Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification											DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*				R-1 ITEM NOMENCLATURE PE 0601101A: *In-House Laboratory Independent Research*							
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	19.357	19.568	21.780	0.000	21.780	19.139	20.692	21.301	21.650	0	143.487
91A: *ILIR-AMC*	13.739	14.794	17.205	0.000	17.205	14.376	15.940	16.236	16.521	Continuing	Continuing
91C: *ILIR-MED R&D CMD*	4.053	3.009	2.860	0.000	2.860	2.817	2.809	2.858	2.906	Continuing	Continuing
91D: *ILIR-CORPS OF ENGR*	1.395	1.115	1.075	0.000	1.075	1.066	1.067	1.088	1.107	Continuing	Continuing
91E: *ILIR-ARI*	0.170	0.161	0.152	0.000	0.152	0.151	0.151	0.154	0.155	Continuing	Continuing
F16: *ILIR-SMDC*	0.000	0.489	0.488	0.000	0.488	0.729	0.725	0.965	0.961	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program element (PE) is utilized to attract and retain top doctoral degreed scientists and engineers at the Army's research organizations. The In-House Laboratory Independent Research (ILIR) program provides a source of competitive funds to Army laboratories to stimulate high quality, innovative research with significant opportunity for payoff to Army warfighting capability. The basic research lays the foundation for future developmental efforts by identifying the fundamental principles governing various phenomena and appropriate pathways to exploit this knowledge. The ILIR program serves as a catalyst for major technology breakthroughs by giving the laboratory directors flexibility in implementing novel research ideas and nurturing promising young scientists and engineers. This PE supports ILIR at the Army Materiel Command's (AMC) six Research, Development, and Engineering Centers (RDECs) (project 91A); at the six Medical Research and Materiel Command (MRMC) laboratories (project 91C); at the Corps of Engineer's seven Engineer Research, and Development Center (ERDC) laboratories (project 91D); at the Army Research Institute for the Behavioral and Social Sciences (ARI) validate new techniques in social network analysis as well as training techniques to enhance expertise and adaptability and decrease training time project (91E); at the Space and Missile Defense Command (SMDC) high energy lasers and directed energy for air and missile defense (project F16).The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Department of Defense Basic Research Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.The work in this PE is performed by the Army Materiel Command (AMC), Ft. Belvoir, VA, Army Medical Research and Materiel Command (MRMC), Ft. Detrick, MD, the Army Corps of Engineers Engineer Research, and Development Center (ERDC), Vicksburg, MS, the Space and Missile Defense Command (SMDC), Huntsville, AL, and the Army Research Institute (ARI), Arlington, VA.

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B. Program Change Summary ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
Previous President's Budget	19.766	19.671	19.686	0.000	19.686
Current President's Budget	19.357	19.568	21.780	0.000	21.780
Total Adjustments	-0.409	-0.103	2.094	0.000	2.094
• Congressional General Reductions		-0.103			
• Congressional Directed Reductions					
• Congressional Rescissions		0.000			
• Congressional Adds		0.000			
• Congressional Directed Transfers					
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	-0.409	0.000			
• Adjustments to Budget Years	0.000	0.000	2.094	0.000	2.094

Change Summary Explanation

FY11 funding increases for Edgewood Chemical Bbiological Center ILIR.

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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**
91A: *ILIR-AMC*	13.739	14.794	17.205	0.000	17.205	14.376	15.940	16.236	16.521	Continuing	Continuing

