TR1.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| Program #5 | | 0.000 | 1.502 | 3.791 | 0.000 | 3.791 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602782A: <i>Command, Control, Communications Technology</i> | | PROJECT H92: <i>Communications Technology</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Cognitive Networking: This effort develops technologies enabling wireless networks to sense network and spectrum conditions and automatically adapt for more efficient use. In FY10, begin 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), provide knowledge oriented representation of radio frequency (RF) connectivity, network operations/behaviors, and effectiveness of learning/prediction techniques in dynamic environment. In FY11 will develop and refine a cognitive network design tool set; will design and develop initial protocol function and capability for cognitive networking; will conduct modeling and simulation on small scale networks to evaluate protocol functionality. Work on this effort is also being accomplished under PE 0603008A/project TR1.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #6</p> <p>Dynamic Spectrum and Network Technologies: This effort develops and investigates technology for radios and network management systems to enable access to spectrum currently unavailable because of current spectrum management methods. In FY10, investigate and develop 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, adapt the DARPA Disruption Tolerant Networking (DTN) technology for</p> | | | | 0.000 | 2.984 | 3.007 | 0.000 | 3.007 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602782A: <i>Command, Control, Communications Technology</i> | PROJECT H92: <i>Communications Technology</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>military communications systems to improve reliability and transportability. In FY11, will 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; will integrate the DSA policy generation tool with existing spectrum database. Work on this effort is also being accomplished under PE 0603008A/project TR1.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #7 Small Business Innovative Research/Small Business Technology Transfer Programs</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> | | 0.000 | 0.193 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602782A: <i>Command, Control, Communications Technology</i> | | PROJECT H92: <i>Communications Technology</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Accomplishments/Planned Programs Subtotals | | | | 14.241 | 14.700 | 14.990 | 0.000 | 14.990 |
| 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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | R-1 ITEM NOMENCLATURE PE 0602782A: <i>Command, Control, Communications Technology</i> | | | | PROJECT TR9: <i>C3 COMPONENT TECHNOLOGY (CA)</i> | | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| TR9: <i>C3 COMPONENT TECHNOLOGY (CA)</i> | 21.668 | 5.332 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| A. Mission Description and Budget Item Justification | | | | | | | | | | | |
| Congressional Interest Item funding for C3 Component Technology applied research. | | | | | | | | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | | | | |
| | | | | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #1 Dynamically Managed Data Dissemination: In FY09, this Congressional Interest Item developed technologies that will enable net-centric capabilities including bandwidth mediation services and image recognition adaptation evaluation. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | 1.196 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #2 | | | | | | | 2.392 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602782A: <i>Command, Control, Communications Technology</i> | PROJECT TR9: <i>C3 COMPONENT TECHNOLOGY (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Intelligent Distributed Command & Control (IDC2): In FY09, this Congressional Interest Item researched a comprehensive force protection security system equipped with the capability to share relevant, tailored information to multiple geographically separated operation centers.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #3</p> <p>Ruggedized Cylinders for Expandable Mobile Shelters: In FY09, this Congressional Interest Item researched a turnkey motion control system that is fully integrated, compact, reliable, easy to use, quick to deploy, and facilitates mobile and deployable Command Post (CP) operation.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> | | 2.392 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602782A: <i>Command, Control, Communications Technology</i> | PROJECT TR9: <i>C3 COMPONENT TECHNOLOGY (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #4 Innovative Wireless Technologies for Sensor Networks: In FY09, this Congressional Interest Item conducted field testing and performance verification of multi-wave form radio. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.697 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #5 Tactical Booster for Mobile Network Centric Warfare: In FY09, this Congressional Interest Item researched a device that translates traditional protocols into new advanced protocols designed for tactical networks. <i>FY 2009 Accomplishments:</i> FY 2009 | | 1.595 | 0.000 | 0.000 | 0.000 | 0.000 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602782A: <i>Command, Control, Communications Technology</i> | PROJECT TR9: <i>C3 COMPONENT TECHNOLOGY (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #6 Portable Non-Magnetic Compass/Positioning/Timing Device: In FY09, this Congressional Interest Item provided heading information from a non-magnetic source. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 1.595 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #7 21st Century Command, Control, and Communications Technology. In FY09, this Congressional Interest Item investigated advanced C3 technologies. | | 0.637 | 0.000 | 0.000 | 0.000 | 0.000 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602782A: <i>Command, Control, Communications Technology</i> | PROJECT TR9: <i>C3 COMPONENT TECHNOLOGY (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #8 Automated Language and Cultural Analysis for National Security: In FY09, this Congressional Interest Item focused on the development of automated language translation capabilities and the application of cultural analysis that improves the utilization of collected information in the tactical environment. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 1.994 | 0.000 | 0.000 | 0.000 | 0.000 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602782A: <i>Command, Control, Communications Technology</i> | PROJECT TR9: <i>C3 COMPONENT TECHNOLOGY (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Program #9</p> <p>On-the-Move Telescoping Mast: In FY09, this Congressional Interest Item developed On-The-Move mast technologies and product concepts for elevating optic and radar sensors, communication, and electronic warfare payloads on ground vehicles while traveling over rough terrain.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | 2.392 | 0.000 | 0.000 | 0.000 | 0.000 |
| <p>Program #10</p> <p>Modular Universal TOC Packages for Vehicles and Shelters: In FY09, this Congressional Interest Item developed modular, reconfigurable TOC mission and support equipment.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> | | 2.392 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602782A: <i>Command, Control, Communications Technology</i> | PROJECT TR9: <i>C3 COMPONENT TECHNOLOGY (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #11 Command, Control, Communications Technology. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 1.592 | 0.000 | 0.000 | 0.000 |
| Program #12 Mobile Mesh Network Node. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 | | 0.000 | 1.751 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602782A: <i>Command, Control, Communications Technology</i> | | PROJECT TR9: <i>C3 COMPONENT TECHNOLOGY (CA)</i> | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #13 Lightweight 10-Meter Antenna Mast. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 1.989 | 0.000 | 0.000 | 0.000 |
| Program #14 Command, Control, Communications and Computer Module. This is a Congressional Interest Item. | | 1.196 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602782A: <i>Command, Control, Communications Technology</i> | PROJECT TR9: <i>C3 COMPONENT TECHNOLOGY (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #15 Nanophotonic Device Development. This is a Congressional Interest Item. | | 1.595 | 0.000 | 0.000 | 0.000 | 0.000 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #16 | | 1.595 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602782A: <i>Command, Control, Communications Technology</i> | PROJECT TR9: <i>C3 COMPONENT TECHNOLOGY (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Integrated Lightweight Tracker System. This is a Congressional Interest Item. | | | | | | |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Accomplishments/Planned Programs Subtotals | | 21.668 | 5.332 | 0.000 | 0.000 | 0.000 |
| 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. | | | | | | |

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Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification **DATE:** February 2010

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602783A: <i>COMPUTER AND SOFTWARE TECHNOLOGY</i> |
|--|--|

| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
|---|----------------|------------------|-----------------------|----------------------|------------------------|------------------|------------------|------------------|------------------|------------------|------------|
| Total Program Element | 7.786 | 5.609 | 6.768 | 0.000 | 6.768 | 5.960 | 6.134 | 6.251 | 6.369 | 0 | 51.645 |
| Y10: <i>COMPUTER/INFO SCI TECH</i> | 5.394 | 5.609 | 6.768 | 0.000 | 6.768 | 5.960 | 6.134 | 6.251 | 6.369 | Continuing | Continuing |
| Y11: <i>COMPUTER & INFORMATION SCIENCE APPLIED RES CA</i> | 2.392 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

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). Project Y11 funds congressional special interest items. Work in this PE is related to and fully coordinated with efforts in PE 0602782A (Command, Control, Communications Technology), PE 0603772A (Advanced Tactical Computer Science and Sensor Technology), and PE 0603008A (Command, Control, Communications 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), Adelphi and Aberdeen Proving Ground, MD locations.

B. Program Change Summary (\$ in Millions)

| | <u>FY 2009</u> | <u>FY 2010</u> | <u>FY 2011 Base</u> | <u>FY 2011 OCO</u> | <u>FY 2011 Total</u> |
|-------------------------------------|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 6.274 | 5.639 | 5.756 | 0.000 | 5.756 |
| Current President's Budget | 7.786 | 5.609 | 6.768 | 0.000 | 6.768 |
| Total Adjustments | 1.512 | -0.030 | 1.012 | 0.000 | 1.012 |
| • Congressional General Reductions | | -0.030 | | | |
| • Congressional Directed Reductions | | | | | |
| • Congressional Rescissions | | 0.000 | | | |
| • Congressional Adds | | 0.000 | | | |
| • Congressional Directed Transfers | | | | | |
| • Reprogrammings | 1.617 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.105 | 0.000 | | | |
| • Adjustments to Budget Years | 0.000 | 0.000 | 1.012 | 0.000 | 1.012 |

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| Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification | | DATE: February 2010 |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602783A: <i>COMPUTER AND SOFTWARE TECHNOLOGY</i> | |
| <p><u>Change Summary Explanation</u> FY09 funding increase due to reprogramming of congressional special interest item.FY11 funding increase for Materials Force Protection technology efforts.</p> | | |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602783A: <i>COMPUTER AND SOFTWARE TECHNOLOGY</i> | | | | PROJECT Y10: <i>COMPUTER/INFO SCI TECH</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| Y10: <i>COMPUTER/INFO SCI TECH</i> | 5.394 | 5.609 | 6.768 | 0.000 | 6.768 | 5.960 | 6.134 | 6.251 | 6.369 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

The objective of this project is to conduct applied research of information and communications technology with the goal of developing information 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 devising communication/network technologies that will enable the synchronization of secure data/information from humans to humans, humans to computers, computers to humans, as well as reducing dependence on mouse and keyboard versus other modes of computer interaction. This is key to enabling enhanced understanding and accelerating the decision cycle time for commanders and leaders operating in the 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 Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Information Processing: Enhance information processing techniques in order to inform and protect the force from imminent threats. User directed fusion techniques that, when combined with methods developed at the Communications-Electronics Research, Development, and Engineering Center (CERDEC), enables semi-automated fusion to improve the completeness and timeliness of decision-making in command and control (C2) operations. The integrated technology will be matured for Distributed Common Ground Station-Army (DCGS-A) and future force assessment. In FY09, developed and transitioned fusion (relationship discovery) services to CERDEC for integration into DCGS-A. In FY10, investigate measures of interest 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. In FY11, will 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); investigations will lead to improved social network analysis tools, interfaces, and visualization routines for Army intelligence. | 1.090 | 1.100 | 1.160 | 0.000 | 1.160 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602783A: <i>COMPUTER AND SOFTWARE TECHNOLOGY</i> | | PROJECT Y10: <i>COMPUTER/INFO SCI TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #2</p> <p>Information Assurance: Conduct applied research on tactical information protection technologies for agent-based vulnerability assessment over wireless bandwidth constrained links and security infrastructures for sensor networks. The future force will operate in a complex wireless environment where survivability must be maintained in spite of inherent vulnerabilities of standardized protocols and commercial technologies. In FY09, evaluated the scalability of the distributed wireless intrusion detection system (IDS) system in large networks and determined the expected bounds of performance (e.g. overhead, missed detection probability, and false alarm probability). In FY10, evaluate the wireless IDS system performance in terms of network overhead (i.e., bandwidth, energy and latency). In FY11, will evaluate secure information flow techniques in mobile tactical networks via simulation/emulation to enhance the reliable delivery of information to the Soldier.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> | | | | 1.040 | 1.113 | 1.089 | 0.000 | 1.089 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602783A: <i>COMPUTER AND SOFTWARE TECHNOLOGY</i> | | PROJECT Y10: <i>COMPUTER/INFO SCI TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #3</p> <p>Information Exchange: 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. In FY09, integrated cross-security-level information exchange algorithms to ensure tactically relevant information is presented to the user in a minimally intrusive manner. In FY10, investigate 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 integrate information assurance modules to support the evaluation in tactically relevant environments. In FY11, will 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.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> | | | | 1.104 | 1.145 | 1.185 | 0.000 | 1.185 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602783A: <i>COMPUTER AND SOFTWARE TECHNOLOGY</i> | PROJECT Y10: <i>COMPUTER/INFO SCI TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #4 Language Translation: 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. In FY09, evaluated the use of document image processing tools operating through web service on noisy and handwritten foreign language documents. In FY10, assess the impact of pre-processing tools on downstream processes like named entity extraction, machine translation, and summarization that are critical to the Intelligence Community. In FY11, will integrate new optical character recognition/machine translation (OCR/MT) evaluation tools and expand the testbed to accommodate select Net Centric Enterprise Services (NCES). Will jointly evaluate/modify/transition best-of-breed language processing tools with PM-Sequoyah for the Army and Intelligence Communities. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.545 | 0.551 | 0.580 | 0.000 | 0.580 |
| Program #5 | | 1.615 | 1.625 | 1.742 | 0.000 | 1.742 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602783A: <i>COMPUTER AND SOFTWARE TECHNOLOGY</i> | | PROJECT Y10: <i>COMPUTER/INFO SCI TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Network Theory: Statistical based methods for studying networks supports theory development in network science. Provide a basis to validate or invalidate theoretical results, identify gaps between theory prediction and field performance, provide 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. All of this leads to the right levels of robust abstraction to understand network behavior, resulting in a tight coupling between theoretical developments, simulation, emulation, and over-the-air testing in lab and field environments. 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. In FY09, refined and expanded the scope of the effort (size of the network, complexity of the deployed algorithms and protocols, heterogeneity of the nodes, harshness of the radio frequency (RF) channel conditions and sophistication of the adaptation). Validated theoretical work against the acquired data. In FY10, create models that incorporate network characteristics and human information processing, and communication and decision making capabilities for enhanced system performance. In FY11, will 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).</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> | | | | | | | | |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602783A: <i>COMPUTER AND SOFTWARE TECHNOLOGY</i> | PROJECT Y10: <i>COMPUTER/INFO SCI TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #6 Heterogeneous Computing and Computational Sciences: In FY11, will investigate scalable interface algorithms for implementing heterogeneous computing systems on battlefield applications of robotics information decision aids and biometric applications. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 0.000 | 1.012 | 0.000 | 1.012 |
| Program #7 Small Business Innovative Research/Small Business Technology Transfer Programs <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 | | 0.000 | 0.075 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602783A: <i>COMPUTER AND SOFTWARE TECHNOLOGY</i> | | PROJECT Y10: <i>COMPUTER/INFO SCI TECH</i> | | | | |
| <u>B. Accomplishments/Planned Program (\$ in Millions)</u> | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Accomplishments/Planned Programs Subtotals | | | | 5.394 | 5.609 | 6.768 | 0.000 | 6.768 |
| <u>C. Other Program Funding Summary (\$ in Millions)</u> | | | | | | | | |
| N/A | | | | | | | | |
| <u>D. Acquisition Strategy</u> | | | | | | | | |
| N/A | | | | | | | | |
| <u>E. Performance Metrics</u> | | | | | | | | |
| 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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | R-1 ITEM NOMENCLATURE PE 0602783A: <i>COMPUTER AND SOFTWARE TECHNOLOGY</i> | | | | PROJECT Y11: <i>COMPUTER & INFORMATION SCIENCE APPLIED RES CA</i> | | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| Y11: <i>COMPUTER & INFORMATION SCIENCE APPLIED RES CA</i> | 2.392 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| A. Mission Description and Budget Item Justification | | | | | | | | | | | |
| Congressional Interest Item funding for Computer and Software Technology applied research. | | | | | | | | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | | | | |
| | | | | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #1 Lightweight Soldier Sensor Computing. In FY09, this Congressional Interest Item investigated new techniques to provide sensor networks and sensors increased computing power. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | 0.797 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #2 Integrated Information Technology Policy Analyses Research. This is a Congressional Interest Item. | | | | | | | 1.595 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602783A: <i>COMPUTER AND SOFTWARE TECHNOLOGY</i> | PROJECT Y11: <i>COMPUTER & INFORMATION SCIENCE APPLIED RES CA</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Accomplishments/Planned Programs Subtotals | | 2.392 | 0.000 | 0.000 | 0.000 | 0.000 |
| 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. | | | | | | |

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| Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification | | | | | | | | | | DATE: February 2010 | |
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| APPROPRIATION/BUDGET ACTIVITY | | | | R-1 ITEM NOMENCLATURE | | | | | | | |
| 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | PE 0602784A: <i>MILITARY ENGINEERING TECHNOLOGY</i> | | | | | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| Total Program Element | 58.671 | 60.779 | 79.189 | 0.000 | 79.189 | 77.608 | 75.650 | 72.876 | 70.159 | 0 | 574.121 |
| 855: <i>TOPOGRAPHICAL, IMAGE INTEL & SPACE</i> | 14.952 | 15.414 | 17.056 | 0.000 | 17.056 | 18.106 | 19.086 | 19.462 | 19.846 | Continuing | Continuing |
| H71: <i>Meteorological Research for Battle Command</i> | 6.706 | 5.627 | 5.588 | 0.000 | 5.588 | 6.055 | 6.228 | 6.385 | 6.545 | Continuing | Continuing |
| T40: <i>MOB/WPNS EFF TECH</i> | 17.750 | 20.339 | 31.231 | 0.000 | 31.231 | 30.801 | 25.742 | 26.180 | 26.660 | Continuing | Continuing |
| T41: <i>MIL FACILITIES ENG TEC</i> | 4.417 | 4.381 | 16.949 | 0.000 | 16.949 | 14.199 | 16.040 | 12.122 | 8.206 | Continuing | Continuing |
| T42: <i>Terrestrial Science Applied Research</i> | 4.746 | 5.526 | 5.090 | 0.000 | 5.090 | 5.244 | 5.348 | 5.457 | 5.566 | Continuing | Continuing |
| T45: <i>ENERGY TEC APL MIL FAC</i> | 3.183 | 3.246 | 3.275 | 0.000 | 3.275 | 3.203 | 3.206 | 3.270 | 3.336 | Continuing | Continuing |
| T48: <i>Center for Geosciences & Atmospheric Research</i> | 1.595 | 2.984 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| T53: <i>Military Engineering Applied Research (CA)</i> | 5.322 | 3.262 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

This program element (PE) provides military engineering technologies. Research is conducted that 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, test, and operations communities in evaluating the impacts of weather, terrain, and atmospheric obscurants on military materiel and operations. Major research efforts focus on: advanced distributed simulation including networking of models, complex data interchange, and collaborative training; military engineering including improving airfields and pavements, sustainment and cold regions engineering, vehicle mobility modeling, and reduced logistics footprint at base camps; facilities engineering including simulation of infrastructure capabilities for force projection, protection, and readiness; and geospatial research and engineering including terrain awareness. This research improves the efficiency and cost effectiveness of supporting the training/readiness/force projection missions in garrison and force sustainment missions in theaters of operation. Research is transitioned to PE 0603734A (Military Engineering Advanced Technology), PE 0603125A (Combating Terrorism, Technology Development), and to Project Managers (PM) such as PM Force Projection and Project Director, Combat Terrain Information 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 in this PE is being performed by the US Army Engineer Research and Development Center, Vicksburg, MS, and the Army Research Laboratory, Aberdeen Proving Ground, MD.

