Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army										DATE: February 2011	
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*				R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*							
COST ($ in Millions)	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**Cost To Complete**	**Total Cost**
Total Program Element	107.582	98.087	120.937	-	120.937	118.577	123.282	127.163	131.926	Continuing	Continuing
F17: *NEUROERGONOMICS COLLABORATIVE TECHNOLOGY ALLIANCE*	4.785	5.030	5.161	-	5.161	5.195	5.321	5.347	5.438	Continuing	Continuing
H04: *HBCU/MI CENTERS - TRADOC BATTLELABS*	2.638	2.776	18.071	-	18.071	18.308	18.643	18.981	19.479	Continuing	Continuing
H05: *INSTITUTE FOR COLLABORATIVE BIOTECHNOLOGIES*	8.251	9.672	12.214	-	12.214	12.494	12.812	13.218	13.638	Continuing	Continuing
H09: *ROBOTICS COLLABORATIVE TECH ALLIANCE (CTA)*	4.364	5.077	5.284	-	5.284	5.490	5.586	5.677	5.773	Continuing	Continuing
H50: *Network Sciences CTA*	2.554	3.289	12.908	-	12.908	12.979	15.283	15.567	15.831	Continuing	Continuing
H53: *Army High Performance Computing Research Center*	3.311	3.706	4.355	-	4.355	4.467	4.847	6.119	6.909	Continuing	Continuing
H54: *Micro-Autonomous Systems Technology (MAST) CTA*	7.739	8.050	7.945	-	7.945	8.290	8.434	8.570	8.716	Continuing	Continuing
H59: *UNIV CENTERS OF EXCEL*	5.345	5.580	6.356	-	6.356	7.431	7.543	7.647	7.777	Continuing	Continuing
H62: *Institude for Advanced Technology (IAT)*	6.184	5.506	1.423	-	1.423	-	-	-	-	Continuing	Continuing
H64: *MATERIALS CENTER*	2.726	2.869	2.920	-	2.920	2.971	3.023	3.072	3.829	Continuing	Continuing
H73: *Automotive Research Center (ARC)*	2.831	2.947	3.994	-	3.994	4.049	4.102	4.153	4.207	Continuing	Continuing
J08: *INSTITUTE FOR CREATIVE TECHNOLOGY*	7.486	7.878	8.022	-	8.022	8.167	8.310	8.944	9.838	Continuing	Continuing
J12: *Institute for Soldier Nanotechnology (ISN)*	9.862	10.487	10.787	-	10.787	10.891	11.181	11.261	11.452	Continuing	Continuing
J13: *UNIVERSITY AND INDUSTRY INITIATIVES (CA)*	21.924	-	-	-	-	-	-	-	-	Continuing	Continuing

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army									DATE: February 2011		
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*				R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*							
J14: *ECYBERMISSION*	4.086	5.330	5.426	-	5.426	-	-	-	-	Continuing	Continuing
J15: *NETWEORK SCIENCES INTERNATIONAL TECHNOLOGY ALLIANC*	7.828	8.072	8.217	-	8.217	8.363	8.510	8.647	8.794	Continuing	Continuing
J17: *VERTICAL LIFT RESEARCH CENTER OF EXCELLENCE*	1.963	2.066	2.654	-	2.654	2.741	2.828	2.990	3.151	Continuing	Continuing
J22: *NETWORK SCIENCE AND TECHNOLOGY RESEARCH CENTER*	3.705	9.752	-	-	-	-	-	-	-	Continuing	Continuing
VS2: *CENTER FOR ADVANCED RESEARCH*	-	-	5.200	-	5.200	6.741	6.859	6.970	7.094	Continuing	Continuing

Note

FY12 funding increase includes the transfer in for Historical Black Colleges and Universities (HBCU) Science.

A. Mission Description and Budget Item Justification

This program element (PE) investigates research that supports enabling technologies for future force capabilities. Broadly, the work in this project falls into three categories: Collaborative Technology Alliances (CTAs), University Centers of Excellence (COE), and University-Affiliated Research Centers (UARCs). The Army formed CTAs to leverage large investments by the commercial sector in basic research areas that are of great interest to the Army. CTAs involve partnerships between industry, academia, and the Army Research Laboratory (ARL) to incorporate the practicality of industry, the expansion of the boundaries of knowledge from universities, and Army scientists to shape, mature, and transition technology. CTAs have been competitively established in the areas of Micro Autonomous Systems Technology (MAST), Network Sciences, Robotics and Cognition and Neuroergonomics. This PE includes the Army's COE, which focus on expanding the frontiers of knowledge in research areas where the Army has enduring needs, such as rotorcraft, automotive, microelectronics, materials, and information sciences. COEs couple state-of-the-art research programs at academic institutions with broad-based graduate education programs to increase the supply of scientists and engineers in information sciences, materials science, electronics, automotive, and rotary wing technology. Also included is eCYBERMISSION, the Army's national web-based competition to stimulate interest in science, math, and technology among middle and high school students. This PE includes the four Army UARCs, which have been created to exploit opportunities to advance new capabilities through a sustained long-term multidisciplinary effort. The Institute of Advanced Technology (IAT) funds basic research in electromagnetic and hypervelocity physics. In January 2012 the UARC contract with IAT will end with all remaining funds moved to project VS2. These funds will be used to competitively establish a new external center to address the extreme challenges associated with understanding and modeling materials subject to high impact rates. The Institute for Soldier Nanotechnologies focuses on Soldier protection by emphasizing revolutionary materials research for advanced Soldier protection and survivability. The Institute for Collaborative Biotechnologies focuses on enabling network centric-technologies, and broadening the Army's use of biotechnology for the development of bio-inspired materials, sensors, and information processing. The Institute for Creative Technologies is a partnership with academia and the entertainment and gaming industries to leverage innovative research and concepts for training and simulation. Examples of specific research of mutual interest to the entertainment industry and the Army are technologies for realistic immersion in synthetic environments, networked simulation, standards for

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army	DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	**R-1 ITEM NOMENCLATURE** PE 0601104A: *University and Industry Research Centers*

interoperability, and tools for creating simulated environments. This PE also includes the Historically Black Colleges and Universities and Minority Institution (HBCU/MI) Centers of Excellence that address critical research areas for Army Transformation.

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 managed by: the Army Research Lab (ARL) in Adelphi, MD; the US Army Tank-Automotive Research, Development, and Engineering Center (TARDEC) in Warren, MI; the Simulation and Training Technology Center (STTC) in Orlando, FL; and the US Army Research Institute for the Behavioral and Social Sciences (ARI) in Arlington, VA.

Project J13 funds Congressional interest items.

B. Program Change Summary ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Previous President's Budget	115.338	98.087	99.355	-	99.355
Current President's Budget	107.582	98.087	120.937	-	120.937
Total Adjustments	-7.756	-	21.582	-	21.582
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	-4.721	-			
• SBIR/STTR Transfer	-3.035	-			
• Adjustments to Budget Years	-	-	21.582	-	21.582

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT F17: *NEUROERGONOMICS COLLABORATIVE TECHNOLOGY ALLIANCE*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
F17: *NEUROERGONOMICS COLLABORATIVE TECHNOLOGY ALLIANCE*	4.785	5.030	5.161	-	5.161	5.195	5.321	5.347	5.438	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

This project supports the Neuroergonomics Collaborative Technology Alliance (CTA), a competitively selected industry and university consortium, to leverage world-class research in support of future force and Army transformation needs. Escalating levels of complexity and uncertainty on the current and future battlefield present conditions which have never existed before now. Solution strategies and approaches must be developed or tailored. The emerging field of neuroergonomics, which seeks to understand the brain at work and to leverage that understanding to optimize system design, offers tremendous potential for providing the solutions needed to meet the needs of Army forces in the future. This CTA addresses the solution strategies and approaches needed to design systems to fully exploit investments in revolutionary technological advances in areas such as robotics, microelectronics, and computer and network information systems. These technologies present significant opportunities to enhance Army mission capabilities, but impose significant burdens on the human brain, which will ultimately limit Soldier-system effectiveness, sustainability, and survivability. The technical barriers associated with this project include: immature knowledge base to guide the neuroergonomic approach to human-system integration; inadequate capabilities to sense and extract information about brain activity in dynamic, operational environments; lack of valid measures to robustly and uniquely characterize operationally-relevant cognitive performance; lack of techniques for integrating advanced understandings of brain activity into systems designs, including real-time use of measures of cognitive behavior as system inputs and the capability to account for individual differences in maximizing Soldier-system performance. This CTA conducts an intensive and accelerated program to formulate, validate, and transition basic research findings through multi-dimensional approaches focused in three areas: understanding fundamental principles underlying Soldier neurocognitive performance in operational environments, advancing computational approaches for the analysis and interpretation of neural functioning, fundamental advancement in neurotechnologies that enhance Soldier-system interactions and performance. This Cognition and Neuroergonomics CTA began in FY10.

