Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army										DATE: February 2011	
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 3: *Advanced Technology Development (ATD)*				R-1 ITEM NOMENCLATURE PE 0603005A: *Combat Vehicle and Automotive Advanced 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	261.689	89.499	106.145	-	106.145	107.544	112.151	111.884	111.114	Continuing	Continuing
221: *COMBAT VEH SURVIVABLTY*	42.008	24.897	44.275	-	44.275	49.905	51.817	51.589	52.227	Continuing	Continuing
441: *COMBAT VEHICLE MOBILTY*	45.272	42.154	42.508	-	42.508	38.048	37.909	38.990	39.610	Continuing	Continuing
497: *COMBAT VEHICLE ELECTRO*	7.246	7.507	8.659	-	8.659	8.789	11.433	10.143	7.925	Continuing	Continuing
515: *ROBOTIC GROUND SYSTEMS*	9.753	10.637	10.703	-	10.703	10.802	10.992	11.162	11.352	Continuing	Continuing
533: *Ground Vehicle Demonstrations*	124.342	-	-	-	-	-	-	-	-	Continuing	Continuing
53D: *NAC Demonstration Initiatives (CA)*	30.720	-	-	-	-	-	-	-	-	Continuing	Continuing
C66: *DC66*	2.348	4.304	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

The objective of this program element (PE) is to mature and demonstrate combat and tactical vehicle automotive technologies that enable Army transformation to a lighter, more mobile and more survivable force. This PE supports maturation and demonstration of enabling component and subsystems for ground combat/tactical vehicles in the areas of survivability (project 221), mobility (project 441), combat vehicle electronics (project 497), and robotic ground systems (project 515). . Projects 533 and 53D fund congressional special interest items. Project C66 supports classified activities. Properly accessed individuals can obtain further information from the ASA(ALT) Special Programs Office.

Work in this PE is coordinated with, PEs 0602601A (Combat Vehicle and Automotive Technology), 0602618A (Ballistics Technology), 0602120A (Sensors and Electronic Survivability, Robotics Technology), 0602105A (Materials), 0602624A (Weapons and Munitions Technology), 0602705A (Battery/Ind Power Technology), 0603004A (Weapons and Munitions Advanced Technology), and 0708045A (Manufacturing Technology). Work in this PE is coordinated with the US Marine Corps, the Naval Surface Warfare Center, the Naval Research Laboratory, Air Force Armaments Command, and other ground vehicle developers within the Departments of Energy, Commerce, and Transportation as well as DARPA.

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 performed by the Tank Automotive Research, Development, and Engineering Center (TARDEC), Warren, Michigan.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army					DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 3: *Advanced Technology Development (ATD)*			R-1 ITEM NOMENCLATURE PE 0603005A: *Combat Vehicle and Automotive Advanced Technology*		
B. Program Change Summary ($ in Millions)	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**
Previous President's Budget	240.190	89.499	105.848	-	105.848
Current President's Budget	261.689	89.499	106.145	-	106.145
Total Adjustments	21.499	-	0.297	-	0.297
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-2.493	-			
• Other Adjustments 1	23.992	-	0.297	-	0.297

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603005A: *Combat Vehicle and Automotive Advanced Technology*	PROJECT 221: *COMBAT VEH SURVIVABLTY*	

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
221: *COMBAT VEH SURVIVABLTY*	42.008	24.897	44.275	-	44.275	49.905	51.817	51.589	52.227	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project matures and demonstrates survivability technologies such as active protection systems (APS), advanced vehicle armors, and safety devices. This project focuses on integrating and demonstrating active protection technologies and vision protection to defeat optical attacks. This project looks at the integration of survivability technologies that enable entire protection suites to provide greater survivability than armor alone.

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 Tank Automotive Research, Development, and Engineering Center (TARDEC), Warren, Michigan; Army Research Laboratory (ARL), Aberdeen Proving Ground, Maryland; Armaments Research, Development, and Engineering Center (ARDEC), Picatinny, New Jersey; and the Aviation and Missile Research, Development, and Engineering Center (AMRDEC), Huntsville.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Active Protection Systems (APS) against Kinetic Energy (KE) threats: ***Description:*** This effort conducts essential trade studies, technical evaluations, and demonstrations of APS components/ subsystems designed for protection against KE penetrators. Coordinated work is also being conducted under Program Elements (PE) 0602624A, 0603004A, and 0603313A. ***FY 2010 Accomplishments:*** Supported KE APS demonstrations with interceptor/system evaluation, demonstration, and analysis; completed component and system design specifications and finalized all system interfaces. ***FY 2011 Plans:*** Support final end-to-end KE APS demonstration, including vertical launch and use of warhead to defeat a KE threat, with interceptor/system testing, demonstration, and analysis; complete integration of all components into interceptor; facilitate final transition to PEO Ground Combat Systems.	3.925	1.534	-
Title: Tactical Wheeled Vehicle (TWV) Survivability: ***Description:*** This effort focuses on maturing and demonstrating viable integrated survivability suites that can be tailored to meet current and future threats for light, medium, and heavy tactical wheeled vehicles. Coordinated work is also being performed under Program Elements (PE) 0602601A, 0602618A, and 0602105A	10.525	11.035	13.442

