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| ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2 Exhibit) | DATE February 1999 |
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| BUDGET ACTIVITY 6 - Management and Support | PE NUMBER AND TITLE 0605604A Survivability/Lethality Analysis |
|---|--|

| COST <i>(In Thousands)</i> | FY1998 Actual | FY 1999 Estimate | FY 2000 Estimate | FY 2001 Estimate | FY 2002 Estimate | FY 2003 Estimate | FY2004 Estimate | FY2005 Estimate | Cost to Complete | Total Cost |
|--|------------------|---------------------|---------------------|---------------------|---------------------|---------------------|--------------------|--------------------|---------------------|------------|
| Total Program Element (PE) Cost | 30263 | 34131 | 30138 | 33916 | 34293 | 34404 | 37716 | 40214 | Continuing | Continuing |
| D670 Emerging Technology Systems | 4945 | 5698 | 3754 | 4276 | 4457 | 4638 | 4920 | 5310 | Continuing | Continuing |
| D671 Air Defense/Missile Defense Systems | 5550 | 5718 | 5341 | 5866 | 5272 | 5491 | 5877 | 6360 | Continuing | Continuing |
| D672 Aviation Systems | 3112 | 3138 | 2576 | 2784 | 2946 | 3049 | 3320 | 3598 | Continuing | Continuing |
| D675 Force XXI and C4I/IEW Systems | 4217 | 6962 | 9837 | 11299 | 11477 | 10657 | 12075 | 12444 | Continuing | Continuing |
| D677 Ground Combat Systems | 4862 | 6334 | 3927 | 4435 | 4646 | 4840 | 5452 | 5920 | Continuing | Continuing |
| D678 Munitions Systems | 5258 | 5554 | 4289 | 4798 | 5016 | 5229 | 5537 | 5992 | Continuing | Continuing |
| D679 Soldier Systems | 773 | 727 | 414 | 458 | 479 | 500 | 535 | 590 | Continuing | Continuing |
| D734 Survivability Evaluation | 1546 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1546 |

A. Mission Description and Budget Item Justification: This Program Element (PE) funds activities and functions to conduct objective and integrated survivability and lethality analyses (SLA) for all major and designated non-major Army systems. The analyses quantify the effects of electronic warfare (EW) and ballistic battlefield threats and meteorological conditions on Army individual soldiers and systems. This PE also funds vulnerability assessments of digitized systems for Force XXI.

The work is accomplished through threat research, theoretical and engineering analyses, signature measurements, modeling, simulations, laboratory experiments, and field investigations. Activities in progress include assessment of the effects of atmospheric, passive countermeasures, tactics, lasers, high-power microwave, electro-optical/radio frequency (EO/RF) jammers, electromagnetic environment effects (E3), information warfare (IW), decoys, and conventional ballistics on Army soldiers and systems. The PE work efforts provide U.S. Army decision makers, materiel and combat developers, system users, and independent evaluators critical soldier and system survivability analyses that quantify the soldier/system's survivability effectiveness in battlefield threat environments. Recommendations are provided to the materiel and combat developers on how to mitigate soldier/system deficiencies and enhance their survivability.

This PE funds civilian salaries, travel, development and maintenance of equipment and facilities, general management, administrative and contractor support required for program execution. The U.S. Army Research Laboratory (ARL) Survivability/Lethality Analysis Directorate (SLAD) conducts this effort.

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BUDGET ACTIVITY

6 - Management and Support

PE NUMBER AND TITLE

0605604A Survivability/Lethality Analysis

| B. Program Change Summary | <u>FY 1998</u> | <u>FY 1999</u> | <u>FY 2000</u> | <u>FY 2001</u> |
|---|----------------|----------------|----------------|----------------|
| Previous President's Budget (<u>FY 1999</u> PB) | 31308 | 30498 | 16363 | 18744 |
| Appropriated Value | 32330 | 34498 | | |
| Adjustments to Appropriated Value | | | | |
| a. Congressional General Reductions | -1022 | -367 | | |
| b. SBIR / STTR | -785 | | | |
| c. Omnibus or Other Above Threshold Reductions | -260 | | | |
| d. Below Threshold Reprogramming | | | | |
| e. Rescissions | | | | |
| Adjustments to Budget Years Since <u>FY 1999</u> PB | | | +13775 | +15172 |
| Current Budget Submit (<u>FY 2000 / 2001</u> PB) | 30263 | 34131 | 30138 | 33916 |

Change Summary Explanation:

- Funding - FY 1999 Funds (+4000) – congressional funding increase provides vulnerability assessments of First Digitized Division
- Funding - FY 2000 Funds (+7167) - funding continues electronic warfare vulnerability analysis of major and designated non-major Army systems.
 - (+3000) - funding provides for information warfare vulnerability assessments of C4I systems in the First Digitized Division.
 - (+3000) - funding provides chemical/biological/nuclear survivability analysis for U.S. Army systems.
- Funding - FY 2001 Funds (+7323) - funding continues electronic warfare vulnerability analysis of major and designated non-major Army systems.
 - (+4000) - funding provides for information warfare vulnerability assessments of C4I systems in the First Digitized Division.
 - (+3000) - funding provides chemical/biological/nuclear survivability analysis for U.S. Army systems.