A. Mission Description and Budget Item Justification

The project funds basic research within the Army Materiel Command's (AMC) Research, Development, and Engineering Centers and lays the foundation for future developmental efforts by identifying the fundamental principles governing various phenomena and appropriate pathways to exploit this knowledge. The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Department of Defense Basic Research Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.The work in this program is performed by the Communications and Electronics Research, Development, and Engineering Center (CERDEC), Ft. Monmouth, NJ, the Armaments Research, Development, and Engineering Center (ARDEC), Picatinny, NJ, the Tank and Automotive Research, Development, and Engineering Center (TARDEC), Warren, MI, the Natick Soldier Research, Development, and Engineering Center (NSRDEC), Natick, MA, the Aviation and Missile Research, Development, and Engineering Center (AMRDEC), Huntsville, AL, and the Edgewood Chemical and Biological Center (ECBC), Aberdeen Proving Grounds, MD within AMC.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	**FY 2010**	**Base FY 2011**	**OCO FY 2011**	**Total FY 2011**
Program #1	1.036	0.919	3.007	0.000	3.007
Edgewood Chemical Biological Center: In FY09, conducted cell toxicity studies using nuclear magnet resonance spectroscopy; investigated hydrogen production from novel bioenergy crops and characterizing the volatile organic compound profiles of bacteria for detection. Investigated electrospun fiber mats as a substrate for surface-enhanced infrared spectroscopy; invested molecule-surface interactions with overtone absorption spectroscopy; developed a themostable platform for single domain antibodies; investigated the synthetic routes to produce TETS (Tetramethylenedisulfotetramine); and used proteomics mass spectrometry to study the discrimination of pathogenic vs. non-pathogenic bacteria. In FY10 investigate recent advances in "panomics" for molecular toxicology; rational molecular design for the design of functional self-organizing supramolecular self-assembly; the complex behavior of mass transport in microporous systems at the nano scale; the application of controlled coherent laser radiation to direct the dynamics of quantum systems; and the characterization of chemical and biochemical phenomena occurring at or near solid surfaces and interfaces. In FY11, ECBC will conduct research in the following areas; fundamental studies in surface science, specifically furthering the characterization of					

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
chemical and biochemical phenomena occurring at or near solid surfaces and interfaces; exploring molecular techniques for bio-energy production; rational design of nano- biomolecular abiotic structures; further explore the interaction of matter and energy transfer at the nano-scale; and the synthesis of new nanomaterials for control of electromagnetic energy propagation and to drive photonic behavior. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #2 Armaments RDEC: In FY09, conducted basic research for developing new explosives and smaller warheads for increased lethality and volume reduction, lighter and stronger materials for guns, algorithms for future intelligent munitions using various sensors, and area denial technologies. In FY10, research ways to synthesize more powerful explosives with IM properties, technologies for detection and neutralization of IEDs/explosives, sensors/ sensor fusion for area denial, smaller more lethal warheads and composite materials. In FY11, will conduct further basic research into synthesizing more powerful explosives with IM properties, technologiesproperties; technologies for detection and neutralization of IEDs/explosives, sensors/sensor fusion for area denial, smaller more lethal warheads and composite materials.	1.834	1.628	1.684	0.000	1.684

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
FY 2009 Accomplishments: FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #3 Tank-automotive RDEC: In FY09, recorded real-time polarization images for robotic vehicle terrain perception and signature countermeasure applications; investigated ultra-wide band (UWB) radar development for localizing mobile robots in battlefield scenarios, and explored fuzzy logic clustering algorithms for robotic vehicle stereovision range perception in difficult urban terrain environments. In FY10, develop high performance control algorithms for unmanned ground vehicles in heterogeneous off-road terrain environments; use fuzzy logic C-mean clustering algorithms for vehicle terrain classification; and investigate JP-8 heat release combustion chemistry as a function of cetane number and nozzle geometry. In FY11, will develop reinforcement-based Learning and Control for Robots Using Ethical Behavior Frameworks; will investigate photophysical response measurements for directed energy carbon-60 (C60) colloid materials; and will use event-driven control strategies to couple remote dynamical systems. *FY 2009 Accomplishments:* FY 2009	1.307	1.255	1.201	0.000	1.201

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
FY 2010 Plans: FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #4 Natick Soldier RDEC: In FY09, utilized morphology control data results to make initial selections of methodology to verify ability to regulate nanoscale characteristics, identified nanomaterials (metal or dielectrics) and developed preliminary design for nanorectenna array for converting visible/near-infrared light to direct current for photonic applications and derived a fundamental understanding of how immobilization influences the antimicrobial peptide mechanisms of lytic behavior for Soldier protection against pathogens. In FY10 solicit new concepts for basic research efforts with broad applicability to science and technology that enable advancement of developments such as electro-textiles, multifunctional fibers, advanced nutrient delivery, performance enhancing biomechanics and precision airdrop systems. In FY11, will continue fundamental research of nanoelectronics that has the potential to provide new nanomaterials and nanoarchitectures that could help revolutionize the performance and miniaturization of optoelectronic devices; will further the understanding of fundamental principles which govern Botulinim Neurotoxin catalytic activity and binding of peptide and aptamers to this catalytic domain that may lead to new technologies which couple toxin capture and inactivation. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010	1.441	1.384	1.323	0.000	1.323