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603005A: *Combat Vehicle and Automotive Advanced Technology*	PROJECT 221: *COMBAT VEH SURVIVABLTY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
FY 2010 Accomplishments: Completed tactical platform active protection prototype system integration; conducted live fire blast and ballistic evaluation; conducted mobility/durability tests on demonstration vehicles; assessed emerging technologies against current and emerging threats to optimize suites of integrated survivability technologies including high performance ballistic materials, active protection systems, and common displays; integrated suite options and delivered test report, lessons learned, and recommendations to ground combat and tactical vehicle developers. ***FY 2011 Plans:*** Utilize requirements analysis, technology assessments, concept integration studies based upon emerging technology, and lessons learned to apply a systems engineering evaluation approach to provide a holistic, platform-level process for the maturation of the integrated survivability suites; mature advanced armor to include: opaque, transparent, and underbody kits; integrate advanced tactical vehicle active protection; and establish a concept for an optimized convoy mission focused survivability suite based upon a down selection process. ***FY 2012 Plans:*** Will apply the lessons learned from the systems engineering evaluation and survivability suite; begin work on an optimized suite of survivability systems that focus on convoy protection; will define, fabricate, integrate and evaluate an advanced active protection system for tactical vehicles.			
Title: Vision Protection: ***Description:*** This effort matures and demonstrates treatments to optical systems that provide protection from frequency-agile laser weapons. Coordinated work is also being performed in Program Elements (PE) 0602120A, 0602705A, 0602786A and 0602712A. ***FY 2010 Accomplishments:*** Demonstrated eye protection concepts in optical sight testbed and completed new laser-protected optical design for M1A2 Abrams Tank gunner's primary sight ***FY 2011 Plans:*** Evaluate and refine an architecture that enables a large focal plane optical switch to be implemented; conduct lab testing of laser protected fire control and driver's cameras; and design and implement a liquid optical limiter handling system. ***FY 2012 Plans:***	2.450	5.339	5.163

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603005A: *Combat Vehicle and Automotive Advanced Technology*	PROJECT 221: *COMBAT VEH SURVIVABLTY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Will demonstrate vision protection technologies at TRL 6 and deliver design to PM Abrams; will explore application of protection techniques to other Heavy Brigade platforms and perform laboratory assessments to address evolving threats.			
Title: Armor/Mine Protection: ***Description:*** This effort integrates and demonstrates advanced ballistic protection for combat and tactical vehicle including smart and ceramic armors, advanced composite and laminate structures, and advanced transparent armor formulations. ***FY 2012 Plans:*** Will fabricate and evaluate combat and tactical wheeled vehicle armor recipes and improved mine kit designs against objective threats while reducing armor weights; integrate armors on demonstrator vehicles and begin performance evaluations; will validate platform-level mine-blast response modeling and simulation tools to include crew/occupant response to support system level analysis	-	-	8.323
Title: High Performance Lightweight Track (Blast Mitigation): ***Description:*** This effort improves lightweight track durability and survivability. This effort is done in coordination with PE 0603005A projects 441 and 497. ***FY 2010 Accomplishments:*** Used Modeling and Simulation (M&S) to perform blast event analysis on the double pin lightweight track prototype and exploited analysis results to optimize track design for mine blast/IED survivability. ***FY 2011 Plans:*** Integrate track solutions, fabricate prototypes and demonstrate blast protection. ***FY 2012 Plans:*** Will complete validation of track performance in an operational environment and transition design to PM Bradley Block II modernization program.	1.973	2.498	2.975
Title: Vehicle Integration Laboratory: ***Description:*** This effort provides for continuous improvements to ground vehicles to include technology trades, integration, concepts and configuration management designs. A ground system vertical test rig to enable in-house Occupant Centric Survivability evaluations. The system vertical test rig will simulate the vertical forces that occur from an underbelly explosive event (initial vertical and drop-down forces). This test device evaluates the occupant and restraint system (seat, seat belt, floor kits) response to the vertical forces	2.166	4.491	9.047

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603005A: *Combat Vehicle and Automotive Advanced Technology*	PROJECT 221: *COMBAT VEH SURVIVABLTY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
FY 2010 Accomplishments: Developed M&S framework to assess system integration impacts for emerging technologies (i.e. , advanced engines, suspensions, survivability technologies) for ground combat and tactical vehicle platforms; began life cycle environmental and stability studies of laser protection systems for tactical and ground combat vehicles. ***FY 2011 Plans:*** Integrate prototype tactical wheeled vehicle active protection systems onto a surrogate platform and conduct performance testing; evaluate integration techniques and concepts for advanced armor kits that defeat objective and emerging threats for ground and tactical vehicle fleets; and conduct system-level testing of combined fire protection technologies on representative ground vehicle platforms. ***FY 2012 Plans:*** Initial occupant protection suites will be analyzed, for tradeoff studies, balancing protection against performance and payload; will conduct an In Progress Review to present analysis results and make recommendations for a program selection of demonstrator platform and occupant protection technologies; will design, build, and integrate the selected technologies onto the demonstrator vehicle and optimization of the ideal occupant cab will begin.			
Title: Armor Integration ***Description:*** This effort integrates and demonstrates passive, reactive, and electromagnetic technologies for use in active protection armor applications to defeat objective and emerging kinetic energy and chemical energy threats. ***FY 2010 Accomplishments:*** Matured and validated passive and reactive armor solutions from PE 0602601A/Project C05 and PE 0602618A that defeat objective and emerging threats.	1.281	-	-
Title: Underbody Blast Methodolgy ***Description:*** Advancement of modeling and simulation to improve the survivability of ground vehicle occupants to underbody blast threats ***FY 2012 Plans:*** Evaluate vehicle and underbody Soldier blast protection and modeling to address information knowledge gaps that include sensitivity of the elements of the blast kill chain, human effects and injury modeling, blast insult to injury mechanisms and optimization of form, fit and performance	-	-	5.325
Title: Lighter Weight Armor Solutions	19.688	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603005A: *Combat Vehicle and Automotive Advanced Technology*	PROJECT 221: *COMBAT VEH SURVIVABLTY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: This effort explored new "out-of-the-box" and "out-of-the-mainstream" armor solutions. The goal was to design, develop and build a concept vehicle within twelve months to meet four overarching objectives (payload, performance, protection and price) while emphasizing occupant-centric survivability. ***FY 2010 Accomplishments:*** designed, analyzed (through analytical and physical M&S), fabricated, integrated and conducted limited sub-system evaluations (live fire test and evaluation (LFT&E) and automotive performance evaluation). Data (M&S, LFT&E, CAD, etc.) and lessons learned are helping shape/inform Army programs such as MRAP, JLTV and HMMWV RECAP.			
Accomplishments/Planned Programs Subtotals	42.008	24.897	44.275