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| BUDGET ACTIVITY 6 - Management and Support | PE NUMBER AND TITLE 0605604A Survivability/Lethality Analysis | PROJECT D670 |
|--|---|------------------------|

| COST (In Thousands) | FY1998 Actual | FY 1999 Estimate | FY 2000 Estimate | FY 2001 Estimate | FY 2002 Estimate | FY 2003 Estimate | FY2004 Estimate | FY2005 Estimate | Cost to Complete | Total Cost |
|----------------------------------|---------------|------------------|------------------|------------------|------------------|------------------|-----------------|-----------------|------------------|------------|
| D670 Emerging Technology Systems | 4945 | 5698 | 3754 | 4276 | 4457 | 4638 | 4920 | 5310 | Continuing | Continuing |

Mission Description and Justification: This project performs integrated survivability/lethality analyses for the category of systems which include Horizontal Technology Integration systems, Advanced Technology Demonstration initiatives, and proposed survivability enhancements to weapon platforms. Survivability deficiencies are identified, and recommendations are made to Program Executive Officers and Program Managers (PEOs/PMs) to provide hardening fixes early in program development. Work is accomplished through threat research, theoretical and engineering analyses, laboratory experiments, models, simulations, and field investigations. This effort also supports HQDA, independent evaluators, and PEOs/PMs with technical expertise in electronic warfare (EW), ballistics, and meteorology to conduct special studies and to support Test Integration Working Groups (TIWGs), weapon system program reviews, acquisition documentation reviews, and Government testers. This project also provides oversight of the Army's Electromagnetic Environmental Effects (E3) Program. Horizontal Technology Integration systems include 2nd Generation FLIR (2nd GEN FLIR), Battlefield Combat Identification System (BCIS), Global Positioning System (GPS), and Enhanced Position Location Reporting System (EPLRS). Advanced Technology Demonstration initiatives include Hit Avoidance, Precision Guided Mortar Munition, Tank Extended Range Munition, Tactical Command and Control Protect (TCCP), Guided Multiple Launch Rocket System (MRLS) and Future Scout and Cavalry System (FSCS). Proposed survivability enhancements to weapon platforms include advanced armament technologies, defensive aide suites (DAS), missile countermeasure devices (MCD), emerging propellant technologies, advanced propulsion systems, advanced electronics, and improved spall liners in combat vehicles.

FY 1998 Accomplishments:

- 2512 Performed integrated EW survivability and lethality investigations and analyses of emerging technology systems, including performance predictions of hit avoidance concepts (laser/missile warning receivers, decoys, obscurants) and the effect of obscured atmosphere on the propagation of missile plume signatures for defensive aided suites, and recommendations for Electronic Counter-Countermeasure (ECCM) enhancements. Supported the Army's E3 program, and provided E3 shielding implications for composite materials for a ground system in development.
 - 1328 Performed ballistic effects investigations and survivability/lethality analyses of emerging technology systems, including the residual aerodynamic and structural properties of damaged composite rotary blades, the residual performance of novel vehicle drive trains and electro-optical components, blast effects of select mines, and vulnerabilities with Army's air fleet's transition to JP-8 fuel.
 - 1105 Provided engineering-based predictions of chemical and biological warfare contamination and decontamination and dirty battlefield conditions to support integrated survivability/lethality analyses of emerging technology systems and horizontal technology applications. Completed model to predict chemical infiltration hazards to crew and equipment inside a combat vehicle, and predict the effects of chemical agents and decontaminates on materials to obviate the need for testing all new candidate materials.
- Total 4945

