Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification											DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*				R-1 ITEM NOMENCLATURE PE 0602786A: *Warfighter Technology*							
COST ($ in Millions)	**FY 2009 Actual**	**FY 2010 Estimate**	**Base FY 2011 Estimate**	**OCO FY 2011 Estimate**	**Total FY 2011 Estimate**	**FY 2012 Estimate**	**FY 2013 Estimate**	**FY 2014 Estimate**	**FY 2015 Estimate**	**Cost To Complete**	**Total Cost**
Total Program Element	35.866	38.347	27.746	0.000	27.746	28.335	29.686	32.996	34.847	0	255.569
283: *AIRDROP ADV TECH*	2.360	2.456	2.527	0.000	2.527	2.604	2.665	2.719	2.776	Continuing	Continuing
E01: *Warfighter Technology Initiatives (CA)*	14.258	11.380	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
H98: *CLOTHING & EQUIPM TECH*	13.983	19.052	19.624	0.000	19.624	19.982	21.141	24.280	25.956	Continuing	Continuing
H99: *JOINT SERVICE COMBAT FEEDING TECHNOLOGY*	5.265	5.459	5.595	0.000	5.595	5.749	5.880	5.997	6.115	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program element (PE) investigates and develops technologies which improve Soldier and Small Combat Unit survivability, sustainability, mobility, combat effectiveness, and field quality of life. This PE supports the design, development, and improvement of components used for air delivery of personnel and cargo (project 283), combat clothing and personal equipment (including protective equipment such as personal armor, helmets and eye wear) (project H98) and combat rations and combat feeding equipment (project H99). Project E01 funds congressional special interest items. The projects in this PE adhere to Tri-Service Agreements on clothing, textiles, and food with coordination provided through the Cross Service Warfighter Equipment Board, the Soldier as a System Integrated Concepts Development Team, and the DoD Combat Feeding Research and Engineering Board. Work in this PE is related to, and fully coordinated with, PE 0602105A (Materials Technology), PE 0602618A (Ballistics Technology), PE 0603001A (Warfighter Advanced Technology) and PE 62787 (Medical Technology Initiatives). 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 led, performed, and/or managed by the Natick Soldier Research, Development, and Engineering Center (NSRDEC), Natick, MA.

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B. Program Change Summary ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
Previous President's Budget	36.133	27.109	27.684	0.000	27.684
Current President's Budget	35.866	38.347	27.746	0.000	27.746
Total Adjustments	-0.267	11.238	0.062	0.000	0.062
• Congressional General Reductions		-0.202			
• Congressional Directed Reductions					
• Congressional Rescissions		0.000			
• Congressional Adds		11.440			
• Congressional Directed Transfers					
• Reprogrammings	0.399	0.000			
• SBIR/STTR Transfer	-0.666	0.000			
• Adjustments to Budget Years	0.000	0.000	0.062	0.000	0.062

Change Summary Explanation

FY10 Congressionally directed increases.

Exhibit R-2A, PB 2011 Army RDT&E Project Justification			DATE: February 2010
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COST ($ in Millions)	FY 2009 Actual	FY 2010 Estimate	Base FY 2011 Estimate	OCO FY 2011 Estimate	Total FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
283: *AIRDROP ADV TECH*	2.360	2.456	2.527	0.000	2.527	2.604	2.665	2.719	2.776	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project researches, investigates and evaluates component technologies to enhance cargo and personnel airdrop capabilities for global precision delivery, rapid deployment, and insertion for force projection into hostile regions. Areas of emphasis include parachute technologies, parachutist injury reduction, precision offset aerial delivery, soft landing technologies, and airdrop simulation. 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 led, performed and/or managed by the US Army Natick Soldier Research, Development and Engineering Center (NSRDEC), Natick, MA.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Program #1	1.275	1.838	1.770	0.000	1.770

Precision Airdrop Enhancements: This effort improves delivery accuracy of varying load weights and transitions technology for maturation and demonstration to PE 0603001A/project 242. In FY09, downselected and implemented the most mature and favorable Guidance, Navigation and Control (GN&C) component technologies (e.g., glide modulation) into precision airdrop designs. In FY10, research and evaluate performance of height sensor technology to include a radar height sensor to augment existing Sound Detection and Ranging (SODAR) height sensor.In FY11, will research and evaluate performance of adaptive GN&C software and wind sensor technology to incorporate into on-board airborne guidance unit (AGU), enabling wind updates to be transmitted to the AGU for parafoil flight pattern adjustment.