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 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603005A: *Combat Vehicle and Automotive Advanced Technology*	PROJECT 441: *COMBAT VEHICLE MOBILTY*	

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
441: *COMBAT VEHICLE MOBILTY*	45.272	42.154	42.508	-	42.508	38.048	37.909	38.990	39.610	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project matures and demonstrates advanced mobility and electric technologies for propulsion, power, and electrical components and subsystems. Mobility technologies are being developed to meet program thresholds and move towards ground combat/tactical vehicle objectives. Additionally this program looks at the integration of mobility technologies to enable lightweight, agile, deployable, fuel efficient, and survivable ground 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 by Tank Automotive Research, Development, and Engineering Center (TARDEC), Warren, MI, in conjunction with Army Research Laboratory (ARL), Adelphi, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Hybrid Electric Vehicle (HEV) Propulsion and Power & Energy (P&E) System Integration Lab (SIL): ***Description:*** This effort matures and demonstrates power and energy component technologies and assesses HEV performance benefits and burdens. Transistion to PEO Combat Support and Combat Service Support. ***FY 2010 Accomplishments:*** Supported demonstration of HEV components and hybrid electric system for combat platforms; performed thermal management evaluation of components that increase heat transfer capabilities of onboard power electronics, and performed evaluation of high temperature power electronics. ***FY 2011 Plans:*** Mature and demonstrate HEV components and system integration capabilities in simulated field conditions to solve user identified-technical issues and evaluate high temperature/high power electronic devices.	4.259	1.974	-
Title: Ground Systems Power Evaluation: ***Description:*** This effort matures and demonstrates power and energy components for propulsion, control systems, communications, life support, electric weapons, and protection systems. ***FY 2010 Accomplishments:***	2.734	2.402	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603005A: *Combat Vehicle and Automotive Advanced Technology*	PROJECT 441: *COMBAT VEHICLE MOBILTY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Demonstrated high temperature power electronics, advanced motors and generator systems; matured advanced diesel engines for JP-8 compatibility and increased thermal efficiency; and matured and demonstrated components, including traction motor inverters, energy converters and motor generator concepts in integrated hybrid electric (HE) systems for wheeled vehicles. ***FY 2011 Plans:*** Continue optimization of higher temperature power electronics for use in wheeled vehicle platforms; and continue the optimization of HE systems for wheeled vehicle system upgrades, as well as advanced motors and generators that offer onboard and export power generation.			
Title: Demonstration and Evaluation of Power Electronics: ***Description:*** This effort demonstrates Silicon Carbide power conversion components. ***FY 2012 Plans:*** Will demonstrate SiC power conversion components, such as SiC DC-DC converter, DC/AC motor inverter and AC/DC generator inverter, to evaluate their performance at higher inlet coolant temperatures, to assess their impact on the total system efficiency and cooling burden, and the effect on total system reliability; will mature thermal systems to increase HVAC efficiency; and will demonstrate electronics cooling technologies for increased performance.	-	-	5.994
Title: Track and Suspension: ***Description:*** This effort matures track and suspension system technologies and conducts system and vehicle level evaluations. This effort is done in coordination with PE 0603005A, projects 221 and 497 ***FY 2010 Accomplishments:*** Matured, fabricated and conducted preliminary laboratory evaluation of advanced lightweight track systems; designed improvements included track durability, survivability, and flame resistance while decreasing system weight. ***FY 2011 Plans:*** Refine, fabricate, and conduct vehicle performance and durability testing of the advanced lightweight track systems. ***FY 2012 Plans:*** Will evaluate reformulated track elastomer improvements through on-vehicle evaluation to determine effectiveness in increasing track system durability and survivability. Will construct and complete demonstration of material improvements to the T-161 track system with the goal to reduce the track system weight by over 1,000 lbs. Will mature advanced suspension systems such as	1.806	4.331	6.730

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603005A: *Combat Vehicle and Automotive Advanced Technology*	PROJECT 441: *COMBAT VEHICLE MOBILTY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
energy regenerative suspensions, for integration on-vehicle platforms. Will establish components necessary to increase vehicle stability in conjunction with on-board vehicle braking systems.			
Title: Power Management: ***Description:*** This effort demonstrates power management components to meet objective tactical and combat vehicle power requirements. ***FY 2012 Plans:*** Will validate and integrate advanced intelligent (learning and adaptive) control architecture to control multiple vehicular power sources and loads and will validate the modeling and simulation toolset.	-	-	2.300
Title: Energy Storage: ***Description:*** This effort will investigate advances in chemistry and materials for energy storage devices. ***FY 2012 Plans:*** Will improve battery energy density resulting in reduced battery size and weight thereby minimizing component footprint on vehicle platform for pulse power electromagnetic armor applications.	-	-	3.054
Title: Pulse Power: ***Description:*** This effort matures and demonstrates compact components and subsystems that enable significantly improved survivability and lethality applications. ***FY 2010 Accomplishments:*** Demonstrated second generation SiC switch reliability technology at threshold metrics defined by Future Force concepts; refined the programmable pulse power supply for field demonstrations at threshold metrics; and refined designs for active cooling programmable pulse power supply for High Energy Laser Technology Demonstrator (HEL TD) ***FY 2011 Plans:*** Demonstrate Advanced Pulse forming card for the programmable pulse power supply at objective metrics for ground combat systems; and demonstrate SiC switch at objective metrics defined by ground combat systems. ***FY 2012 Plans:***	4.902	10.889	3.679