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| BUDGET ACTIVITY 6 - Management and Support | PE NUMBER AND TITLE 0605604A Survivability/Lethality Analysis PROJECT D670 | |
| FY 1999 Planned Program: | | |
| • | 2893 | Conduct EW vulnerability investigations and analyses to support integrated survivability and lethality analyses of advanced 2nd and 3rd generation emerging technology and horizontal technology applications. Prepare interim survivability analysis reports. |
| • | 1463 | Perform ballistic effects investigations and survivability/lethality analyses of candidate emerging technologies most influential on future system designs, including advanced armors (such as active protection systems), advanced armaments (such as electric armaments and Electro thermal chemical), advanced propellants, and advanced vehicle propulsion. Prepare interim survivability analysis reports. |
| • | 1249 | Conduct vulnerability analysis of Army's digitized battlefield systems to radio frequency (RF) weapons. Identify possible countermeasure to threat RF weapons. Support the Army E3 program, and expand E3 predictive capabilities for other composite materials. |
| • | 93 | Small Business Innovative Research/Small Business Technology Transfer Programs |
| Total | 5698 | |
| FY 2000 Planned Program: | | |
| • | 1500 | Continue EW vulnerability investigations and analyses to support integrated survivability and lethality analyses of advanced 2nd and 3rd generation emerging technology and horizontal technology applications. Prepare survivability analysis reports. |
| • | 1400 | Perform ballistic effects investigations and survivability/lethality analyses of candidate emerging technologies most influential on future system designs, including advanced armors (such as active protection systems), advanced armaments (such as electric armaments and electro-thermal chemical), advanced propellants, and advanced vehicle propulsion. Investigate Advanced KE Cartridge, and Precision Guided Mortar Munition. |
| • | 854 | Continue vulnerability analysis of Army's digitized battlefield systems to radio frequency (RF) weapons. Identify possible countermeasure to threat RF weapons. Expand E3 predictive capabilities for new materials and out year threats. Support Army E3 program. |
| Total | 3754 | |
| FY 2001 Planned Program: | | |
| • | 1650 | Perform ballistic effects investigations and survivability/lethality analyses of emerging technologies and support ballistic vulnerability and lethality studies of Armor and Munition ATDs. |
| • | 990 | Support analysis of Army's ability to protect modern commercial based tactical information networks, components and data though TCCP. Analyze digitized battlefield systems to radio frequency (RF) weapons. Support Army E3 program. |
| • | 1636 | Perform integrated EW survivability and lethality investigations and analyses of emerging technology systems, including performance predictions of new hit avoidance concepts. |
| Total | 4276 | |
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|---|---------------|------------------|--------------------|--|------------------|------------------|----------------------------|-----------------------|------------------|------------|
| BUDGET ACTIVITY 6 - Management and Support | | | | PE NUMBER AND TITLE 0605604A Survivability/Lethality Analysis | | | | PROJECT D671 | | |
| COST (In Thousands) | FY1998 Actual | FY 1999 Estimate | FY 2000 Estimate | FY 2001 Estimate | FY 2002 Estimate | FY 2003 Estimate | FY2004 Estimate | FY2005 Estimate | Cost to Complete | Total Cost |
| D671 Air Defense/Missile Defense Systems | 5550 | 5718 | 5341 | 5866 | 5272 | 5491 | 5877 | 6360 | Continuing | Continuing |
| <p>Mission Description and Justification: This project provides the survivability/lethality analysis of U.S. Army air defense and missile defense systems to battlefield threats and recommends fixes to improve their battlefield survivability. The results are used by each Project Manager (PM) and the Program Executive Officer (PEO) to direct weapon system development efforts and structure product improvement programs; by the independent evaluator when they provide system evaluations in support of milestone decisions; by the user to develop survivability/lethality requirements, doctrine and tactics; and by decision makers in formulating program/production decisions. Anti-Radiation Missile (ARM) Counter-Arm efforts assess threat technologies against THAAD and National Missile Defense (NMD), PATRIOT, Medium Extended Air Defense System (MEADS), and FAAD-C21 ground based sensors. Also funds salaries, travel, equipment/facilities, and management/administrative support needed to execute the program.</p> <p>FY 1998 Accomplishments:</p> <ul style="list-style-type: none"> • 3507 Conducted electronic warfare vulnerability/survivability analysis and assessment of U.S. Army air defense and missile defense systems that are in development, undergoing P3I, or have been recently fielded to include PATRIOT, MEADS, Stinger, GBS, THAAD, and NMD. • 713 Conducted chemical, biological, nuclear, and atmospheric effects survivability analysis for U.S. Army air defense and missile defense systems. • 955 Conducted ballistic survivability/lethality analysis for U.S. Army air defense and missile defense systems. • 375 Provided integrated survivability/lethality analyses to support scheduled air defense/missile defense program decision milestones in FY 98. <p>Total 5550</p> <p>FY 1999 Planned Program:</p> <ul style="list-style-type: none"> • 3478 Conduct electronic warfare vulnerability assessments for developmental U.S. Army air defense and missile defense systems, pre-planned product improvements of current systems, and recently fielded systems. Provide interim susceptibility reports. Recommend ECCM enhancements. Complete PATRIOT PAC-3 MSIII ECCM Assessment Support THAAD/NMD Radar HWIL Simulation ECM Investigations. Develop a THAAD System MSII Integrated Survivability/Lethality Assessment. Conduct NMD Radar Far-Term Threat Analysis. • 900 Conduct chemical, biological, nuclear, and atmospheric effects survivability analysis for U.S. Army air defense and missile defense systems. • 950 Conduct ballistic survivability/lethality analysis for U.S. Army air defense and missile defense systems. Perform Stinger Block 2 Lethality Analysis. • 300 Provide integrated survivability/lethality analyses to support scheduled air defense/missile defense program decision milestones in FY 99. Develop MEADS multi-year survivability strategy. • 90 Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs <p>Total 5718</p> | | | | | | | | | | |
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| BUDGET ACTIVITY 6 - Management and Support | | February 1999 |
| PE NUMBER AND TITLE 0605604A Survivability/Lethality Analysis | | PROJECT D671 |
| FY 2000 Planned Program: | | |
| • | 2491 | Provide strawman ECM parameters in support of PATRIOT post-MS III missile countermeasures experiments. Provide ECCM performance analysis of PACM risk reduction program. Support NMD ECM Analysis. Support THAAD Radar ECM Field Investigations. Conduct electronic warfare vulnerability assessments for other developmental U.S. Army air defense and missile defense systems, pre-planned product improvements of current systems, and recently fielded systems. Provide interim susceptibility reports. Recommend ECCM enhancements. |
| • | 500 | Conduct ballistic survivability/lethality analysis for U.S. Army air defense and missile defense systems. |
| • | 1500 | Complete PATRIOT MS III integrated survivability/lethality assessment. Support Sentinel P3I program. Develop NMD Integrated survivability/lethality assessment for deployment review. |
| • | 500 | Focal Plane Array Countermeasures (FPACM) (Partner: United Kingdom): Characterize and assess advanced focal plane array missile seekers and develop electronic countermeasures (ECM) to defeat them through simulation, modeling and lab testing. |
| • | 350 | Electronic Countermeasures (ECM) Simulation – Common Set (Partner: Australia): Develop a common set of ECM simulations for investigating the EW effects on specific threat missile systems. Develop methodologies to evaluate ECM against infrared, electro-optical, and radio frequency-guided missiles to determine degradation. |
| Total | 5341 | |
| FY 2001 Planned Program: | | |
| • | 2758 | Analyze ECM experiments in support of PATRIOT post-MS III missile countermeasures experiments. Support MEADS ECM analysis. Conduct THAAD BMC4I IW Countermeasure Investigations. Conduct electronic warfare vulnerability assessments for other developmental U.S. Army air defense and missile defense systems, pre-planned product improvements of current systems, and recently fielded systems. Provide interim susceptibility reports. Recommend ECCM enhancements. |
| • | 800 | Conduct ballistic survivability/lethality analysis for U.S. Army air defense and missile defense systems. |
| • | 1458 | Complete NMD Integrated survivability/lethality assessment for deployment final review. Provide survivability support to PATRIOT post-MS III growth program. Complete survivability analysis for Sentinel P3I program. |
| • | 500 | Focal Plane Array Countermeasures (FPACM) (Partner: United Kingdom): Continue characterization and assessment of advanced focal plane array missile seekers and develop electronic countermeasures (ECM) to defeat them through simulation, modeling and lab testing. |
| • | 350 | Electronic Countermeasures (ECM) Simulation – Common Set (Partner: Australia): Develop a common set of ECM simulations for investigating the EW effects on specific threat missile systems. Develop methodologies to evaluate ECM against infrared, electro-optical, and radio frequency-guided missiles to determine degradation. |
| Total | 5866 | |
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| BUDGET ACTIVITY 6 - Management and Support | | | | PE NUMBER AND TITLE 0605604A Survivability/Lethality Analysis | | | | | PROJECT D672 | |
| COST (In Thousands) | FY1998 Actual | FY 1999 Estimate | FY 2000 Estimate | FY 2001 Estimate | FY 2002 Estimate | FY 2003 Estimate | FY2004 Estimate | FY2005 Estimate | Cost to Complete | Total Cost |
| D672 Aviation Systems | 3112 | 3138 | 2576 | 2784 | 2946 | 3049 | 3320 | 3598 | Continuing | Continuing |
| <p>Mission Description and Justification: Project investigates the Survivability/Lethality/Vulnerability (SLV) of Army aviation systems to battlefield threats. Aircraft SLV deficiencies are identified and hardening recommendations identified as appropriate. SLV analysis directly supports major decision milestone reviews, acquisition documentation, test and evaluation master plans, and cost/operational effectiveness analyses.</p> <p>FY 1998 Accomplishments:</p> <ul style="list-style-type: none"> • 1776 Performed electronic warfare vulnerability analysis and assessment of U.S. Army aviation systems and aviation support equipment to include: AH-64D Longbow Apache; RAH-66 Comanche; Suite of Integrated RF Countermeasures; Suite of Integrated IR Countermeasures. • 663 Completed ballistic survivability/lethality analysis of UH-60Q Ambulance and Comanche. Conducted ballistic vulnerability analysis of Improved Cargo Helicopter (ICH). • 673 Conducted the chemical, biological, nuclear, and atmospheric effects survivability analysis for Comanche and Longbow Apache. <p>Total 3112</p> <p>FY 1999 Planned Program:</p> <ul style="list-style-type: none"> • 1614 Continue electronic warfare vulnerability assessment for aviation systems and aviation support equipment that are in development, undergoing P3I, or have been recently fielded, including AH-64D Longbow Apache, RAH-66 Comanche, CH-47D Chinook, Suite of Integrated RF Countermeasures, and Suite of Integrated IR Countermeasures. Provide susceptibility reports. Provide electronic counter-countermeasures recommendations. • 798 Conduct the ballistic survivability/lethality analysis for Comanche and ICH. • 681 Complete chemical, biological, nuclear, and atmospheric effects survivability analysis for Comanche and aviation support systems. • 45 Small Business Innovative Research/Small Business Technology Transfer Programs <p>Total 3138</p> <p>FY 2000 Planned Program:</p> <ul style="list-style-type: none"> • 726 Continue electronic warfare vulnerability assessment for aviation systems and aviation support equipment that are in development, undergoing P3I, or have been recently fielded, including AH-64D Longbow Apache, RAH-66 Comanche, CH-47D Chinook. Provide electronic counter-countermeasures recommendations. Conduct E3 analysis of Suite of Radio Frequency Counter Measures (SIRFC). Perform SIRFC CM/CCM analysis in support of DT and OT. Conduct E3 analysis for Suite of Infra-red counter measures (SIIRCM). Conduct laser jamming susceptibility analysis of system sensors and jam head. | | | | | | | | | | |
| Project D672 | Page 7 of 18 Pages | | | | | Exhibit R-2A (PE 0605604A) | | | | |