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) in Adelphi, MD.

Funding was restructured from the Advanced Decision Architecture Collaborative Technology Alliance in PE 0601104A, project H56.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Neurocognitive performance in operational environments	1.391	1.540	1.950

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: This effort is intended to understand fundamental principles underlying Soldier neurocognitive performance in operational environments. ***FY 2010 Accomplishments:*** Combined multiple levels of performance and physiological assessment (electroencephalogram (EEG), eye tracking, and behavioral observations) to investigate multiple sensory modality perceptual-motor interactions; included assessment of interactions between basic elements of cognition, sensory-perceptual channel inputs, and motor systems; explored multisensory interactions that support attention allocation and decision-making across a distributed and complex environment and under the influence of performance stressors. ***FY 2011 Plans:*** Explore formal models of information presentation, including multi-modal and adaptive displays as well as multisensory attentional cueing; examine interactions between information systems and physical-cognitive performance. ***FY 2012 Plans:*** Will transition lessons learned to the design and creation of simulation experiments to capture neurocognitive performance while embedded in military-relevant operational contexts; will utilize simulation environments to evaluate predictions made from formal models; will elaborate and refine models of neurocognitive function developed based on results generated during simulation experiments.			
Title: Computational neural analysis ***Description:*** This effort advances computational approaches for the analysis and interpretation of neural functioning. ***FY 2010 Accomplishments:*** Focused on methodological exploration and model development; collected and analyzed data sets needed to facilitate the exploration and elaboration of data analytic, data fusion, visualization and modeling techniques and establish computational infrastructure to be applied to future years; investigated methods for sparse and mixed data-type modeling for insertion into analysis of physiological and performance observations in other program areas. ***FY 2011 Plans:*** Examine how the nervous system filters large-scale, multi-dimensional data sets for decision making; identify individual differences in neural processing underlying successful and unsuccessful decision making. ***FY 2012 Plans:***	1.431	1.540	1.550

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Will analyze data sets generated during large-scale simulation experiments; will use simulation data sets for further expansion and elaboration of models and methods for assessing predictive features involving inter- and intra-subject variability; and will refine models according to assessments of the adequacy of overlap and agreement between data and observations.			
Title: Neurotechnologies ***Description:*** This effort provides a fundamental advancement in neurotechnologies that enhance Soldier-system interactions and performance. ***FY 2010 Accomplishments:*** Established a science of neuroergonomic interaction to guide the development of multi-touch screen interfacing for Soldier-system interaction; evaluated physiological (EEG) signals acquired from newly-developed wireless micro-electrode technologies; and began the investigation and evaluation of novel online signal processing methods for brain-signal extraction from complex data. ***FY 2011 Plans:*** Explore methods for state detection and signal processing techniques for signal integration; develop static algorithms that account for the variability in individual differences and/or environmental stressors on performance. Implement modeling of human visual attention for insertion into computer vision algorithm for automated scene processing and alerting of events of interest in the visual field. ***FY 2012 Plans:*** Will refine online signal processing methods as well as expand methods for analysis of EEG data; will identify key biomechanical measures based on the inertial fatigue-monitoring sensors and will investigate remote monitoring of Soldier fatigue; will design algorithms for a neuro-computer vision system for automated environmental appraisal; and will develop methods for integration of user feedback into a system for alerting the Soldier to important environmental events involving saliency and attention modeling, object detection, object tracking and crowd modeling.	1.963	1.950	1.661
Accomplishments/Planned Programs Subtotals	4.785	5.030	5.161

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

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

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT H04: *HBCU/MI CENTERS - TRADOC BATTLELABS*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
H04: *HBCU/MI CENTERS - TRADOC BATTLELABS*	2.638	2.776	18.071	-	18.071	18.308	18.643	18.981	19.479	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Historically Black Colleges and Universities and Minority Institutions (HBCU/MI) program provides support for research and collaboration with DoD facilities and personnel. Centers of Excellence have proven effective in harnessing a critical mass of university research expertise and focusing their intellectual capabilities on Army unique science and technology problems. The focus of this effort is to enhance programs and capabilities of a select number of high-interest scientific and engineering disciplines through innovative research at Centers of Excellence established at Historically Black Colleges and Universities (HBCU). These COEs work with Army, industrial, and other academic partners to accelerate the transition from the research phase to technology demonstration. In addition, these Centers of Excellence recruit, educate, and train outstanding students and post-doctoral researchers in science and technology areas relevant to Army Transformation. This project was previously funded in PE 0601104A, project H59 (University Centers of Excellence) and is being transferred into a distinct project for visibility and management. The National Defense Authorization Act for Fiscal Year 2010 established new program authority (enacted in 10 U.S.C. 2362, Section 252) and a delegation of authority memo from the Under Secretary of Defense (Acquisition, Technology and Logistics) to the Secretary of the Army cleared the way for the next iteration of the Centers of Excellence, called the Partnership in Research Transition (PIRT) Program. Up to five new PIRT Centers will be established focusing on Army-relevant, topic focused, near-transition-ready innovative research that support Army Warfighter Outcomes.

The increase in the PE is the result of the Office of the Secretary of Defense increase of funding.

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

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Centers of Excellence for Battlefield Capability Enhancements (BCE)	2.638	2.776	2.826
Description: Through FY10 centers were located at: Tuskegee Univ. (Flexible Extremities Protection); NCA&T State Univ. (Environmentally-stable Flexible Displays, and Human-centric Command and Control Decision Making: predictive modeling of group situational awareness); Tennessee State Univ. (Sensor Fusion); and Prairie View A&M Univ. (Beyond-Line-of-Sight Lethality). Collaborations with TRADOC Battle Labs have helped accelerate technology transitions to the battlefield.			
FY 2010 Accomplishments:			

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APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT H04: *HBCU/MI CENTERS - TRADOC BATTLELABS*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Established a new PIRT Program to enhance programs and capabilities of a select number of high-interest scientific and engineering disciplines through Army-relevant, topic-focused, near-transition-ready innovative research. ***FY 2011 Plans:*** Completing awards for up to five centers. ***FY 2012 Plans:*** Will continue initial FY11 research efforts based upon new Centers.			
Title: Historically Black Colleges and Universities and Minority Institutions (HBCU/MI) ***Description:*** The Historically Black Colleges and Universities and Minority Institutions (HBCU/MI) program provides support for research and collaboration with DoD facilities and personnel; the research grants further knowledge in the basic physical scientific and engineering disciplines through theoretical and empirical activities; collaborative research allows university professors to work directly with military laboratories or other universities. ***FY 2012 Plans:*** This effort is devolved from the Office of the Secretary of Defense, PE 0602228D8Z; as executive agent, the Army will conduct Broad Agency Announcement and solicitations to execute funding for grants and awards following legislative and executive policy and guidance when Congress directs.	-	-	15.245
Accomplishments/Planned Programs Subtotals	2.638	2.776	18.071

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

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

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT H05: *INSTITUTE FOR COLLABORATIVE BIOTECHNOLOGIES*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
H05: *INSTITUTE FOR COLLABORATIVE BIOTECHNOLOGIES*	8.251	9.672	12.214	-	12.214	12.494	12.812	13.218	13.638	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project supports the Army's Institute for Collaborative Biotechnologies (ICB), a University Affiliated Research Center led by the University of California-Santa Barbara, and two major supporting partners, the California Institute of Technology and the Massachusetts Institute of Technology. The ICB is the Army's primary conduit for leveraging biotechnology for: advanced sensors; new electronic, magnetic, and optical materials; and information processing and bioinspired network analysis. The objective is to perform sustained multidisciplinary basic research supporting technology to provide the Army with biomolecular sensor platforms with unprecedented sensitivity, reliability, and durability; higher-order arrays of functional electronic and optoelectronic components capable of self-assembly and with multi-functions; and new biological means to process, integrate, and network information. These sensor platforms will incorporate proteomics (large scale study of proteins) technology, DNA sequence identification and detection tools, and the capability for recognition of viral pathogens. A second ICB objective is to educate and train outstanding students and post doctoral researchers in revolutionary areas of science to support Army Transformation. The ICB has many industrial partners, such as IBM and SAIC, and has strong collaborations with Argonne, Lawrence Berkley, Lawrence Livermore, Los Alamos, Oak Ridge, and Sandia National Laboratories, the Army's Institute for Soldier Nanotechnologies, the Institute for Creative Technologies, and Army Medical Research and Materiel Command (MRMC) laboratories.