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603005A: *Combat Vehicle and Automotive Advanced Technology*	PROJECT 441: *COMBAT VEHICLE MOBILTY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Will start integration of power brick based electro-magnetic armor components for ground combat systems schedule, and start build of generation 2 Programmable Pulse Power supply for the HEL Technology Demonstrator at Space and Missile Defense Center (SMDC).			
Title: Fuel Cell Power: ***Description:*** This effort develops fuel cell technology as an auxiliary power unit for providing electrical power to ground combat vehicles. This effort is done in coordination with efforts in PE 0602601A , Project H91. ***FY 2010 Accomplishments:*** Identified ground vehicle system power requirements and space available for fuel cell applications; created system layout map and performed modeling and simulation; and matured and demonstrated fuel cell system components.	4.412	-	-
Title: JP-8 Fuel Cell Reformer System: ***Description:*** This effort identifies and demonstrates fuel cell technology, that when integrated with a JP-8 reformer, creates an Auxiliary Power Unit (APU). This effort is done in coordination with efforts in PE 0602601A. ***FY 2010 Accomplishments:*** Improved the JP-8 reformer system model to optimize the layout design and mature system process models; identified all JP-8 reformer components and technologies to be used; and began reformer component characterization to ensure operational parameters are met. ***FY 2011 Plans:*** Begin integration demonstration of essential reformer components; characterize performance of components when integrated in complete reformer system; and begin physical assembly of a JP-8 reformation system.	4.112	3.920	-
Title: Non-Primary Power: ***Description:*** This effort matures and demonstrates small engines based auxiliary power units, fuel cell based auxiliary power units for military ground vehicles. ***FY 2012 Plans:*** Will begin integrating JP-8 reformer/fuel cell system into a relevant Abrams space claim; will finalize JP-8 reformer/fuel cell system design; will begin testing engine based auxiliary power units in a relevant environment; will integrate small engine technologies for use on small unmanned ground vehicles.	-	-	3.531
Title: Fuel Efficiency ground vehicle Demonstrator (FED):	4.721	4.839	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603005A: *Combat Vehicle and Automotive Advanced Technology*	PROJECT 441: *COMBAT VEHICLE MOBILTY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: This effort focuses on demonstrating the viability of achieving significant decreases in fuel consumption without sacrificing tactical vehicle performance or capability. ***FY 2010 Accomplishments:*** Completed design of demonstrator(s); and began fabrication/integration of the demonstrator(s); conducted subsystem evaluation. ***FY 2011 Plans:*** Complete fabrication of demonstrator and begin validation of the findings of the FED system modeling and simulation.			
Title: Propulsion-Prime Power: ***Description:*** This effort provides powertrain and power technologies for military wheeled and tracked vehicles. ***FY 2010 Accomplishments:*** Completed performance and durability demonstration of modified commercial diesel engines; integrated and evaluated compact advanced high power density, high operating temperature, components on vehicle platforms; ruggedized Stryker Magneto-Rheological (MR) suspension hardware and software. ***FY 2011 Plans:*** Complete testing of the MR suspension on a Stryker vehicle; perform advanced development and integration of sensors and control algorithms for closed- loop control of diesel engines; perform vehicle noise analysis; improve control strategy for powertrain; evaluate and select power generation components. ***FY 2012 Plans:*** Will advance powertrain technologies by increasing thermal efficiency and reducing heat rejection of diesel engines; will improve the development and integration of sensors and control algorithms for closed-loop control of diesel engines; will validate advanced high efficiency transmissions; will evaluate and mature control strategies for powertrain systems; will adapt power generation components through powertrain analysis; will improve and mature components to reduce engine cooling burden.	7.818	7.660	10.189
Title: Power and Thermal Management: ***Description:*** This effort demonstrates power and thermal management components and control strategies to meet objective tactical and combat vehicle power requirements. This effort is done in coordination with efforts in PE 0602601A. ***FY 2010 Accomplishments:***	4.860	1.293	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603005A: *Combat Vehicle and Automotive Advanced Technology*	PROJECT 441: *COMBAT VEHICLE MOBILTY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Matured and demonstrated intelligent power management utilizing Artificial Intelligence (AI) to optimize vehicle control strategies and provide data for Condition Based Maintenance (CBM); and tested, evaluated and demonstrated power and thermal management systems in a relevant laboratory environment. ***FY 2011 Plans:*** Investigate optimal strategy for combining power and thermal management components into a system architecture.			
Title: Non-primary Power Sources (NPS): ***Description:*** This effort demonstrates component technologies for energy storage and generation. This effort is done in coordination with efforts in PE 0602601A. ***FY 2010 Accomplishments:*** Integrated power generation and energy storage system into advanced power and energy vehicle architecture system; and demonstrated improved engine-off vehicle performance on system demonstrator for silent watch. ***FY 2011 Plans:*** Complete maturation of electrochemical cells, modules, and batteries; demonstrate and refine hybrid battery systems.	5.648	0.921	-
Title: Force Projection: ***Description:*** This effort focuses on reducing the logistics footprint by maturing water generation, common powertrain lubricant and alternative fuel technologies. This effort is done in coordination with efforts in PE 0602601A. ***FY 2011 Plans:*** Conduct field evaluation and military utility assessment of water from air demonstrators; integrate basic in-line water quality monitoring demonstration technology into purification systems and design and fabricate advanced hand held monitoring technology for water treatment process monitoring; develop water reuse technology; complete laboratory and engine testing and initiate field evaluation of the single powertrain lubricant. ***FY 2012 Plans:*** Will complete field evaluation and military utility assessment and refurbish water from air demonstrators, will fabricate hand held and in-line monitoring technology for water treatment process monitoring, will develop wastewater treatment and recycle technology, will develop nanofluid technology that suspends nanoparticles in coolants and lubricants to improve thermal, friction, and wear properties and will evaluate alternative fuels for use in ground systems.	-	3.925	7.031
Accomplishments/Planned Programs Subtotals	45.272	42.154	42.508