FY 2009 Accomplishments:
FY 2009

FY 2010 Plans:
FY 2010

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Base FY 2011 Plans: FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #2 Modeling and Simulation for Tactical Parachute System Performance Enhancement: This effort investigates technologies for safer, more efficient personnel parachutes.In FY09, complete analysis of Advanced Tactical Parachute System (ATPS) parachuting opening; Simulated multiple ATPS C-17 formations (dropping multiple ATPS parachutists) and transitioned results to PM-Soldier Clothing and Individual Equipment (SCIE) to support operational testing. Experimentally and computationally characterized effects of material porosity of parachute fabrics to better understand modeling factors used to assess personal airdrop parachute device performance and effectiveness. Computationally validated and verified simulations of flow dynamics from a wind and water tunnel experiments for further analysis under Enabling Airdrop Research and Technologies efforts. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO	1.085	0.000	0.000	0.000	0.000
Program #3	0.000	0.612	0.757	0.000	0.757

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Enabling Airdrop Research and Technologies: This effort investigates technologies for enhanced payload extraction and subsequent gliding capabilities. In FY10, expand Domain Specific Software Architecture (DSSA) modeling capabilities to include low altitude opening and design the main parachutes to allow both extracting the payload from the aircraft and decelerating the payload to a desirable descent rate. In FY11, will verify/and validate both physics-based and engineering (simplified, first order) aerial delivery models. Will investigate methods to increase the airfoil glide ratio which allows the jumper/cargo to exit the aircraft further from the target. These methods include the optimization of parafoil canopy design such as variations in canopy size, shape, materials, and suspension lines. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #4 Small Business Innovative Research/Small Business Technology Transfer Programs *FY 2009 Accomplishments:* FY 2009	0.000	0.006	0.000	0.000	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
FY 2010 Plans: FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Accomplishments/Planned Programs Subtotals	2.360	2.456	2.527	0.000	2.527

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

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

Exhibit R-2A, PB 2011 Army RDT&E Project Justification			DATE: February 2010
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COST ($ in Millions)	FY 2009 Actual	FY 2010 Estimate	Base FY 2011 Estimate	OCO FY 2011 Estimate	Total FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
E01: *Warfighter Technology Initiatives (CA)*	14.258	11.380	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for Warfighter Technology Applied Research.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Program #1	1.595	1.592	0.000	0.000	0.000
Biosecurity Research for Food Safety: In FY09, this Congressional Interest developed a biosafety level 3 biocontainment facility to support both military and civilian research needs regarding biological agent contamination of the nation's food supply chain. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #2	2.233	0.000	0.000	0.000	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Chemical and Biological-Protective Hangars (CAB-PH): In FY09, this Congressional Interest Item evaluated feasibility of floorless barrier liner technology utilizing vacuum seal technology for use in a large scale chemical and biological protective and decontamination enclosure. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #3 Active and Smart Packaging for Combat Feeding: In FY09, this Congressional Interest Item assessed light protection for ration components by incorporating light blocking techniques in various non-foil barrier packaging systems. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010	1.675	0.000	0.000	0.000	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Base FY 2011 Plans: FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #4 Injection Molded Ceramic Body Armor: In FY09, this Congressional Interest Item developed injection molded silicon carbide technology which has potential for enhanced performance small arms (7.62 mm armor piercing) protective body armor. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO	0.797	0.796	0.000	0.000	0.000
Program #5 Modular Ballistic System for Force Protection: In FY09, this Congressional Interest Item developed a rapidly deployable ballistic shelter protection system for expeditionary units.	0.797	0.000	0.000	0.000	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
FY 2009 Accomplishments: FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #6 Protective Textile Fabric: In FY09, this Congressional Interest Item investigated a new material treatment to protect the individual Warfighter from biological agents. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO	0.797	0.000	0.000	0.000	0.000
Program #7	2.392	0.000	0.000	0.000	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Wearable Personal Area Network Technology: In FY09, this Congressional Interest Item researched prototype WearNet systems that are rugged, suitable for field testing, and configured for specified needs for power, data, and communications. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #8 Solid State Shelter Lighting System: In FY09, this Congressional Interest Item researched energy efficient, long life solid state lighting systems for shelters and structures. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base	0.383	0.000	0.000	0.000	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
OCO FY 2011 Plans: FY 2011 OCO					
Program #9 Photovoltaic Tent Fabric: In FY09, this Congressional Interest Item developed flexible photovoltaic modules with high power to weight ratio suitable for application to tents or deployment on the ground. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO	2.791	0.000	0.000	0.000	0.000
Program #10 Lightweight 1-2 Person Low-Pressure Inflatable Tents: In FY09, this Congressional Interest Item investigated improved military backpackable tents that are lighter, pack to a small size and are more durable. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010	0.798	0.000	0.000	0.000	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Base FY 2011 Plans: FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #11 Carbon Nanotube Production. This is a Congressional Interest Item. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO	0.000	1.592	0.000	0.000	0.000
Program #12 Joint Precision Air Drop Systems-Wind Profiling Portable Radar. This is a Congressional Interest Item. *FY 2009 Accomplishments:* FY 2009	0.000	1.830	0.000	0.000	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
FY 2010 Plans: FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #13 Nano-Enabled Ultra High Storage Density Non-volatile Memory for Commanders Digital Assistant. This is a Congressional Interest Item. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO	0.000	2.387	0.000	0.000	0.000
Program #14 Improved Thermal Resistant Nylon for Enhanced Durability and Thermal Protection in Combat Uniforms. This is a Congressional Interest Item.	0.000	3.183	0.000	0.000	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
FY 2009 Accomplishments: FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Accomplishments/Planned Programs Subtotals	14.258	11.380	0.000	0.000	0.000