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 extramurally by the Army Research Laboratory (ARL) in Adelphi, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Institute for Collaborative Biotechnologies	7.069	8.453	11.000
Description: Perform sustained multidisciplinary basic research supporting technology to provide the Army with biomolecular sensor platforms.			
FY 2010 Accomplishments: Translated discoveries of the mechanisms by which lightweight biological composites dissipate energy and resist fracture into new approaches for blast-resistant materials and structures; and developed nanofluidic platform to analyze mechanisms underlying nanoscale fluidic biomeolcule separations.			
FY 2011 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Devise a platform that integrates surface enhanced Raman spectroscopy technologies into free surface fluidic explosives detection system with an open surface microchannel system featuring controlled flow velocities; develop optimized materials as implantable, biodegradable tissue scaffolds for eventual application to battlefield trauma; and conduct force measurements to verify a gecko-inspired reversible adhesive system. ***FY 2012 Plans:*** Research will be conducted toward development of mass-based assays for detecting molecular, viral and cell-based pathogens relevant to the Army; will develop shell and bone-inspired passive actuators aimed toward dissipating energy targeted against buildings, barracks and bunkers; will expand use of synthetic biology for engineering novel materials and fuels; and will develop first-principles molecular design rules to create honeycomb micro-trusses for fabrication into composite blast-resistant materials.			
Title: Neuroscience ***Description:*** Perform multidisciplinary basic research in the area of neuroscience. ***FY 2010 Accomplishments:*** Extended brain mapping to evaluate Army personnel with field experience for decision making, executive function and memory performance; partnered with the Institute for Creative Technologies (ICT) to begin to design, develop and implement standard virtual human-agent interaction contexts and scenarios in order to create standard test-bed scenarios for determining the human interactional efficacy of virtual human agents. ***FY 2011 Plans:*** Research electroencephalogram (EEG) and functional magnetic resonance imaging (fMRI) methods to understand the neural underpinnings leading to successful perceptual discrimination; and improve the characterization of neural data developed in this research effort using methodologies in network dynamics, optimal control and complex systems. ***FY 2012 Plans:*** Efforts will continue the study of spatial and temporal dynamics of brain function via simultaneous fMRI-EEG neuroimaging; will integrate cognitive theory and biologically constrained computational models with multimodel imaging to further develop enabling technologies that support improved methods for Soldier training; will continue investigation of genetic markers that can be linked to abilities in classification learning; and will investigate the shared neural substrates for action simulation and intention understanding.	1.182	1.219	1.214
Accomplishments/Planned Programs Subtotals	8.251	9.672	12.214

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
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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.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT H09: *ROBOTICS COLLABORATIVE TECH ALLIANCE (CTA)*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
H09: *ROBOTICS COLLABORATIVE TECH ALLIANCE (CTA)*	4.364	5.077	5.284	-	5.284	5.490	5.586	5.677	5.773	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project supports a collaborative effort between the competitively selected industry and university consortium, the Robotics Collaborative Technology Alliance (CTA), and the Army Research Laboratory (ARL) for the purpose of leveraging world-class research in support of the future force and Army transformation needs. This project conducts basic research in areas that will expand the capabilities of intelligent mobile robotic systems for military applications with a focus on enhanced, innate intelligence, ultimately approaching that of a dog or other intelligent animal, to permit unmanned systems to function as productive members of a military team. Research is conducted in machine perception, including the exploration of sensor phenomenology, and the investigation of basic machine vision algorithms enabling future unmanned systems to more fully understand their local environment for enhanced mobility and tactical performance; intelligent control, including the advancement of artificial intelligence techniques for robot behaviors permitting future systems to autonomously adapt, and alter their behavior to dynamic tactical situations; understanding the interaction of humans with machines focusing upon intuitive control by Soldiers to minimize cognitive burden; dexterous manipulation of the environment by unmanned systems; and unique modes of mobility to enable unmanned systems to seamlessly navigate complex or highly constrained three dimensional environments. The program will conduct both analytic and validation studies. Research products will be transitioned to the companion applied technology program, PE 0602618A, project H03, for integration and evaluation in test bed platforms and will form the scientific basis for new technology that will migrate into Army and Joint advanced and system development programs to provide highly capable unmanned systems 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) at the Aberdeen Proving Ground, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Autonomous systems	4.364	5.077	5.284
Description: Explore opportunities enabling revolutionary, autonomous, highly mobile systems for the future force. Research focuses on unmanned systems operating as a team with human supervisors and displaying a high degree of adaptability to dynamic environmental and tactical situations.			
FY 2010 Accomplishments: Expanded research to include a more complete understanding of control and interaction between humans and robots through non-verbal cues and natural language; autonomous understanding and retention of salient features and activities to promote			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT H09: *ROBOTICS COLLABORATIVE TECH ALLIANCE (CTA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
learning and adaptation to dynamic, unknown environments; and novel structural and control techniques to enable more dexterous manipulation. ***FY 2011 Plans:*** Research expanded abilities to perceive and understand activities, consistent with complex urban environments and investigate concepts underlying the planning and coordinated response by multiple heterogeneous robots. ***FY 2012 Plans:*** Will focus upon exploration of principles for constructing and managing a hierarchical world model combining cognitive higher level representations with lower level planning to enable formation of effective human robot teams; will evaluate the learned recognition of terrain and objects with placement into context; will assess situational awareness within human-robot teams; and will explore methodologies for coordinated manipulation.			
Accomplishments/Planned Programs Subtotals	4.364	5.077	5.284

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

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

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT H50: *Network Sciences CTA*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
H50: *Network Sciences CTA*	2.554	3.289	12.908	-	12.908	12.979	15.283	15.567	15.831	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project supports a competitively selected university and industry consortium, the Communication and Networks Collaborative Technology Alliance (CTA) that was formed to leverage commercial research investments to provide solutions for the Army's requirements for robust, survivable, and highly mobile wireless communications networks. The future force has a requirement for state-of-the-art wireless mobile communications networks for command-on-the-move. The objectives include designing communications systems for survivable wireless mobile networks; providing signal processing for communications-on-the-move; secure jam-resistant communications; and tactical information protection. The CTA facilitates the exchange of people among the collaborating organizations to provide cross-organizational perspectives on basic research challenges, as well as the use of state-of -the-art facilities and equipment at the participating organizations. This CTA accelerates the transition of communications and networks technology to PE 0602783A (Computer and Software Technology). The results of this work will significantly affect future force communications and networking formulation efforts.

The Communications and Networks CTA ended in FY09. In FY10, a portion of this program shifts to in-house efforts in PE 0601102A/project H48. The remainder of the program is refocused in FY10 on the Network Sciences CTA to more strongly emphasize Information Assurance and Network Science as defined by the December 2005 National Research Council Board on Army Science and Technology study. Since the International Technology Alliance on Network and Information Sciences (PE 0601104A/project J15) was established in 2006, joint planning of the research programs prevents redundancies and leverages accomplishments from both programs. Beginning in FY12, all funds from PE 61104/project J22 will be realigned to this project.

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) in Adelphi, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Network Sciences Collaborative Technology Alliance (NS CTA)	2.554	3.289	12.908
Description: The Network Sciences CTA began in FY10 and focuses on two major research areas: Information Networks and Social/Cognitive Networks; and builds upon successes of the Communications & Networks CTA for Communications Networks and Integration. The vision for the NS CTA is to develop a fundamental understanding of the ways that information, social/cognitive, and communications networks can be designed, composed, and controlled to dramatically increase mission effectiveness and ultimately enable humans to effectively exploit information for timely decision-making. Information Networks research develops the fundamental understanding of autonomous network activities and its linkage to the physical and human domains as related to human decision making within the networked command and control (C2) structure. Social/Cognitive			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT H50: *Network Sciences CTA*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Networks research is developing the fundamental understanding of the interplay of the various aspects of the social and cognitive networks with information and communications. Communications Networks research is developing the foundational techniques to model, analyze, predict, and control the behavior of secure tactical communication networks as an enabler for information and C2 networks. Integration is focused on achieving an integrated Information Networks, Social/Cognitive Networks, Communications Networks research program that significantly enhances the fundamental understanding of the underlying science of networks. ***FY 2010 Accomplishments:*** Established the Network Sciences CTA in support of the Network Science & Technology Research Center (PE 0601104A/project J22). Research included modeling to understand network centric organizations and developing mobile ad hoc network simulation and emulation technologies to evaluate networks in organizations. ***FY 2011 Plans:*** Design an evaluation scheme for the verification and validation of models of trust in network supported decision making. ***FY 2012 Plans:*** Will develop models of network performance that capture the complex interactions between social, cognitive, information and communication networks; will extend the initial trust model that will improve network fidelity and reliability in the tactical mobile ad hoc network (MANET) environment; will develop theoretically grounded empirical models of emergence and propagation of trust and beliefs in insurgent-civilian populations and in battle command decision-making; will produce experimentally-confirmed results in dynamics and stability of large-scale, dynamic, distributed, human-centric networks of information; and will investigate the impacts of mobility and adversarial attacks on the dynamics of information quality delivered through mobile communication networks.			
Accomplishments/Planned Programs Subtotals	2.554	3.289	12.908