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| Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification | | | | DATE: February 2010 | |
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| <u>B. Program Change Summary (\$ in Millions)</u> | | | | | |
| | <u>FY 2009</u> | <u>FY 2010</u> | <u>FY 2011 Base</u> | <u>FY 2011 OCO</u> | <u>FY 2011 Total</u> |
| Previous President's Budget | 58.810 | 54.818 | 55.905 | 0.000 | 55.905 |
| Current President's Budget | 58.671 | 60.779 | 79.189 | 0.000 | 79.189 |
| Total Adjustments | -0.139 | 5.961 | 23.284 | 0.000 | 23.284 |
| • Congressional General Reductions | | -0.319 | | | |
| • Congressional Directed Reductions | | | | | |
| • Congressional Rescissions | | 0.000 | | | |
| • Congressional Adds | | 6.280 | | | |
| • Congressional Directed Transfers | | | | | |
| • Reprogrammings | 0.195 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.334 | 0.000 | | | |
| • Adjustments to Budget Years | 0.000 | 0.000 | 23.284 | 0.000 | 23.284 |
| <u>Change Summary Explanation</u> | | | | | |
| FY10 Congressionally directed increases.FY11 funding increase for Deployable Force Protection, Social/Cultural Behavior Research, Joint Integrated Base Defense, NORAD-NORTHCOM Surveillance Research, Materials Modeling | | | | | |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602784A: <i>MILITARY ENGINEERING TECHNOLOGY</i> | | | | PROJECT 855: <i>TOPOGRAPHICAL, IMAGE INTEL & SPACE</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| 855: <i>TOPOGRAPHICAL, IMAGE INTEL & SPACE</i> | 14.952 | 15.414 | 17.056 | 0.000 | 17.056 | 18.106 | 19.086 | 19.462 | 19.846 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

This project provides novel and innovative technologies 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 with 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. Work in this project includes developing logic and conceptual models to support Civil Military Operations (CMO), and examining unification of Geospatial Intelligence with environmental and emerging cultural geography information requirements associated with CMO extending geospatial tools support to military decision making within stability operation environment. Weather and atmospheric data is provided for this project through the Army Research Laboratory efforts funded in PE 0601102A, project 52C and PE 0602784A, project H71. 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 US Army Engineer Research and Development Center (ERDC), Vicksburg, MS.

B. Accomplishments/Planned Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Terrestrial Data Generation: In FY09, modeled nanomaterial efficiency in identifying or illuminating items of interest using the Light Detection and Ranging (LIDAR) equation across various environmental conditions. In FY10, empirically test optical reporting, or signal emission in the presence of certain target molecules, of remote sensors. In FY11, research is conducted in task "Terrain Analysis for Signal and Signature Phenomenology." <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 | 2.484 | 2.595 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602784A: <i>MILITARY ENGINEERING TECHNOLOGY</i> | PROJECT 855: <i>TOPOGRAPHICAL, IMAGE INTEL & SPACE</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #2 Data Generation and Management: In FY09, developed tools and techniques to improve the speed and accuracy to create orthophotos, which are aerial photos geometrically corrected for scale, and support change detection. In FY10, develop 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, and modeling extracted data into realistic three-dimensional representations. In FY11, research is conducted in task "Imagery and GeoData Sciences" and "Geospatial Infostructure & Framework." <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 5.899 | 5.786 | 0.000 | 0.000 | 0.000 |
| Program #3 | | 6.569 | 6.906 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602784A: <i>MILITARY ENGINEERING TECHNOLOGY</i> | PROJECT 855: <i>TOPOGRAPHICAL, IMAGE INTEL & SPACE</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Data Analysis: In FY09, developed battlefield geospatial reasoning tools for planning and analysis by Brigade Combat Teams that is accessible through Commercial Joint Mapping Toolkit which supports Battle Command systems. In FY10, evolve evidential reasoning model(s) from standalone to reachback services. In FY11 research is conducted in task "Geospatial Reasoning", "Geoenabled Battle Command" and "Geospatial Infostructure & Framework."</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #4</p> <p>Terrain Analysis for Signal and Signature Phenomenology In FY11, will matrix test Chemical, Biological, Radiological, Nuclear and Explosives (CBRNE) reporters, which are engineered materials that emit signals when triggered by a target molecule. Will conduct laboratory and field trials under real environmental conditions to optimizing reportor selection for incorporation into a nano-material tool kit.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> | | 0.000 | 0.000 | 3.517 | 0.000 | 3.517 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #5 Imagery and GeoData Sciences: In FY11, will develop urban mapping tools and techniques including modeling complex buildings, roofs, building interiors, and subterranean features. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 0.000 | 2.514 | 0.000 | 2.514 |
| Program #6 | | 0.000 | 0.000 | 1.511 | 0.000 | 1.511 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602784A: <i>MILITARY ENGINEERING TECHNOLOGY</i> | | PROJECT 855: <i>TOPOGRAPHICAL, IMAGE INTEL & SPACE</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Geospatial Reasoning: In FY11, will develop geospatially enabled decision support aids to meet uncertain adaptive threats and will develop techniques to increase the rate at which large volumes of geospatial data and products are disseminated.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #7</p> <p>Geospatial Infostructure & Framework: In FY11 will incorporate weather effects and cultural feature analysis to support unmanned systems command and control. Will develop framework for describing elements of political, military, economic, social, infrastructure, and information domains and linking to temporal and spatial analysis.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> | | | | 0.000 | 0.000 | 5.766 | 0.000 | 5.766 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602784A: <i>MILITARY ENGINEERING TECHNOLOGY</i> | PROJECT 855: <i>TOPOGRAPHICAL, IMAGE INTEL & SPACE</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #8 Geo-Enabled Battle Command: In FY11, will extend common geospatial architecture and services to support geospatial analysis tools and linkages to command and control for U.S. and coalition force applications. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 0.000 | 3.748 | 0.000 | 3.748 |
| Program #9 Small Business Innovative Research/Small Business Technology Transfer Programs <i>FY 2009 Accomplishments:</i> FY 2009 | | 0.000 | 0.127 | 0.000 | 0.000 | 0.000 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602784A: <i>MILITARY ENGINEERING TECHNOLOGY</i> | | PROJECT 855: <i>TOPOGRAPHICAL, IMAGE INTEL & SPACE</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Accomplishments/Planned Programs Subtotals | | | | 14.952 | 15.414 | 17.056 | 0.000 | 17.056 |
| 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: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602784A: <i>MILITARY ENGINEERING TECHNOLOGY</i> | | | | PROJECT H71: <i>Meteorological Research for Battle Command</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| H71: <i>Meteorological Research for Battle Command</i> | 6.706 | 5.627 | 5.588 | 0.000 | 5.588 | 6.055 | 6.228 | 6.385 | 6.545 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

The objective of this project is to perform applied research for tactical weather and atmospheric effects algorithms, and for the integration into battlefield atmospheric environment information products. The Army's transformation plan to the future force requires capabilities for battlefield commanders to make decisions based on tactical weather technology and impacts. This weather intelligence data must not only be accurate and timely, but distributed down to the lowest levels of command, which may include the individual Soldier. This project accomplishes this mission by transitioning technology to the Program Manager, Distributed Common Ground System-Army (DCGS-A), through support to the Project Manager for Target Identification and Meteorological Systems (PM-TIMS) for field artillery systems, and to the Department of Defense (DoD) weather and operations modeling community. 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 expert systems for assessing the impacts of weather on a very broad spectrum of friendly and threat weapons systems, sensors, platforms, and operations. The technology can be applied to mission planning, battlefield visualization, reconnaissance surveillance and target acquisition (RSTA); route planning to maximize stealth and efficiency; web enabled tactical decision aids, and 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 weather/atmospheric impacts on Army systems and personnel, and an on-scene weather sensing and prediction capability. 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) located at Adelphi, MD.

B. Accomplishments/Planned Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Weather Modeling: Develop new high resolution, short-range forecasting capability and high resolution urban diagnostic modeling capability. In FY09, formulated new methods to use microscale model output for critical micro-unmanned aircraft system (UAS) flight parameters that can improve launch, operation, and recovery of UAS assets. Designed, and applied high resolution meteorological model improvements that account for fine scale structure in the urban boundary layer for an improved capability for predicting atmospheric effects. In FY10, | 2.544 | 2.259 | 2.188 | 0.000 | 2.188 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>complete a dynamic weather data assimilation package for weather running estimate nowcast (WRE-N) and couple a diagnostic Microscale model such as 3D wind field (3DWF) to provide high resolution meteorological sources for weather products and applications. Improve the physics and computational accuracy of the 3DWF 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. In FY11, will complete a full physics version of the WRE-N for Distributed Common Ground System-Army (DCGS-A) Nowcasting and verify the accuracy improvements in the 3DWF model achieved by applying an immersed boundary method for 3DWF with additional parameterizations of unresolved turbulence to improve the accuracy and increase the resolution of local flow modeling and weather parameter predictions in high resolution urban and complex terrain.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| Program #2 | Weather Diagnostics: Measure critical value thresholds for weather impacts on systems for tactical decision aids. Devise technologies to improve environmental awareness and to enhance and protect autonomous and semi-autonomous systems. In FY09, collected urban acoustic signature data to support the development of an acoustic model predicting effects of urban structures on detection and avoidance. Explored machine-to-machine options for | 2.100 | 1.697 | 1.721 | 0.000 | 1.721 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602784A: <i>MILITARY ENGINEERING TECHNOLOGY</i> | PROJECT H71: <i>Meteorological Research for Battle Command</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>autonomous flight control to eliminate need for the man-in-the-loop. Devised web-enabled decision aid capability for hosting on battlefield systems to enhance data availability in a net-centric environment. Integrated night-time illumination model improvements into Tri-Service Target Acquisition Weapons Software (TAWS) to improve prediction of target acquisition. Investigated bio-inspired technologies to protect small sensor platforms from environmental hazards, to aid in the location and navigation around hazards, and to locate sources based on environmental cues. Investigated use of ultrasonic detection and ranging technology to measure wind profiles to enhance sniper accuracy and to locate objects in low visibility. In FY10, integrate acoustic detection algorithms into the Aviation Weather Routing Tool (AWRT) and verify the light urban model effects (LUME) integrated into TAWS to extend the capability to environmental effects in applications. In FY11, will implement methods for optimizing aircraft routing in adverse weather conditions and integrate AWRT 4-D 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.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| Program #3 | | 2.062 | 1.671 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602784A: <i>MILITARY ENGINEERING TECHNOLOGY</i> | PROJECT H71: <i>Meteorological Research for Battle Command</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Weather Prediction: Devise models to improve prediction of atmospheric conditions in urban and complex terrain that integrate high resolution boundary layer meteorological (MET) measurements. Verify high resolution boundary layer models with field measurements. In FY09, applied stable boundary layer research to improve existing high resolution boundary layer MET models. Delivered a database of detailed high resolution MET measurements including wind flow around a small set of buildings for verification and improvement of urban MET models. Devised an improved urban dust and smoke obscuration model (UDSOM) for electro-optical transmission effects of urban dust and smoke for use in infantry combat simulations. Simulated and evaluated use of a microscale wind model as an integrated part of the DCGS-A weather system. Devised and integrated a Doppler Light Detection and Ranging (LIDAR) analysis toolkit (DLAT) for semi-autonomous data assimilation/processing. In FY10, complete/evaluate the DLAT for improving the effectiveness of real-time LIDAR data. Investigate receiver arrays for remote sensing LIDAR. Investigate two-wavelength laser induced fluorescence spectra of aerosols; analyze chem biol assays of aerosols to improve environmental monitoring. Perform sampling with novel aerosol sampling equipment and analyze coupled meteorological-sampler data in support of Warfighter health. Develop and evaluate a Local-Rapid Evaluation of Atmospheric Conditions (L-REAC) system to provide automated 24/7 detailed wind flow maps over installation and down to individual building scales by integrating local met and terrain data, forecasts and urban wind models to support installation and forward operating base force protection.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> | | | | | | |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602784A: <i>MILITARY ENGINEERING TECHNOLOGY</i> | PROJECT H71: <i>Meteorological Research for Battle Command</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #4 Weather Prediction (continued):In FY11, will complete testing of coupled 3DWF and WRE-N for transition to DCGS-A Weather Services. Will employ active LIDAR with passive spectral sensing systems for environmental characterization; Will extend the L-REAC system to integrate airborne CBRN hazard models for rapid decision making for emergency execution of evacuation vs shelter in place and safe routing of emergency responders. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 0.000 | 1.679 | 0.000 | 1.679 |
| Accomplishments/Planned Programs Subtotals | | 6.706 | 5.627 | 5.588 | 0.000 | 5.588 |
| C. Other Program Funding Summary (\$ in Millions) | | | | | | |
| N/A | | | | | | |
| D. Acquisition Strategy | | | | | | |
| N/A | | | | | | |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | DATE: February 2010 |
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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: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602784A: <i>MILITARY ENGINEERING TECHNOLOGY</i> | | | | PROJECT T40: <i>MOB/WPNS EFF TECH</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| T40: <i>MOB/WPNS EFF TECH</i> | 17.750 | 20.339 | 31.231 | 0.000 | 31.231 | 30.801 | 25.742 | 26.180 | 26.660 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

This project develops technologies for adaptive and expedient force protection across the range of military operations; overcoming battlespace gaps (such as cliffs, ravines and other natural obstacles) through prediction, definition, avoidance, or defeat of the gaps; for rapid port enhancement; scalable weapons effects; high-resolution representation of near-surface terrain and environment for use with sensor models for things such as target recognition and unmanned systems (UMS). 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. 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 (ERDC), Vicksburg, MS.

B. Accomplishments/Planned Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Adaptive Protection: In FY09, designed and assessed protective systems and retrofits to defeat large caliber rockets, light artillery, and 50-caliber arms. Developed sensor/geophysical algorithms for disturbed material signatures to be utilized by sensors that detect buried objects. Commenced development of tunnel sensor fusion algorithms and real time analysis techniques for tunnel sensor performance assessment. Using the computational protection testbed, assessed expedient protection against artillery and missiles. In FY10, develop interim lightweight rapidly erected protective systems for use inside and outside base perimeters to defeat emerging weapons effects. Develop the capability to accurately predict vehicle loadings due to subsurface explosive detonations to increase the survivability of the current and future tactical wheeled vehicle fleet by providing protection with significant weight savings. In FY11, will produce a computational protection testbed for validated high-performance modeling to predict and evaluate protective material and system response to blast and ballistic loads. Will develop force protection technologies for use in remote outposts or in other expeditionary | 6.979 | 8.298 | 10.645 | 0.000 | 10.645 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602784A: <i>MILITARY ENGINEERING TECHNOLOGY</i> | PROJECT T40: <i>MOB/WPNS EFF TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>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.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #2</p> <p>Austere Entry and Maneuver: In FY09, provided technical expertise to support Joint Capability Technology Demonstrations (JCTD) user evaluations and provide guidance and training to military units selected to test and evaluate the LMCS residuals. The residuals included an emplacement and recovery system, two sections of LMCS (approximately 100 feet), and the associated mooring system. In FY11, will initiate effort to provide material and modeling solutions that provide a logistics capability for austere entry and maneuver.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> | | 7.854 | 0.000 | 1.036 | 0.000 | 1.036 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602784A: <i>MILITARY ENGINEERING TECHNOLOGY</i> | PROJECT T40: <i>MOB/WPNS EFF TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #3 Scalable Weapons Effects: Future Force Breaching in MOUT: In FY09, determined blast effects from multi-output explosive and coupled reactive materials, penetration performance of novel weapons geometries, and numerical simulations of blast, fragmentation and structural target debris. In cooperation with Armament Research, Development and Engineering Center (ARDEC), developed and transitioned a lightweight, single-stage explosive wall breaching system to Project Manager Close Combat Systems (PM-CCS) for system development and demonstration. In FY10, demonstrate warhead technologies for rapid wall breaching (RWB) 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. Quantify damage to concrete, brick, and adobe walls due to prototype shoulder launched munitions impact. Complete evaluations of multi-phase low-to-high order detonation-blast effects against urban walls, conduct perforation tests against ultra-high strength concrete panels with current and advanced weapon designs, and characterize advanced materials. In FY11, will participate in the demonstrations of small, medium and large caliber scalable weapons against urban structure and bunker targets. Will utilize data to finalize prediction capabilities for the use of scalable weapons. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 | | 1.707 | 5.107 | 4.203 | 0.000 | 4.203 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602784A: <i>MILITARY ENGINEERING TECHNOLOGY</i> | | PROJECT T40: <i>MOB/WPNS EFF TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Program #4 Geospatial Research and Engineering Support: In FY09, developed bridging analysis tactical decision aid (TDA) for determining necessary bridging assets to conduct gap crossing and eliminate solutions, and will support geospatial battle management language (GEOBML) syntax in support of the Battlespace Terrain Reasoning and Awareness Battle Command (BTRA-BC) efforts. In FY10, complete development of a bridging analysis TDA for determining necessary bridging assets to conduct gap crossing and defeat solutions. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | 1.210 | 0.461 | 0.000 | 0.000 | 0.000 |
| Program #5 Near Surface Effects: This effort develops a physics-based, multiscale numerical testbed for virtual testing of unmanned systems (UMS) for intelligent autonomous navigation and tactical behaviors for sensors. In FY10, | | | | 0.000 | 6.444 | 7.683 | 0.000 | 7.683 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>provide sophisticated innovative physics models for disturbed soil phenomenology. Develop Joint Architecture for Unmanned Systems (JAUS) compliant components for performance evaluations during mission simulations in complex environmentally enriched models. In FY11, will provide novel automated target recognition algorithms for electro-optical (EO), infrared (IR), radar and multi-modal sensors. Will provide parameter estimation models to approximate terrain surface properties for false alarm reduction. Will integrate sensor perception of unmanned systems (UMS) interactions for intelligent navigation.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #6</p> <p>NORAD-NORTHCOM Surveillance Research: In FY11 will demonstrate capability to image subsurface voids, or tunnels, up to thirty feet below surface, and work toward demonstration of integrated technologies and sensor fusion capabilities to characterize tunnel features, such as axes of approach and cross sections, and movement of contraband.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> | | 0.000 | 0.000 | 3.659 | 0.000 | 3.659 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602784A: <i>MILITARY ENGINEERING TECHNOLOGY</i> | | PROJECT T40: <i>MOB/WPNS EFF TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #7</p> <p>Joint Integrated Base Defense: This funding is intended to support the stand-up of a Joint Program Office 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. This will improve situational awareness and effectiveness in base protection and will potentially reduce manpower requirements by fusing data and information on common displays. These sensor systems include systems such as the Base Expeditionary Targetting Surveillance System - Combined (BETSS-C), Counter Rockets, Artillery, and Mortars (CRAM), Entry Control Point (ECP), and others. These systems detect threat activity (e.g., persons, vehicles, incoming fires) out to several kilometers.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> | | | | 0.000 | 0.000 | 4.005 | 0.000 | 4.005 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602784A: <i>MILITARY ENGINEERING TECHNOLOGY</i> | PROJECT T40: <i>MOB/WPNS EFF TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #8 Small Business Innovative Research/Small Business Technology Transfer Programs | | 0.000 | 0.029 | 0.000 | 0.000 | 0.000 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Accomplishments/Planned Programs Subtotals | | 17.750 | 20.339 | 31.231 | 0.000 | 31.231 |
| 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: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602784A: <i>MILITARY ENGINEERING TECHNOLOGY</i> | | | | PROJECT T41: <i>MIL FACILITIES ENG TEC</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| T41: <i>MIL FACILITIES ENG TEC</i> | 4.417 | 4.381 | 16.949 | 0.000 | 16.949 | 14.199 | 16.040 | 12.122 | 8.206 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