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| BUDGET ACTIVITY | | February 1999 |
| 6 - Management and Support | PE NUMBER AND TITLE | PROJECT |
| | 0605604A Survivability/Lethality Analysis | D672 |
| FY 2000 Planned Program: (continued) | | |
| • | 1750 | Conduct Kiowa Warrior LFT& E survivability programs for Phases IB, IC, ID, IE, & II and prepare experiment and modeling reports. Develop target descriptions and perform ballistic vulnerability analysis of four configurations of the Improved Cargo helicopter and compare with the CH-47D. Continue support for Improved Cargo Helicopter LFT&E (damage assessments, pre-shot predictions, post-shot analyses, and input to independent evaluation). |
| • | 100 | Perform MANPRINT SIRFC Solder Survivability (SSv) analysis and prepare domain report. |
| Total | 2576 | |
| FY 2001 Planned Program: | | |
| • | 934 | Continue electronic warfare vulnerability assessment for aviation systems and aviation support equipment that are in development, undergoing P3I, or have been recently fielded. |
| • | 1850 | Continue development of target descriptions and perform ballistic vulnerability analysis of four configurations of the Improved Cargo Helicopter and compare with the CH-47D. Continue Kiowa LFT&E support and finalize report for Phase II. Continue support for Improved Cargo Helicopter LFT&E (experiments, damage assessments, preshot predictions, postshot analyses, and input to independent evaluation). |
| Total | 2784 | |
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| BUDGET ACTIVITY 6 - Management and Support | PE NUMBER AND TITLE 0605604A Survivability/Lethality Analysis | PROJECT D675 |
|--|---|------------------------|

| COST (<i>In Thousands</i>) | FY1998 Actual | FY 1999 Estimate | FY 2000 Estimate | FY 2001 Estimate | FY 2002 Estimate | FY 2003 Estimate | FY2004 Estimate | FY2005 Estimate | Cost to Complete | Total Cost |
|------------------------------------|------------------|---------------------|---------------------|---------------------|---------------------|---------------------|--------------------|--------------------|---------------------|------------|
| D675 Force XXI and C4I/IEW Systems | 4217 | 6962 | 9837 | 11299 | 11477 | 10657 | 12075 | 12444 | Continuing | Continuing |

Mission Description and Justification: Supports survivability analysis, information warfare, and information operations of Army communications, electronic equipment and Digitized Force against friendly and enemy threats. Provides field threat environment support for Electronic Warfare Vulnerability Analysis (EWVA). Analyzes vulnerabilities of foreign threat weapons and command, control, communications, computers and intelligence (C4I) and Intelligence Electronic Warfare (IEW) systems to U.S. Army EW systems. Provides threat weapon electronic design data to countermeasure developers and technical capability information to the intelligence community. Supports Army initiatives in vulnerability reduction of C4I/IEW systems against battlefield threats, including information warfare. Provides analysis for understanding potential vulnerabilities of digitized Force XXI developmental systems. Supports Army Warfighting Experiments and associated Information Operations Vulnerability Assessments for Force XXI Architecture.

