Exhibit R-2, PB 2010 Army RDT&E Budget Item Justification								DATE: May 2009		
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 2008 Actual**	**FY 2009 Estimate**	**FY 2010 Estimate**	**FY 2011 Estimate**	**FY 2012 Estimate**	**FY 2013 Estimate**	**FY 2014 Estimate**	**FY 2015 Estimate**	**Cost To Complete**	**Total Cost**
Total Program Element	38.604	42.208	18.605						Continuing	Continuing
H70: HUMAN FACT ENG SYS DEV	16.769	17.291	18.605						Continuing	Continuing
J21: HUMAN FACTORS APPLIED RESEARCH CA	21.835	24.917	.000						Continuing	Continuing

A. Mission Description and Budget Item Justification

The objective of this program element (PE) is applied research on aspects of human factors engineering that impact the capabilities of individual and teams of Soldiers operating in complex, dynamic environments. The results of the research will enable maximizing the effectiveness of Soldiers and their equipment for mission success. The aspects of human factors that will be studied include sensing, perceptual and cognitive processes, ergonomics, biomechanics and the tools and methodologies required to manage interaction within these areas and within the Soldiers' combat environment. Research is focused on decision-making; human robotic interaction; crew station design; improving Soldier performance under stressful conditions such as time pressure, information overload, information uncertainty, fatigue, on-the-move and geographic dispersion; and enhancing human performance modeling tools (project H70). Project J21 funds congressional special interest items.

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

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

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

Exhibit R-2, PB 2010 Army RDT&E Budget Item Justification	DATE: May 2009
APPROPRIATION/BUDGET ACTIVITY 2040 - Research, Development, Test & Evaluation, Army/BA 2 - Applied Research	**R-1 ITEM NOMENCLATURE** PE 0602716A HUMAN FACTORS ENGINEERING TECHNOLOGY

B. Program Change Summary ($ in Millions)

	FY 2008	FY 2009	FY 2010	FY 2011
Previous President's Budget	39.763	17.348	18.656	
Current BES/President's Budget	38.604	42.208	18.605	
Total Adjustments	-1.159	24.860	-.051	
Congressional Program Reductions	.000	-.140		
Congressional Rescissions	.000	.000		
Total Congressional Increases	.000	25.000		
Total Reprogrammings	-.529	.000		
SBIR/STTR Transfer	-.630	.000		

Change Summary Explanation

FY09 increase is due to congressional adds.

Exhibit R-2a, PB 2010 Army RDT&E Project Justification								DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY 2040 - Research, Development, Test & Evaluation, Army/BA 2 - Applied Research				R-1 ITEM NOMENCLATURE PE 0602716A HUMAN FACTORS ENGINEERING TECHNOLOGY					PROJECT NUMBER H70	
COST ($ in Millions)	**FY 2008 Actual**	**FY 2009 Estimate**	**FY 2010 Estimate**	**FY 2011 Estimate**	**FY 2012 Estimate**	**FY 2013 Estimate**	**FY 2014 Estimate**	**FY 2015 Estimate**	**Cost To Complete**	**Total Cost**
H70: HUMAN FACT ENG SYS DEV	16.769	17.291	18.605						Continuing	Continuing

A. Mission Description and Budget Item Justification

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

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

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

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

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

B. Accomplishments/Planned Program ($ in Millions)	**FY 2008**	**FY 2009**	**FY 2010**	**FY 2011**
Human-Robotic Interaction (HRI): Develop requirements and technologies for supervision and Soldier intervention for multiple semi-autonomous unmanned vehicles (UVs) in an urban environment.	3.668	3.800	2.371	

Exhibit R-2a, PB 2010 Army RDT&E Project Justification		DATE: May 2009
APPROPRIATION/BUDGET ACTIVITY 2040 - Research, Development, Test & Evaluation, Army/BA 2 - Applied Research	R-1 ITEM NOMENCLATURE PE 0602716A HUMAN FACTORS ENGINEERING TECHNOLOGY	PROJECT NUMBER H70

B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
In FY08, transitioned HRI modeling results and design guidelines for automation and interface design and provided empirically-based recommendations for improving teaming performance to TARDEC; contributed to data collection and HRI analysis of TARDEC's field evaluations using multiple UVs to validate workload reduction and performance effects. In FY09, devise multimodal and performance based adaptive automation interfaces to control multiple, non-heterogeneous, aerial, and ground robotic systems. In FY10, will devise intuitive interface designs for supervising multiple assets. Will conduct baseline field evaluation for safe robotic operations in urban environments. Will collect Soldier performance data for marsupial small unattended ground vehicle missions at Ft. Benning.				
Adaptive Learning: Identify sources of usability deficiencies and mismatches between Soldier capabilities and technological advances and provide tools to enable adaptive learning, reduce uncertainty, and increase situational awareness to improve decision quality for leaders and teams engaged in C2 planning and execution. In FY08, performed studies of team skills and acuity while performing multiple concurrent tasks and functions using integrated Intelligence, Surveillance, and Reconnaissance (ISR) technologies. Used field and lab venues to investigate real-time human-system/-network interaction measurement, monitoring and facilitation techniques. In FY09, determine methods to identify and monitor neural and behavioral markers of pending performance drops; consider correlates such as fatigue and system reliability issues. Incorporate these methods into the cognitive fight-ability model-based evaluation tool for use within the acquisition and system design process as a candidate information system to recommend design modifications before prototypes are developed. In FY10, will assess performance of Soldiers executing multiple tasks simultaneously when using integrated technologies under differing conditions of task priority.	4.095	3.855	4.502	
Improved Man-Machine Interfaces: Investigate and determine interface design solutions for maneuver team information systems that enhance situational understanding and decision cycle performance. Identify, mature, and quantify human performance measures and methods to address future warrior performance issues. In FY08, explored the effects of advanced technologies, weight distribution, and focused on small arms shooting performance and incorporated data to refine Soldier small arms shooter model. In FY09, explore advanced technologies to identify improvements in dismounted squad performance; and transition the small arms shooter model to the Soldier Program Executive Office.	4.538	4.822	4.908	