This project delivers sustainable, cost efficient and effective facilities and provides technologies and techniques for achieving 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 (ERDC), 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 (DARPA) and the Services.

B. Accomplishments/Planned Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Facility Engineering: In FY09, developed and validated predictive models and algorithms for durability of fiber reinforced polymer (FRP) composites for facilities and equipment, based on mechanisms of deformation and degradation. Also, developed molecular polarity maps for contaminant compounds using computational chemistry models. Synthesized a 1-million psi carbon-nanotube (CNT)-based filament at the macro-scale. In FY10, conduct assessment of material enhancement using self healing technologies. Initiate micro-scale design of high-performance CNT-composite materials. In FY11, will conduct evaluations of multi-layered protective systems and protection decision/assessment tools. | 2.050 | 2.798 | 2.860 | 0.000 | 2.860 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #2 Facility Modeling and Simulation: In FY09, developed analysis and predictive capabilities to enable units to gain cultural competence relevant to their mission. Developed rate constants for uptake of contaminants on pipe wall\ based on results of the dynamic models using static representation of the contaminant alone. In FY10, develop a framework for integrated ontology for facility life-cycle model. Incorporate near real-time assessment of facility sustainment metrics for energy and water and expand model framework for net-centric regional management with emerging resiliency concepts. In FY11, will develop sensor fusion algorithms for facility life-cycle model. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base | | 2.367 | 1.574 | 1.333 | 0.000 | 1.333 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| <p>Program #3</p> <p>Socio-Cultural Modeling: In FY11, will develop models relating socio-cultural and cultural geographic factors to human, or population response or behaviors to inform decision making in Counter-Insurgency Operations, Stability and Support Operations, and nation building, Will develop means to identify dynamic signatures, or indicators, in the socio-cultural realm to assist in estimating or predicting behavioral response to operations.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | 0.000 | 0.000 | 2.750 | 0.000 | 2.750 |
| <p>Program #4</p> <p>Materials Modeling: In FY11 will build on foundational knowledge of nano- and macro-scale physical, chemical, and mechanical properties of materials as well as understanding of the fate of the materials once in the environment to research and develop designs that will scale well for production and manufacturing. The focus will be 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. Work is coordinated with Nanotechnology/Fate and Effects effort in PE0602720A/Project 835.</p> | | 0.000 | 0.000 | 1.006 | 0.000 | 1.006 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #5 Deployable Force Protection: In FY11 will develop integrated system constructs for base protection technologies in smaller bases that often operate in remote locations or are near/with local populations and have a less overt security posture. The integrated designs will 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 will address detection of threats, assessment of activities and signals, and passive and active defense capabilities. Will investigate means to increase sensor detection capabilities for layered defense of the operational environment, including electro-optical, infrared, seismic and acoustic. Will develop designs for sustainable power and energy. Efforts support deployable force protection activities in PE 0603734A and 0603313A <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 | | 0.000 | 0.000 | 9.000 | 0.000 | 9.000 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602784A: <i>MILITARY ENGINEERING TECHNOLOGY</i> | PROJECT T41: <i>MIL FACILITIES ENG TEC</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #6 Small Business Innovative Research/Small Business Technology Transfer Programs | | 0.000 | 0.009 | 0.000 | 0.000 | 0.000 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Accomplishments/Planned Programs Subtotals | | 4.417 | 4.381 | 16.949 | 0.000 | 16.949 |
| C. Other Program Funding Summary (\$ in Millions) | | | | | | |
| N/A | | | | | | |
| D. Acquisition Strategy | | | | | | |
| N/A | | | | | | |

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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: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602784A: <i>MILITARY ENGINEERING TECHNOLOGY</i> | | | | PROJECT T42: <i>Terrestrial Science Applied Research</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| T42: <i>Terrestrial Science Applied Research</i> | 4.746 | 5.526 | 5.090 | 0.000 | 5.090 | 5.244 | 5.348 | 5.457 | 5.566 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

This project will provide Warfighters with timely understanding of 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 (ERDC), Vicksburg, MS.

B. Accomplishments/Planned Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Terrain State: In FY09, assessed the use of risk-based analyses in employing terrain-sensitive platforms and sensor mixes operating in harsh, complex environments with accompanying uncertainty about the physical environment. In FY10, develop 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 vehicles on complex terrain. In FY11, will design weather effects physical security sensor planning tool integrated with passive protection systems. <i>FY 2009 Accomplishments:</i> FY 2009 | 2.744 | 1.773 | 1.426 | 0.000 | 1.426 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602784A: <i>MILITARY ENGINEERING TECHNOLOGY</i> | PROJECT T42: <i>Terrestrial Science Applied Research</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #2</p> <p>Signature Physics: In FY09, designed and evaluated sensor data fusion aids based on predicted environmental effects for incorporation into geo-precise software tools; and implement infrared and acoustic sensor performance algorithms. In FY10, build geo-precise software tools incorporating awareness about the physical environment (known and unknown) to optimize sensor emplacement and selection of sensor asset mixes. In FY11, will define normal and anomalous sensor data features (statistical properties) as a function of the geospatial and socio-cultural context; will leverage the Warfighter's understanding of important features and contextual cues; and will 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. Will 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.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> | | 2.002 | 3.724 | 3.664 | 0.000 | 3.664 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602784A: <i>MILITARY ENGINEERING TECHNOLOGY</i> | | PROJECT T42: <i>Terrestrial Science Applied Research</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Program #3 Small Business Innovative Research/Small Business Technology Transfer Programs | | | | 0.000 | 0.029 | 0.000 | 0.000 | 0.000 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Accomplishments/Planned Programs Subtotals | | | | 4.746 | 5.526 | 5.090 | 0.000 | 5.090 |
| C. Other Program Funding Summary (\$ in Millions) | | | | | | | | |
| N/A | | | | | | | | |
| D. Acquisition Strategy | | | | | | | | |
| N/A | | | | | | | | |

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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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Exhibit R-2A, PB 2011 Army RDT&E Project Justification **DATE:** February 2010

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602784A: <i>MILITARY ENGINEERING TECHNOLOGY</i> | PROJECT T45: <i>ENERGY TEC APL MIL FAC</i> |
|--|---|--|

| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
|------------------------------------|----------------|------------------|-----------------------|----------------------|------------------------|------------------|------------------|------------------|------------------|------------------|------------|
| T45: <i>ENERGY TEC APL MIL FAC</i> | 3.183 | 3.246 | 3.275 | 0.000 | 3.275 | 3.203 | 3.206 | 3.270 | 3.336 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

This project will provide 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. Provide technologies to protect facility indoor air quality from contaminants such as mold, bacteria and viruses in work and living spaces. Develop 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 (ERDC), Vicksburg, MS.

B. Accomplishments/Planned Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|---|---------|---------|--------------|-------------|---------------|
| Program #1 Systems Response to Threats: In FY09, evaluated and tested simulation algorithms based on failure modes and mechanistic models under interactive conditions. Developed nanotechnology based detection and identification of targeted multiple contaminants in near-real-time for detect-to-warn sensing in mission critical facilities. In FY10, predict nanosensing complex stability under long term storage conditions that involve evaluating the stability of fluorescent nanoparticles, conjugated with antibodies, at various temperatures and in different environments. In FY11, will 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. <i>FY 2009 Accomplishments:</i> FY 2009 | 3.183 | 2.440 | 1.701 | 0.000 | 1.701 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602784A: <i>MILITARY ENGINEERING TECHNOLOGY</i> | | PROJECT T45: <i>ENERGY TEC APL MIL FAC</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #2</p> <p>Installation Modeling and Simulation: In FY10, initiate development of parametric models of most effective energy measures for high demand Army facilities and initiate 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. In FY11 will develop a computational framework for non-linear network simulation to predict performance and optimize integration of installation energy systems.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | 0.000 | 0.800 | 1.574 | 0.000 | 1.574 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602784A: <i>MILITARY ENGINEERING TECHNOLOGY</i> | PROJECT T45: <i>ENERGY TEC APL MIL FAC</i> | | | | |
| <u>B. Accomplishments/Planned Program (\$ in Millions)</u> | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #3 Small Business Innovative Research/Small Business Technology Transfer Programs <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 0.006 | 0.000 | 0.000 | 0.000 |
| Accomplishments/Planned Programs Subtotals | | 3.183 | 3.246 | 3.275 | 0.000 | 3.275 |
| <u>C. Other Program Funding Summary (\$ in Millions)</u> N/A | | | | | | |
| <u>D. Acquisition Strategy</u> N/A | | | | | | |
| <u>E. Performance Metrics</u> 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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602784A: <i>MILITARY ENGINEERING TECHNOLOGY</i> | | | | PROJECT T48: <i>Center for Geosciences & Atmospheric Research</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| T48: <i>Center for Geosciences & Atmospheric Research</i> | 1.595 | 2.984 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| A. Mission Description and Budget Item Justification Congressional Interest Item funding for Geosciences/Atmospheric Research. | | | | | | | | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | | | | |
| | | | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 | |
| Program #1 Geosciences/Atmospheric Research. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | 1.595 | 2.984 | 0.000 | 0.000 | 0.000 | |
| Accomplishments/Planned Programs Subtotals | | | | | | 1.595 | 2.984 | 0.000 | 0.000 | 0.000 | |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | DATE: February 2010 |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602784A: <i>MILITARY ENGINEERING TECHNOLOGY</i> | PROJECT T48: <i>Center for Geosciences & Atmospheric Research</i> |
| 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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
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| APPROPRIATION/BUDGET ACTIVITY | | | R-1 ITEM NOMENCLATURE | | | | | PROJECT | | | |
| 2040: Research, Development, Test & Evaluation, Army BA 2: Applied Research | | | PE 0602784A: MILITARY ENGINEERING TECHNOLOGY | | | | | T53: Military Engineering Applied Research (CA) | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| T53: Military Engineering Applied Research (CA) | 5.322 | 3.262 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| A. Mission Description and Budget Item Justification | | | | | | | | | | | |
| Congressional Interest Item funding for Military Engineering applied research. | | | | | | | | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | | | | |
| | | | | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #1 Airborne Threats. This is a Congressional Interest Item. FY 2009 Accomplishments: FY 2009 FY 2010 Plans: FY 2010 Base FY 2011 Plans: FY 2011 Base OCO FY 2011 Plans: FY 2011 OCO | | | | | | | 1.495 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #2 Nano-Crystalline Cement for High Strength, Rapid Curing Concrete with Improved Blast Resistance. This is a Congressional Interest Item. | | | | | | | 1.435 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602784A: <i>MILITARY ENGINEERING TECHNOLOGY</i> | PROJECT T53: <i>Military Engineering Applied Research (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #3 Cellulose Nanocomposite Panels for Blast and Ballistic Protection. In FY09, this Congressional Interest Item investigated the feasibility of using bio-based nanocomposite materials to develop advanced structures for defense and infrastructure applications. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 2.392 | 1.591 | 0.000 | 0.000 | 0.000 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602784A: <i>MILITARY ENGINEERING TECHNOLOGY</i> | PROJECT T53: <i>Military Engineering Applied Research (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #4 Environmentally Intelligent Moisture and Corrosion Control for Concrete. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 1.671 | 0.000 | 0.000 | 0.000 |
| Accomplishments/Planned Programs Subtotals | | 5.322 | 3.262 | 0.000 | 0.000 | 0.000 |
| 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. | | | | | | |

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| Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification | | | | | | | | | | DATE: February 2010 | |
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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602785A: <i>Manpower/Personnel/Training Technology</i> | | | | | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| Total Program Element | 16.096 | 16.614 | 22.198 | 0.000 | 22.198 | 19.022 | 19.381 | 19.409 | 19.708 | 0 | 154.626 |
| 790: <i>Personnel Performance & Training Technology</i> | 16.096 | 16.614 | 22.198 | 0.000 | 22.198 | 19.022 | 19.381 | 19.409 | 19.708 | Continuing | Continuing |
| <u>A. Mission Description and Budget Item Justification</u> | | | | | | | | | | | |
| <p>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.</p> | | | | | | | | | | | |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602785A: <i>Manpower/Personnel/Training Technology</i> |
|--|--|

B. Program Change Summary (\$ in Millions)

| | <u>FY 2009</u> | <u>FY 2010</u> | <u>FY 2011 Base</u> | <u>FY 2011 OCO</u> | <u>FY 2011 Total</u> |
|-------------------------------------|-----------------------|-----------------------|----------------------------|---------------------------|-----------------------------|
| Previous President's Budget | 16.358 | 18.701 | 18.853 | 0.000 | 18.853 |
| Current President's Budget | 16.096 | 16.614 | 22.198 | 0.000 | 22.198 |
| Total Adjustments | -0.262 | -2.087 | 3.345 | 0.000 | 3.345 |
| • Congressional General Reductions | | -2.087 | | | |
| • Congressional Directed Reductions | | | | | |
| • Congressional Rescissions | | 0.000 | | | |
| • Congressional Adds | | 0.000 | | | |
| • Congressional Directed Transfers | | | | | |
| • Reprogrammings | 0.000 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.262 | 0.000 | | | |
| • Adjustments to Budget Years | 0.000 | 0.000 | 3.345 | 0.000 | 3.345 |

Change Summary Explanation

FY10 congressional reduction for premature growth. FY11 increases for Large Scale Distributive Training and Social/Cultural Behavior Research.