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Base FY 2011 Plans: FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #5 Aviation and Missile RDEC Missile Efforts: In FY09, demonstrated new mechanism for transmission of light through an absorptive semiconductor, demonstrated first use of symbolic dynamical model for chaotic, high-dimensional turbulent flow, demonstrated performance of ZnO-based phosphor for lighting and combat ID, developed THz spectroscopic imager for non-destructive testing and stand-off agent detection. In FY10, explain why complex networks can respond consistently to external signals, explore phase locked harmonic generation of light, demonstrate quantum EM field sensor, and demonstrate THz holographic imaging of obscured object/IED. In FY11, will solicit new concepts for basic research efforts with broad applicability to science and technology that support exploratory and advanced development for guided missile and rocket systems, directed energy weapons, unmanned vehicles, and related components. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO	2.441	2.346	2.243	0.000	2.243

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Program #6	1.769	1.698	1.623	0.000	1.623
Aviation and Missile RDEC Aviation Efforts: In FY09, wind tunnel tested advanced airfoil aerodynamics for passive rotor performance improvement, investigated phenomenon and assessed computational fluid dynamics, accuracy using existing data for pitching airfoil double dynamic stall events, investigated the behavior of fluidic oscillators. In FY10 conduct dynamic stall testing of advanced active and passive concepts with an emphasis on the fundamental flow physics of unsteady separation of turbulent boundary layers, develop microscopic particle image velocimetry for identification of flow reversal and separation in unsteady turbulent boundary layers, develop an analytical framework that enables the systematic evaluation of autonomous UAV path planning algorithms. In FY11, will investigate the effectiveness of fluidic oscillators to control separation for bluff body flows, will initiate computational fluid dynamics and computational structural dynamics methods for accurate rotor stability analysis. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #7	1.619	1.436	1.487	0.000	1.487
Communications-Electronics RDEC: In FY09, investigated novel means of creating wideband high-dielectric Electromagnetic Metamaterials using carbon nanotubes for use in designing future generations of antennas; investigated a new family of polymer based electrolyte materials (required to be ionically conductive and					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
both chemically and electro-chemically stable to voltages greater than 5.0 Volts) for advanced lithium high energy electrochemical couples; conducted basic research on the pseudo noise modulation of radar wave forms; developed a novel approach for lower defect IR detector materials by investigating lattice phonons and electrons interactions within a sensor material, such as HgCdTe. In FY10 investigate new metamaterial to significantly improve antenna signature and power handling capacity and conduct research in network science to investigate novel neural management tools for optimum network performance; research separator-electrolyte sub-components for high voltage electrochemical cells; develop a novel approach for extensions of advanced signal processing from a cooperative regime (known parameters) to a non-cooperative regime. In FY11 will investigate new anode and cathode materials for electrochemical couples with increased kinetic properties; will perform experimental validation of the derived theoretical limits of EO interference cancelation systems intended to enable communications during jamming; will perform experimental validation of new cognitive radio techniques for blind signal interception; will investigate fundamental parameters affecting Shockley-Reed-Hall (SRH) defect centers in narrow gap infrared (IR) semiconductors (e.g. III-V and II-VI epitaxial compounds), will research and investigate novel conducting polymers for use as explosive specific sensors and as low power displays, will explore new measurement methodologies (e.g. catholuminescence) for studying IR detector defects at the atomic level. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Program #8	2.292	3.845	4.637	0.000	4.637
Peer reviewed proposal efforts: Proposal efforts will be selected near the start of each fiscal year through competitive applications among the Army laboratories with ILIR funding. Selections are based on an outside independent peer review of the proposals. The intent to provide increased quality and responsiveness in exploring in basic research new technological concepts that are highly relevant to Army needs. This funding will also enhance recruitment, development, and retention of outstanding scientists and engineers engaged in high quality basic research for the Army which will bring a constant flow of new knowledge to our laboratories. In FY09, solicited new basic research efforts aimed at developing and maintaining a cadre of active research scientists who can distill and extend results from worldwide research and apply them to Army problems. In FY10, award 5 new projects in Network/Internet optimization of detection capabilities; Infrared (IR) detectors and focal plane arrays (FPAs) for night vision, surveillance, target acquisition, searching, tracking and missile seeking; effect of vortex interactions not only on the tip vortex formation, but also on the lift and drag aircraft wings.In FY11, will solicit new basic research efforts aimed at developing and maintaining a cadre of active research scientists who can distill and extend results from worldwide research and apply them to Army problems. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #9	0.000	0.283	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
Small Business Innovative Research/Small Business Technology Transfer Programs *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Accomplishments/Planned Programs Subtotals	13.739	14.794	17.205	0.000	17.205