FY 1998 Accomplishments:

- 1915 Conducted integrated electronic, ballistic, and chemical/biological/nuclear/atmospheric effects survivability analysis for U.S. Army command and control systems. Conducted information operations vulnerability analysis. This effort supports the Advanced Field Artillery Tactical Data System, Common Hardware and Software, Maneuver Control System, FAAD-C2I, Standard Integrated Command Post Shelter, All Source Analysis System, Combat Service Support Control System and FBCB2 (Applique).
 - 1400 Conducted integrated electronic, ballistic, and chemical/biological/nuclear/atmospheric effects survivability analysis for U.S. Army communications systems such as SINCGARS, EPLRS, GPS, Mobile Subscriber Equipment, Single Channel Anti-jam Man Portable radio, Secure Mobile Anti-jam Reliable Tactical Terminal, and the Near Term Digital Radio.
 - 702 Conducted integrated electronic, ballistic, and chemical/biological/nuclear/atmospheric effects survivability analysis for U.S. Army IEW systems such as the BCIS, Joint Surveillance Target Attack Radar System/Ground Station Module and 2nd Generation FLIR enhanced Firefinder radar.
 - 200 Provided integrated survivability/lethality analyses to support scheduled C4I/IEW systems program decision milestones in FY 98.
- Total 4217

FY 1999 Planned Program:

- 1506 Conduct integrated electronic, ballistic, and chemical/biological/nuclear/atmospheric effects survivability analysis for U.S. Army command and control systems. Conduct information operations vulnerability analysis. This effort supports the Advanced Field Artillery Tactical Data System, Common Hardware and Software, Maneuver Control System, FAAD-C2I, Standard Integrated Command Post Shelter, All Source Analysis System, Combat Service Support Control System, and FBCB2 (Applique).

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| | | PROJECT D675 |
| <ul style="list-style-type: none"> • 3000 | Conduct Radio Frequency Directed Energy (RFDE) vulnerability assessments on computer/communication systems of the First Digitized Division (FDD). Conduct IO vulnerability assessments against hackers, malicious codes, unauthorized users, etc., on critical command, control, communications, computers and intelligence (C4I) systems supporting FDD. Provide recommendations to mitigate susceptibilities/vulnerabilities | |
| FY 1999 Planned Program: (continued) encountered during IO vulnerability investigations. Build database of results. Establish the technical core capability and initiate development of a prototype IO vulnerability assessment (IOVA) tool/model for conducting IOVA's of system and systems of systems supporting the FDD. The IOVA tool is founded in a Decision Related Structures (DRS) environment which addresses vulnerabilities in the context of data/information that directly influences the decision making process. | | |
| <ul style="list-style-type: none"> • 1405 | Conduct integrated electronic, ballistic, and chemical/biological/nuclear/atmospheric effects survivability analysis for U.S. Army communications systems such as Mobile Subscriber Equipment, Single Channel Anti-jam Man Portable radio, Secure Mobile Anti-jam Reliable Tactical Terminal, and the Near Term Digital Radio. | |
| <ul style="list-style-type: none"> • 776 | Conduct integrated electronic, ballistic, and chemical/biological/nuclear/atmospheric effects survivability analysis for U.S. Army IEW systems such as the BCIS, Joint Surveillance Target Attack Radar System/Ground Station Module, and enhanced Firefinder radar. | |
| <ul style="list-style-type: none"> • 147 | Provide integrated survivability/lethality analyses to support scheduled C4I/IEW systems program decision milestones in FY 99. | |
| <ul style="list-style-type: none"> • 128 | Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs | |
| Total | 6962 | |
| FY 2000 Planned Program: | | |
| <ul style="list-style-type: none"> • 2515 | Conduct integrated electronic and ballistic effects survivability analysis for U.S. Army command and control systems. Conduct information operations vulnerability analysis. This effort supports the Advanced Field Artillery Tactical Data System, Common Hardware and Software, Maneuver Control System, FAAD-C2I, All Source Analysis System, Combat Service Support Control System, FBCB2 (Applique), and A2C2S, and AMPS. | |
| <ul style="list-style-type: none"> • 2028 | Conduct integrated electronic and information operations vulnerability analysis for U.S. Army communications systems such as Mobile Subscriber Equipment, Single Channel Anti-jam Man Portable radio, Secure Mobile Anti-jam Reliable Tactical Terminal, the Near Term Digital Radio, ARC-220, and SINCGARS ASIP, EPLR-VHSIC, SPITFIE, GBS, and ISYSCON. | |
| <ul style="list-style-type: none"> • 2294 | Conduct integrated electronic and ballistic effects survivability analysis for U.S. Army IEW systems such as the BCIS, CIDDS, IEWCCS, ETLOS, enhanced Firefinder radar, TROJAN SPIRIT, and COCS-H. Conduct information operations vulnerability analysis for these systems. | |
| <ul style="list-style-type: none"> • 3000 | Conduct integrated chemical/biological/nuclear/atmospheric effects survivability analysis for U.S. Army systems. | |
| Total | 9837 | |
| FY 2001 Planned Program: | | |

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| <ul style="list-style-type: none"> • 2995 • 2656 FY 2001 Planned Program: (Continued) • 1648 • 1000 • 3000 Total | <ul style="list-style-type: none"> Conduct integrated electronic and ballistic effects survivability analysis for U.S. Army command and control systems. Conduct information operations vulnerability analysis. This effort supports the Advanced Field Artillery Tactical Data System, Common Hardware and Software, Maneuver Control System, FAAD-C2I, All Source Analysis System, Combat Service Support Control System, FBCB2 (Applique), and A2C2S, and AMPS. Conduct integrated electronic and information operations vulnerability analysis for U.S. Army communications systems such as Mobile Subscriber Equipment, Single Channel Anti-jam Man Portable radio, Secure Mobile Anti-jam Reliable Tactical Terminal, the Near Term Digital Radio, ARC-220, and SINCGARS ASIP, EPLR-VHSIC, SPITFIE, GBS, and ISYSCON. Conduct integrated electronic and ballistic effects survivability analysis for U.S. Army IEW systems such as the BCIS, CIDDS, IEWCCS, ETLOS, enhanced Firefinder radar, TROJAN SPIRIT, and COCS-H. Conduct information operations vulnerability analysis for these systems. Conduct integrated information operations vulnerability analysis for First Digitized Corp weapon systems connected via the Tactical Internet: C2V, M1A2 SEP, AH-64-D, M2A3, Paladin, Linebacker, Wolverine, OH-58D, Avenger, and Land Warrior. Conduct integrated chemical/biological/nuclear/atmospheric effects survivability analysis for U.S. Army systems. | |
| <p>Project D675</p> | <p align="center"><i>Page 11 of 18 Pages</i></p> | <p align="right">Exhibit R-2A (PE 0605604A)</p> |