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602785A: <i>Manpower/Personnel/Training Technology</i> | | | | PROJECT 790: <i>Personnel Performance & Training Technology</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| 790: <i>Personnel Performance & Training Technology</i> | 16.096 | 16.614 | 22.198 | 0.000 | 22.198 | 19.022 | 19.381 | 19.409 | 19.708 | Continuing | Continuing |

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 Program (\$ in Millions)

| | | | | | |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #1 Personnel: In FY09, further validated behavioral retention strategies and developed guidelines to implement strategies and track effects on actual retention, and collected job performance data and supervisor's performance assessments to empirically test knowledge, skills, and abilities (KSA) instruments/ clusters for strength in | 5.071 | 4.852 | 6.295 | 0.000 | 6.295 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | |
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| APPROPRIATION/BUDGET ACTIVITY | R-1 ITEM NOMENCLATURE | | PROJECT | | |
| 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | PE 0602785A: <i>Manpower/Personnel/Training Technology</i> | | 790: <i>Personnel Performance & Training Technology</i> | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | |
| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>predicting actual job performance and longer-term Soldier success. In FY10, initiate research to validate temperament/personality (i.e., non-cognitive) measures to better predict Soldier performance in initial training; and investigate 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. In FY11, will continue 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.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | |
| <p>Program #2</p> <p>Training: In FY09, leveraged basic and applied research on intelligent agents and integrated into role-playing distributed simulations for training with command post and tactical scenarios; began research to assess the effectiveness of alternative blended training approaches for teaching selected basic Soldier skills and improving retention of those skills; determined differences in after action review (AAR) requirements across simulation domains; identified components and developed alternative models for effectively training collective maneuver and aviation tasks. In FY10, develop tools for unit-developed individual/small group training based on near-real time knowledge elicitation; conduct field assessments of role-playing distributed simulations; analyze methods for</p> | 7.149 | 7.915 | 11.229 | 0.000 | 11.229 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602785A: <i>Manpower/Personnel/Training Technology</i> | PROJECT 790: <i>Personnel Performance & Training Technology</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>improving automated, diagnostic, and prescriptive tutoring systems to tailor training experiences; and investigate methods to maintain relevance of unit and institutional training. In FY11, will research innovative training methods and technology based on learning sciences; will refine tools/methods for rapid training development to increase relevancy and timeliness of training; will design/develop methods of diagnostic evaluation of individual and unit performance; will develop processes to integrate live and simulated training methods in emerging large-scale distributive environments that may include coalition forces.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #3</p> <p>Leader Development: In FY09, continued investigation of influence techniques and strategies that show potential to be most effective in other contingency operations scenarios, and that will improve leader capability for rapid team building. Further investigated methods and tools designed to improve training and collaboration in multi-team systems in complex and networked environments; developed a framework for investigating social and communication networks in complex organizations; expanded framework of human system automation reliance to team-system reliance. In FY10, assess multilevel influence strategies and the extent these strategies improve adaptive leadership and negotiation skills and techniques; develop team training modules for rapid team building and team adaptability; investigate training strategies and design guidelines to promote appropriate</p> | | 3.876 | 3.636 | 4.674 | 0.000 | 4.674 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602785A: <i>Manpower/Personnel/Training Technology</i> | PROJECT 790: <i>Personnel Performance & Training Technology</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>trust and automation reliance in networked human system teams. In FY11, will refine 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); will develop and refine model of multi-team system performance characteristics and effectiveness for joint, interagency, intergovernmental, and multinational (JIIM) teams; develop measures of socio-cultural capabilities for operational environments.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #4 Small Business Innovation Research/Small Business Technology Transfer Programs</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> | | 0.000 | 0.211 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602785A: <i>Manpower/Personnel/Training</i> <i>Technology</i> | PROJECT 790: <i>Personnel Performance & Training</i> <i>Technology</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Accomplishments/Planned Programs Subtotals | | 16.096 | 16.614 | 22.198 | 0.000 | 22.198 |
| 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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Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification **DATE:** February 2010

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602786A: <i>Warfighter Technology</i> |
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| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
|---|-------------------|---------------------|-----------------------------|----------------------------|------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|------------|
| Total Program Element | 35.866 | 38.347 | 27.746 | 0.000 | 27.746 | 28.335 | 29.686 | 32.996 | 34.847 | 0 | 255.569 |
| 283: <i>AIRDROP ADV TECH</i> | 2.360 | 2.456 | 2.527 | 0.000 | 2.527 | 2.604 | 2.665 | 2.719 | 2.776 | Continuing | Continuing |
| E01: <i>Warfighter Technology Initiatives (CA)</i> | 14.258 | 11.380 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| H98: <i>CLOTHING & EQUIPM TECH</i> | 13.983 | 19.052 | 19.624 | 0.000 | 19.624 | 19.982 | 21.141 | 24.280 | 25.956 | Continuing | Continuing |
| H99: <i>JOINT SERVICE COMBAT FEEDING TECHNOLOGY</i> | 5.265 | 5.459 | 5.595 | 0.000 | 5.595 | 5.749 | 5.880 | 5.997 | 6.115 | 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). 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) and PE 62787 (Medical Technology Initiatives). 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.

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602786A: <i>Warfighter Technology</i> |
|--|---|

B. Program Change Summary (\$ in Millions)

| | <u>FY 2009</u> | <u>FY 2010</u> | <u>FY 2011 Base</u> | <u>FY 2011 OCO</u> | <u>FY 2011 Total</u> |
|-------------------------------------|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 36.133 | 27.109 | 27.684 | 0.000 | 27.684 |
| Current President's Budget | 35.866 | 38.347 | 27.746 | 0.000 | 27.746 |
| Total Adjustments | -0.267 | 11.238 | 0.062 | 0.000 | 0.062 |
| • Congressional General Reductions | | -0.202 | | | |
| • Congressional Directed Reductions | | | | | |
| • Congressional Rescissions | | 0.000 | | | |
| • Congressional Adds | | 11.440 | | | |
| • Congressional Directed Transfers | | | | | |
| • Reprogrammings | 0.399 | 0.000 | | | |
| • SBIR/STTR Transfer | -0.666 | 0.000 | | | |
| • Adjustments to Budget Years | 0.000 | 0.000 | 0.062 | 0.000 | 0.062 |

Change Summary Explanation

FY10 Congressionally directed increases.

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602786A: <i>Warfighter Technology</i> | | | | PROJECT 283: <i>AIRDROP ADV TECH</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| 283: <i>AIRDROP ADV TECH</i> | 2.360 | 2.456 | 2.527 | 0.000 | 2.527 | 2.604 | 2.665 | 2.719 | 2.776 | 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 Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Precision Airdrop Enhancements: This effort improves delivery accuracy of varying load weights and transitions technology for maturation and demonstration to PE 0603001A/project 242. In FY09, downselected and implemented the most mature and favorable Guidance, Navigation and Control (GN&C) component technologies (e.g., glide modulation) into precision airdrop designs. In FY10, research and evaluate performance of height sensor technology to include a radar height sensor to augment existing Sound Detection and Ranging (SODAR) height sensor. In FY11, will research and evaluate performance of adaptive 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. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 | 1.275 | 1.838 | 1.770 | 0.000 | 1.770 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602786A: <i>Warfighter Technology</i> | PROJECT 283: <i>AIRDROP ADV TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #2 Modeling and Simulation for Tactical Parachute System Performance Enhancement: This effort investigates technologies for safer, more efficient personnel parachutes. In FY09, complete analysis of Advanced Tactical Parachute System (ATPS) parachuting opening; Simulated multiple ATPS C-17 formations (dropping multiple ATPS parachutists) and transitioned results to PM-Soldier Clothing and Individual Equipment (SCIE) to support operational testing. Experimentally and computationally characterized effects of material porosity of parachute fabrics to better understand modeling factors used to assess personal airdrop parachute device performance and effectiveness. Computationally validated and verified simulations of flow dynamics from a wind and water tunnel experiments for further analysis under Enabling Airdrop Research and Technologies efforts. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 1.085 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #3 | | 0.000 | 0.612 | 0.757 | 0.000 | 0.757 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602786A: <i>Warfighter Technology</i> | PROJECT 283: <i>AIRDROP ADV TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Enabling Airdrop Research and Technologies: This effort investigates technologies for enhanced payload extraction and subsequent gliding capabilities. In FY10, expand Domain Specific Software Architecture (DSSA) modeling capabilities to include low altitude opening and design the main parachutes to allow both extracting the payload from the aircraft and decelerating the payload to a desirable descent rate. In FY11, will verify/and validate both physics-based and engineering (simplified, first order) aerial delivery models. Will 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.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #4 Small Business Innovative Research/Small Business Technology Transfer Programs</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> | | 0.000 | 0.006 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602786A: <i>Warfighter Technology</i> | PROJECT 283: <i>AIRDROP ADV TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Accomplishments/Planned Programs Subtotals | | 2.360 | 2.456 | 2.527 | 0.000 | 2.527 |
| 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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602786A: <i>Warfighter Technology</i> | | | | PROJECT E01: <i>Warfighter Technology Initiatives (CA)</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| E01: <i>Warfighter Technology Initiatives (CA)</i> | 14.258 | 11.380 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| A. Mission Description and Budget Item Justification | | | | | | | | | | | |
| Congressional Interest Item funding for Warfighter Technology Applied Research. | | | | | | | | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | | | | |
| | | | | | | | | | | | |
| Program #1 | 1.595 | 1.592 | 0.000 | 0.000 | 0.000 | | | | | | |
| Biosecurity Research for Food Safety: In FY09, this Congressional Interest 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. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | | | | |
| Program #2 | 2.233 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | | |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602786A: <i>Warfighter Technology</i> | PROJECT E01: <i>Warfighter Technology Initiatives (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Chemical and Biological-Protective Hangars (CAB-PH): In FY09, this Congressional Interest Item evaluated feasibility of floorless barrier liner technology utilizing vacuum seal technology for use in a large scale chemical and biological protective and decontamination enclosure.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #3</p> <p>Active and Smart Packaging for Combat Feeding: In FY09, this Congressional Interest Item assessed light protection for ration components by incorporating light blocking techniques in various non-foil barrier packaging systems.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> | | 1.675 | 0.000 | 0.000 | 0.000 | 0.000 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602786A: <i>Warfighter Technology</i> | PROJECT E01: <i>Warfighter Technology Initiatives (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #4 Injection Molded Ceramic Body Armor: In FY09, this Congressional Interest Item developed injection molded silicon carbide technology which has potential for enhanced performance small arms (7.62 mm armor piercing) protective body armor. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.797 | 0.796 | 0.000 | 0.000 | 0.000 |
| Program #5 Modular Ballistic System for Force Protection: In FY09, this Congressional Interest Item developed a rapidly deployable ballistic shelter protection system for expeditionary units. | | 0.797 | 0.000 | 0.000 | 0.000 | 0.000 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602786A: <i>Warfighter Technology</i> | PROJECT E01: <i>Warfighter Technology Initiatives (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #6 Protective Textile Fabric: In FY09, this Congressional Interest Item investigated a new material treatment to protect the individual Warfighter from biological agents. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.797 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #7 | | 2.392 | 0.000 | 0.000 | 0.000 | 0.000 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602786A: <i>Warfighter Technology</i> | PROJECT E01: <i>Warfighter Technology Initiatives (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Wearable Personal Area Network Technology: In FY09, this Congressional Interest Item researched prototype WearNet systems that are rugged, suitable for field testing, and configured for specified needs for power, data, and communications.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #8</p> <p>Solid State Shelter Lighting System: In FY09, this Congressional Interest Item researched energy efficient, long life solid state lighting systems for shelters and structures.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> | | 0.383 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602786A: <i>Warfighter Technology</i> | PROJECT E01: <i>Warfighter Technology Initiatives (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #9 Photovoltaic Tent Fabric: In FY09, this Congressional Interest Item developed flexible photovoltaic modules with high power to weight ratio suitable for application to tents or deployment on the ground. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 2.791 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #10 Lightweight 1-2 Person Low-Pressure Inflatable Tents: In FY09, this Congressional Interest Item investigated improved military backpackable tents that are lighter, pack to a small size and are more durable. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 | | 0.798 | 0.000 | 0.000 | 0.000 | 0.000 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602786A: <i>Warfighter Technology</i> | PROJECT E01: <i>Warfighter Technology Initiatives (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #11 Carbon Nanotube Production. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 1.592 | 0.000 | 0.000 | 0.000 |
| Program #12 Joint Precision Air Drop Systems-Wind Profiling Portable Radar. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 | | 0.000 | 1.830 | 0.000 | 0.000 | 0.000 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602786A: <i>Warfighter Technology</i> | PROJECT E01: <i>Warfighter Technology Initiatives (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #13 Nano-Enabled Ultra High Storage Density Non-volatile Memory for Commanders Digital Assistant. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 2.387 | 0.000 | 0.000 | 0.000 |
| Program #14 Improved Thermal Resistant Nylon for Enhanced Durability and Thermal Protection in Combat Uniforms. This is a Congressional Interest Item. | | 0.000 | 3.183 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602786A: <i>Warfighter Technology</i> | | PROJECT E01: <i>Warfighter Technology Initiatives (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Accomplishments/Planned Programs Subtotals | | | | 14.258 | 11.380 | 0.000 | 0.000 | 0.000 |
| 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. | | | | | | | | |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602786A: <i>Warfighter Technology</i> | | | | PROJECT H98: <i>CLOTHING & EQUIPM TECH</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| H98: <i>CLOTHING & EQUIPM TECH</i> | 13.983 | 19.052 | 19.624 | 0.000 | 19.624 | 19.982 | 21.141 | 24.280 | 25.956 | 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, as well as certain directed energy threats such as lasers) and the field environment (e.g., cold, heat, wet) to increase operational effectiveness while decreasing the Soldier's 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, methods used 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 Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Ballistic and Blast Protection for the Individual Warrior: This effort focuses on technologies incorporating novel materials into component designs that protect Soldiers against ballistic and blast threats. In FY09, validated performance of selected materials configurations for enhanced helmet performance; downselected materials and began construction of technology components into a breadboard system for next generation armor systems and evaluation of breadboards in various environments; continued refinement and validation of material system components for integrated ballistic and blast protection for use in improved body armor for thorax protection. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 | 6.732 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602786A: <i>Warfighter Technology</i> | | PROJECT H98: <i>CLOTHING & EQUIPM TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Program #2 Ballistic and Blast Protection for the Individual Warrior (cont'd): This effort focuses on technologies incorporating novel materials into component designs that protect Soldiers against ballistic and blast threats. In FY10, validate survivability modeling tool enhancements (including the Integrated Casualty Estimation Methods model) for personnel ballistic and blast protection systems development and complete validation of configuration performance enhancements to selected breadboards for next generation armor systems. Develop improved armor coverage map utilizing medical community data, and extract geometric data from 3-D body scans for use in initial soft armor and ballistic plate designs to optimize ballistic plate coverage areas for improved soldier protection and mobility. In FY11, will investigate and conduct trade analysis of parameters leading to lighter weight personnel protective systems against advanced ballistic and blast threats. Will construct and evaluate initial soft armor and ballistic plate designs using emerging materials investigated in PE 0602105A/project H84 and optimize geometry with data from the Integrated Casualty Estimation Method modeling tool. Will conduct initial anthropometric study (human body measurement), human factors and biomechanical evaluations on male/female Soldiers; will provide enhanced survivability analysis and modeling tools to materiel developers and PMs to aid in future requirements, design, and acquisition decisions. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 | | | | 0.000 | 5.641 | 5.594 | 0.000 | 5.594 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602786A: <i>Warfighter Technology</i> | | PROJECT H98: <i>CLOTHING & EQUIPM TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #3</p> <p>Soldier Integrated Tunable (Frequency Agile) Laser/Ballistic Eye Protection: This effort focuses on technologies which provide eye protection from laser/ballistic threats. In FY09, combined ballistic materials, and abrasion resistance coatings into a new composite eye wear material; assembled laser eye protection (optical limiting concept) components on breadboard and performed system evaluation in a simulated environment. In FY10, develop a plastic eyewear lens scaffold (pixilated lens with a battery operated sensor) that can sense and respond (lighten/darken) to visible and infrared (IR) irradiation sources at precise lens locations to protect Soldiers' eyes, maximize overall visual acuity, and determine directionality of threats. Mature lens technology to serve as the platform for subsequent vision protection and enhancement technologies; consider producibility issues to combine vision protection and enhancement technologies with a ballistic lens; and examine Soldier acceptance issues by testing the ability to differentiate color or objects in both day and night scenarios. In FY11, will develop and evaluate variable transmission eyewear technology and investigate and research materials, material properties and methods to integrate glare, laser flash and dazzle protection into eyewear.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> | | | | 0.976 | 2.140 | 2.493 | 0.000 | 2.493 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602786A: <i>Warfighter Technology</i> | PROJECT H98: <i>CLOTHING & EQUIPM TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| <p>Program #4</p> <p>Infantry Warrior Simulation (IWARS): This effort focuses on incorporating data into modeling and analysis tools that enable technologists and military users to trade-off potential Soldier system capabilities and mature a human-centered Soldier system design. In FY09, enhanced IWARS to include effects of netted communications and collaborative situational awareness to assess enhancements to Soldier capabilities. In FY10, provide credible Soldier physiological representations within IWARS to include biomechanic effects of equipment load on Soldier movement and the effect of hearing protection and helmets on sound detection and direction; expand 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 and vehicle platforms. In FY11, will link IWARS with other models, simulations and computational environments (i.e. Combat XXI and OneSAF), to bring high fidelity Soldier representations to collaborative environments and enable Soldier analysis across a wider range of missions and environments.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | 2.286 | 2.233 | 2.331 | 0.000 | 2.331 |
| Program #5 | | 0.588 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602786A: <i>Warfighter Technology</i> | PROJECT H98: <i>CLOTHING & EQUIPM TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Biomechanical Tools for Individual Soldier Extremity Protection and Performance Enhancement: This effort focuses on human science, anthropometric, and psychophysical methods to assess human responses to sensory, cognitive and affective stimuli. In FY09, defined additional complex Soldier output measures (energy expended and muscle force exercised) for incorporation into biomechanical model, scaled biomechanical tools to address range of human male anthropometry (5 to 95% size and shape); conducted human experiments to refine fatigue prediction into short term and long term components; refined awareness model with additional human experimental data and began investigating strategies for mitigating decrements in awareness documented by preceding experiments. This task is done in collaboration with DOD Medical Research programs under PE 62787 (Medical Technology Initiatives). Work will continue under Predicting and Enhancing Warfighter Cognitive Performance.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #6</p> <p>Predicting and Enhancing Warfighter Cognitive Performance: This effort builds on biomechanical tools development and focuses on methods to better predict performance and effectiveness of the Warfighter. In FY10, identify neurocognitive mechanisms, such as regions, networks and type of brain activity, underlying dismounted Soldier performance relative to battlespace awareness using human experimental studies and cognitive task</p> | | 0.000 | 2.996 | 3.590 | 0.000 | 3.590 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>analysis of squad-level operations under stressed and non stressed task situations. This work is collaborative with the Army Research Laboratory and the Medical Research and Materiel Command. In FY11, will 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. Will conduct human research to quantify the influence of contextual variables (e.g., physical fatigue) on cognitive processes involved in performing squad-level infantry tasks.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #7</p> <p>Electrotexiles - Self Powered, Conductive, and Smart Materials: This effort focuses on technologies which aid in the design and evaluation of clothing and equipment for signature management and conducting materials. In FY09, integrated a sensing device into photovoltaic fabric to demonstrate a new class of self-powered, smart electrotexile applications; explored various textile integration methods to provide additional strength and protection to electronic and optical fibers; investigated eco-friendly fibers and materials and developed evaluation methods for laboratory testing of novel fibers and materials that provide future Soldier flame and thermal protection without the use of hazardous materials. Work will continue under Electronic and Multifunctional Textiles effort.</p> | | 2.516 | 0.000 | 0.000 | 0.000 | 0.000 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #8 Electronic and Multifunctional Textiles: This effort builds on the Electrotextile work and focuses on technologies which aid in the design and evaluation of multifunctional clothing and equipment for the Soldier. In FY10, investigate alternative textile and film-based approach to wearable Soldier power; investigate advanced analytical methods for predicting protection levels provided by flame-protective materials; examine new fibers and materials created for potential application to Soldier flame and thermal protection; complete laboratory testing of novel materials against thermal threats; fabricate and characterize novel extruded multi-component fibers for potential application to Soldier protective materials. In FY11, will investigate modeling and control of low cost electrospinning process to produce micro/nanostructure fibrous materials with high surface areas to increase combat and environmental protection capabilities of fabric used to manufacture advanced combat clothing; will apply analytical methods to develop design approaches for novel flame and thermal protective concepts. Will investigate and fabricate advanced textiles and composites having multifunctionality within a single fiber and evaluate for military feasibility; will develop and evaluate designs for multifunctional fibers that provide flame and thermal protection as key functions; will develop and evaluate advanced textile concepts for improved signature management. | | 0.000 | 5.679 | 5.616 | 0.000 | 5.616 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602786A: <i>Warfighter Technology</i> | PROJECT H98: <i>CLOTHING & EQUIPM TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #9 Soldier Borne Microclimate Cooling: This effort focused on technologies which provide cooling to the Soldier to reduce risk of heat stress. In FY09, completed testing of microclimate cooling breadboard system, and used the test results to downselect cooling technologies for Soldier applications and establish a baseline technology capability. Transitioned downselected technologies to PE 0603001A/project J50 for further maturation. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base | | 0.885 | 0.000 | 0.000 | 0.000 | 0.000 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #10 Small Business Innovative Research/Small Business Technology Transfer Programs | | 0.000 | 0.363 | 0.000 | 0.000 | 0.000 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Accomplishments/Planned Programs Subtotals | | 13.983 | 19.052 | 19.624 | 0.000 | 19.624 |
| 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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602786A: <i>Warfighter Technology</i> | | | | PROJECT H99: <i>JOINT SERVICE COMBAT FEEDING TECHNOLOGY</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| H99: <i>JOINT SERVICE COMBAT FEEDING TECHNOLOGY</i> | 5.265 | 5.459 | 5.595 | 0.000 | 5.595 | 5.749 | 5.880 | 5.997 | 6.115 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