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.

Exhibit R-2A, PB 2011 Army RDT&E Project Justification			DATE: February 2010
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COST ($ in Millions)	FY 2009 Actual	FY 2010 Estimate	Base FY 2011 Estimate	OCO FY 2011 Estimate	Total FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
H98: *CLOTHING & EQUIPM TECH*	13.983	19.052	19.624	0.000	19.624	19.982	21.141	24.280	25.956	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project investigates and evaluates components and materials that have potential to enhance Soldier survivability from combat threats (flame and thermal threats, blast and ballistic threats, as well as certain directed energy threats such as lasers) and the field environment (e.g., cold, heat, wet) to increase operational effectiveness while decreasing the Soldier's burden. Included are technologies and novel materials related to personnel armor, helmets, hearing protection, eyewear and protective inserts for shelters. In addition, this project supports the development and refinement of essential analytic tools needed to predict and/or assess the combat effectiveness of next generation Soldier systems, with a focus on network centric warfare technologies and human science, methods used to assess human cognitive responses to sensory, physical, cognitive and affective stimuli and stressors. 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 led, performed and/or managed by the Natick Soldier Research, Development, and Engineering Center (NSRDEC), Natick, MA.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Program #1	6.732	0.000	0.000	0.000	0.000

Ballistic and Blast Protection for the Individual Warrior: This effort focuses on technologies incorporating novel materials into component designs that protect Soldiers against ballistic and blast threats. In FY09, validated performance of selected materials configurations for enhanced helmet performance; downselected materials and began construction of technology components into a breadboard system for next generation armor systems and evaluation of breadboards in various environments; continued refinement and validation of material system components for integrated ballistic and blast protection for use in improved body armor for thorax protection.

FY 2009 Accomplishments:
FY 2009

FY 2010 Plans:
FY 2010

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Base FY 2011 Plans: FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #2 Ballistic and Blast Protection for the Individual Warrior (cont'd): This effort focuses on technologies incorporating novel materials into component designs that protect Soldiers against ballistic and blast threats. In FY10, validate survivability modeling tool enhancements (including the Integrated Casualty Estimation Methods model) for personnel ballistic and blast protection systems development and complete validation of configuration performance enhancements to selected breadboards for next generation armor systems. Develop improved armor coverage map utilizing medical community data, and extract geometric data from 3-D body scans for use in initial soft armor and ballistic plate designs to optimize ballistic plate coverage areas for improved soldier protection and mobility. In FY11, will investigate and conduct trade analysis of parameters leading to lighter weight personnel protective systems against advanced ballistic and blast threats. Will construct and evaluate initial soft armor and ballistic plate designs using emerging materials investigated in PE 0602105A/project H84 and optimize geometry with data from the Integrated Casualty Estimation Method modeling tool. Will conduct initial anthropometric study (human body measurement), human factors and biomechanical evaluations on male/female Soldiers; will provide enhanced survivability analysis and modeling tools to materiel developers and PMs to aid in future requirements, design, and acquisition decisions. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010	0.000	5.641	5.594	0.000	5.594