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| ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit) | | | | | | | | DATE February 1999 | | | |
|---|-----------------------|------------------|---------------------|---|---------------------|---------------------|---------------------|----------------------------|------------------------|---------------------|------------|
| BUDGET ACTIVITY 6 - Management and Support | | | | PE NUMBER AND TITLE 0605604A Survivability/Lethality Analysis | | | | | PROJECT D677 | | |
| COST (In Thousands) | | FY1998 Actual | FY 1999 Estimate | FY 2000 Estimate | FY 2001 Estimate | FY 2002 Estimate | FY 2003 Estimate | FY2004 Estimate | FY2005 Estimate | Cost to Complete | Total Cost |
| D677 | Ground Combat Systems | 4862 | 6334 | 3927 | 4435 | 4646 | 4840 | 5452 | 5920 | Continuing | Continuing |
| <p>Mission Description and Justification: Project investigates the survivability and vulnerability of Army ground combat systems to battlefield threats. Analysis will support weapon requirements, test and evaluation master plans, cost/operational effectiveness analysis, and major milestone decisions.</p> <p>FY 1998 Accomplishments:</p> <ul style="list-style-type: none"> • 1234 Conducted integrated electronic warfare vulnerability analysis and assessment of U.S. Army ground combat systems – Future Scout Cavalry System, Crusader, Bradley A3, Command and Control Vehicle, ABRAMS M1A2, Grizzly and Wolverine. Provided interim susceptibility reports. Recommend EW survivability enhancements. • 2030 Conducted the ballistic survivability/lethality analysis for U.S. Army ground combat systems. • 1340 Conducted the chemical, biological, nuclear, and atmospheric effects survivability analysis for U.S. Army ground combat systems. • 258 Provided integrated survivability/lethality analyses to support scheduled ground combat systems program decision milestones in FY 98. <p>Total 4862</p> <p>FY 1999 Planned Program:</p> <ul style="list-style-type: none"> • 1410 Conduct the electronic warfare vulnerability assessment for U.S. Army ground combat systems such as Crusader, Bradley A3, Command and Control Vehicle, ABRAMS 2000, Breacher. • 2146 Conduct the ballistic survivability/lethality analysis for U.S. Army ground combat systems (Abrams, Bradley, and Wolverine). • 1405 Conduct the chemical, biological, nuclear, and atmospheric effects survivability analysis for U.S. Army ground combat systems. • 270 Provide integrated survivability/lethality analyses to support scheduled ground combat systems program decision milestones in FY 99. • 1000 Conduct IO vulnerability assessments against hackers, malicious codes, unauthorized users, etc., on weapon platform systems supporting FDD. • 103 Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs <p>Total 6334</p> <p>FY 2000 Planned Program:</p> <ul style="list-style-type: none"> • 1240 Continue analytical support for Crusader survivability detailed design, development and fabrication of prototype vehicles. • 1927 Perform HMMWV II ballistic vulnerability analysis/vulnerability reduction on selected components. Perform Future Combat System (FCS) ballistic vulnerability assessments on selected concepts. Support Abrams Live Fire Test and Evaluation (LFT&E) including damage assessments, post shot analyses and input to Independent Evaluation. Conduct Grizzly LFT&E Pre-Shot Predictions. Support Future Scout and Cavalry System (FSCS) | | | | | | | | | | | |
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| BUDGET ACTIVITY 6 - Management and Support | PE NUMBER AND TITLE 0605604A Survivability/Lethality Analysis | |
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| FY 2000 Planned Program: (continued) | | |
| Ballistic survivability TRAC modeling effort. Support FSCS Ballistic survivability AMSAA Item Level Performance Analysis. Conduct Wolverine analyses of vulnerabilities in non-ballistic areas. Conduct Wolverine E3 Analysis. | | |
| • 360 | Provide FCS analyses which supports technology development (APS, Advanced. Armaments, Advanced Vehicle Propulsion Systems, Advanced Armor). | |
| • 300 | Provide integrated survivability/lethality analyses to support scheduled ground combat systems program decision milestones in FY 00 (i.e. C2V, Bradley A3). | |
| • 100 | Conduct Wolverine and Crusader Soldier Survivability (SSv) Assessment. | |
| Total | 3927 | |
| FY 2001 Planned Program: | | |
| • 1235 | Continue the electronic warfare vulnerability assessment for U.S. Army ground combat systems as Crusader, Bradley A3, Command and Control Vehicle (C2V), and Breacher. | |
| • 2850 | Conduct the ballistic survivability/lethality analysis for U.S. Army ground combat systems. Initiate Crusader LFT&E support. Support Abrams LFT&E (damage assessments, post shot analyses and input to Independent Evaluation). Conduct Grizzly damage assessments of LFT shorts and provide post Shot analyses. | |
| • 350 | Provide integrated survivability/lethality analyses to support scheduled ground combat systems program decision milestones in FY01. | |
| Total | 4435 | |

