Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army										DATE: February 2011	
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*				R-1 ITEM NOMENCLATURE PE 0602716A: *HUMAN FACTORS ENGINEERING TECHNOLOGY*							
COST ($ in Millions)	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**Cost To Complete**	**Total Cost**
Total Program Element	30.395	21.042	21.801	-	21.801	21.484	21.687	22.339	22.626	Continuing	Continuing
H70: *HUMAN FACT ENG SYS DEV*	18.457	21.042	21.801	-	21.801	21.484	21.687	22.339	22.626	Continuing	Continuing
J21: *HUMAN FACTORS APPLIED RESEARCH CA*	11.938	-	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

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

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

Project J21 funds Congressional interest item.

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

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

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

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

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

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

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

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

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

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

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

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

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

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

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

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

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

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

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for Human Factors applied research.

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

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

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