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603005A: *Combat Vehicle and Automotive Advanced Technology*	PROJECT 441: *COMBAT VEHICLE MOBILTY*

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 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603005A: *Combat Vehicle and Automotive Advanced Technology*	PROJECT 497: *COMBAT VEHICLE ELECTRO*	

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
497: *COMBAT VEHICLE ELECTRO*	7.246	7.507	8.659	-	8.659	8.789	11.433	10.143	7.925	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project matures, integrates, and demonstrates vehicle electronics hardware (displays, sensors, communications systems, and vehicle command/control/driving mechanisms) and software that result in increased crew efficiencies, performance, and/or reduced crew size, and reductions in vehicle maintenance costs. The project advances open system architectures for ground combat vehicles that allow more efficient crew stations to be adapted for a variety of ground platforms. Technical challenges include: increased levels of automation for both manned and unmanned systems, advanced user interfaces that support improved/increased span of control for robotic operations and collaborative vehicle operations, workload management, reliability of driving aids and commander's decision aids, and embedded simulation for battlefield visualization and fully integrated virtual test/evaluation. Additionally this project matures and demonstrates mobility technologies that reduce the weight as well as the operation and sustainment of ground vehicles, including advanced track and vehicle electronics and power. .

The cited work is consistent with Strategic Planning Guidance, the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan, and the Defense Technology Area Plan (DTAP).

Work in this project is performed by the Tank Automotive Research, Development, and Engineering Center (TARDEC), Warren, MI, in conjunction with Army Research Laboratory - Human Resources Engineering Directorate (ARL-HRED), Aberdeen, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Improved Mobility and Operations Performance through Autonomous Technologies:	6.344	6.534	2.930
Description: This effort matures indirect vision technologies to provide the Soldier with full hemispherical situational awareness in closed hatched vehicle operations. ***FY 2010 Accomplishments:*** Refined enhanced crewstations and software based on mobility and local situational awareness tasks and workload; matured local situational awareness warfighter machine interfaces for dismounting Soldiers and conducted an experiment to assess impact of dismount information tools on local situational awareness; integrated enhanced crew station 360/90 (day/night) local situational awareness, assisted mobility, and Soldier monitoring/state classification technologies with surrogate platform; and analyzed results of the experiments to capture physiological and physical data from mounted Soldiers in operational environments. ***FY 2011 Plans:*** Integrate driver assist technologies and mounted Soldier monitoring, along with the local situational awareness system for dismounting Soldiers; integrate motion based cueing, video capture with closed hatch 360/90 Electro-Optic Indirect Vision (EOIV)			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603005A: *Combat Vehicle and Automotive Advanced Technology*	PROJECT 497: *COMBAT VEHICLE ELECTRO*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
system; and conduct warfighter assessment and engineering evaluations to collect enhanced quantitative performance level understanding of future EOIV operations. ***FY 2012 Plans:*** Will integrate advanced crew stations with state of the art EOIV (high resolution threat interrogation and driving sensors, digital video recording and displays), assisted mobility aids, mounted Soldier assessment and dismounting Soldier local situational awareness technologies; will conduct the final experiment to quantify system performance.			
Title: Enhanced Vehicle Technologies to Improve Lightweight Track Reliability: ***Description:*** This effort will improve/optimize lightweight segmented band track technology through utilization of high performance elastomers and design with the goal of improving track durability. This effort is done in coordination with related efforts in PE 0603005A projects 221 and 441. ***FY 2010 Accomplishments:*** Investigated wear gauges and developed measurement systems for bushing deformation in track shoes and wear, cracking, and chunking of track pad and road wheel rubber ***FY 2011 Plans:*** In FY11, identify and demonstrate health monitoring systems for track applications. Develop diagnostic and prognostic algorithms to report health predictions and future failures on track system components. ***FY 2012 Plans:*** Will integrate and evaluate the optimized track health monitoring system design performance including wear gauges, damage algorithms, and diagnostic/prognostics algorithms.	0.902	0.973	1.942
Title: Vehicle Electronics Integration and Power Architecture: ***Description:*** This effort matures and demonstrates military ground vehicle electrical/power architecture strategies. This effort done in coordination with efforts in PE 0603005 project 441. ***FY 2012 Plans:*** Will support technical standards development or modification to existing standards for military ground vehicle electrical systems. Will perform trade analysis of existing and future combat and tactical vehicle electrical systems and develop architectural design concepts for intra-vehicle data and video networks, general purpose computing resources, input/output devices, and associated	-	-	3.787

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603005A: *Combat Vehicle and Automotive Advanced Technology*	PROJECT 497: *COMBAT VEHICLE ELECTRO*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
software architectures. Also, will support technical standards development or modification to existing standards for low, medium, and high voltage power systems for military ground vehicles.			
Accomplishments/Planned Programs Subtotals	7.246	7.507	8.659

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 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603005A: *Combat Vehicle and Automotive Advanced Technology*	PROJECT 515: *ROBOTIC GROUND SYSTEMS*	

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
515: *ROBOTIC GROUND SYSTEMS*	9.753	10.637	10.703	-	10.703	10.802	10.992	11.162	11.352	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project matures and demonstrates Unmanned Ground Vehicle (UGV) technologies. The main focus is on integrating and demonstrating in relevant environments sensor technologies, perception hardware and software, and robotic control technologies that enable UGV systems to maneuver on- and off-road at militarily significant speeds with minimal human intervention, thereby enabling the Soldier to perform other mission tasks. Challenges addressed include: obstacle avoidance, overcoming perception limitations, intelligent situational behaviors, command and control by Soldier operators, frequency of human intervention, operations in adverse weather, and robots protecting themselves and their surroundings from intruders. Mature technologies are incorporated in UGV technology demonstrators so that performance can be evaluated for tactical maneuver and sustainment applications.