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

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

Exhibit R-2A, PB 2011 Army RDT&E Project Justification									DATE: February 2010		
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*				R-1 ITEM NOMENCLATURE PE 0601101A: *In-House Laboratory Independent Research*				PROJECT 91C: *ILIR-MED R&D CMD*			
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**
91C: *ILIR-MED R&D CMD*	4.053	3.009	2.860	0.000	2.860	2.817	2.809	2.858	2.906	Continuing	Continuing

A. Mission Description and Budget Item Justification

The objective of this project is to address investigator-driven medical and force health protection basic research initiatives performed at the six US Army Medical Research and Materiel Command laboratories. Research areas address countermeasures against infectious diseases, defense against environmental extremes and operational hazards to health, mechanisms of combat trauma and innovative treatment and surgical procedures, and medical chemical/biological warfare threats.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 Medical Research Institute of Chemical Defense (USAMRICD), Aberdeen Proving Ground, MD; US Army Medical Research Institute of Infectious Diseases (USAMRIID), Fort Detrick, MD; US Army Institute of Environmental Medicine (USARIEM), Natick, MA; US Army Institute of Surgical Research (USAISR), Fort Sam Houston, TX; and US 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	3.075	2.425	2.860	0.000	2.860
Independent Research Efforts: In FY09, the ILIR program funded innovative in-house basic research proposals that focus on research to explore treatments and countermeasures against militarily relevant infectious diseases; defense against environmental extremes and operational hazards to health; and mechanisms of combat trauma and innovative treatment and surgical procedures. In FY10 and FY11, the program will fund innovative in-house basic research proposals that will focus on research to explore treatments and countermeasures against militarily relevant infectious diseases; defense against environmental extremes and operational hazards to health; mechanisms of combat trauma and innovative treatment and surgical procedures, and medical chemical/biological warfare threats.					
FY 2009 Accomplishments: FY 2009					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
FY 2010 Plans: FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #2 Peer Reviewed Proposal efforts: In FY09, solicited new and continuing basic research efforts aimed at developing and maintaining a cadre of active basic research scientists who can initiate new research as well as extend results from worldwide research and apply them to Army problems. In FY10, continue ongoing awarded innovative basic research activities and continue to solicit new innovative medical and force protection basic research efforts in support of Army needs. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO	0.978	0.503	0.000	0.000	0.000
Program #3	0.000	0.081	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
Small Business Innovative Research/Small Business Technology Transfer Programs *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Accomplishments/Planned Programs Subtotals	4.053	3.009	2.860	0.000	2.860

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
91D: *ILIR-CORPS OF ENGR*	1.395	1.115	1.075	0.000	1.075	1.066	1.067	1.088	1.107	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project funds In-house Laboratory Independent Research (ILIR) in the areas of geospatial research and engineering, military engineering, and environmental quality/installations at the seven laboratories within the Corps of Engineer's Engineering Research and Development Center. The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Department of Defense Basic Research Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.The work in this project is performed by the U.S. Army Engineer Research and Development Center (ERDC), at Vicksburg, MS.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Program #1	1.190	1.098	1.075	0.000	1.075

Geospatial Research and Engineering/Military Engineering/Environmental Quality and Installations: In FY09, conducted research to determine factors influencing partitioning and ecological risk of military unique nanomaterials in the environment. In FY10 investigate reduction potentials for military compounds through the application of computationally feasible approximations for predicting reduction-oxidation reaction potentials of explosives and their environmental transformation products. Determine whether mineral surfaces or surface chemical processes can be exploited to promote the adsorption and transformation of nitroaromatic compounds and other explosives munitions on military training, testing and demolition ranges. In FY11, will investigate a set of theoretical algorithms for poly-disperse soil packings based upon historical granular research and using simulations to validate performance; and continue basic research efforts focused on fundamental questions in science relevant to military application such as signature physics, next generation remote sensing, and ecological risk of military unique emerging contaminates in the environment.