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

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

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT H53: *Army High Performance Computing Research Center*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
H53: *Army High Performance Computing Research Center*	3.311	3.706	4.355	-	4.355	4.467	4.847	6.119	6.909	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

This project supports critical research at the Army High Performance Computing Research Center (AHPCRC). Research at the AHPCRC is focused on the Lightweight Combat Systems Survivability, computational nano- and bio-sciences, computational battlefield network and information sciences including evaluating materials suitable for armor/anti-armor and sensor applications, defense from chemical and biological agents, and associated enabling technologies requiring computationally intensive algorithms in the areas of combat systems survivability, battlefield network sciences, chemical and biological defense, nanoscience and nanomechanics, and computational information sciences, scientific visualization enabling technologies that support the future force transition path. This project also supports the Robotics Collaborative Technology Alliance which explores new opportunities to enable revolutionary autonomous mobility of unmanned systems for the Future Force. This research is an integral part of the larger Army Robotics Program and feeds technology into Robotics Technology (PE 0602618A, project H03). The project will also address research focusing on unmanned systems operating as a team with human supervisors and displaying a high degree of adaptability to dynamic environmental and tactical situations.

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

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: AHPCRC	3.311	3.706	4.355
Description: The AHPCRC research mission is to advance computational science and its application to critical Army technologies through an Army-university-industry collaborative research program.			
FY 2010 Accomplishments: Enhanced lightweight fabric structure systems; enhanced innovative scalable algorithms to analyze very large-scale complex mobile network simulation applications; developed new scalable multi-scale computational approaches for micro-systems design; and implemented computational bio- and nano-science scalable algorithms.			
FY 2011 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT H53: *Army High Performance Computing Research Center*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Validate lightweight fabric structure systems; implement and evaluate new and novel programming models on heterogeneous systems; implement computational approaches to analyze very large-scale mobile network simulation applications; implement new multi-scale computational approaches for micro-systems design; advance scalable algorithms for material sciences, computational bio- and nano-sciences; and stimulate innovations in algorithms for new multi-core hybrid computing architectures. ***FY 2012 Plans:*** Will develop: computational approaches for coupling light weight fabric structural mechanics with computational electromagnetics to study contact mechanics between electromagnetically charged fabrics and structures; scalable approaches for nano-fluidics for Army medical applications; quantum level approaches for an all electron battery; and programming models for emerging hybrid computing architectures for Army applications. Will investigate scalable algorithms for large-scale social networks and will validate multi-scale computational approach for micro-systems design.			
Accomplishments/Planned Programs Subtotals	3.311	3.706	4.355

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

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

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT H54: *Micro-Autonomous Systems Technology (MAST) CTA*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
H54: *Micro-Autonomous Systems Technology (MAST) CTA*	7.739	8.050	7.945	-	7.945	8.290	8.434	8.570	8.716	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

This project supports the Micro Autonomous Systems and Technology (MAST) Collaborative Technology Alliance (CTA), a competitively selected industry-university consortium which leverages world-class research necessary to address future force and Army Transformation needs. The CTA links a broad range of government technology agencies, as well as industrial and academic partners with the Army Research Laboratory (ARL). The MAST CTA focuses on innovative research in four main technical areas related to the coherent and collaborative operation of multiple micro autonomous platforms: microsystem mechanics, processing for autonomous operation, microelectronics, and platform integration. Payoff to the warfighter will be advanced technologies to support future force requirements in situational awareness. The CTA facilitates the exchange of people among the collaborating organizations to provide cross-organizational perspectives on basic research challenges, and to make available to the Alliance state-of-the-art facilities and equipment at the participating organizations.

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) in Adelphi, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Micro Autonomous Systems Technology CTA	7.739	8.050	7.945
Description: Funding is provided for the following effort			
FY 2010 Accomplishments: Developed limits on platform power and tradeoffs between power for propulsion, sensing, signal processing, and communication; implemented small group collaborative tactical behaviors and investigated tradeoffs in distributed processing and communications for perception and navigation; developed initial prototypes in microelectronics for navigation, communication, information processing, and sensing for micro-autonomous systems; proved the hover capability of a flapping wing platform; and investigated performance of small flying platforms under gusty wind conditions.			
FY 2011 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT H54: *Micro-Autonomous Systems Technology (MAST) CTA*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Extramural partners are modeling multiple robotic platform architectures; exploring autonomous tactical behaviors in realistic 3-D environments, designing holistic sensing, processing, actuation architectures; and transitioning processing algorithms to the Army robotics community; and investigating contractor developed models and technologies for future implementation. Will investigate methods to optimize and implement microelectronics technology for navigation, communication, information processing, and sensing for micro-autonomous systems. ***FY 2012 Plans:*** Will experimentally validate the ability of small air and ground platforms to identify points of ingress into a structure and to navigate through them in a robust, stable manner and; will conduct experiments on the ability of small air and ground platforms to navigate to a waypoint based on sensor input.			
Accomplishments/Planned Programs Subtotals	7.739	8.050	7.945

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

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

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT H59: *UNIV CENTERS OF EXCEL*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
H59: *UNIV CENTERS OF EXCEL*	5.345	5.580	6.356	-	6.356	7.431	7.543	7.647	7.777	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

This project funds the International Technology Centers (ITCs), the Foreign Technology (and Science) Assessment Support (FTAS) program, and a Basic Research Center for Network Science located at the United States Military Academy.

The nine ITCs located in Australia, the United Kingdom, Canada, France, Germany, Japan, Chile, Argentina, and Singapore support the Army's goals of providing the best technology in the world to our Warfighters by leveraging the Science and Technology (S&T) investments of our international partners. The ITCs perform identification and evaluation of international technology programs to assess their potential impact on the Army's S&T investment strategy. ITC 'technology finds' are submitted as technology information papers (TIPs) to various Army S&T organizations for evaluation and consideration for further research and development. The ITC TIPs also serve as input into the international section of the Army S&T Master Plan. The FTAS program builds upon the TIPs submitted by the ITCs. In some cases the TIP is truly unique and may well meet an Army requirement or potentially support ongoing Army S&T investments. In such cases, the FTAS program can provide initial resources (seed money) to fund basic research in these technology areas identified by the TIPs as having potential relevance to the Army's S&T plan. The research will provide information useful in making early assessments of the technology's potential contributions to the Army's S&T strategy.

Beginning in FY09, this project funds a Basic Research Center in Network Science at the United States Military Academy (USMA) to further the theoretical understanding of engineering design principles on network sciences and how they operate. Work in this project is coordinated with and complementary to the work at the Network Science and Technology Research Center (NSTRC) funded under PE 0601104A/project J22 and PE 0601104/project H50.

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 extramurally by Headquarters, Army Research, Development and Engineering Command (RDECOM) and the Army Research Laboratory (ARL) in Adelphi, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: International Technology Centers (ITC)	4.387	4.593	5.371
Description: Funding is provided for the following effort.			
FY 2010 Accomplishments:			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT H59: *UNIV CENTERS OF EXCEL*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
The ITCs made progress in several main areas of foreign technology identification and supported international collaboration including: Counter-Improvised Explosive Devices and Mines, Training, Power and Energy, Human Dimension, Sustainment, Battle Command, and Battle Space Awareness; five FTAS projects were completed with technology originating from the United Kingdom, Israel, Brazil and Belgium. These projects have shown to have successfully advanced technology programs for ARL, Armament Research, Development, and Engineering Center (RDEC), Communications-Electronics RDEC and Tank-Automotive RDEC. ***FY 2011 Plans:*** Continue to solicit projects and build on the success of the FTAS Program. Continue efforts to explore ITCs technology based on critical Army requirements. Eleven additional projects with technology originating from eight different countries are being worked on in FY11. These projects were initiated from TIPs received and submitted by AMRDEC, ARDEC, ARL, CERDEC and TARDEC. Twelve FTAS project proposals submitted during FY10 are currently awaiting decision. ***FY 2012 Plans:*** Will continue to solicit projects and build on the success of the FTAS Program; will continue to enhance and refine technology search capabilities using feedback from customers (RDECs, PMs and labs) to focus on near and long term capabilities.			
Title: Basic Research Center in Network Science at the United States Military Academy (USMA) ***Description:*** Network science research at USMA in support of the Network Science and Technology Research Center. ***FY 2010 Accomplishments:*** Contributed to and facilitated the Army transformation to network-centric operations (NCO), and promoted the professional development of the United States Military Academy (USMA) faculty in the physical, mathematical, engineering, biological, behavioral, and social sciences relevant to network science; as well as created tools that allowed the design and synthesis of networks to obtain desired properties and to increase the level of rigor and mathematical structure in network science. ***FY 2011 Plans:*** The Center is abstracting common concepts across fields, performing evaluations and measurements of network structure, to allow enhancement of the robustness and security of networks; advancing scientific and technological knowledge needed to support NCO and contributing to the tactics, techniques and procedures using the existing USMA knowledge of current and emerging Army doctrine, world geo-political circumstances, and the Army as an organization. ***FY 2012 Plans:***	0.958	0.987	0.985