The approach builds upon, complements, and does not duplicate previous and ongoing investments conducted under the Joint Robotics Program Office, in program element (PE) 0602601A, project H91 (Ground Vehicle Technology) and by the Army Research Laboratory (ARL) PE 0602120A (Sensors and Electronic Survivability).

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 Tank Automotive Research, Development, and Engineering Center (TARDEC), Warren, MI, in collaboration with the Army Research Laboratory (ARL), Adelphi and Aberdeen Proving Ground, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Safe Operations of Unmanned systems for Reconnaissance:	5.066	10.637	10.703
Description: This effort demonstrates perception, control and tactical behavior technologies to safely conduct unmanned urban operations.			
FY 2010 Accomplishments: Provided quantitative performance data based on demonstrations that enabled development of Techniques, Tactics and Procedures; developed mission-focused tactical behaviors; and developed and conducted initial warfighter assessment and engineering evaluations including the evaluation of combined mobility/mission workload for UGVs and Unmanned Air Vehicles (UAVs).			
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 3: *Advanced Technology Development (ATD)*	**R-1 ITEM NOMENCLATURE** PE 0603005A: *Combat Vehicle and Automotive Advanced Technology*	**PROJECT** 515: *ROBOTIC GROUND SYSTEMS*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
In FY11, integrate and evaluate behaviors that enable UGVs to navigate safely around people and other vehicles in a realistic military testing environment; integrate situational awareness and operational procedures to assure safe UGV employment across anticipated missions; demonstrate tactical behaviors focused on mission execution; integrate specialized classification algorithms for sensor and algorithm fusion; increase capabilities of M&S tools to evaluate perception/control algorithms and human-robot interaction; and evaluate sensors and tactical behaviors that enable the use of UGVs to assist in the security of maneuver elements (i.e., Convoy Operations). ***FY 2012 Plans:*** Will perform integration of all developed technologies on relevant testbed platforms and conduct a final Warfighter evaluation designed to examine resultant capabilities for a group of heterogeneous unmanned systems to conduct urban reconnaissance; will collect and provide performance data that will be validated through M&S and live experimentation to support transition into future systems; will perform systems engineering process, ensure interoperability and begin integration of subsystems, assess system design through modeling and simulation; and will mature relevant technologies for systems integration, gain safety approval for testing, and mature robotic control station.			
Title: Robotic Vehicle Control Architecture (RVCA) Technology: ***Description:*** This effort developes an Unmanned Ground Vehicle (UGV) end-to-end control architecture to reduce future technology integration risk and demonstrates the viability of autonomous operations in a relevant environment. ***FY 2010 Accomplishments:*** Integrated a prototype Autonomous Navigation System and new Reconnaissance, Surveillance and Target Acquisition system onto the Autonomous Platform Demonstrator; vehicle. Conducted a series of field engineering evaluations to measure system performance and effectiveness, Conducted a Soldier operational exercise at Ft. Hood, TX to gain user feedback on the system performance in its final configuration in a relevant environment. Analyzed data from all field assessments and developed final test reports.	4.687	-	-
Accomplishments/Planned Programs Subtotals	9.753	10.637	10.703

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603005A: *Combat Vehicle and Automotive Advanced Technology*	PROJECT 515: *ROBOTIC GROUND SYSTEMS*

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 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603005A: *Combat Vehicle and Automotive Advanced Technology*	PROJECT 533: *Ground Vehicle Demonstrations*	

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
533: *Ground Vehicle Demonstrations*	124.342	-	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