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Base FY 2011 Plans: FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #3 Soldier Integrated Tunable (Frequency Agile) Laser/Ballistic Eye Protection: This effort focuses on technologies which provide eye protection from laser/ballistic threats. In FY09, combined ballistic materials, and abrasion resistance coatings into a new composite eye wear material; assembled laser eye protection (optical limiting concept) components on breadboard and performed system evaluation in a simulated environment. In FY10, develop a plastic eyewear lens scaffold (pixilated lens with a battery operated sensor) that can sense and respond (lighten/darken) to visible and infrared (IR) irradiation sources at precise lens locations to protect Soldiers' eyes, maximize overall visual acuity, and determine directionality of threats. Mature lens technology to serve as the platform for subsequent vision protection and enhancement technologies; consider producibility issues to combine vision protection and enhancement technologies with a ballistic lens; and examine Soldier acceptance issues by testing the ability to differentiate color or objects in both day and night scenarios. In FY11, will develop and evaluate variable transmission eyewear technology and investigate and research materials, material properties and methods to integrate glare, laser flash and dazzle protection into eyewear. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base	0.976	2.140	2.493	0.000	2.493

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
OCO FY 2011 Plans: FY 2011 OCO					
Program #4 Infantry Warrior Simulation (IWARS): This effort focuses on incorporating data into modeling and analysis tools that enable technologists and military users to trade-off potential Soldier system capabilities and mature a human-centered Soldier system design. In FY09, enhanced IWARS to include effects of netted communications and collaborative situational awareness to assess enhancements to Soldier capabilities. In FY10, provide credible Soldier physiological representations within IWARS to include biomechanic effects of equipment load on Soldier movement and the effect of hearing protection and helmets on sound detection and direction; expand analysis capabilities to determine impact to small unit effectiveness by using combined arms scenarios to identify a number of interactions that occur between ground Soldiers and vehicle platforms. In FY11, will link IWARS with other models, simulations and computational environments (i.e. Combat XXI and OneSAF), to bring high fidelity Soldier representations to collaborative environments and enable Soldier analysis across a wider range of missions and environments. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO	2.286	2.233	2.331	0.000	2.331
Program #5	0.588	0.000	0.000	0.000	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Biomechanical Tools for Individual Soldier Extremity Protection and Performance Enhancement: This effort focuses on human science, anthropometric, and psychophysical methods to assess human responses to sensory, cognitive and affective stimuli. In FY09, defined additional complex Soldier output measures (energy expended and muscle force exercised) for incorporation into biomechanical model, scaled biomechanical tools to address range of human male anthropometry (5 to 95% size and shape); conducted human experiments to refine fatigue prediction into short term and long term components; refined awareness model with additional human experimental data and began investigating strategies for mitigating decrements in awareness documented by preceding experiments. This task is done in collaboration with DOD Medical Research programs under PE 62787 (Medical Technology Initiatives). Work will continue under Predicting and Enhancing Warfighter Cognitive Performance. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #6 Predicting and Enhancing Warfighter Cognitive Performance: This effort builds on biomechanical tools development and focuses on methods to better predict performance and effectiveness of the Warfighter. In FY10, identify neurocognitive mechanisms, such as regions, networks and type of brain activity, underlying dismounted Soldier performance relative to battlespace awareness using human experimental studies and cognitive task	0.000	2.996	3.590	0.000	3.590

Exhibit R-2A, PB 2011 Army RDT&E Project Justification		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602786A: *Warfighter Technology*	PROJECT H98: *CLOTHING & EQUIPM TECH*