This project researches, investigates and evaluates combat ration and field food service equipment component technologies. The project investigates novel ration packaging and combat feeding equipment/systems, investigates and develops advanced food processing technologies that prolong shelf-life, investigates technologies that detect food safety hazards on the battlefield and enhances quality, and/or increase 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 Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Combat Feeding Equipment Technologies: This effort investigates equipment and energy technologies to enhance effectiveness and reduce logistics footprint of field feeding. In FY09, completed concept evaluations of inline water heater; completed concept development of an ethylene control system (prolongs freshness and extends shelf life) for fresh fruits and vegetables. Investigated a sanitizing solution generator that provided sanitation capability on demand in remote/small kitchen facilities without any chemical supplies (bleach, class III sanitizers, etc). In FY10, investigate and develop technology concepts for a standard size container that extends the shelf life of semi-perishable rations in hot environments and an off-grid pallet chiller with self-containing power supply for bottled water; and complete concept development of a flameless individual water heater. In FY11, will investigate and develop technology concepts for greywater (non-industrial wastewater generated from field food | 2.182 | 2.246 | 2.320 | 0.000 | 2.320 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | |
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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | |
| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>sanitation systems) recycling technology for the Food Sanitation Center; and will complete concept development of self-powered appliances with next generation high efficiency thermoelectric modules to reduce reliance on JP8.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | |
| <p>Program #2</p> <p>Ration Stabilization and Novel Nutrient Delivery Technologies: This effort focuses on enhancing nutrient composition and consumption to maximize cognitive and physical performance on the battlefield. In FY09, evaluated shelf stability of probiotic-enhanced ration components; ensured microbiological, chemical stability analyses of advanced shelf-stable meat products; and investigated stability and functional effectiveness of water/oil emulsion for military ration systems. In FY10, test acceptance of shelf-stable sandwiches containing emulsion-based fillings to control food water content; down-select component food matrices for incorporation of performance optimizing and nano-sized functional ingredients. In FY11, will optimize shelf-stable pocket bread formulas and production parameters; will test the efficacy of carbon dioxide treatment of fresh fruits and vegetables and antimicrobial effects on ration components; will demonstrate nanotechnology-based carriers (ration component) for enhancing micronutrient stability in food items of military rations.</p> | 1.639 | 1.588 | 1.698 | 0.000 | 1.698 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602786A: <i>Warfighter Technology</i> | PROJECT H99: <i>JOINT SERVICE COMBAT FEEDING TECHNOLOGY</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #3 Packaging and Food Safety Technologies: This effort investigates novel ration packaging technologies to minimize physical, chemical and nutritional degradation of combat rations during storage. In FY09, investigated multiplexing of nanofibers for improved capture of pathogens and incorporation into systems that enable multiple pathogen detection from one sample; molecular beacon signal (method to detect nucleic acids) enhancement as an alternative technique to identifying pathogens using array-based (matrix) systems; quality data reaction rates and determined kinetic correlations based on storage studies; continued long-term storage study to include extensive analytical, microbiological and sensory testing; Continued long term storage study of select ration components; incorporated analytical, microbiological and sensory data (texture, color, flavor) into a model used to predict the shelf life of rations. In FY10, develop an integrated sensor circuit concept diagram for printed electronic display for real-time ration condition assessment to determine remaining shelf life; develop a bacteriophage (viruses that infect specific bacteria) cocktail to reduce bacteria in fresh fruits and vegetables; conduct polymer processing of thermoplastic materials to optimize novel multilayer polymer films properties; optimize conductive membranes for sensing and integrate with capture/detection assemblies to capture and detect pathogenic bacteria through optical detection techniques. In FY11, will investigate compatibility and integration issues with printed electronic display applications on packaging structures for ration condition assessment; | | 1.444 | 1.586 | 1.577 | 0.000 | 1.577 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602786A: <i>Warfighter Technology</i> | PROJECT H99: <i>JOINT SERVICE COMBAT FEEDING TECHNOLOGY</i> | | | | |
| <u>B. Accomplishments/Planned Program (\$ in Millions)</u> | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>evaluate electrochemical measurements generated by an antibody-antigen reaction with conductive membranes. These membranes are utilized as an electrode coated with antibodies which capture a target antigen and produce a change in conductivity (an electrical signal) for more rapid and reliable detection of pathogens in foods.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #4 Small Business Innovative Research/Small Business Technology Transfer Programs</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> | | 0.000 | 0.039 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602786A: <i>Warfighter Technology</i> | PROJECT H99: <i>JOINT SERVICE COMBAT FEEDING TECHNOLOGY</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Accomplishments/Planned Programs Subtotals | | 5.265 | 5.459 | 5.595 | 0.000 | 5.595 |
| 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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| Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification | | | | | | | | | | DATE: February 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 | | | | | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| Total Program Element | 198.105 | 221.944 | 96.797 | 0.000 | 96.797 | 99.310 | 99.060 | 98.450 | 91.339 | 0 | 1,001.802 |
| 869: Warfighter Health Prot & Perf Stnds | 3.069 | 35.098 | 34.718 | 0.000 | 34.718 | 35.135 | 34.500 | 31.986 | 31.667 | Continuing | Continuing |
| 870: DOD MED DEF AG INF DIS | 15.464 | 17.100 | 13.914 | 0.000 | 13.914 | 14.485 | 15.208 | 15.875 | 16.963 | Continuing | Continuing |
| 873: HIV EXPLORATORY RSCH | 11.054 | 9.199 | 9.243 | 0.000 | 9.243 | 9.392 | 9.582 | 9.638 | 9.586 | Continuing | Continuing |
| 874: CBT CASUALTY CARE TECH | 12.828 | 17.719 | 16.782 | 0.000 | 16.782 | 17.517 | 18.898 | 19.907 | 21.916 | Continuing | Continuing |
| 878: HLTH HAZ MIL MATERIEL | 11.956 | 0.000 | 0.078 | 0.000 | 0.078 | 0.110 | 0.115 | 0.118 | 0.120 | Continuing | Continuing |
| 879: MED FACT ENH SOLD EFF | 10.199 | 0.000 | 0.106 | 0.000 | 0.106 | 0.151 | 0.157 | 0.161 | 0.165 | Continuing | Continuing |
| 968: SYNCH BASED HI ENERGY RADIATION BEAM CANCER DETECT | 4.984 | 5.969 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| FH2: FORCE HEALTH PROTECTION - APPLIED RESEARCH | 8.474 | 8.277 | 10.779 | 0.000 | 10.779 | 11.438 | 9.618 | 9.791 | 9.956 | Continuing | Continuing |
| PA4: WOUND HEALING PROJECT (CA) | 0.000 | 1.990 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| PA5: NANOFABRICATED BIOARTIFICIAL KIDNEY (CA) | 2.491 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| UA8: PROTEIN HYDROGEL (CA) | 0.000 | 0.796 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| VB3: MEDICAL TECHNOLOGY INITIATIVES (CA) | 105.592 | 114.679 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| VB4: SYSTEM BIOLOGY AND NETWORK SCIENCE TECHNOLOGY | 0.000 | 1.169 | 1.177 | 0.000 | 1.177 | 1.082 | 0.982 | 0.974 | 0.966 | Continuing | Continuing |

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| Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification | | | | | | | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | | | | | | | | |
| VJ4: <i>SUICIDE PREVENTION/ MITIGATION</i> | 10.000 | 9.948 | 10.000 | 0.000 | 10.000 | 10.000 | 10.000 | 10.000 | 10.000 | 0.000 | Continuing | Continuing |
| X06: <i>HIBERNATION GENOMICS</i> | 1.994 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 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, doctrine, and other preventive measures essential to the protection and sustainment of Warfighter health. Research is conducted in five principal areas: 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, 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, 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 (878) 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 on identifying health hazards inherent to the engineering design and operational use of equipment, systems, and materiel used in Army combat operations and training. This project is being coordinated with the Defense Health Program. Project (879) 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 on identification of baseline physiological performance and assessment of degradations produced by operational stressors. This project is being coordinated with the Defense Health Program. Project (968) supports Congressional Interest Item funding for Cancer Detection applied research. Project (FH2) This project funds research to support applied research directed toward the sustainment of a healthy force of Warfighters from accession through retirement. Project (PA5) supports Congressional Interest Item funding for Nanofabricated Bioartificial Kidney applied research. 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. 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 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

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> |
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(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 research and development of technologies such as product purification, formulation and assay development; and involves pre-clinical testing in animals and early human clinical testing (Phase 1 safety and Phase 2 expanded safety and efficacy). The EPA also requires thorough testing of products such as repellents and insecticides to ensure the environment is adequately protected before they can be licensed for use. Program development and execution is externally peer-reviewed and fully coordinated with all Services and other agencies through the Joint Technology Coordinating Groups of the Armed Services Biomedical Research, Evaluation & Management (ASBREM) Committee to prevent unnecessary duplication. Work in this PE is performed by the Walter Reed Army Institute of Research (WRAIR), Silver Spring, MD and its overseas laboratories; US Army Medical Research Institute of Infectious Diseases (USAMRIID), Fort Detrick, MD; US Army Research Institute of Environmental Medicine (USARIEM), Natick, MA; US Army Institute of Surgical Research (USAISR), Fort Sam Houston, TX; US Army Aeromedical Research Laboratory (USAARL), Fort Rucker, AL; the Naval Medical Research Center (NMRC), Silver Spring, MD; the US Army Dental Trauma Research Detachment, Great Lakes, IL, and the Armed Forces Institute of Regenerative Medicine (AFIRM), Fort Detrick, MD.

B. Program Change Summary (\$ in Millions)

| | <u>FY 2009</u> | <u>FY 2010</u> | <u>FY 2011 Base</u> | <u>FY 2011 OCO</u> | <u>FY 2011 Total</u> |
|-------------------------------------|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 188.210 | 99.027 | 88.133 | 0.000 | 88.133 |
| Current President's Budget | 198.105 | 221.944 | 96.797 | 0.000 | 96.797 |
| Total Adjustments | 9.895 | 122.917 | 8.664 | 0.000 | 8.664 |
| • Congressional General Reductions | | -1.163 | | | |
| • Congressional Directed Reductions | | | | | |
| • Congressional Rescissions | | 0.000 | | | |
| • Congressional Adds | | 124.080 | | | |
| • Congressional Directed Transfers | | | | | |
| • Reprogrammings | 14.168 | 0.000 | | | |
| • SBIR/STTR Transfer | -4.273 | 0.000 | | | |
| • Adjustments to Budget Years | 0.000 | 0.000 | 8.664 | 0.000 | 8.664 |

Change Summary Explanation

FY10 Congressionally directed increases.

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R-1 Line Item #28

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT 869: <i>Warfighter Health Prot & Perf Stnds</i> |
|--|--|---|

| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
|---|----------------|------------------|-----------------------|----------------------|------------------------|------------------|------------------|------------------|------------------|------------------|------------|
| 869: <i>Warfighter Health Prot & Perf Stnds</i> | 3.069 | 35.098 | 34.718 | 0.000 | 34.718 | 35.135 | 34.500 | 31.986 | 31.667 | 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, standards for 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 forms the basis for behavioral, training, pharmacological (drug actions), and nutritional interventions. The four main thrust areas are (1) Physiological Health (2) Environmental Health and Protection, (3) Injury Prevention and Reduction, and (4) Psychological Health. (1) Physiological Health - develop and evaluate applied predictive modeling and simulation to support improvements in training doctrine and individual equipment; evaluate new methods of monitoring fluid consumption; demonstrate remote real-time prediction and management of thermal strain in physically active Soldiers; and evaluate methods for managing and controlling the effects of nutrition and fatigue on Soldier operational performance. (2) Environmental Health and Protection -- evaluate remote monitoring of Soldier physiological status and mitigating/eliminating the effects of heat, cold, altitude and other environmental stressors on Soldier performance. (3) Injury Prevention and Reduction - Musculoskeletal Injury Prevention: evaluate the effects of repetitive motion and military operations and training on the human body; analyze and model 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. Evaluate standards and methods for the rapid return to duty of Soldiers following injury. (4) Psychological Health & Resilience - develop and evaluate methods to detect and treat concussion and identify and evaluate the effects of cognitive deficits in Soldiers during operations; assess psychological resilience factors and investigate methods of preventing or reducing the risk of psychological trauma in operational environments; investigate methods to treat Post-Traumatic Stress Disorder in a military population and identify causative and preventative factors in military suicides. Beginning in FY10, projects 878 and 879 will be consolidated into project 869. 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; and the US Army Aeromedical Research Laboratory (USAARL), Fort Rucker, AL.