These are Congressional Interest Items

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Antiballistic Windshield Armor (AWA): ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Researched Antiballistic Windshield Armor.	2.387	-	-
Title: Unmanned Ground Vehicle Initiative (UGVI): ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Assessed the capability to expeditiously develop and field robotic systems through (1) modeling and simulation, (2) robotic experimentation and (3) robotic knowledge management.	10.943	-	-
Title: Protective 3-D Armor Structure to Safeguard Military Vehicles and Troops ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Assessed currently available capabilities in the area of Flammability, Smoke, and Toxicity (FST) and performed a gap assessment.	1.592	-	-
Title: Logistical Fuel Processors Development ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Developed smaller and more efficient reforming systems for fuel cell power systems; built a steam reformer prototype utilizing microfibrous entrapped materials for more compact, more efficient, and better process control.	1.194	-	-
Title: Ground Forces Readiness Enabler for Advanced Tactical Vehicles (GREAT-V)	0.796	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603005A: *Combat Vehicle and Automotive Advanced Technology*	PROJECT 533: *Ground Vehicle Demonstrations*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Converted raster to CAD data for retention of data related to legacy vehicle.			
Title: Advanced Lithium Ion Phosphate Battery System ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Continued development of cells and battery packs for hybrid HMMWVs and developed lithium battery packs.	2.387	-	-
Title: Hybrid Electric Heavy Truck Vehicle ***Description:*** This is a Congressional Interest Item ***FY 2010 Accomplishments:*** Developed and demonstrated a fuel efficient, low heat rejecting prototype engine from an on-road commercial off the shelf (COTS) engine that has been modified and is compatible with military heavy hydrocarbon fuels (JP-8 and DF-2).	1.592	-	-
Title: Pre-Discharge Threat Cues ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Developed supporting technology for a mobile sensor and processor for use by mobile ground force (vehicle and dismount) protection in dense urban environments against urban weapons threats.	1.592	-	-
Title: Fire Shield ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Upgraded and updated the Full Spectrum Active Protection Close-In Shield (FCLAS) technology and applied and integrated it into the Fire Shield (FS) close-in active protection concept; Developed & demonstrated Fire Shield for vehicle application; Developed and updated the Safe & Arm, CM materials, deployment design, and obtained Fire Shield (FS) component hardware for GOV testing.	3.183	-	-
Title: Silent Watch , 1B NPS 1160 Lithium-Ion Advanced Battery	0.796	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603005A: *Combat Vehicle and Automotive Advanced Technology*	PROJECT 533: *Ground Vehicle Demonstrations*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Continued the development of IB's 160-Ah large-format, prismatic Lithium-Iron Phosphate cells for use in ground vehicle silent watch and starting applications.			
Title: Advanced Suspension Systems for Heavy Vehicles ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Developed and manufactured a compressible magneto rheological vehicle suspension system for vehicle proof of principal testing on a Bradley Fighting Vehicle.	2.149	-	-
Title: Advanced Corrosion Protection for Military Vehicles ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Demonstrated technologies for Army vehicle corrosion prevention and control through development of new materials and application processes.	2.387	-	-
Title: Ceramic and Metal Matrix Composite (MMC) Armor Development Using Ring Extruder Technology ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Developed potential applications for a 12-screw ring extruder to extrude mixtures that can be formed or cast into armor tiles or panels.	0.796	-	-
Title: Advanced Carbon Hybrid Battery for Hybrid Electric Vehicles ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Researched, designed, developed, and tested improvements to Absorbed Glass Mat (AGM) Lead acid batteries for 24V military batteries.	0.796	-	-
Title: Advanced Technology for Energy Storage	1.592	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603005A: *Combat Vehicle and Automotive Advanced Technology*	PROJECT 533: *Ground Vehicle Demonstrations*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated materials in the following areas: Ionic Liquid Electrolytes, Li-air Battery Cathode Catalysts, Graphene-based Electrodes, Battery Interface Characterization, Improved Solid Polymer Electrolytes, and Solid State Electrolytes.			
Title: Electric All Terrain Ultra Light Vehicle for the Minnesota National Guard ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Developed range extending technology for the all electric all terrain ultra light vehicles.	1.592	-	-
Title: Fuel System Component Technology Research ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Developed efficient and effective production of fuel system components made from titanium and other lightweight, high performance materials.	1.592	-	-
Title: Integrated Defense Technical Information ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Developed Windchill Product Data Management (PDM) capabilities.	1.592	-	-
Title: All Composite Lightweight Military Vehicle ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Designed and developed a low cost all-composite military vehicle.	1.592	-	-
Title: 30-kW Auxiliary Power for Armored Combat Vehicles ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:***	1.592	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603005A: *Combat Vehicle and Automotive Advanced Technology*	PROJECT 533: *Ground Vehicle Demonstrations*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Developed an auxiliary power unit for silent watch onboard various military ground vehicles.			
Title: Compact 10 Kilowatt Generator Set for Army and Marine Combat Vehicles ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Developed and tested a highly compact 10 kW Generator for combat vehicles.	1.592	-	-
Title: Networked Reliability and Safety Early Evaluation System (NRSEES) ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Designed a Multi Axis Simulation Table for the vibration testing of vehicle components and subsystems.	1.592	-	-
Title: Unmanned Robotic System Utilizing Hydrocarbon Fueled Solid Oxide Fuel Cell ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Developed a solid oxide fuel cell for a selected UGV.	2.387	-	-
Title: Friction Stir Welding Program ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Developed friction spin welding technology to attached fixed appurtenances with a friction weld head.	2.387	-	-
Title: On-board Vehicle Power Systems Development ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Developed a prototype kit of a Transmission Integral Generator (TIG) On-Board Vehicle Power (OBVP), based on the Allison 3200SP.	2.467	-	-
Title: VePro - Vehicle Health Usage Monitoring and Prognostics ***Description:*** Funding is provided for the following effort.	2.866	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603005A: *Combat Vehicle and Automotive Advanced Technology*	PROJECT 533: *Ground Vehicle Demonstrations*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
FY 2010 Accomplishments: This Congressional Interest Item provided tools, methodology and technology/knowledge to develop, configure and implement conditional based maintenance (diagnostics and prognostic) algorithms for onboard vehicle platforms.			
Title: VSIL: Armored Vehicle Components and Systems Simulated in Cost-Effective Virtual Design and Test Environment ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Developed and demonstrated a standalone version of the Virtual Systems Integration Laboratory (VSIL).	3.183	-	-
Title: Hybrid Engine Development Program ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Developed hybrid engine technologies with the goal of improving the efficiency, reliability, power density and cost of hybrid electric configurations for military applications.	3.183	-	-
Title: Zouline Armor ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Reduced the areal density of the Zouline Armor system while providing ballistic protection for Tactical Vehicles.	3.342	-	-
Title: Program Increase ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated improving the current capabilities by (a) consolidating baseline 3D CAD geometry, creating a scanned data set repository, and creating links between the scanned, OEM, SE, Concepts, and other data sets. (b) implemented an Enterprise Program Data Repository and defined the concept of operation and Standard Operating Procedures (SOPs) for use of available commercial tools (MS Project, Sharepoint, Windchill). (c) developed M&S capabilities for a Simulation Data Management capability.	3.730	-	-
Title: Advanced Battery Materials and Manufacturing ***Description:*** This is a Congressional Interest Item.	3.979	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603005A: *Combat Vehicle and Automotive Advanced Technology*	PROJECT 533: *Ground Vehicle Demonstrations*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
FY 2010 Accomplishments: Installed data loggers on Stryker vehicles to collect vehicle data and validate and verify CBM Solutions; identified opportunities for enhanced diagnostic development.			
Title: Army Vehicle Condition Based Maintenance ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Collected data on power train and power management systems.	3.979	-	-
Title: Simulation Based Reliability and Safety (SimBRS) Program ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Provided models, simulation methods and software tools to addressed Modeling, Analysis, and Simulation capabilities.	4.874	-	-
Title: Advanced Battery Development Program ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Developed a battery management system (battery electronics) developed Hardware-in-loop capability for the design, development & assessment of battery management system technologies; developed electrical subsystem modeling to support system level modeling.	8.953	-	-
Title: Advanced Composites for Light Weight, Low Cost Transportation Systems Using 3+ Extruder ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Developed extrusion technology for powder-to-parts continuous manufacturing process near net shapes.	2.387	-	-
Title: Enhanced Military Vehicle Maintenance System Demo Project ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:***	2.785	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603005A: *Combat Vehicle and Automotive Advanced Technology*	PROJECT 533: *Ground Vehicle Demonstrations*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Applied prognostic health monitoring modeling techniques to determine root cause of failure upon entering the depot maintenance process			
Title: Advanced Reactive Armor Systems ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Developed and tested Magmacore Reactive Armor.	1.592	-	-
Title: Superlattice Semiconductors for Mobile SS Lighting and Solar Power Applications ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Examined efficient, cost-effective alternative energy for mobile applications using superlattice silicon carbide.	2.785	-	-
Title: Water Purification System for Natural Disasters ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Developed a mobile, reverse osmosis water purification system.	0.800	-	-
Title: Tire to Track Transformer System for Light Vehicles ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Designed and developed a tire to track transformer system.	1.600	-	-
Title: All Composite Bus Program ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Designed and developed a lightweight composite transit bus.	1.990	-	-
Title: Hybrid Electric Drive All Terrain Vehicle ***Description:*** This is a Congressional Interest Item.	1.592	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603005A: *Combat Vehicle and Automotive Advanced Technology*	PROJECT 533: *Ground Vehicle Demonstrations*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
FY 2010 Accomplishments: Developed hybrid automotive technologies for defense applications integrating the next iteration of electric drive technology.			
Title: Alternative Energy Research ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Demonstrated a mobile advanced power management architecture that incorporates source and demand management, plug-and-play capability, and interoperability with legacy equipment; Developed tools to assess the business case for future investments in micro-grid research or demonstration; Generated the technical data to assess the performance, durability, and operability of tactical ground systems operating on synthetic (FT SPK) and renewable (HRJ) fuel blends. Three tactical vehicle engines were operated on a renewable fuel blend according to the NATO 400-hr protocol and the data generated was compared to baseline operation on JP-8; Demonstrated mixed renewable generation sources and energy storage.	18.155	-	-
Accomplishments/Planned Programs Subtotals	124.342	-	-