Exhibit R-2a, PB 2010 Army RDT&E Project Justification		DATE: May 2009
APPROPRIATION/BUDGET ACTIVITY 2040 - Research, Development, Test & Evaluation, Army/BA 2 - Applied Research	R-1 ITEM NOMENCLATURE PE 0602716A HUMAN FACTORS ENGINEERING TECHNOLOGY	PROJECT NUMBER H70

B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
In FY10, will examine the effects of information content and information display on individual and team performance in an operational setting. Conduct research to identify assault rifle and optic characteristics that would improve Soldier reflexive firing performance.				
Vehicle Mobility Systems: Develop and integrate intelligent, indirect-vision-based vehicle mobility; advanced crew stations; 360/90 degree situational awareness systems; crew and dismount scalable interfaces; and neurophysiologically- and behavior-based technologies. Implement guidelines for: sensor and data handling; algorithms for characterizing Soldier brain activity in operational contexts; real-time techniques to integrate neurally-based information into systems designs. In FY08, explored techniques to improve Soldiers' ability to simultaneously perform visual scanning for targets and mobility-related tasks and transitioned recommendations to TARDEC. In FY09, determine Soldier machine interface design recommendations to enable the local area security function and the optimization of performance in mixed autonomous driving environments. In FY10, will devise and conduct an evaluation focused on indirect vision driving and local area security workload; will devise guidelines for noise-reduction and cognitive state classification algorithms; will advance multi-aspect measurement of Soldier, system, and environment.	2.000	2.240	3.766	
Human Performance Modeling: Enhance human performance modeling tools to optimize Soldier machine interactions. Collect empirical data on human perception (vision and hearing) to support human and system performance models. In FY08, incorporated stressor algorithms from other Services into Improved Performance Research Integration tool (IMPRINT 8 (Pro)), re-verified and distributed the tool; collected human performance data using head-mounted, dual waveband sensors for room clearing, and other operations in urban environments. In FY09, verify and distribute linked basic task, cognitive and human motion models to the human systems integration community and platform developers; validate approach to modeling body size increase due to clothing; transition data to Army Night Vision and Electronic Sensors Directorate to verify metrics for the evaluation of algorithms for fusing imagery from multiple-waveband sensors. In FY10, will link manpower and personnel tradeoff tools such as IMPRINT with Army/DoD personnel cost tools; develop tradeoff tool for multimodal interface design; evaluate the use of head-mounted displays for sniper localization; quantify differences in human spatial vision sensitivity from fixation to 30 degrees for incorporation into ACQUIRE	2.468	2.574	3.058	

Exhibit R-2a, PB 2010 Army RDT&E Project Justification		DATE: May 2009
APPROPRIATION/BUDGET ACTIVITY 2040 - Research, Development, Test & Evaluation, Army/BA 2 - Applied Research	R-1 ITEM NOMENCLATURE PE 0602716A HUMAN FACTORS ENGINEERING TECHNOLOGY	PROJECT NUMBER H70

B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
Model simulations. Conduct a series of human-observer studies to characterize the situational-awareness benefits of various dynamic-range algorithms and devices.				
Total	16.769	17.291	18.605	

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

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

Exhibit R-2a, PB 2010 Army RDT&E Project Justification								DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY 2040 - Research, Development, Test & Evaluation, Army/BA 2 - Applied Research				R-1 ITEM NOMENCLATURE PE 0602716A HUMAN FACTORS ENGINEERING TECHNOLOGY					PROJECT NUMBER J21	
COST ($ in Millions)	**FY 2008 Actual**	**FY 2009 Estimate**	**FY 2010 Estimate**	**FY 2011 Estimate**	**FY 2012 Estimate**	**FY 2013 Estimate**	**FY 2014 Estimate**	**FY 2015 Estimate**	**Cost To Complete**	**Total Cost**
J21: HUMAN FACTORS APPLIED RESEARCH CA	21.835	24.917	.000						Continuing	Continuing

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for Human Factors applied research.

B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
High Optempo Performance Soldier Training	1.546	.000	.000	
Leonard Wood Institute (LWI) Training-Based Collaborative Research	20.289	24.219	.000	
SBIR/STTR	.000	.698	.000	
Total	21.835	24.917	.000	

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

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