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT H59: *UNIV CENTERS OF EXCEL*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Greater emphasis will be placed on studying emerging markets and the role they play in the economic development of a country; will research biological networks to understand the impact of environmental contaminants on genetic and metabolomic circuits in the human body.			
Accomplishments/Planned Programs Subtotals	5.345	5.580	6.356

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

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

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT H62: *Institude for Advanced Technology (IAT)*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
H62: *Institude for Advanced Technology (IAT)*	6.184	5.506	1.423	-	1.423	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project funds a University Affiliated Research Center (UARC), the Institute for Advanced Technology (IAT) at the University of Texas, to conduct basic research in electromechanics and hypervelocity physics in support of electromagnetic (EM) guns. Of particular interest are EM power, EM launchers, EM integrated launch packages, and hypervelocity terminal ballistics. Advanced computational models are devised and/or applied to solve complex problems in each of these areas. In keeping with the Army EM Armaments Program strategy, highest emphasis has been placed on advancing the state-of-the-art in pulsed power. The sponsored research provides the scientific underpinning for EM gun pulsed power including switching; addresses technical barriers associated with EM gun launcher life; and researches advanced technologies for hypervelocity target defeat. The sum of these focused efforts serves as a catalyst for technological innovation and provides crucial support to the Army technology base for advanced weapon systems development with applications for anti-armor, artillery, air defense, and the future force.

In January 2012, the UARC contract with IAT is scheduled to end. New efforts beginning in FY12 will be conducted via competitive solicitation and performed under PE 0601104/Project VS2, Center for Advanced 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 monitored and guided by the Army Research Laboratory (ARL) in Aberdeen Proving Ground, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Pulsed Power	2.832	2.683	-
Description: This effort investigates advanced pulsed power concepts. ***FY 2010 Accomplishments:*** Analyzed methods to increase energy density of pulsed alternators; and evaluated the design options for moderate-sized advanced pulsed power system assessments of new concepts, especially including battery-inductor arrangements, for Army Electromagnetic (EM) gun applications to define their operating system characteristics. ***FY 2011 Plans:*** Analyze advanced pulsed power concepts that are reduced in size and weight and identify gaps in understanding of pulsed power research.			
Title: Launch	1.649	1.391	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT H62: *Institute for Advanced Technology (IAT)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: This effort investigates rail and armature design. ***FY 2010 Accomplishments:*** Investigated techniques to increase rail life and showed higher muzzle energy railgun operation with integrated launch packages that contain realistic flight bodies; and updated theories for elevated temperature railgun operation based on experiments and simulations. ***FY 2011 Plans:*** Will incorporate FY10 investigation results into advanced rail and armature design.			
Title: Electromagnetic Lethality ***Description:*** Funding is provided for the following effort ***FY 2010 Accomplishments:*** Studied target effects of novel penetrator concepts for precision fires and other high velocity impact conditions; and studied target effects of novel penetrator concepts for precision fires and other high velocity impact conditions. ***FY 2011 Plans:*** Conduct theory critical evaluations that determine the lethality potential of novel concepts. . ***FY 2012 Plans:*** Will complete theoretical investigations of novel lethal concepts and document findings; and will finalize contract obligations.	1.703	1.432	1.423
Accomplishments/Planned Programs Subtotals	6.184	5.506	1.423

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

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

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT H64: *MATERIALS CENTER*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
H64: *MATERIALS CENTER*	2.726	2.869	2.920	-	2.920	2.971	3.023	3.072	3.829	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

This project concentrates scientific resources on materials research for lightweight vehicle protection and is executed through Cooperative Research Agreements (CRAs). The effort funds collaborative research in three Materials Science and Engineering Research Areas (MSERAs): Composite Materials Research; Advanced Metals and Ceramics Research; and Polymer Materials Research. Each MSERA pursues thematic research thrusts that address topics pertinent to lightweight vehicle protection and that are aligned with the Army's strategic materials research vision enabling long-term synergistic collaboration between the Army Research Laboratory (ARL) scientists and university researchers. The Materials Cooperative Research Agreements provide for mutual exchange of personnel and sharing of research facilities with the University of Delaware, Johns Hopkins University, Rutgers University, Drexel University, and Virginia Polytechnic Institute and State University. Lightweight, multi-functional composites, advanced armor ceramics, dynamic response of metals, protective polymer, and hybrid systems are emphasized. This project is closely coordinated with ARL in-house materials research projects (PE 0601102A, project H42) to promote effective and efficient transfer of fundamental scientific research addressing lightweight protective material requirements for the future force. The center accelerates the transition of technology to PE 0602105A (Materials 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) in Aberdeen Proving Ground, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Materials Research for vehicle protection	2.726	2.869	2.920
Description: Materials Research for vehicle protection Performs research and exploits promising breakthroughs in multi-functional composites, advanced armor ceramics, dynamic response of metals, protective polymers, and hybrid systems to enable revolutionary vehicle protection.			
FY 2010 Accomplishments:			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT H64: *MATERIALS CENTER*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Examined high rate deformation mechanisms for ceramics and other advanced materials; examined the role of defects; characterized materials using advanced microscopy methods; and developed microstructure-processing relationships for severely plastically deformed materials. ***FY 2011 Plans:*** Research the relationship between microstructures of nanoscale composites and observations of high rate deformation; and examine the dynamic response of multifunctional materials systems. ***FY 2012 Plans:*** Will research the role of non-traditional deformation mechanisms in the failure and flow of potential armor materials; and will model the twinning (local intermediate plastically) behavior of non-cubic metals and ceramic materials.			
Accomplishments/Planned Programs Subtotals	2.726	2.869	2.920

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

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

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT H73: *Automotive Research Center (ARC)*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
H73: *Automotive Research Center (ARC)*	2.831	2.947	3.994	-	3.994	4.049	4.102	4.153	4.207	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

This project significantly enhances the Army's transformation to the future force by the application of novel, high payoff technologies that can be integrated into Army ground platforms. The Center of Excellence for Automotive Research is part of the basic research component of the National Automotive Center (NAC), a business group within the US Army Tank-Automotive Research, Development, and Engineering Center (TARDEC). The Center of Excellence for Automotive Research is an innovative university/industry/government consortium leveraging commercial technology for potential application in Army vehicle systems through ongoing and new programs in automotive research, resulting in significant cost savings and performance enhancing technological opportunities. The research performed in this project contributes to formulating and establishing the basic scientific and engineering principles for these technologies.

Efforts are fully coordinated and complementary to those performed by the NAC and TARDEC under PE 0602601A (Combat Vehicle and Automotive Technology). Selected university partners include: University of Michigan, Virginia Tech, Wayne State University, University of Alaska, Oakland University, and Clemson University. Key industry partners include all major US automotive manufacturers and suppliers. The Automotive Research Center (ARC) formulates and evaluates advanced automotive technologies and advances state-of-the-art modeling and simulation for the Army's future ground vehicle platforms.