B. Accomplishments/Planned Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|------------|---------|---------|--------------|-------------|---------------|
| Program #1 | 3.069 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT 869: <i>Warfighter Health Prot & Perf Stnds</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Physiological Health - Life Sign Monitoring: In FY09, demonstrated remote medical monitoring capability in mountain and swamp phases of Ranger training; evaluated models predicting thermal status and water requirements for missions in rugged terrain, swamps, and cold weather. In FY10 these efforts are funded in Environmental Health and Protection - Physiological Awareness Tools and Warrior Sustainment in Extreme Environments. In FY11, these efforts are funded in Physiological Health - Nutritional Sustainment and Fatigue, Physiological Status Monitoring Interventions.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #2</p> <p>Environmental Health and Protection - Physiological Awareness Tools and Warrior Sustainment in Extreme Environments: In FY09, research efforts were funded in task Physiological Health - Life Sign Monitoring, in projects 878 and 879. In FY10, employ hydration sensor technologies to conduct early device evaluations; determine the efficacy of a 7 to 8 hour nighttime exposure to a normal altitude, low oxygen environment for high altitude pre-acclimatization; evaluate current heat strain decision aid capabilities for potential future enhancement. In FY11, will develop low oxygen training guidelines based on analysis of low oxygen-exposure studies; will perform biomedical modeling to define individual differences on heat regulation; and will develop methods and predictive models to predict core temperature using identified thermal parameters.</p> | | 0.000 | 1.987 | 2.379 | 0.000 | 2.379 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | | PROJECT 869: <i>Warfighter Health Prot & Perf Stnds</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #3</p> <p>Physiological Health - Nutritional Sustainment and Fatigue Interventions: In FY09, research efforts were funded in project 879. In FY10, demonstrate efficacy of nutritional supplements for sustaining cognition during military operational stress; determine impact of nutritional supplements on enhancing post-exercise recovery; determine efficacy of zinc supplements for reducing the incidence of diarrhea; develop models to study the relationship of hormonal regulation and eating behavior; evaluate individualized alertness and performance prediction model software for the Sleep Management System. In FY11, will develop nutritional countermeasures for diminished bone health in response to operational stress; will define impact of micronutrient status on performance and immune function during military training; will demonstrate protective effects of probiotics (dietary supplements) for sustaining digestive and immune function during operational stress; will demonstrate efficacy of nutritional supplements for promoting fat loss in overweight Warriors; will conduct study to determine changes in sleep brain activity on Soldiers in theater; will conduct a study to determine extent to which sleep duration impacts resilience/sensitivity to combat experiences.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> | | | | 0.000 | 2.145 | 2.787 | 0.000 | 2.787 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #4 Injury Prevention and Reduction - Neurosensory Injury Prevention: In FY09, research efforts were funded in project 878. In FY10, characterize blunt impact protection capabilities of current and future helmet designs to develop biomedically valid criteria for US Army Test and Evaluation Command (ATEC) to use in materiel development to develop realistic visual headforms and to model eye injury vulnerabilities for candidate protection solutions; develop auditory test fixtures/headforms for model hearing protection solutions; conduct assessment of candidate drugs to prevent hearing loss. In FY11, will determine head injury thresholds in boxers and paratroopers for risk assessment and development of biomedically valid criteria for ATEC to use in materiel development; will complete eye injury dose-response modeling for vulnerability assessments using the instrumented headform system; will 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 specific jobs that will define job specific strategies and interventions; conduct comparative analysis of foam and preformed eartips for use with the Communications Earplug (CEP). <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 | | 0.000 | 10.263 | 8.926 | 0.000 | 8.926 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #5</p> <p>Injury Prevention and Reduction - Musculoskeletal Injury Prevention: Evaluate and assess the effects of repetitive motion, military operations and training on the human body. In FY09, research efforts were funded in project 878. In FY10, characterize performance deficits from Warfighter injury and identify promising interventions for rapid return to duty following musculoskeletal injury; provide high resolution musculoskeletal injury data for use in the training and overuse injury prediction model; evaluate physical impact forces on the lower leg associated with prolonged running and fatigue; and evaluate musculoskeletal adaptations in response to military-relevant training and injuries to assess mechanisms of skeletal muscle repair, regeneration, and adaptation. In FY11, will develop recovery assessment tests to develop return-to-duty recommendations after musculoskeletal injury; refine and validate the training, overuse and injury prediction model to incorporate stress fracture data.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | 0.000 | 4.588 | 4.775 | 0.000 | 4.775 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT 869: <i>Warfighter Health Prot & Perf Stnds</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Program #6</p> <p>Injury Prevention and Reduction - Injury Return to Duty Standards: In FY09, research efforts were funded in project 879. In FY10, characterize specific performance deficits from Warfighter brain, eye, and hearing injury and develop promising interventions for rapid return to duty; develop Return to Duty Standards for mission-critical occupations following brain, eye, and hearing injury; and determine appropriate clinical and physical health assessment tools to enable early return to duty. In FY11, will develop measures of effectiveness for interventions with baseline criteria for Warriors with brain, eye, and hearing injury; and will develop preliminary techniques and technologies to accelerate and assist Wounded Warriors in rapid return to military duty.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | 0.000 | 2.645 | 2.798 | 0.000 | 2.798 |
| <p>Program #7</p> <p>Psychological Health - Psychological Resilience: In FY09, research efforts were funded in project 879. In FY10, develop initial Advanced Battlemind Training to reduce symptoms associated with Post-Traumatic Stress Disorder (PTSD), post concussive symptoms and other post-deployment problems; evaluate stigma related to seeking mental health care and barriers to care; complete study of behavioral health providers to determine current status of diagnostic decision-making, treatment trends, and standards of care. In FY11, will finalize assessments</p> | | 0.000 | 5.050 | 5.219 | 0.000 | 5.219 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT 869: <i>Warfighter Health Prot & Perf Stnds</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>of components of Advanced Battlemind; will determine lessons-learned from post-deployment health assessments and health care utilization to determine outcomes of psychological disorders.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #8</p> <p>Psychological Health & Resilience - Suicide Prevention and Treatment of PTSD: In FY10, initiate a new research effort that will evaluate PTSD risk factors, including co-occurring mild Traumatic Brain Injury (mTBI) and mental health problems, and other factors (i.e. deployment, combat, multiple deployments) to improve diagnostic capabilities; conduct a laboratory study to compare sensitivity of existing neurocognitive tests for PTSD; collect and evaluate all data on the suicide intervention programs. In FY11, will conduct a laboratory study to determine effects of PTSD on objectively measured sleep and neuro-cognitive performance; will conduct studies to assess effectiveness of suicide interventions on suicide behavior.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> | | 0.000 | 5.210 | 5.193 | 0.000 | 5.193 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT 869: <i>Warfighter Health Prot & Perf Stnds</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #9 Psychological Health & Resilience - Concussion/Mild Traumatic Brain Injury (mTBI) Interventions: In FY09, research efforts were funded in project S15. In FY10, compare initial sensitivity and practicality of neuropsychological performance tests/batteries for diagnosis of concussion in Soldiers and civilians; conduct a study to determine susceptibility to concussion based upon baseline psychological and neurological functioning; determine short term effects of concussion on sleep patterns and neurocognitive performance. In FY11, will assess the utility of neuropsychological measures for tracking/monitoring recovery rate from concussion; will conduct a study to determine predictive value of a neuropsychological test for prediction of subsequent post concussive symptoms; will conduct study to determine changes in sleep parameters coincident with concussion and correlate with changes in neuropsychological performance. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base | | 0.000 | 2.257 | 2.641 | 0.000 | 2.641 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT 869: <i>Warfighter Health Prot & Perf Stnds</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #10 Small Business Innovative Research/Small Business Technology Transfer Programs | | 0.000 | 0.953 | 0.000 | 0.000 | 0.000 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Accomplishments/Planned Programs Subtotals | | 3.069 | 35.098 | 34.718 | 0.000 | 34.718 |
| 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: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | | | | PROJECT 870: <i>DOD MED DEF AG INF DIS</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| 870: <i>DOD MED DEF AG INF DIS</i> | 15.464 | 17.100 | 13.914 | 0.000 | 13.914 | 14.485 | 15.208 | 15.875 | 16.963 | 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 repellent 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 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) and 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: Conduct assessments and improve candidate drugs coming from the DoD discovery program and from other collaborations for prevention and treatment of malaria to counter continuing spread of drug resistance to current drugs. Assess in animal models 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. (2) Vaccines for Preventing Malaria: Conduct studies to investigate new candidate vaccines for preventing malaria, and select 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. (3) Bacterial Threats: Conduct studies to develop antibacterial countermeasures including vaccine candidates to prevent diarrhea (a common disease in deployed troops), 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). (4) Diagnostics and Disease Transmission Control: Design and prototype new medical diagnostic and surveillance tools for the field, focusing on bedside and field-deployable diagnostic systems. Develop interventions that protect Warfighters from biting insects such as sand flies responsible for transmitting leishmaniasis, and mosquitoes which transmit a variety of diseases including dengue fever, Japanese encephalitis, and malaria. (5) Viral threats: Design and laboratory test new vaccine candidates against dengue and other hemorrhagic fever viruses such as hantaviruses (cause of Korean hemorrhagic fever) and other lethal viruses (i.e., Lassa fever and Crimean-Congo hemorrhagic fever), and assess other non-vaccine technologies to protect against such lethal viral diseases. 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

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT 870: <i>DOD MED DEF AG INF DIS</i> | | | | |
| <p>duplication of effort within the Military Departments. Promising medical countermeasures identified in this project are further matured under PE 0603002A, project 810. 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.</p> | | | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #1 | | 4.590 | 4.579 | 3.385 | 0.000 | 3.385 |
| <p>Drugs to Prevent/Treat Parasitic Diseases (harmful effects on host by an infecting organism): In FY09, assessed new chemical compounds that have shown the greatest potential for effective in cell-based testing against malaria and/or leishmaniasis (a skin-based disease transmitted by sand flies). Assessed in animal models a new formulation of amphotericin B, an FDA-approved drug as an oral treatment against cutaneous Leishmania. Developed bioluminescent (the production and emission of light by a living organism as the result of a chemical reaction) parasite animal model to assess drug effectiveness. Modified the current lead drugs to improve safety, effectiveness in animal models. In FY10, optimize chemical compounds that have potential to be effective drugs against malaria and/or leishmaniasis, including new candidate(s). Complete optimization of one lead malaria drug to test in animals, and if successful, prepare for initial testing in humans. In FY11, will synthesize promising compounds in larger quantities to support pre-clinical studies. Promising drugs against malaria and/or leishmaniasis will be further screened in animal tests for toxicity and effectiveness. Will complete testing and prepare for FDA application for testing in humans.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> | | | | | | |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT 870: <i>DOD MED DEF AG INF DIS</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #2 Vaccines for Prevention of Malaria: In FY09, manufactured pilot lots of candidate vaccines (both DNA - and protein-based) against a severe form of malaria (<i>Plasmodium falciparum</i>) to maintain a pipeline of new technologies and to mitigate risk if lead technologies fail. Tested protein-based candidate vaccines in small animals for proof-of-concept for eventual down selection. In FY10, manufacture and test in animal models a DNA based <i>P. falciparum</i> vaccine candidates to support a new vaccine application with the FDA. File the application for approval to test these candidates in humans. Evaluate the safety and effectiveness in animals of DNA-based candidate <i>P. falciparum</i> vaccines. In FY11, will down-select among the vaccine candidates, based on results from safety and effectiveness studies in animals, select promising candidates, and prepare for vaccine testing in locations where the disease occurs naturally. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 3.174 | 4.323 | 2.798 | 0.000 | 2.798 |
| Program #3 | | 2.589 | 3.614 | 2.800 | 0.000 | 2.800 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT 870: <i>DOD MED DEF AG INF DIS</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Bacterial Threats: In FY09, examined potential bacterial proteins as new vaccine candidates against major strains of diarrheal disease (E. coli, Campylobacter and Shigella). Manufactured E. coli candidate vaccine and prepare for human testing. Selected best Campylobacter vaccine candidate. Prepared for initial human testing of Shigella vaccine. Modified the meningitis bacteria to manufacture and test a multicomponent (to broaden protection) Group B vaccine in preparation for testing in humans. Tested new scrub typhus (a debilitating mite-borne disease that is developing resistance to currently available antibiotics) proteins as potential vaccine candidate against multiple strains. In FY10, complete evaluation of E. coli subunit vaccine in monkeys. Evaluate alternative Shigella constituents, as potential vaccine candidates in animals. Manufacture lead candidate Campylobacter vaccine. Transition a multicomponent Group B meningococcal vaccine to next phase of development. Evaluate scrub typhus for drug resistance, identify new proteins as candidate vaccine components, and evaluate vaccine delivery methods in animals. Evaluate new therapeutic approaches to accelerate wound healing such as vacuum-assisted closure of wounds using binding agents to kill bacteria. In FY11, will prepare an alternative E coli vaccine, in preparation for testing in humans. Will evaluate alternative Shigella constituents as potential vaccine candidates in animals. Will test lead candidate Campylobacter vaccine in animals; Will continue to evaluate scrub typhus for drug resistance, will identify new proteins as candidate vaccine components, and will evaluate vaccine delivery methods in animals.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT 870: <i>DOD MED DEF AG INF DIS</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #4 Diagnostics and Disease Transmission Control: In FY09, tested new intervention methods that prevent or reduce biting by disease-transmitting insects, including use of an improved bed net, and prepared for insect repellent testing to replace (Diethylmetatoluamide or DEET (current ingredient in military insect repellent). Designed and evaluated five new medical diagnostic tests and surveillance tools for disease-carrying insects (sand flies, mosquitoes) to improve the medical responses in the field. Developed field deployable point-of-care and hospital-based diagnostic devices for infectious diseases. In FY10, develop passive insect repellent systems that do not require application of chemicals to skin or clothing; evaluate new tests for detecting infectious organisms within insects that transmit diseases; validate field deployable point-of-care diagnostic devices to prepare for FDA review; and develop a repository of standardized critical reagents for producing consistent reproducible results in both laboratory and field-based diagnostic devices. In FY11, will develop super-attractant traps that remove biting insects from localized areas, and conduct proof-of-concept testing of passive insect repellent systems; will optimize hospital-based diagnostic devices for selected infectious disease agents to be transitioned to the Joint Biological Agent Identification System (JBAIDS) platform, and will increase repositories of clinical samples and reagents needed to develop and validate multiple new disease-specific diagnostic devices. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 2.700 | 2.100 | 2.070 | 0.000 | 2.070 |
| Program #5 | | 2.411 | 2.484 | 2.861 | 0.000 | 2.861 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Viral Threats Research: In FY09, assessed and evaluated new antiviral vaccines in animals and support the hantaviral vaccine development effort. Examined new vaccine delivery approaches in animals to enhance effectiveness of DNA-based vaccine in humans. Prepared field site for human testing of candidate dengue vaccine. Manufactured proof-of-concept candidate vaccines (Inactivated, molecular and attenuated) to protect against dengue. In FY10, develop reagents, assays, and animal models to test medical countermeasures for hantaviruses; develop molecular vaccines and antibody-based countermeasures for flaviviruses (Dengue); and explore the feasibility of combining inactivated, molecular and attenuated vaccines into a single vaccine that is effective against four dengue strains. In FY11, will develop proof-of-concept molecular vaccines for viruses of military importance and support vaccine candidate development by providing necessary laboratory and animal tests; and will provide laboratory support for dengue vaccine testing in humans.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| Accomplishments/Planned Programs Subtotals | | 15.464 | 17.100 | 13.914 | 0.000 | 13.914 |

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| 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: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | | | | PROJECT 873: <i>HIV EXPLORATORY RSCH</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| 873: <i>HIV EXPLORATORY RSCH</i> | 11.054 | 9.199 | 9.243 | 0.000 | 9.243 | 9.392 | 9.582 | 9.638 | 9.586 | 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, 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 Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 HIV Research Program: Conduct projects assessing new HIV vaccine candidates, vaccine test site development worldwide, HIV disease outbreaks, and genetic attributes of HIV threat. In FY09, continued long-term efforts to find solutions to the HIV threat to DoD personnel with ongoing studies directed at assessing HIV vaccine candidates, assessed vaccine test sites in Africa and Asia, and identified changes in global risk and genetic makeup of HIV threat to US forces to help direct future research and intervention programs. In FY10, define the potential threat posed by HIV to the US military by continuing to identify and characterize different subtypes involved with the global epidemic of HIV-infected populations; develop 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; and control production quality of new vaccine candidates to be used in humans. In FY11, will test the new East African subtype-based candidate vaccine in animals; will identify and characterize new HIV | 11.054 | 8.965 | 9.243 | 0.000 | 9.243 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>infections, will develop new field sites in Tanzania and Nigeria for future testing of vaccine candidates in humans, and will identify manufacturing processes with multiple combinations of vaccine candidates.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #2</p> <p>Small Business Innovative Research/Small Business Technology Transfer Programs</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | 0.000 | 0.234 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | | PROJECT 873: <i>HIV EXPLORATORY RSCH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Accomplishments/Planned Programs Subtotals | | | | 11.054 | 9.199 | 9.243 | 0.000 | 9.243 |
| 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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | | | | PROJECT 874: <i>CBT CASUALTY CARE TECH</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| 874: <i>CBT CASUALTY CARE TECH</i> | 12.828 | 17.719 | 16.782 | 0.000 | 16.782 | 17.517 | 18.898 | 19.907 | 21.916 | 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), tissue repair including transplant technologies, and treatment of burns, Traumatic Brain Injury (TBI), 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. Research conducted in this project focuses on the following seven areas:(1) Hemorrhage (bleeding) Control, Blood, and Resuscitative Fluids: Includes materials and systems for minimizing the effects of traumatic blood loss, preserving blood and blood products, and resuscitation following trauma: Beginning in FY10, funding shifts to the Damage Control Resuscitation area.(2) Damage Control Resuscitation: Includes 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; the research area starts in FY10.(3) Combat Trauma Therapies: Includes identification and development of candidate drugs and medical procedures to minimize the effects of combat injuries. (4) Far-Forward Medical Systems: Includes diagnostic and therapeutic medical devices and associated algorithms, software, and data-processing systems for resuscitation, stabilization, life support, surgical support, and dental care treatments that can be applied in a pre-hospital, operational field setting. Beginning in FY10, dental efforts move to oral/facial surgery under Combat Trauma Therapies and the remaining efforts shift to the Combat Critical Care Engineering area. (5) Combat Casualty Bioinformatics and Simulation: Focuses on a data management system to capture and analyze data (such as heart and respiration rates) over time and the development of casualty simulations and durable, realistic simulators for initial and reinforcement training of medical care providers. Beginning FY10, will discontinue in-house simulation research and leverage Program Executive Office, Simulation, Training, and Instrumentation (PEO-STRI) medical simulation research. Bioinformatics research will be funded with the Combat Critical Care Engineering research area in FY10.(6) Combat Critical Care Engineering: Includes development of diagnostic and therapeutic medical devices and 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; this research area starts in FY10.(7) Clinical and Rehabilitative Medicine: Includes laboratory and animal studies of regenerating skin, muscle, and bone tissue for the care and treatment of battle-injured casualties, as well as studies regarding ocular and visual system traumatic injury; this research area starts in FY10.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 (ISR), Fort Sam Houston, TX; and 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 Program (\$ in Millions)