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
analysis of squad-level operations under stressed and non stressed task situations. This work is collaborative with the Army Research Laboratory and the Medical Research and Materiel Command. In FY11, will develop an initial set of standard cognitive metrics for quantifying and evaluating Soldier performance under stressed and non stressed task situations based on cognitive task analysis and human experimental studies. Will conduct human research to quantify the influence of contextual variables (e.g., physical fatigue) on cognitive processes involved in performing squad-level infantry tasks. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #7 Electrotextiles - Self Powered, Conductive, and Smart Materials: This effort focuses on technologies which aid in the design and evaluation of clothing and equipment for signature management and conducting materials. In FY09, integrated a sensing device into photovoltaic fabric to demonstrate a new class of self-powered, smart electrotextile applications; explored various textile integration methods to provide additional strength and protection to electronic and optical fibers; investigated eco-friendly fibers and materials and developed evaluation methods for laboratory testing of novel fibers and materials that provide future Soldier flame and thermal protection without the use of hazardous materials. Work will continue under Electronic and Multifunctional Textiles effort.	2.516	0.000	0.000	0.000	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
FY 2009 Accomplishments: FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #8 Electronic and Multifunctional Textiles: This effort builds on the Electrotextile work and focuses on technologies which aid in the design and evaluation of multifunctional clothing and equipment for the Soldier. In FY10, investigate alternative textile and film-based approach to wearable Soldier power; investigate advanced analytical methods for predicting protection levels provided by flame-protective materials; examine new fibers and materials created for potential application to Soldier flame and thermal protection; complete laboratory testing of novel materials against thermal threats; fabricate and characterize novel extruded multi-component fibers for potential application to Soldier protective materials. In FY11, will investigate modeling and control of low cost electrospinning process to produce micro/nanostructure fibrous materials with high surface areas to increase combat and environmental protection capabilities of fabric used to manufacture advanced combat clothing; will apply analytical methods to develop design approaches for novel flame and thermal protective concepts. Will investigate and fabricate advanced textiles and composites having multifunctionality within a single fiber and evaluate for military feasibility; will develop and evaluate designs for multifunctional fibers that provide flame and thermal protection as key functions; will develop and evaluate advanced textile concepts for improved signature management.	0.000	5.679	5.616	0.000	5.616

Exhibit R-2A, PB 2011 Army RDT&E Project Justification		DATE: February 2010
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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
FY 2009 Accomplishments: FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #9 Soldier Borne Microclimate Cooling: This effort focused on technologies which provide cooling to the Soldier to reduce risk of heat stress. In FY09, completed testing of microclimate cooling breadboard system, and used the test results to downselect cooling technologies for Soldier applications and establish a baseline technology capability. Transitioned downselected technologies to PE 0603001A/project J50 for further maturation. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base	0.885	0.000	0.000	0.000	0.000

Exhibit R-2A, PB 2011 Army RDT&E Project Justification		DATE: February 2010
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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
OCO FY 2011 Plans: FY 2011 OCO					
Program #10 Small Business Innovative Research/Small Business Technology Transfer Programs *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO	0.000	0.363	0.000	0.000	0.000
Accomplishments/Planned Programs Subtotals	13.983	19.052	19.624	0.000	19.624

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

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

Exhibit R-2A, PB 2011 Army RDT&E Project Justification			DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602786A: *Warfighter Technology*	PROJECT H99: *JOINT SERVICE COMBAT FEEDING TECHNOLOGY*	