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 TARDEC, Warren, MI.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Automotive Research Center (ARC)	2.831	2.947	3.994
Description: Funding is provided for the following effort.			
FY 2010 Accomplishments:			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT H73: *Automotive Research Center (ARC)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Explored and developed mobility and propulsion models for unmanned ground vehicles; developed more detailed vehicle thermal management models for hybrid electric tactical ground vehicles; and studied the feasibility of advanced materials for reducing Army ground vehicle weight while meeting survivability needs with a focus on improved fragmentation protection models. ***FY 2011 Plans:*** Exploring advanced automotive propulsion concepts that will potentially improve the fuel economy and mobility of military ground vehicles including novel hybrid electric architectures; investigating the feasibility of advanced materials for reducing Army ground vehicle weight while meeting survivability needs; and assessing the impact of alternative diesel and jet fuels on advanced automotive and heavy-duty diesel engines combustion characteristics. ***FY 2012 Plans:*** Will research fundamental challenges synthesizing and advancing ground vehicle technologies as well as power systems to improve mobility and reliability; effort will address novel electronic architectures, alternative fuels and advanced materials for weight reduction.			
Accomplishments/Planned Programs Subtotals	2.831	2.947	3.994

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

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

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT J08: *INSTITUTE FOR CREATIVE TECHNOLOGY*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
J08: *INSTITUTE FOR CREATIVE TECHNOLOGY*	7.486	7.878	8.022	-	8.022	8.167	8.310	8.944	9.838	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project supports simulation and training technology research at the Institute for Creative Technologies (ICT) at the University of Southern California, Los Angeles, California. The ICT was established to support Army training and readiness through research into simulation and training technology for applications such as mission rehearsal, leadership development, and distance learning. The ICT actively engages industry (multimedia, location-based simulation, interactive gaming) to exploit dual-use technology and serves as a means for the military to learn about, benefit from, and facilitate the transfer of applicable entertainment technologies into military systems. The ICT also works with creative talent from the entertainment industry to adapt concepts of story and character to increase the degree of participant immersion in synthetic environments and to improve the realism and usefulness of these experiences. In developing a true synthesis of the creativity, technology, and capability of industry and the research and development community, it is revolutionizing military training and mission rehearsal by making it more effective in terms of cost, time, range of experiences that can be trained or rehearsed, and the quality of the result. This project accomplishes this by performing basic research in modeling and simulation in accordance with the core competencies for the ICT University Affiliated Research Center (UARC).

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 extramurally by the Army Research Laboratory (ARL) in Adelphi, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Immersive Environments	2.832	3.050	3.098
Description: Conduct basic research in immersive environments, to include virtual humans, three dimensional (3D) sound and visual media, to achieve more efficient and affordable training, modeling, and simulation solutions. Research includes investigation of techniques and methods to address the rapid development of synthetic environments that can be used for mission rehearsal, assessment, and training of military operations.			
FY 2010 Accomplishments: Developed semi-automatic environment setup and alignment system that will allow rapid setup and configuration of immersive environments.			
FY 2011 Plans: Investigate methods of interaction between multiple real and virtual humans in virtual immersive environments.			
FY 2012 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT J08: *INSTITUTE FOR CREATIVE TECHNOLOGY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Will investigate use of large scale 3D displays for immersive simulation and learning environments; and will complete social perception as well as reactivity studies to improve virtual human responsiveness and rapport.			
Title: Graphics and Animations ***Description:*** Research will improve computational techniques in graphics for achieving real-time photo-realistic rendering of physical and synthetic environments for training and simulations. Research into auditory aspects of immersion will provide the sound stimulus for increasing the realism for military training and simulation devices. ***FY 2010 Accomplishments:*** Investigated technologies for near-photo real, life-like characters; and investigated methods for metadata tagging of historical art assets. ***FY 2011 Plans:*** Develop tools for rapidly creating virtual characters that can be animated based on real people. ***FY 2012 Plans:*** Will investigate novel approaches for using specialized light sources to facilitate 3D modeling; and will complete the development of algorithms that provide real-time reconstruction of geometric shapes using a single photographic view of an object.	1.719	1.732	1.780
Title: Techniques and Human-virtual Human Interaction ***Description:*** Conduct basic research to investigate methods and techniques for improving the perception, communication, understanding, and responsiveness of virtual humans when interacting with live humans. ***FY 2010 Accomplishments:*** Investigated technologies for enabling virtual humans to sense a person's gestures or facial expressions; and developed new virtual human cognitive architecture to model complex human mental processes within virtual humans. ***FY 2011 Plans:*** Investigate techniques for allowing multiple real people to interact with multiple virtual humans. ***FY 2012 Plans:*** Will enhance toolkits for virtual humans to accelerate the development of virtual humans via collaborations with external organizations; and will develop statistical models of culture-specific behaviors for conversations.	2.935	3.096	3.144
Accomplishments/Planned Programs Subtotals	7.486	7.878	8.022

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT J08: *INSTITUTE FOR CREATIVE TECHNOLOGY*

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

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

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT J12: *Institute for Soldier Nanotechnology (ISN)*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
J12: *Institute for Soldier Nanotechnology (ISN)*	9.862	10.487	10.787	-	10.787	10.891	11.181	11.261	11.452	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

This project supports sustained multidisciplinary research at the Institute for Soldier Nanotechnologies (ISN) at the Massachusetts Institute of Technology. The ISN emphasizes revolutionary materials research for advanced Soldier protection and survivability. The ISN works in close collaboration with the Army Research Laboratory (ARL), the Army's Natick Soldier Research, Development and Engineering Center (NSRDEC), and other Army Research Development and Engineering Command (RDECOM) elements, as well as several major industrial partners, including Raytheon and DuPont, in pursuit of its goals. The institute is designated as a University Affiliated Research Center (UARC) to support research to devise nanotechnology-based solutions for the Soldier. This project emphasizes revolutionary materials research toward an advanced uniform concept. The future uniform will integrate a wide range of functionality, including ballistic protection, responsive passive cooling and insulating, screening of chemical and biological agents, biomedical monitoring, performance enhancement, and extremities protection. The objective is to lighten the Soldier's load through system integration and multifunctional devices while increasing survivability. The new technologies will be compatible with other Soldier requirements, including Soldier performance, limited power generation, integrated sensors, communication and display technologies, weapons systems, and expected extremes of temperature, humidity, storage lifetimes, damage, and spoilage.

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 extramurally by the Army Research Lab (ARL) in Adelphi, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Nanomaterials	2.482	2.651	2.751
Description: Nanomaterials research efforts focus on light-weight, multifunctional nanostructured fibers and materials. ***FY 2010 Accomplishments:*** Prepared nanostructures with unique, controlled sizes and shapes for sensing light; continued development of microfluidic reactors for the synthesis of complex, engineered nanostructured quantum dots; engineered and functionalized carbon nanotubes			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT J12: *Institute for Soldier Nanotechnology (ISN)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
(CNTs) to enhance ability of CNTs to generate photocurrents following absorption in the infrared and visible spectra; began development of an acoustic fiber having acoustic wave detection and modulation capabilities. ***FY 2011 Plans:*** Characterize the absorption and emission properties of nanoparticles using models and experimental tests; toward the development of photodetector arrays, design rules for optimized incorporation of quantum dots into organic and inorganic thin film structures are being developed; begin development of technology for the controlled assembly of large-scale ordered CNT arrays and develop library of new responsive thermoplastic elastomers containing attached field responsive groups for the generation of electro-actuating, chemically responsive or temperature/light responsive contractile fibers or porous fabrics. ***FY 2012 Plans:*** Will design and fabricate photoconducting and photodiode fibers with bandwidth and noise equivalent power commensurate with communication system specifications; will investigate the electrical tunability of conductive electrospun fibers establishing a clear processing-structure-property relationship for these fibers; and will examine properties of nanoparticle-containing layer-by-layer films, including films designed to be self-cleaning and with decontamination properties.			
Title: Blast Effects on Soldier ***Description:*** Blast Effects on Soldier research involves the areas of Battle Suit Medicine and Blast and Ballistic Protection. ***FY 2010 Accomplishments:*** Developed models predicting transdermal transport in skin and investigate various transport pathways and mechanisms; designed nanosized micellar structures formed as a block copolymer thin film on surfaces and interfaces for non-invasive drug delivery; tethered amplified fluorescent polymers for pre-symptomatic biosensing system via polymeric nanocoatings deposited by chemical vapor deposition; designed portable electro-microfluidic devices for real-time medical monitoring, modeling and simulation of the next-generation of 'induced charge electro-osmosis' nanoscale fluid flow regimes; designed protective material prototypes based on graphene chainmail structures. ***FY 2011 Plans:*** Synthesize controlled release films using layer-by-layer technique; use transfer printing of grapheme-carbon nanotube multilayers to build stacked, alternate laminates of grapheme chainmail structures; evaluate mechanical properties of superelastic alloys as a function of their nano-scale dimensions and at blast application rates; conduct novel nanomechanical impact loading experiments to map hydrated-tissue mechanical properties and impact penetration resistance in the absence and presence of protective materials. ***FY 2012 Plans:***	4.910	5.185	5.285