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| BUDGET ACTIVITY 6 - Management and Support | | | | PE NUMBER AND TITLE 0605604A Survivability/Lethality Analysis | | | | PROJECT D678 | | |
| COST <i>(In Thousands)</i> | FY1998 Actual | FY 1999 Estimate | FY 2000 Estimate | FY 2001 Estimate | FY 2002 Estimate | FY 2003 Estimate | FY2004 Estimate | FY2005 Estimate | Cost to Complete | Total Cost |
| D678 Munitions Systems | 5258 | 5554 | 4289 | 4798 | 5016 | 5229 | 5537 | 5992 | Continuing | Continuing |
| <p>Mission Description and Justification: This project funds the investigation of the lethality/vulnerability of Army fire support smart weapons (smart and conventional) to battlefield threats. The analysis is integrated across all battlefield threats, i.e., conventional ballistic, electronic warfare, and directed energy. This work is accomplished through theoretical and engineering analyses, signature measurements, modeling, simulations, laboratory experiments, and field investigations.</p> <p>FY 1998 Accomplishments:</p> <ul style="list-style-type: none"> • 2524 Conducted the electronic warfare vulnerability assessment for developmental U.S. Army munitions systems and any associated P3I. Conducted electronic warfare countermeasure analysis/support for U.S. Army munitions to include Follow On To TOW, MSTAR, Precision Guided Mortar Munition (PGMM), and EFOG-M. • 1114 Conducted the ballistic survivability/lethality analysis for U.S. Army munitions systems. • 1220 Conducted the chemical, biological, nuclear, and atmospheric effects survivability analysis for U.S. Army munitions systems. • 400 Provided integrated survivability/lethality analyses to support scheduled munitions systems program decision milestones in FY 98. <p>Total 5258</p> <p>FY 1999 Planned Program:</p> <ul style="list-style-type: none"> • 2497 Conduct electronic warfare vulnerability assessments for advanced developmental U.S. Army conventional and smart munition systems and any associated pre-planned product improvement programs. Conduct electronic warfare vulnerability analysis/support for U.S. Army munition systems to include BAT/IBAT, TOW 2B P3I, WAM PIP, and Tank Extended Range Munition (TERM). • 2471 Conduct ballistic survivability/lethality analysis for advanced developmental U.S. Army conventional and smart munition systems to include BAT/IBAT, SADARM, TERM, Javelin, Guided MLRS, SuperDragon, M829 and any associated pre-planned product improvement programs. • 500 Provide integrated survivability/lethality analyses to support scheduled munitions systems program decision milestones in FY 99. • 86 Small Business Innovative Research/Small Business Technology Transfer Programs <p>Total 5554</p> <p>FY 2000 Planned Program:</p> <ul style="list-style-type: none"> • 2229 Conduct electronic warfare vulnerability assessments for advanced developmental U.S. Army conventional and smart munition systems and any associated pre-planned product improvement programs. Conduct electronic warfare vulnerability analysis/support for U.S. Army munition systems such as Army Tactical Missile System (ATACMS) with smart payloads such as BAT/IBAT, TOW 2B P3I, WAM PIP, and TERM. | | | | | | | | | | |
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| ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit) | | DATE |
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| BUDGET ACTIVITY | PE NUMBER AND TITLE | PROJECT |
| 6 - Management and Support | 0605604A Survivability/Lethality Analysis | D678 |
| FY 2000 Planned Program: (continued) | | |
| • | 1610 | Conduct ballistic survivability/lethality analysis for U.S. Army munition systems to include BAT/IBAT, TERM, Guided MLRS and M829 and any associated pre-planned product improvement programs. |
| • | 450 | Provide integrated survivability/lethality analyses to support scheduled munition systems program decision milestones during FY00. |
| Total | 4289 | |
| FY 2001 Planned Program: | | |
| • | 1982 | Conduct electronic warfare vulnerability assessments for developmental U.S. Army munition systems such as ATACMS with smart payloads such as BAT/IBAT, TOW 2B P3I, WAM PIP and TERM. |
| • | 1242 | Conduct ballistic survivability/lethality analysis for U.S. Army munition systems to include BAT/IBAT, TERM, Guided MLRS and M829. |
| • | 1062 | Conduct chemical, biological and atmospheric effects survivability analysis for U.S. Army munition systems. |
| • | 512 | Provide integrated survivability/lethality analyses to support scheduled munition systems program decision milestones during FY01. |
| Total | 4798 | |
| Project D678 | Page 15 of 18 Pages | Exhibit R-2A (PE 0605604A) |

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| ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit) | | | | | | | | DATE February 1999 | | |
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| BUDGET ACTIVITY 6 - Management and Support | | | | PE NUMBER AND TITLE 0605604A Survivability/Lethality Analysis | | | | PROJECT D679 | | |
| COST (In Thousands) | FY1998 Actual | FY 1999 Estimate | FY 2000 Estimate | FY 2001 Estimate | FY 2002 Estimate | FY 2003 Estimate | FY2004 Estimate | FY2005 Estimate | Cost to Complete | Total Cost |
| D679 Soldier Systems | 773 | 727 | 414 | 458 | 479 | 500 | 535 | 590 | Continuing | Continuing |
| <p>Mission Description and Justification: Supports individual-soldier related programs and material to maximize survivability and functionality under severe combat environments of electronic and information warfare, countermeasures, directed energy and ballistics. Provides for technical investigations and analyses into the survivability of soldiers in various combat environments with many types of equipment. Provides administration of the MANPRINT Soldier Survivability (SSv) Domain. Broad areas addressed by SSv are: fratricide reduction; soldier detectability reduction; attack prevention if detected; damage prevention; medical injury reduction; the reduction of mental and physical fatigue. The survivability of soldier systems is investigated and reported to milestone decision reviews.</p> <p>FY 1998 Accomplishments:</p> <ul style="list-style-type: none"> • 494 Conducted integrated electronic, ballistic, and chemical/biological/nuclear/atmospheric effects survivability analysis for the U.S. Army Land Warrior and Air Warrior Systems (Computer and Communication System, Weapon System, Protective Clothing and Individual Equipment, Chemical/Biological Mask, and Integrated Headgear), Force XXI Land Warrior ACTD components, the Mounted Warrior System and Military Operations in Urban Terrain ACTD. • 184 Coordinated preparation and direct execution of MANPRINT Soldier Survivability Assessments and Reports. • 20 Sustainment of international soldier activities (NATO); provided chem/bio/physiology expertise for operations other than war and less-than-lethal efforts. • 75 Provided integrated survivability/lethality analyses to support scheduled soldier systems program decision milestones in FY 98. <p>Total 773</p> <p>FY 1999 Planned Program:</p> <ul style="list-style-type: none"> • 422 Conduct integrated electronic, ballistic, and chemical/biological/nuclear/atmospheric effects survivability analysis for the U.S. Army Land Warrior and Air Warrior Systems (Computer and Communication System, Weapon System, Protective Clothing and Individual Equipment, Chem/Bio Mask, and Integrated Headgear), Force XXI Land Warrior ACTD components, the Mounted Warrior System and Military Operations in Urban Terrain ACTD. • 144 Coordinate preparation and direct execution of MANPRINT Soldier Survivability Assessments and Reports. • 47 Sustainment of international soldier activities (NATO); provide chem/bio/physiology expertise for operations other than war and less-than-lethal efforts • 100 Provide integrated survivability/lethality analyses to support scheduled soldier systems program decision milestones in FY 99. • 14 Small Business Innovative Research/Small Business Technology Transfer Programs <p>Total 727</p> | | | | | | | | | | |
| Project D679 | | | Page 16 of 18 Pages | | | | Exhibit R-2A (PE 0605604A) | | | |