COST ($ in Millions)	FY 2009 Actual	FY 2010 Estimate	Base FY 2011 Estimate	OCO FY 2011 Estimate	Total FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
H99: *JOINT SERVICE COMBAT FEEDING TECHNOLOGY*	5.265	5.459	5.595	0.000	5.595	5.749	5.880	5.997	6.115	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project researches, investigates and evaluates combat ration and field food service equipment component technologies. The project investigates novel ration packaging and combat feeding equipment/systems, investigates and develops advanced food processing technologies that prolong shelf-life, investigates technologies that detect food safety hazards on the battlefield and enhances quality, and/or increase variety of food items in military rations.. Efforts funded in this project support all Military Services, the Special Operations Command, and the Defense Logistics Agency. The Army serves as Executive Agent for this Department of Defense (DoD) program, with oversight and coordination provided by the DoD Combat Feeding Research and Engineering Board. Technologies developed within this effort transition to PE 0603001A/project C07 for maturation. 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 led, performed, and/or managed by the US Army Natick Soldier Research, Development and Engineering Center (NSRDEC), Natick, MA, and this project has collaborative efforts with the US Army Research Institute for Environmental Medicine.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Program #1	2.182	2.246	2.320	0.000	2.320
Combat Feeding Equipment Technologies: This effort investigates equipment and energy technologies to enhance effectiveness and reduce logistics footprint of field feeding. In FY09, completed concept evaluations of inline water heater; completed concept development of an ethylene control system (prolongs freshness and extends shelf life) for fresh fruits and vegetables. Investigated a sanitizing solution generator that provided sanitation capability on demand in remote/small kitchen facilities without any chemical supplies (bleach, class III sanitizers, etc). In FY10, investigate and develop technology concepts for a standard size container that extends the shelf life of semi-perishable rations in hot environments and an off-grid pallet chiller with self-containing power supply for bottled water; and complete concept development of a flameless individual water heater. In FY11, will investigate and develop technology concepts for greywater (non-industrial wastewater generated from field food					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
sanitation systems) recycling technology for the Food Sanitation Center; and will complete concept development of self-powered appliances with next generation high efficiency thermoelectric modules to reduce reliance on JP8. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #2 Ration Stabilization and Novel Nutrient Delivery Technologies: This effort focuses on enhancing nutrient composition and consumption to maximize cognitive and physical performance on the battlefield. In FY09, evaluated shelf stability of probiotic-enhanced ration components; ensured microbiological, chemical stability analyses of advanced shelf-stable meat products; and investigated stability and functional effectiveness of water/oil emulsion for military ration systems. In FY10, test acceptance of shelf-stable sandwiches containing emulsion-based fillings to control food water content; down-select component food matrices for incorporation of performance optimizing and nano-sized functional ingredients. In FY11, will optimize shelf-stable pocket bread formulas and production parameters; will test the efficacy of carbon dioxide treatment of fresh fruits and vegetables and antimicrobial effects on ration components; will demonstrate nanotechnology-based carriers (ration component) for enhancing micronutrient stability in food items of military rations.	1.639	1.588	1.698	0.000	1.698

Exhibit R-2A, PB 2011 Army **RDT&E Project Justification**		**DATE:** February 2010
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	**R-1 ITEM NOMENCLATURE** PE 0602786A: *Warfighter Technology*	**PROJECT** H99: *JOINT SERVICE COMBAT FEEDING TECHNOLOGY*

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
FY 2009 Accomplishments: FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #3 Packaging and Food Safety Technologies: This effort investigates novel ration packaging technologies to minimize physical, chemical and nutritional degradation of combat rations during storage. In FY09, investigated multiplexing of nanofibers for improved capture of pathogens and incorporation into systems that enable multiple pathogen detection from one sample; molecular beacon signal (method to detect nucleic acids) enhancement as an alternative technique to identifying pathogens using array-based (matrix) systems; quality data reaction rates and determined kinetic correlations based on storage studies; continued long-term storage study to include extensive analytical, microbiological and sensory testing; Continued long term storage study of select ration components; incorporated analytical, microbiological and sensory data (texture, color, flavor) into a model used to predict the shelf life of rations. In FY10, develop an integrated sensor circuit concept diagram for printed electronic display for real-time ration condition assessment to determine remaining shelf life; develop a bacteriophage (viruses that infect specific bacteria) cocktail to reduce bacteria in fresh fruits and vegetables; conduct polymer processing of thermoplastic materials to optimize novel multilayer polymer films properties; optimize conductive membranes for sensing and integrate with capture/detection assemblies to capture and detect pathogenic bacteria through optical detection techniques. In FY11, will investigate compatibility and integration issues with printed electronic display applications on packaging structures for ration condition assessment;	1.444	1.586	1.577	0.000	1.577

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
evaluate electrochemical measurements generated by an antibody-antigen reaction with conductive membranes. These membranes are utilized as an electrode coated with antibodies which capture a target antigen and produce a change in conductivity (an electrical signal) for more rapid and reliable detection of pathogens in foods. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #4 Small Business Innovative Research/Small Business Technology Transfer Programs *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base	0.000	0.039	0.000	0.000	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
OCO FY 2011 Plans: FY 2011 OCO					
Accomplishments/Planned Programs Subtotals	5.265	5.459	5.595	0.000	5.595

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.