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT 874: <i>CBT CASUALTY CARE TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Program #1</p> <p>Hemorrhage Control, Blood, and Resuscitative Fluids: In FY09, identified candidate diagnostic and therapeutic interventions for abnormal blood clotting; using a small animal model, continued investigation into use of resuscitative fluids to improve outcomes for combined blast-trauma-hemorrhage on brain and lung. Evaluated freeze-dried fibrinogen (a blood component), for improving blood clotting. In FY10 and FY11, this work will be funded under the Damage Control Resuscitation area.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | 1.930 | 0.000 | 0.000 | 0.000 | 0.000 |
| <p>Program #2</p> <p>Damage Control Resuscitation: In FY09, funds were within the Hemorrhage Control, Blood, and Resuscitation Fluids program area. In FY10, continue animal studies of freeze dried plasma; develop and evaluate performance of candidate blood substitutes and expanders (e.g. frozen and freeze dried platelets); test treatment interventions to stop internal bleeding in an animal model; characterize the body's blood clotting mechanism associated with head injury bleeding and other trauma to identify ways to better control clotting and determine effects on resuscitation; continue evaluation using animal models of various combinations of plasma, clotting factors, and Complement Inhibitors (CIs) as therapies to stop severe bleeding and treat trauma. In FY11, will complete identification and characterization of frozen and freeze-dried blood substitutes and expanders; will complete testing of interventions</p> | | 0.000 | 7.747 | 7.405 | 0.000 | 7.405 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT 874: <i>CBT CASUALTY CARE TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>to stop internal bleeding and transition most promising candidates to safety and effectiveness testing in human subjects; will continue to identify and assess potential ways to control blood clotting; will begin investigation of treatment interventions to mitigate effects of head injury on resuscitation; will begin to evaluate products to treat intracavitary or junctional (non-compressible) hemorrhage and complete animal study of blood components and CI's.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #3</p> <p>Combat Trauma Therapies: In FY09, focused AFIRM tissue regeneration activities on most promising clinical treatments for blood vessel grafts, muscle regeneration, regeneration of bones in the head and face, and assessment of long-bone regeneration using an animal model; continued to refine selective brain cooling and neuroregeneration for early intervention and treatment of brain injury; conducted drug combination studies for treatment of acute brain trauma; and expanded biomarker clinical feasibility trial to include diagnosis of mild Traumatic Brain Injury. In FY10, begin several injury studies of Penetrating Ballistic-type Brain Injury (PBBi) in large animals; conduct animal study of oral surgical dressing; and begin studies into the nature of eye injuries and evaluate promising repair methods in laboratory and animal models. In FY11, will continue poly-trauma studies</p> | | 7.725 | 3.364 | 3.168 | 0.000 | 3.168 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT 874: <i>CBT CASUALTY CARE TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>(multiple injuries) of PBBI in large animals; will complete oral surgical dressing study; continue to develop therapeutic strategies(drugs, stem cells and brain cooling) to manage TBI.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #4</p> <p>Far-Forward Medical Systems: In FY09, began laboratory-based evaluation of fluid resuscitation algorithms in an integrated hardware platform (either the Army's integrated litter or the Navy's lightweight trauma module) for casualty transport; and transitioned oral protective, antiplaque compound to commercial partner. In FY10 and FY11, dental efforts move to oral/facial surgery under Combat Trauma Therapies and the remaining efforts shift to the Combat Critical Care Engineering area.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> | | 1.828 | 0.000 | 0.000 | 0.000 | 0.000 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | | PROJECT 874: <i>CBT CASUALTY CARE TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Program #5 Combat Critical Care Engineering: In FY10, conduct large animal studies evaluating change in electrical signals in the brain as non-invasive resuscitative end-points in shock from blood loss. In FY11, will test algorithm(s) under conditions of varying rates and levels of respiration; and for ability to track resuscitation in real-time; will continue testing devices for ICU use. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | 0.000 | 1.529 | 1.409 | 0.000 | 1.409 |
| Program #6 Combat Casualty Bioinformatics and Simulation: In FY09, supported testing and evaluation of trauma simulation component for training assessments developed jointly with the Research, Development and Engineering | | | | 1.345 | 0.000 | 0.000 | 0.000 | 0.000 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | | PROJECT 874: <i>CBT CASUALTY CARE TECH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Command. Bioinformatics research merged into the Combat Critical Care Engineering research area in FY10 and FY11.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #7</p> <p>Clinical and Rehabilitative Medicine: In FY10, conduct studies of compounds to reduce cellular damage during compartment syndrome (nerve or tendon constriction in an enclosed space) in laboratory and animal models; test a tissue-engineered functional human facial expression muscle; evaluate a biodegradable tissue-lined stent; test reconstruction of a facial defect in the skull by using synthetic bone scaffold material; and test a dressing that mimics the fetal skin structure to prevent wound scarring. In FY11, will conduct studies using relevant animals to evaluate the most promising treatments for repairing traumatic eye injuries; and AFIRM will continue regenerative medicine studies addressing ways to construct a nerve conduit scaffold to provide a guide for nerve regeneration; and will test engineered cartilage and methods to reduce post-burn injury progression by use of inhibitors of inflammation and agents to prevent cell death; and will explore the use of stem cells to repair soft and hard tissue defects.</p> | | | | 0.000 | 4.789 | 4.800 | 0.000 | 4.800 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #8 Small Business Innovative Research/Small Business Technology Transfer Programs | | 0.000 | 0.290 | 0.000 | 0.000 | 0.000 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Accomplishments/Planned Programs Subtotals | | 12.828 | 17.719 | 16.782 | 0.000 | 16.782 |

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| 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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| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| 878: <i>HLTH HAZ MIL MATERIEL</i> | 11.956 | 0.000 | 0.078 | 0.000 | 0.078 | 0.110 | 0.115 | 0.118 | 0.120 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

The objective of this project is to support the Medical and Survivability technology areas with a focus on providing Soldier protection from health hazards associated with materiel and operational environments. Emphasis is 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), health hazards of operations in environmental extremes, 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 will be 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 Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|--|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Laser Protection Research: In FY09, utilized animal testing to assess laser eye injury hazards from advanced military systems. Evaluated a combination of drugs for treatment of laser-induced eye injury. In FY10 and FY11, this effort realigned to Injury Return to Duty Standards (project 869). <i>FY 2009 Accomplishments:</i> FY 2009 | 2.406 | 0.000 | 0.000 | 0.000 | 0.000 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT 878: <i>HLTH HAZ MIL MATERIEL</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #2 Injury Protection (face/eye): In FY09, designed an impact test methodology for assessing face shield performance. In FY10 and FY11, this effort realigned to Neurosensory Injury Protection (project 869). <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 2.838 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #3 Pulmonary Hazards and Risk Assessment Models: In FY09, used new and existing animal injury and performance data to validate the integrated blast overpressure/blunt trauma lung injury and performance model. | | 3.377 | 0.000 | 0.000 | 0.000 | 0.000 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Used large-animal performance data to validate the Toxic Gas Assessment Software - Performance Evaluator (TGAS-PE) model for performance impacts from exposure to inhaled toxic fire gases and release TGAS-PE1 (performance) to survivability assessors for live-fire vehicle testing. In FY10 and FY11, this effort realigned to Neurosensory Injury Protection (project 869). Physiological response and blast and blunt trauma models of thoracic and pulmonary injury realigned to project FH2.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #4</p> <p>Biomonitor System and Dehydration Research: In FY09, assessed technologies for rapidly identifying chemical contamination by toxic industrial chemicals and that are appropriate for use with field water production equipment. Conducted field test to evaluate on-the-move enhanced fluid and nutrient delivery systems to enhance fluid and electrolyte delivery to Soldiers. Demonstrated efficacy of inducing acquired thermal tolerance (cellular protection) coincident with heat acclimatization in Soldiers. In FY10 and FY11, this effort realigned to Physiological Health (TICs and Thermal Tolerance initiatives) and to Environmental Health and Protection (Nutrient Delivery System) (project 869).</p> | | 2.135 | 0.000 | 0.000 | 0.000 | 0.000 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #5</p> <p>Systems Biology and Network Science: In FY09, conducted applied research to investigate whether protein-protein network models, developed for a particular pathogen, are portable to a different pathogen sharing a common set of proteins. Developed mathematical models to predict host-pathogen protein-protein interaction networks, and metabolic network models to predict phenotypical (genetically and environmentally determined physical appearance of an organism) responses induced by external stimuli. In FY10, this effort is moved to the new project VB4.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> | | 1.200 | 0.000 | 0.078 | 0.000 | 0.078 |

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| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Accomplishments/Planned Programs Subtotals | | 11.956 | 0.000 | 0.078 | 0.000 | 0.078 |
| 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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | | | | PROJECT 879: <i>MED FACT ENH SOLD EFF</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| 879: <i>MED FACT ENH SOLD EFF</i> | 10.199 | 0.000 | 0.106 | 0.000 | 0.106 | 0.151 | 0.157 | 0.161 | 0.165 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

The objective of this project is to support 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 on 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, including 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. Will also assess the adverse effect of shifting biological rhythms during deployments across multiple time zones (extreme jet lag), night operations, and thermal and altitude stress. In FY10, project 879 will be 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 Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 High Altitude Research: In FY09, examined use of Food and Drug Administration (FDA) approved drug (erythropoietin) to prevent neuropsychological deficits and acute mountain sickness. Provided critical information to the Army Medical Department Combat Developer for the development of new Army doctrine related to high altitude deployments. In FY10 and FY11, this effort realigned to Environmental Health and Protection (project 869). <i>FY 2009 Accomplishments:</i> FY 2009 | 2.634 | 0.000 | 0.106 | 0.000 | 0.106 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT 879: <i>MED FACT ENH SOLD EFF</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #2</p> <p>Fatigue/Sleep Research: In FY09, further integrated components of the next-generation Fatigue Intervention and Recovery Model/Sleep Activity, Fatigue, and Task Effectiveness (FIRM/SAFTE) which included enhanced capability for prediction of the effects of stimulants, into the Sleep History and Readiness Predictor (SHARP). SHARP is a program that facilitates interpretation and usefulness of the FIRM/SAFTE model by providing summary information on the relative predicted efficacy of each individual Soldier within a unit. In FY10 and FY11, this effort realigned to Nutritional Sustainment and Fatigue Interventions (project 869).</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | 1.658 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT 879: <i>MED FACT ENH SOLD EFF</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Program #3</p> <p>Mental Health Research: In FY09, developed unit-level intervention tools for military-wide implementation to improve Warfighter resiliency, health, and performance. In FY10 and FY11, this effort realigned to Psychological Resilience (project 869).</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | 3.548 | 0.000 | 0.000 | 0.000 | 0.000 |
| <p>Program #4</p> <p>Vision and Auditory Research: In FY09, conducted comparative analysis of six eye damage risk criteria identified by NATO countries and provided recommendations of optimum health risk assessment criteria; transitioned a noise immune electronic stethoscope into advanced development with the United States Army Medical Research and Material Command Developmental Activity; conducted assessments of integrated solar protection device eye protection systems. In FY10 and FY11, this effort realigned to Injury Prevention and Reduction - Return to Duty Standards (project 869).</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> | | 2.359 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | | PROJECT 879: <i>MED FACT ENH SOLD EFF</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Accomplishments/Planned Programs Subtotals | | | | 10.199 | 0.000 | 0.106 | 0.000 | 0.106 |
| 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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
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| APPROPRIATION/BUDGET ACTIVITY | | | | R-1 ITEM NOMENCLATURE | | | | PROJECT | | | |
| 2040: Research, Development, Test & Evaluation, Army BA 2: Applied Research | | | | PE 0602787A: MEDICAL TECHNOLOGY | | | | 968: SYNCH BASED HI ENERGY RADIATION BEAM CANCER DETECT | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| 968: SYNCH BASED HI ENERGY RADIATION BEAM CANCER DETECT | 4.984 | 5.969 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| A. Mission Description and Budget Item Justification | | | | | | | | | | | |
| Congressional Interest Item funding for Cancer Detection applied research. | | | | | | | | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | | | | |
| | | | | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #1 | | | | | | | 4.984 | 5.969 | 0.000 | 0.000 | 0.000 |
| This congressionally directed project conducts research into Synchrotron-Based Scanning Research with the Neuroscience and Proton Institute. | | | | | | | | | | | |
| <i>FY 2009 Accomplishments:</i> | | | | | | | | | | | |
| FY 2009 | | | | | | | | | | | |
| <i>FY 2010 Plans:</i> | | | | | | | | | | | |
| FY 2010 | | | | | | | | | | | |
| <i>Base FY 2011 Plans:</i> | | | | | | | | | | | |
| FY 2011 Base | | | | | | | | | | | |
| <i>OCO FY 2011 Plans:</i> | | | | | | | | | | | |
| FY 2011 OCO | | | | | | | | | | | |
| Accomplishments/Planned Programs Subtotals | | | | | | | 4.984 | 5.969 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | DATE: February 2010 |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT 968: <i>SYNCH BASED HI ENERGY RADIATION BEAM CANCER DETECT</i> |
| 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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | | | | PROJECT FH2: <i>FORCE HEALTH PROTECTION - APPLIED RESEARCH</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| FH2: <i>FORCE HEALTH PROTECTION - APPLIED RESEARCH</i> | 8.474 | 8.277 | 10.779 | 0.000 | 10.779 | 11.438 | 9.618 | 9.791 | 9.956 | 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. The program has the following three major thrust areas: (1) Physiological Response and Blast and Blunt Trauma Models of Thoracic (chest) and Pulmonary (lung) Injuries; (2) Millennium Cohort Research; and (3) Biomarkers of Exposure and Environmental Biomonitoring. 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. 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 Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Nerve-based Disease Research: In FY09, completed analyses of the association between jet fuel exposure and nervous system health outcomes. Completed studies of head trauma (i.e., head impact due to poor parachute landings and boxing as models) and neuropsychological adverse effects (mood and cognitive function). Integrated Environmental Sentinel Biomonitor (ESB) components and conduct bench testing of the composite system. In FY10, programmatically realigned to Biomarkers of Exposure and Environmental Biomonitoring. | 4.391 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT FH2: <i>FORCE HEALTH PROTECTION - APPLIED RESEARCH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #2 Health Behavior/Weight Control: In FY09, evaluated associations between weight and chronic medical conditions (e.g. diabetes, cardiovascular disease, metabolic syndrome), tested feasibility and efficacy of new approaches to enhance nutrition in military dining facilities, evaluated community-based environmental intervention programs for weight management by reserve personnel, evaluated associations between Service member weight/weight changes with number and location of deployments and presence of Post Traumatic Stress Disorder, characterized successful and unsuccessful weight management techniques by establishment of a military weight registry database. In FY10 programmatically realign to Millennium Cohort Research. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 | | 4.083 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | | PROJECT FH2: <i>FORCE HEALTH PROTECTION - APPLIED RESEARCH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | | | |
| <p>Program #3</p> <p>Millennium Cohort Research: A long-term study of Soldiers that includes psychological, physical, and spiritual impacts of military service throughout their lifetime. In FY09, this task was conducted under the Health Behavior/Weight Control program area. In FY10, perform 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; link Millennium Cohort data with DoD and Veteran Administration health risk databases; conduct long term studies to investigate the use of tobacco and alcohol among Service members to provide policy recommendations that enhance the long-term health of deploying forces. In FY11, will conduct analyses to determine resilience factors for PTSD symptoms over time; will conduct analysis to determine factors that influence resistance to depression symptoms over time and enhance mental resilience in deploying forces; will conduct death analysis with specific interest in modifying factors for post-combat suicide.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> | | | | 0.000 | 3.314 | 4.212 | 0.000 | 4.212 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT FH2: <i>FORCE HEALTH PROTECTION - APPLIED RESEARCH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #4 Biomarkers of Exposure and Environmental Biomonitoring: Development and evaluation of methods to detect environmental contamination and toxic exposure during military operations. In FY09, this task was conducted under the Nerve-based Disease Research program area. In FY10, review available sensor technology and conduct down-selection of sensors best suited to meet user performance requirements; evaluate biomarkers of exposure to selected Militarily Relevant Chemicals (MRCs) and relevant toxicity pathways to develop a method to detect toxic exposure in Soldiers. In FY11, will evaluate biomarkers of exposure to additional MRCs, and evaluate and accelerate discovery methods for new biomarkers; will 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. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 2.546 | 2.936 | 0.000 | 2.936 |
| Program #5 | | 0.000 | 2.185 | 3.631 | 0.000 | 3.631 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT FH2: <i>FORCE HEALTH PROTECTION - APPLIED RESEARCH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Physiological Response and Blast and Blunt Trauma Models of Thoracic (Chest) and Pulmonary (Lung) Injury: Modeling and assessment of the combined effects of blast, impact, and ballistic trauma on the chest and lung system. In FY09, this task was conducted under the Pulmonary Hazards and Risk Assessment Models program area in Project 878. In FY10, conduct modeling of lung function disruption due to blunt force trauma to the chest; combine thoracic (chest) blunt trauma model with performance decrement models and compare with large animal exercise data for the development of advanced survivability assessment and health hazard analysis tools. In FY11, will refine combined thoracic (chest) blunt trauma/physiology models against combined thoracic blunt trauma and inhalation large animal exposure tests; and will combine thoracic blast trauma model with performance decrement models to develop an integrated tool for survivability assessment and health hazard analysis.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #6 Small Business Innovative Research/Small Business Technology Transfer Programs</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> | | 0.000 | 0.232 | 0.000 | 0.000 | 0.000 |

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | | PROJECT FH2: <i>FORCE HEALTH PROTECTION - APPLIED RESEARCH</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Accomplishments/Planned Programs Subtotals | | | | 8.474 | 8.277 | 10.779 | 0.000 | 10.779 |
| 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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | | | | PROJECT PA4: <i>WOUND HEALING PROJECT (CA)</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| PA4: <i>WOUND HEALING PROJECT (CA)</i> | 0.000 | 1.990 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| A. Mission Description and Budget Item Justification | | | | | | | | | | | |
| Congressional Interest Item funding for Wound Healing applied research. | | | | | | | | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | | | | |
| | | | | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #1 Rapid Wound Healing Technology Development. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | 0.000 | 1.990 | 0.000 | 0.000 | 0.000 |
| Accomplishments/Planned Programs Subtotals | | | | | | | 0.000 | 1.990 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | DATE: February 2010 |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT PA4: <i>WOUND HEALING PROJECT (CA)</i> |
| 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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | | DATE: February 2010 | | |
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| APPROPRIATION/BUDGET ACTIVITY | | | | R-1 ITEM NOMENCLATURE | | | | PROJECT | | | |
| 2040: Research, Development, Test & Evaluation, Army BA 2: Applied Research | | | | PE 0602787A: MEDICAL TECHNOLOGY | | | | PA5: NANOFABRICATED BIOARTIFICIAL KIDNEY (CA) | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| PA5: NANOFABRICATED BIOARTIFICIAL KIDNEY (CA) | 2.491 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| A. Mission Description and Budget Item Justification | | | | | | | | | | | |
| Congressional Interest Item funding for Nanofabricated Bioartificial Kidney applied research. | | | | | | | | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | | | | |
| | | | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 | |
| Program #1 | | | | | | 2.491 | 0.000 | 0.000 | 0.000 | 0.000 | |
| This congressionally directed project conducts research into Nanofabricated Bioartificial Kidney and Bioterrorism. | | | | | | | | | | | |
| <i>FY 2009 Accomplishments:</i> | | | | | | | | | | | |
| FY 2009 | | | | | | | | | | | |
| <i>FY 2010 Plans:</i> | | | | | | | | | | | |
| FY 2010 | | | | | | | | | | | |
| <i>Base FY 2011 Plans:</i> | | | | | | | | | | | |
| FY 2011 Base | | | | | | | | | | | |
| <i>OCO FY 2011 Plans:</i> | | | | | | | | | | | |
| FY 2011 OCO | | | | | | | | | | | |
| Accomplishments/Planned Programs Subtotals | | | | | | 2.491 | 0.000 | 0.000 | 0.000 | 0.000 | |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | DATE: February 2010 |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT PA5: <i>NANOFABRICATED BIOARTIFICIAL KIDNEY (CA)</i> |
| 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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
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| APPROPRIATION/BUDGET ACTIVITY | | | | R-1 ITEM NOMENCLATURE | | | | PROJECT | | | |
| 2040: Research, Development, Test & Evaluation, Army BA 2: Applied Research | | | | PE 0602787A: MEDICAL TECHNOLOGY | | | | UA8: PROTEIN HYDROGEL (CA) | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| UA8: PROTEIN HYDROGEL (CA) | 0.000 | 0.796 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| A. Mission Description and Budget Item Justification | | | | | | | | | | | |
| Congressional Interest Item funding for Protein Hydrogel applied research. | | | | | | | | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | | | | |
| | | | | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #1 | | | | | | | 0.000 | 0.796 | 0.000 | 0.000 | 0.000 |
| BioFoam Protein Hydrogel for Battlefield Trauma. This is a Congressional Interest Item. | | | | | | | | | | | |
| <i>FY 2009 Accomplishments:</i> | | | | | | | | | | | |
| FY 2009 | | | | | | | | | | | |
| <i>FY 2010 Plans:</i> | | | | | | | | | | | |
| FY 2010 | | | | | | | | | | | |
| <i>Base FY 2011 Plans:</i> | | | | | | | | | | | |
| FY 2011 Base | | | | | | | | | | | |
| <i>OCO FY 2011 Plans:</i> | | | | | | | | | | | |
| FY 2011 OCO | | | | | | | | | | | |
| Accomplishments/Planned Programs Subtotals | | | | | | | 0.000 | 0.796 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | DATE: February 2010 |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT UA8: <i>PROTEIN HYDROGEL (CA)</i> |
| 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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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | | | | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | 105.592 | 114.679 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for Medical Technology applied research.