FY 2009 Accomplishments:
FY 2009

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
FY 2010 Plans: FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #2 Peer reviewed proposal efforts: Proposal efforts will be selected near the start of each fiscal year through competitive applications among the Army laboratories with ILIR funding. Selections are based on an outside independent peer review of the proposals. The intent to provide increased quality and responsiveness in exploring in basic research new technological concepts that are highly relevant to Army needs. This funding will also enhance recruitment, development, and retention of outstanding scientists and engineers engaged in high quality basic research for the Army which will bring a constant flow of new knowledge to our laboratories. In FY09, sought new and continuing basic research efforts focused on fundamental questions in science that relate to U.S. Army requirements such as network science. Beginning in FY10, this effort is funded in project 91A. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base	0.205	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
OCO FY 2011 Plans: FY 2011 OCO					
Program #3 Small Business Innovative Research/Small Business Technology Transfer Programs *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO	0.000	0.017	0.000	0.000	0.000
Accomplishments/Planned Programs Subtotals	1.395	1.115	1.075	0.000	1.075

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 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601101A: *In-House Laboratory Independent Research*	PROJECT 91E: *ILIR-ARI*	

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
91E: *ILIR-ARI*	0.170	0.161	0.152	0.000	0.152	0.151	0.151	0.154	0.155	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project provides funding for In-house Laboratory Independent Research (ILIR) in the Army Research Institute. This project supports basic research in the Cognitive Sciences is focused on theories, approaches, and models from the Behavioral and Social Sciences that have the highest potential to improve human performance. Improved recruiting, selection, assignment, training, leader development, performance, performance assessment, organizational dynamics, and retention are the goals. Work in this project is performed by the Army Research Institute.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Program #1	0.170	0.157	0.152	0.000	0.152
Army Research Institute: In FY09: identified training strategies that will help Soldiers recognize challenges that require novel solutions and to adapt their behavior to overcome such challenges. In FY10, identify relevant variables for longitudinal modeling of career performance using latent curve analysis. FY11: will identify key training aspects of synthetic teammates in virtual worlds that will promote training transfer to a team performance setting.					
FY 2009 Accomplishments: FY 2009					
FY 2010 Plans: FY 2010					
Base FY 2011 Plans: FY 2011 Base					

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
OCO FY 2011 Plans: FY 2011 OCO					
Program #2	0.000	0.004	0.000	0.000	0.000
Small Business Innovative Research/Small Business Technology Transfer Program *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Accomplishments/Planned Programs Subtotals	0.170	0.161	0.152	0.000	0.152

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

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

Exhibit R-2A, PB 2011 Army RDT&E Project Justification			DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601101A: *In-House Laboratory Independent Research*	PROJECT F16: *ILIR-SMDC*	

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
F16: *ILIR-SMDC*	0.000	0.489	0.488	0.000	0.488	0.729	0.725	0.965	0.961	Continuing	Continuing

A. Mission Description and Budget Item Justification

The objective of this project is to provide funding for In-house Laboratory Independent Research (ILIR) in the Space and Missile Defense Command Technical Center. This basic research on lasers and directed energy lays the foundation for future developmental efforts on high energy lasers and directed energy systems for missile defense by identifying the fundamental principles governing various phenomena and appropriate pathways to exploit this knowledge. The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Department of Defense Basic Research Plan, the Army Modernization Strategy, the Army Science and Technology Master Plan.Work in this project is performed by the Army Space and Missile Defense Command (SMDC), Huntsville, AL.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Program #1	0.000	0.476	0.488	0.000	0.488
Adaptive optics algorithms and approaches for future directed energy weapon systems.In FY10, investigate beam propagation codes versus real laser beam propagation down an open air range to improve the accuracy of beam propagation codes and understanding of the impact that various atmospheric phenomena have, to include a detailed mapping of the beam path unrivaled to date via Schlieren, optical sensors, and weather metrology data; conduct an experiment implementing quantum optics rather than classical optics for beam propagation to compare the two approaches for computational ease, accuracy, and time requirements; and set up a laboratory tabletop version of a high energy laser adaptive optic system and develop algorithms for sensing and correcting for atmospheric distortion in open loop (without a wavefront sensor or beacon). In FY11, will use prior year data to develop more complex beam propagation experimentation to improve the beam propagation knowledge, codes, and algorithms for Adaptive Optics (AO) systems for directed energy weapons; will begin scaling to higher powers using a 2 KW fiber laboratory laser.					
FY 2009 Accomplishments: FY 2009					

Exhibit R-2A, PB 2011 Army RDT&E Project Justification		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601101A: *In-House Laboratory Independent Research*	PROJECT F16: *ILIR-SMDC*

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
FY 2010 Plans: FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #2 SBIR/STTR *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO	0.000	0.013	0.000	0.000	0.000
Accomplishments/Planned Programs Subtotals	0.000	0.489	0.488	0.000	0.488

Exhibit R-2A, PB 2011 Army RDT&E Project Justification		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601101A: *In-House Laboratory Independent Research*	PROJECT F16: *ILIR-SMDC*

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.