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT J12: *Institute for Soldier Nanotechnology (ISN)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Will investigate and model shock propagation in new polymeric materials; will examine the underlying biomechanical motion mechanisms of the P. senegalus (dinosaur eel) exoskeleton as well as the effect of curvature on the exoskeleton mechanics of this fish; will examine properties of new aluminum nanoscale crystalline alloys and develop underpinning theory for stabilizing these alloys; and will continue development of nanostructured contractile polymers to serve as new actuator material technologies.			
Title: Soldier Protection ***Description:*** Soldier Protection research efforts focus on Soldier Survivability and Protection and Nanosystems Integration. ***FY 2010 Accomplishments:*** Developed the strategy for electrical contacts for optoelectronic fibers; and evaluated virucidal coatings for activity, toxicity, and elucidation of mechanism of virucidal action; as well as demonstrated amplifying, fluorescent, chemical sensing devices with plasmon-mediated electrical transduction to produce resistivity-based chemical sensing. ***FY 2011 Plans:*** Prepare optoelectronic fiber materials with electrical contacts; extend the optical resolution limits of current chemical microscopy methods providing chemically specific mapping of surfaces with a lateral resolution of 5 nm; initiate chemical vapor deposition (iCVD) films containing sensing functionalized groups;, fabricate into various geometries and optimize for sensing sensitivities; establish approaches to enable seamless integration of multiple detection functions on the single fiber level as well as the level of fiber assembly; continue long-term development of laser-to-uniform free-space optical communication system including development of multi-material optical detector fibers, the incorporation of these fibers into a larger fabric, and the hardware/ software needed for interfacing the receiver fabric to a data acquisition system. ***FY 2012 Plans:*** Will optimize quantum dot synthesis in pursuit of new schemes and collaborations with Army partners to improve the performance of quantum detector (QD) sensors in detecting biological warfare agents; will evaluate hemorrhagic shock device and continue to develop rapid reconstitution prototype to be integrated in a spring-loaded syringe; and will characterize novel nanoscale virucidal and bactericidal coatings for equipment surface protection.	2.470	2.651	2.751
Accomplishments/Planned Programs Subtotals	9.862	10.487	10.787

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT J12: *Institute for Soldier Nanotechnology (ISN)*

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

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

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT J13: *UNIVERSITY AND INDUSTRY INITIATIVES (CA)*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
J13: *UNIVERSITY AND INDUSTRY INITIATIVES (CA)*	21.924	-	-	-	-	-	-	-	-	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

Congressional Interest Item funding provided for University and Industry Initiatives.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Nanotubes Optimized for Lightweight Exceptional Strength (NOLES) ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Exploited novel properties and fabrication opportunities associated with nano-based Bucky-paper technology, which includes enhancing flame retardance of polymer composites, low energy displays, and novel, low energy bimorph actuator mechanism development.	3.182	-	-
Title: Visualization for Training and Simulation in Urban Terrains ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This effort focused on refining the visualization and simulation capabilities so that they become more realistic and can be used in war game scenarios and troop training simulations.	1.193	-	-
Title: Development of Enabling Chemical Technologies for Power from Green Sources ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Explored molecular structure, assembly, and physical properties, and their impact on performance. Specific research efforts included: 1) molecular design and synthesis, 2) physical characterization of molecules and macromolecules, 3) bulk materials characterization at soft-hard interfaces, 4) device fabrication and characterization, and 5) theoretical modeling.	1.194	-	-
Title: Manufacturing and Industrial Technology Center	0.398	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT J13: *UNIVERSITY AND INDUSTRY INITIATIVES (CA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Provided manufacturing and technology training that combined effective uses of technology to prepare students for success in science and technology-based professions.			
Title: Center for Nanoscale Bio-Sensors as a Defense against Biological Threats ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Created newly discovered nanoscale materials and used visualization techniques to image and manipulate them at the scale of the individual atom using the unique nanoscale ferroelectric, magnetic and quantum dot material fabrication facilities.	2.984	-	-
Title: Micro Electro Mechanical Systems (MEMS) Antenna for Wireless Communications Supporting unmanned aerial vehicles (UAVs) in the Battlefield ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This effort developed micro electro mechanical systems (MEMS) based electronically steered antenna by leveraging radio frequency MEMS switch technology currently under development by industry and government.	2.387	-	-
Title: Academic Support and Research Compliance for Knowledge Gathering ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This program established a partnership between Kansas University and the Combined Arms Center (CAC) at Fort Leavenworth, Kansas through which Kansas University offers the Army a new Master's program for Special Forces Officers.	1.990	-	-
Title: Ink-Based Desktop Electronic Material Technology ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Developed specialized inks that are wholly capable of fabricating electronics that would be printed on desktop printers and then incorporated into electronics, significantly resulting in improved mobility and point-of-use printing capability.	1.592	-	-
Title: Army Material Degradation	0.637	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT J13: *UNIVERSITY AND INDUSTRY INITIATIVES (CA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Performed modeling and formulation studies to better understand the degradation and failure of Army coating systems.			
Title: Center for Hetero-Functional Materials ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** As conventional semiconductor manufacturing technology matures, new materials to create single-chip-devices are needed for a wide range of applications to ensure our national security. The Center combined federal funds with state funds to acquire additional research scientists, equipment, infrastructure improvements, technicians, and technical staff in the physics, chemistry, engineering and biology departments.	0.796	-	-
Title: ARL-ONAMI Center for Nanoarchitectures for Enhanced Performance ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Created early-stage technology for future Army sensing, communications, portable energy storage and generation and thermal management requirements based on breakthroughs in nanomaterials, nanostructured films and surfaces, micro-scale reaction engineering and ultra-lower power mixed signal electronics.	0.796	-	-
Title: Intelligent Network-Centric Sensor Development Program ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Developed improved sensors, including network sensors that would integrate imagery and other sensor information from several platforms.	1.194	-	-
Title: Materials Processing and Applications Development Center of Excellence for Industry ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:***	1.194	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT J13: *UNIVERSITY AND INDUSTRY INITIATIVES (CA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Focused on rapid development and applications insertion of emerging design, materials, and manufacturing technologies to provide solution options for many important military needs.			
Title: Advanced Polymer Systems for Defense Applications - Power Generation, Protection and Sensing ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Provided materials that will potentially lead to advances in the generation and storage of power for military devices.	2.387	-	-
Accomplishments/Planned Programs Subtotals	21.924	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

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

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT J14: *ECYBERMISSION*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
J14: *ECYBERMISSION*	4.086	5.330	5.426	-	5.426	-	-	-	-	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

This project supports eCYBERMISSION, a nation-wide, web-based, science, technology, engineering and mathematics (STEM) competition designed to stimulate interest and encourage continued education in these areas among middle and high school students nationwide. The project supports Army Transformation by providing a pool of technologically literate citizenry that potentially grow to become future Soldiers and civilians for the Army workforce of tomorrow.

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, the Department of Defense Basic Research Plan, and the President's initiative for education.

Work in this project is executed by the U. S. Army Research, Development and Engineering Command (RDECOM).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: eCYBERMISSION	4.086	5.330	5.426
Description: This effort supports a web-based science, technology, engineering and math competition for students in grades 6 through 9. ***FY 2010 Accomplishments:*** Continued to seek increased participation from existing levels and to increase geographic diversity; sustained eCYBERMISSION and implemented enhancements based on lessons learned from previous years. ***FY 2011 Plans:*** Continue to seek increased participation from existing levels and to increase geographic diversity and sustain eCYBERMISSION and implement enhancements based on lessons learned from previous years. ***FY 2012 Plans:*** Will work to increase participation from existing levels and to increase geographic diversity; will sustain eCYBERMISSION and implement enhancements based on lessons learned from previous years.			
Accomplishments/Planned Programs Subtotals	4.086	5.330	5.426

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT J14: *ECYBERMISSION*

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

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

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT J15: *NETWEORK SCIENCES INTERNATIONAL TECHNOLOGY ALLIANC*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
J15: *NETWEORK SCIENCES INTERNATIONAL TECHNOLOGY ALLIANC*	7.828	8.072	8.217	-	8.217	8.363	8.510	8.647	8.794	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

This project supports a competitively selected United States (US)/United Kingdom (UK) government, university, and industry consortium established to perform fundamental network and information science research in the areas of network theory, system-of-systems security, sensor processing and delivery, and distributed coalition planning and decision making. The focus is on enhancing distributed, secure, and flexible decision-making to improve coalition operations, and developing the scientific foundations for complex and dynamic networked systems-of-systems to support the complex human, social, and technical interactions anticipated in future coalition operations. The US Army Research Laboratory (ARL) and the UK Ministry of Defense (MOD) established a jointly funded and managed US and UK consortium, to be known as an International Technology Alliance (ITA) on Network and Information Sciences in FY06. The goal is fundamental science breakthroughs to enable superior coalition operations. Emphasis is on integration of multiple technical disciplines in an international arena. This program supports the future force transition path of the Transformation Campaign Plan (TCP).