B. Accomplishments/Planned Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Cancer Prevention Through Remote Biological Sensing. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | 1.595 | 1.592 | 0.000 | 0.000 | 0.000 |
| Program #2 Center for Injury Biomechanics. This is a Congressional Interest Item. | 3.189 | 3.979 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #3 Center for Ophthalmic Innovation. This is a Congressional Interest Item. | | 2.392 | 0.000 | 0.000 | 0.000 | 0.000 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #4 | | 1.744 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Disposable Unit Dose Drug Pumps for Anesthesia and Antibiotics. This is a Congressional Interest Item.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #5</p> <p>Impact of Intensive Lifestyle Modification on Chronic Medical Conditions. This is a Congressional Interest Item.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | 1.744 | 1.492 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #6 Neuroscience Research Consortium to Study Spinal Cord Injury. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.797 | 1.194 | 0.000 | 0.000 | 0.000 |
| Program #7 Plant-based Vaccine Research. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 1.993 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #8 Rapid Vaccine Discovery Technology. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 1.595 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #9 Wound Infection Treatment Program. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 2.392 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #10 Cold Spring Harbor Laboratory Womens Cancer Genomics Center. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 2.791 | 2.387 | 0.000 | 0.000 | 0.000 |
| Program #11 New Vaccines to Fight Respiratory Infection. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 3.987 | 4.775 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #12 Copper Air Quality Program. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 1.994 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #13 Medical Resources Conservation Technology Pilot Energy Cost Control Evaluation (PECCE). This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base | | 2.392 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #14 Complementary and Alternative Medicine Research (MIL-CAM). This is a Congressional Interest Item. | | 4.984 | 5.173 | 0.000 | 0.000 | 0.000 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #15 Orthopaedic Extremity Trauma Research Program. This is a Congressional Interest Item. | | 4.984 | 0.000 | 0.000 | 0.000 | 0.000 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #16 Respiratory Biodefense Initiative. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 1.595 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #17 Carbon Nanotube Production. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 | | 1.196 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #18 Lehman Injury Research Center-Ryder Trauma Center. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 5.981 | 3.183 | 0.000 | 0.000 | 0.000 |
| Program #19 Military Interoperable Digital Hospital Testbed. This is a Congressional Interest Item. | | 9.966 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #20 Neutron/Hadron Particle Therapy. This is a Congressional Interest Item. | | 1.196 | 0.000 | 0.000 | 0.000 | 0.000 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #21 | | 0.797 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Biological and Immunological Infectious Agent and Cancer Vaccine Research. This is a Congressional Interest Item.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #22</p> <p>Combat Stress Intervention Program (CSIP). This is a Congressional Interest Item.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | 2.392 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #23 Advanced Functional Nanomaterials for Biological Processes. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 1.993 | 2.387 | 0.000 | 0.000 | 0.000 |
| Program #24 Minimizing Health Effects of Air Toxics on Military Personnel. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 1.595 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #25 Plasma Technology Laboratory. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.797 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #26 Military Photomedicine Program. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 2.791 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #27 Freeze Dried Blood Technology Clinical Research. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 1.994 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #28 Battlefield Research Accelerating Virtual Environments for Mil Indiv Neuro Disorders (BRAVEMIND). This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base | | 0.797 | 0.995 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #29 Battlefield Treatment of Hemorrhagic Shock. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.797 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #30 Control of Vector-Borne Diseases. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 | | 1.197 | 2.387 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #31 Extended Duration Silver Wound Dressing-Clinical Trials. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 1.595 | 0.796 | 0.000 | 0.000 | 0.000 |
| Program #32 Nano-Imaging Agents for Early Disease Detection. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 | | 1.595 | 0.796 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #33 Neuroimaging of Brain Disorders. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.797 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #34 Self-Powered Prosthetic Limb Technology. This is a Congressional Interest Item. | | 2.392 | 1.592 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #35 Use of Drugs to Reduce Hearing Loss from Acute Acoustic Trauma. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 1.276 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #36 | | 3.189 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>Vision Integrating Strategies in Opthamology and Neurochemistry (VISION). This is a Congressional Interest Item.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #37</p> <p>Center for Aerospace Human Factors Research and Innovation. This is a Congressional Interest Item.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | 0.797 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #38 Development of Drugs for Malaria and Leishmaniasis in US Military and Civilian Personnel. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 3.389 | 3.104 | 0.000 | 0.000 | 0.000 |
| Program #39 Engineering Replacement Tissues. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base | | 1.595 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #40 Expansion and Development, Upper and Lower Bionic Limbs. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 1.994 | 1.990 | 0.000 | 0.000 | 0.000 |
| Program #41 Facilitating Use of Advanced Prosthetic Limb Technology. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 | | 1.595 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #42 Mosquito Borne Disease Prevention: Malaria & Dengue Fever. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.797 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #43 Optical Neural Techniques for Combat/Post-Trauma Healthcare. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 | | 1.595 | 3.482 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #44 Soldier Survival in Extreme Environments. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 2.951 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #45 Behavior and Neuroscience, Functional Magnetic Resonance Imaging Research Project. This is a Congressional Interest Item. | | 0.797 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #46 Plug-In Architecture for DoD Medical Imaging. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.797 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #47 | | 0.797 | 2.387 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>National Eye Eval & Research Network (NEER)-Clinical Trials of Orphan Retinal Degenerative Diseases. This is a Congressional Interest Item.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #48</p> <p>Neural Controlled Prosthetic Device for Amputees. This is a Congressional Interest Item.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | 1.595 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #49 Prevention of Compartment Syndrome, Ultrafiltration Catheter. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 1.595 | 0.000 | 0.000 | 0.000 | 0.000 |
| Program #50 Consortium for Bone and Tissue Repair and Regeneration. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.797 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #51 New York Medical College Bioterrorism Research. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 0.131 | 0.000 | 0.000 | 0.000 |
| Program #52 Center for Engineered Biomedical Devices. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 0.286 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #53 Lightweight, Battery Driven and Battlefield Deployment Ready NG Feeding Tube Cleaner. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 0.496 | 0.000 | 0.000 | 0.000 |
| Program #54 Eye Trauma and Visual Restoration. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base | | 0.000 | 0.795 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #55 Carbide-Derived Carbon for Treatment of Combat Related Sepsis. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 0.796 | 0.000 | 0.000 | 0.000 |
| Program #56 Clinical Trial to Investigate Efficacy of Human Skin Substitute. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 | | 0.000 | 0.796 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #57 Cleveland Clinic Rehabilitation Research. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 0.796 | 0.000 | 0.000 | 0.000 |
| Program #58 Military Family Empowerment Initiative. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 | | 0.000 | 0.796 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #59 Myositis Association-Exposure to Environmental Toxins. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 0.995 | 0.000 | 0.000 | 0.000 |
| Program #60 Nanofiber Based Synthetic Bone Repair Devices for Limb Salvage. This is a Congressional Interest Item. | | 0.000 | 0.995 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #61 Regenerative Medicine for Battlefield Injuries. This is a Congressional Interest Item. | | 0.000 | 0.995 | 0.000 | 0.000 | 0.000 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #62 | | 0.000 | 1.194 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Center for Bone Repair and Military Readiness. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #63 Flu Vaccine Technology Program. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 1.194 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #64 Non-Leaching Antimicrobial Surface for Orthopedic Devices. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 1.194 | 0.000 | 0.000 | 0.000 |
| Program #65 Technology Solutions for Brain Cancer Detection and Treatment. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 1.194 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #66 Westchester County Medical Center Health Imaging Upgrades. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 1.194 | 0.000 | 0.000 | 0.000 |
| Program #67 Stabilized Hemoglobin Wound Healing Development. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 1.194 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #68 Human Organ and Tissue Preservation Technology. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 1.592 | 0.000 | 0.000 | 0.000 |
| Program #69 Alginate Oligomers to Treat Infectious Microbial Biofilms. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 1.592 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #70 Diabetes Care in the Military. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 1.592 | 0.000 | 0.000 | 0.000 |
| Program #71 Evaluation of Integrative Approaches to Resilience. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 1.592 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #72 Neuro-Performance Research. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 1.592 | 0.000 | 0.000 | 0.000 |
| Program #73 Portable Low-Volume Therapy for Severe Blood Loss. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 1.592 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #74 Regenerative Medicine Research. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 1.592 | 0.000 | 0.000 | 0.000 |
| Program #75 Research to Develop Strategies to Improve Prognosis of Soldiers Suffering Abdominal Trauma. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base | | 0.000 | 1.592 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #76 Research to Treat Cancerous Brain Tumors using Neural Stem Cells. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 1.592 | 0.000 | 0.000 | 0.000 |
| Program #77 Lightweight Medical Devices. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 | | 0.000 | 1.592 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #78 Epigenetic Disease Research. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 1.592 | 0.000 | 0.000 | 0.000 |
| Program #79 Neuroprosthetics and BioMEMS Development Project. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 | | 0.000 | 1.592 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #80 Minimizing Shock in Battlefield Injuries. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 1.890 | 0.000 | 0.000 | 0.000 |
| Program #81 Jackson Health System Military Trauma Training Enhancement Initiative. This is a Congressional Interest Item. | | 0.000 | 1.989 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #82 Operating Room of the Future. This is a Congressional Interest Item. | | 0.000 | 1.990 | 0.000 | 0.000 | 0.000 |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | |
| Program #83 | | 0.000 | 1.990 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <p>School of Nursing Advancement. This is a Congressional Interest Item.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | | | | | |
| <p>Program #84</p> <p>Identification of New Drug Targets in Multi-Drug Resistant Bacterial Infections. This is a Congressional Interest Item.</p> <p><i>FY 2009 Accomplishments:</i> FY 2009</p> <p><i>FY 2010 Plans:</i> FY 2010</p> <p><i>Base FY 2011 Plans:</i> FY 2011 Base</p> <p><i>OCO FY 2011 Plans:</i> FY 2011 OCO</p> | | 0.000 | 1.990 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #85 Long-term Pain and Infection Management for Combat Casualt Care. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 2.308 | 0.000 | 0.000 | 0.000 |
| Program #86 Florida Trauma Rehabilitation Institute for Returning Military Personnel. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 2.386 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #87 Framework for Electronic Health Record-Linked Predictive Models. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 2.386 | 0.000 | 0.000 | 0.000 |
| Program #88 Understanding Blast-Induced Brain Injury. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 2.387 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #89 SupportNet for Frontline Providers. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 2.387 | 0.000 | 0.000 | 0.000 |
| Program #90 Center for Respiratory Biodefense. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 2.387 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #91 Advanced Bioengineering for Enhancement of Solider Survivability. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 2.487 | 0.000 | 0.000 | 0.000 |
| Program #92 Online Health Services Optimization. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 3.104 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #93 Imp Soldier Recovery from Catastrophic Bone Injury. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 3.183 | 0.000 | 0.000 | 0.000 |
| Program #94 Center for Advanced Emergency Response. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | 0.000 | 3.979 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB3: <i>MEDICAL TECHNOLOGY INITIATIVES (CA)</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | |
| | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| | Accomplishments/Planned Programs Subtotals | 105.592 | 114.679 | 0.000 | 0.000 | 0.000 |
| 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. | | | | | | |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | | | | PROJECT VB4: <i>SYSTEM BIOLOGY AND NETWORK SCIENCE TECHNOLOGY</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| VB4: <i>SYSTEM BIOLOGY AND NETWORK SCIENCE TECHNOLOGY</i> | 0.000 | 1.169 | 1.177 | 0.000 | 1.177 | 1.082 | 0.982 | 0.974 | 0.966 | 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 Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|---|----------------|----------------|---------------------|--------------------|----------------------|
| Program #1 Systems Biology: In FY09, this research is funded in project 878 under the Systems Biology and Network Science task. Conducted research to refine the new mathematical and computational methods that have identified gaps in network linkages (such as protein to protein networks). Explored whether protein-protein network models developed for a particular pathogen are portable to a different pathogen sharing a common set of proteins. In FY10, apply validated models to the identification of therapeutic candidates against common targets identified. In FY11, will establish lead candidate studies in appropriate model systems in preparation for candidate development. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 | 0.000 | 1.136 | 1.177 | 0.000 | 1.177 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | | PROJECT VB4: <i>SYSTEM BIOLOGY AND NETWORK SCIENCE TECHNOLOGY</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Program #2 Small Business Innovative Research/Small Business Technology Transfer Programs <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | 0.000 | 0.033 | 0.000 | 0.000 | 0.000 |
| Accomplishments/Planned Programs Subtotals | | | | 0.000 | 1.169 | 1.177 | 0.000 | 1.177 |
| C. Other Program Funding Summary (\$ in Millions) | | | | | | | | |
| N/A | | | | | | | | |
| D. Acquisition Strategy | | | | | | | | |
| N/A | | | | | | | | |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | DATE: February 2010 |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VB4: <i>SYSTEM BIOLOGY AND NETWORK SCIENCE TECHNOLOGY</i> |

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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Exhibit R-2A, PB 2011 Army RDT&E Project Justification **DATE:** February 2010

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| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VJ4: <i>SUICIDE PREVENTION/MITIGATION</i> |
|--|--|---|

| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
|---|----------------|------------------|-----------------------|----------------------|------------------------|------------------|------------------|------------------|------------------|------------------|------------|
| VJ4: <i>SUICIDE PREVENTION/MITIGATION</i> | 10.000 | 9.948 | 10.000 | 0.000 | 10.000 | 10.000 | 10.000 | 10.000 | 0.000 | 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 and to improve the overall mental health and behavioral function of Army personnel during and after their Army 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 Program (\$ in Millions)

| | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
|---|---------|---------|--------------|-------------|---------------|
| Program #1 In FY10 through FY11, conduct research to better understand the apparent increase in suicide deaths and nonfatal attempts among Active Duty Soldiers. Initiate epidemiological (population-based) studies to identify determinants of suicidal behaviors and potential modifiable risk factors. Begin the process to develop better methods for preventing suicidal behaviors based on data driven recommendations to mitigate or prevent suicidal behaviors. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 | 10.000 | 9.669 | 10.000 | 0.000 | 10.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | DATE: February 2010 | | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | | PROJECT VJ4: <i>SUICIDE PREVENTION/MITIGATION</i> | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | |
| | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Program #2 | | | | 0.000 | 0.279 | 0.000 | 0.000 | 0.000 |
| SBIR/STTR | | | | | | | | |
| <i>FY 2009 Accomplishments:</i> FY 2009 | | | | | | | | |
| <i>FY 2010 Plans:</i> FY 2010 | | | | | | | | |
| <i>Base FY 2011 Plans:</i> FY 2011 Base | | | | | | | | |
| <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | | |
| Accomplishments/Planned Programs Subtotals | | | | 10.000 | 9.948 | 10.000 | 0.000 | 10.000 |
| C. Other Program Funding Summary (\$ in Millions) | | | | | | N/A | | |
| D. Acquisition Strategy | | | | | | N/A | | |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | DATE: February 2010 |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT VJ4: <i>SUICIDE PREVENTION/MITIGATION</i> |

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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|--|-----------------------|-------------------------|------------------------------|--|-------------------------------|-------------------------|-------------------------|--|-------------------------|-------------------------|----------------------|
| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | | | | | | | DATE: February 2010 | | | |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | | | | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | | | | PROJECT X06: <i>HIBERNATION GENOMICS</i> | | | |
| COST (\$ in Millions) | FY 2009 Actual | FY 2010 Estimate | Base FY 2011 Estimate | OCO FY 2011 Estimate | Total FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate | FY 2014 Estimate | FY 2015 Estimate | Cost To Complete | Total Cost |
| X06: <i>HIBERNATION GENOMICS</i> | 1.994 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | Continuing | Continuing |
| A. Mission Description and Budget Item Justification | | | | | | | | | | | |
| These are Congressional Interest Items | | | | | | | | | | | |
| B. Accomplishments/Planned Program (\$ in Millions) | | | | | | | | | | | |
| | | | | | | | FY 2009 | FY 2010 | Base FY 2011 | OCO FY 2011 | Total FY 2011 |
| Program #1 Hibernation Genomics. This is a Congressional Interest Item. <i>FY 2009 Accomplishments:</i> FY 2009 <i>FY 2010 Plans:</i> FY 2010 <i>Base FY 2011 Plans:</i> FY 2011 Base <i>OCO FY 2011 Plans:</i> FY 2011 OCO | | | | | | | 1.994 | 0.000 | 0.000 | 0.000 | 0.000 |
| Accomplishments/Planned Programs Subtotals | | | | | | | 1.994 | 0.000 | 0.000 | 0.000 | 0.000 |

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| Exhibit R-2A, PB 2011 Army RDT&E Project Justification | | DATE: February 2010 |
| APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 2: <i>Applied Research</i> | R-1 ITEM NOMENCLATURE PE 0602787A: <i>MEDICAL TECHNOLOGY</i> | PROJECT X06: <i>HIBERNATION GENOMICS</i> |
| 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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