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| BUDGET ACTIVITY 6 - Management and Support | PE NUMBER AND TITLE 0605604A Survivability/Lethality Analysis | PROJECT D679 |
| FY 2000 Planned Program: | | |
| • | 180 Conduct integrated electronic, and ballistic survivability analysis for the U.S. Army Land Warrior and Air Warrior Systems (Computer and Communication System, Weapon System, Protective Clothing and Individual Equipment, and Integrated Headgear). Review contractor capability for Air Warrior (AW) prototype testing for Soldier Survivability. Support PM ACIS with Survivability analysis of equipment usage with different operational scenarios. Conduct AW signature analysis. Support integration of AW into the overall JSAM program. | |
| • | 134 Coordinate preparation and direct execution of MANPRINT Soldier Survivability Assessments and Reports. | |
| • | 100 Provide integrated survivability/lethality analyses to support scheduled soldier systems program decision milestones in FY 00. Ballistics, Electronic Warfare, and Information Warfare technical support for MS III issues of Land Warrior. | |
| Total | 414 | |
| FY 2001 Planned Program: | | |
| • | 204 Conduct integrated electronic, and ballistic survivability analysis for the U.S. Army Land Warrior and Air Warrior Systems (Computer and Communication System, Weapon System, Protective Clothing and Individual Equipment, and Integrated Headgear). Support OPTEC in survivability analysis of (AW) in operational testing | |
| • | 145 Coordinate preparation and direct execution of MANPRINT Soldier Survivability Assessments and Reports. | |
| • | 109 Provide integrated survivability/lethality analyses to support scheduled soldier systems program decision milestones in FY 01 | |
| Total | 458 | |

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| BUDGET ACTIVITY 6 - Management and Support | | | | PE NUMBER AND TITLE 0605604A Survivability/Lethality Analysis | | | | PROJECT D734 | | |
| COST <i>(In Thousands)</i> | FY1998 Actual | FY 1999 Estimate | FY 2000 Estimate | FY 2001 Estimate | FY 2002 Estimate | FY 2003 Estimate | FY2004 Estimate | FY2005 Estimate | Cost to Complete | Total Cost |
| D734 Survivability Evaluation | 1546 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1546 |
| <p>Mission Description and Justification: Effective in FY 1998, all U.S. Army Research Laboratory (ARL) Survivability/Lethality Analysis Directorate (SLAD) evaluation functions in support of survivability/lethality testing were financed through Project D734 under the direction of the U.S. Army Operational Test and Evaluation Command (OPTEC). Starting in FY 1999, funding for Project D734 has been transferred to PE 0605716A, Army Evaluation Center, established under OPTEC to perform the Army's consolidated developmental and operational evaluation function. The FY 1998 program provided evaluations of soldier and materiel system survivability into an integrated Army evaluation supporting decision-makers at milestone reviews. It included the planning and coordination of developmental tests, experiments, and subsequent evaluation of results to determine system survivability in battlefield threat environments. Evaluators developed the strategy and incorporated SLAD efforts to ensure that electronic warfare (EW), information warfare (IW), conventional ballistics, nuclear, chemical, biological, electromagnetic environmental effects (E3), atmospheric/obscuration and meteorological effects on soldier/system survivability were properly addressed. Evaluation results were incorporated into a single Army evaluation and presented at all acquisition milestones.</p> <p>FY 1998 Accomplishments:</p> <ul style="list-style-type: none"> • 1546 Conducted integrated survivability evaluations for Army weapon systems and Automated Information Systems for major milestone decisions, materiel changes, and materiel releases in support of the Army Acquisition Executive and force development. Developed the evaluation strategy, designed technical and operational tests, and evaluated the test results to address the survivability and lethality factors pertinent to the decision process such as: soldier survivability, performance in countermeasures, and system survivability. As the Army lead for Live Fire Test and Evaluation, planned and executed the Army Live Fire Test and Evaluation program for developmental systems as required. Specific efforts included: conducted evaluations of Crusader, Search and Destroy Armor (SADARM), Land Warrior (LW), Improved Cargo Helicopter (ICH), Armored Scout Vehicle (ASV), Army Tactical Missile System Block II/Brilliant Anti-armor Tank Pre-Planned Product Improvement (ATACMS Blk II/BAT P3I), Hellfire, Longbow, Follow-On To Tow (FOTT), and Wide Area Munition (WAM) Milestone III results; prepared System Evaluation Plans for Multiple Launch Rocket System (MLRS A1), Bradley Fire Support Team (BFIST), Breacher, Bradley Fighting Vehicle System, Command and Control Vehicle (C2V), Command, Control, Communication, Computer and Intelligence (C4I) systems, and Suite of Integrated Infrared Countermeasures (SIRFCM). Efforts included costs for 18 civilian authorizations. <p>Total 1546</p> <p>FY 1999 Planned Program: Project restructured to PE 0605716A Army Evaluation Center under OPTEC.</p> <p>FY 2000 Planned Program: Project restructured to PE 0605716A Army Evaluation Center under OPTEC</p> <p>FY 2001 Planned Program: Project restructured to PE 0605716A Army Evaluation Center under OPTEC.</p> | | | | | | | | | | |
| Project D734 | | | Page 18 of 18 Pages | | | | Exhibit R-2A (PE 0605604A) | | | |