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 extramurally by the Army Research Laboratory (ARL) at Adelphi, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Network and information science basic research for US/UK coalition operations information.	7.828	8.072	8.217
Description: Funding is provided for the following effort.			
FY 2010 Accomplishments: Devised efficient robust resource usage algorithms for operations without centralized control, and with inaccurate knowledge of operating conditions for enhanced network capabilities; investigated trust models to ensure distributed sensor data fusion under uncertainty; devised agent reasoning models and agent interaction models as well as algorithms to allow for effective agent support for human ad hoc teams in time stressed environments.			
FY 2011 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT J15: *NETWEORK SCIENCES INTERNATIONAL TECHNOLOGY ALLIANC*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Establish theoretical foundations for policy specification with formal representations at various levels of abstraction. Devise mathematical models to represent mappings between events, sensor monitored information, and end-uses; optimal compression of information flows based on human cognition metrics. Design reasoning algorithms to enable the creation of agents that promote trust among teammates and manage differing levels of trust. ***FY 2012 Plans:*** Will devise mathematical models to reason about network behaviors and composite security metrics to improve the security of heterogeneous coalition networks; and will investigate efficient and effective distributed federated database techniques to fuse and aggregate data from heterogeneous networks in support of dynamic coalition operations.			
Accomplishments/Planned Programs Subtotals	7.828	8.072	8.217

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

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

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT J17: *VERTICAL LIFT RESEARCH CENTER OF EXCELLENCE*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
J17: *VERTICAL LIFT RESEARCH CENTER OF EXCELLENCE*	1.963	2.066	2.654	-	2.654	2.741	2.828	2.990	3.151	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

This project is for Vertical Lift Research Center of Excellence to couple state-of-the-art research programs with broad-based graduate education programs at academic institutions with the goal of increasing the supply of scientists and engineers who can contribute to Army Transformation. Work will provide research into technologies that can improve tactical mobility, reduce the logistics footprint, and increase survivability for rotary wing 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 extramurally 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).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Vertical Lift Research Center of Excellence	1.963	2.066	2.654
Description: Funding is provided for the following effort			
FY 2010 Accomplishments: Designed and fabricated robust wind tunnel testing system for rotating icing environment evaluations; built and evaluated active trailing edge flaps rotor configurations for reducing rotor vibrations, power, and noise; investigated the performance improvements in the tip/casing region of ducted fan systems; and evaluated health monitoring capability of hybrid carbon-fiber/carbon-nanotube epoxy composites.			
FY 2011 Plans: Develop a method to describe nonlinear propagation path of rotor noise, develop a methodology for airfoil design that accounts for unsteady aerodynamics, use validated 3-D model to explore helical gear vibration, and compute induced power for typical rotor configurations and compare with measured data. The Vertical Lift Research Center of Excellence (VLRCOE) program will be re-competed in FY2011 and new agreements will be initiated in 4th quarter FY2011.			
FY 2012 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT J17: *VERTICAL LIFT RESEARCH CENTER OF EXCELLENCE*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Will fully implement multiple new VLRCOE agreements, with substantial participation of Navy and NASA that includes experimental and analytic work toward basic research applicable to future DoD rotorcraft fleet requirements.			
Accomplishments/Planned Programs Subtotals	1.963	2.066	2.654

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

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

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT J22: *NETWORK SCIENCE AND TECHNOLOGY RESEARCH CENTER*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
J22: *NETWORK SCIENCE AND TECHNOLOGY RESEARCH CENTER*	3.705	9.752	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project funds the establishment of the Network Science and Technology Research Center (NSTRC). The NSTRC will be competitively awarded and managed by the Army Research Laboratory (ARL). ARL researchers, with partners at other sites, will collaborate in a virtual center environment. There will be an effort undertaken to include additional partners such as universities, industry, and other government agencies. Network Science is the study of network representations of physical, biological, and social phenomena leading to predictive models of these phenomena. As such, network science may be seen as the cornerstone for future military operations and the conduct of network-centric warfare. The mission of this center will be to strengthen the theoretical underpinnings of network science; conduct basic research on how and why biological and social (non-physical) networks function and determine their applications to military networks; to manage the activities in network science research, technology development, and network experimentation for the Army; to focus science and technology investments to enable network-centric operations and warfare; to focus applied science and technology to enable social networks important to Army operations; and to enable the development of network science applications and facilitate their transition to Army and Joint operations. Network science, technology, and evaluations encompasses all information and information exchange, visualization, collaboration, manipulation, protection, restoration, transport, services, data storage, and application layers, including the knowledge that human use of networks is a critical component. Establishment of the center will require a phased approach cable of supporting development of fundamental network theory and network technologies, and carry out the assessment of impacts upon human performance; the integration of new technologies and social networks into capabilities; and experimentation as a means to evaluate and confirm fundamental theories and predictive models and/or characterize new technologies and operational concepts while also being capable of promoting training of personnel when applicable. Unlike the Training and Doctrine Commands on-going efforts within their centers, schools, and battle-labs, the focus of the NSTRC will be to develop the framework to perform research important to the Army in the areas of modeling, simulation and evaluation of very large networks, command and control of joint/combined networked forces, impact of network structure on organizational behavior, security and information assurance of networks, swarming behavior, and managing network complexity. It will also have a significant focus on and investment in the discovery and foundational aspects of the science of networks both human engineered and biologically evolved.

Work is this project is coordinated with and complementary to the work at the United States Military Academy (USMA) Basic Research Network Science Center funded under PE 0601104/project H59. Beginning in FY12 all funds in this project will be realigned to PE 61104/project H50.

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 will be primarily preformed extramurally with a small intramural effort by the Army Research Laboratory (ARL) in Adelphi, MD.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	**R-1 ITEM NOMENCLATURE** PE 0601104A: *University and Industry Research Centers*	**PROJECT** *J22: NETWORK SCIENCE AND TECHNOLOGY RESEARCH CENTER*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Network Science and Technology Research Center (NSTRC)	3.705	9.752	-
Description: Research in the broad area of network sciences technology is performed at various government agencies, industries and universities across the country and is coordinated through the Network Sciences Collaborative Technology Alliance, PE 0601104A/project H50. The future Army will have to take advantage of a multitude of new technologies to network the force and create a decisive warfighting advantage. The challenges will be to select, on the basis of their technical merit and applicability, those technologies best able to resolve identified technology shortfalls. ***FY 2010 Accomplishments:*** Developed diagnostic models and methods to advance the science of social/cognitive networks; established a synergistic framework for physics-based and human-based information fusion; and developed models of mobile ad hoc networking to define interactions and behavior among information networks. ***FY 2011 Plans:*** Study cross-domain issues to develop trust models that will support networks of humans connected through wireless mobile ad hoc networks. Study mathematical models and human/metric-driven mobility modeling to develop a better understanding of the dynamic behaviors of composite networks; investigate the ability of network science to assess, understand, analyze, measure and predict the performance of combined social, cognitive, information and communication networks.			
Accomplishments/Planned Programs Subtotals	3.705	9.752	-

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

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

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT VS2: *CENTER FOR ADVANCED RESEARCH*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
VS2: *CENTER FOR ADVANCED RESEARCH*	-	-	5.200	-	5.200	6.741	6.859	6.970	7.094	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

In January 2012, the University Affiliated Research Center (UARC) contract with Institute for Advanced Technology (IAT) (PE 0601104A/Project H62) is scheduled to end. In FY12, a competitive external center will be awarded to provide the Army with next generation multi-functional materials for ballistic and electronic applications and to address the extreme challenges associated with understanding and modeling materials subject to Army operational environments. This center will address the modeling and experimental challenges associated with developing multidisciplinary physics simulations across multiple length scales for materials to include: A limited ability to relate materials chemistry, structure, and defects to materials response and failure under extreme conditions; An inadequate ability to predict the roles of materials structure, processing, and properties on performance in relevant extreme environments and designs; and The lack of experimental capabilities to quantify multiscale response and failure of materials under extreme conditions. It is envisioned that once this multi-scale modeling capability is in place, it will be applied across multiple disciplines to facilitate revolutionary advances in materials for coupled environments (electromagnetic, high rate, high pressure, etc).

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 monitored and guided by the Army Research Laboratory (ARL) in Aberdeen Proving Ground, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Multi-Disciplinary, Multi-Scale Materials Behavior in Extreme Environments.	-	-	5.200
Description: Research will focus on the following areas: two-way multiscale modeling for predicting performance and designing materials, investigating analytical and theoretical analyses to effectively define the interface physics across length scales; advancing experimental capabilities for verification and validation of multiscale physics; and modeling and strategies for the synthesis of high loading rate tolerant materials so that all of the latter lead to the development of a comprehensive set of metrics that define high loading rate tolerant material systems. The multi-scale modeling capability will be applied across multiple disciplines to facilitate revolutionary advances in materials for coupled environments (electromagnetic, high rate, high pressure and other extreme environments).			
FY 2012 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601104A: *University and Industry Research Centers*	PROJECT VS2: *CENTER FOR ADVANCED RESEARCH*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
An external center will be competitively awarded to establish first- generation modeling and experimental techniques for multi-scale materials modeling.			
Accomplishments/Planned Programs Subtotals	-	-	5.200

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.