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 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603005A: *Combat Vehicle and Automotive Advanced Technology*	PROJECT 53D: *NAC Demonstration 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
53D: *NAC Demonstration Initiatives (CA)*	30.720	-	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

These are Congressional Interest Items

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Advanced Thermal Management System ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Developed electrical engine/vehicle thermal management accessories and oil management systems.	2.388	-	-
Title: Hydraulic Hybrid Vehicles (HHV) for the Tactical Wheeled Fleet ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Developed series hydraulic hybrid drivetrain technology for military tactical vehicle applications.	2.785	-	-
Title: JAMMA Family of Vehicles ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Took feedback on vehicle performance from the user and incorporated lessons learned improvements back into the vehicle.	0.795	-	-
Title: Advanced Digital Hydraulic Hybrid Drive System ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Developed series hydraulic hybrid drivetrain technology for military tactical vehicle applications.	1.990	-	-
Title: Field Deployable Fleet Hydrogen Fueling ***Description:*** This is a Congressional Interest Item.	2.388	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603005A: *Combat Vehicle and Automotive Advanced Technology*	PROJECT 53D: *NAC Demonstration Initiatives (CA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
FY 2010 Accomplishments: Developed and tested Proton Exchange Membrane Electrolyzer components.			
Title: Defense Advanced Transportation Technology Program Hybrid Truck Users Forum ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Explored opportunities for hybrids and advanced vehicle technologies for trucks and commercial construction equipment.	4.775	-	-
Title: Smart Plug-in Hybrid Vehicle Program ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Developed, demonstrated, and validated new technologies for grid to vehicle and vehicle to grid (V2G) power flow and communications.	3.263	-	-
Title: Advanced Lightweight Multi-Functional Multi-Threat Composite Armor Material Technology ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Developed lightweight armor for the U.S. Army that will protect a variety of military vehicles from multiple threats.	2.388	-	-
Title: Plug-in Hybrid Electric Vehicle ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Designed and developed a lightweight, plug-in hybrid electric vehicle (PHEV) specifically suited to military transportation needs and requirements.	3.979	-	-
Title: Fully Burdened Cost of Fuel and Alternative Energy Methodology and Conceptual Model ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:***	2.785	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603005A: *Combat Vehicle and Automotive Advanced Technology*	PROJECT 53D: *NAC Demonstration Initiatives (CA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Developed a standard methodology and conceptual model for Department of Defense ground vehicle systems and posts, camps and stations to determine the fully burdened cost of fuel.			
Title: Future Tactical Truck Carbon Composite Shelter & Retrofit of Current Vehicle Shelters ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Developed a carbon composite shelter for military vehicles.	3.184	-	-
Accomplishments/Planned Programs Subtotals	30.720	-	-

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 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603005A: *Combat Vehicle and Automotive Advanced Technology*	PROJECT C66: *DC66*	

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
C66: *DC66*	2.348	4.304	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program is reported in accordance with Title 10, United States Code, Section 119(a)(1) in the Special Access Program Annual Report to Congress.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Classified Efforts	2.348	4.304	-
Description: Funding is provided for the following effort ***FY 2010 Accomplishments:*** Classified Efforts ***FY 2011 Plans:*** Classified Efforts			
Accomplishments/Planned Programs Subtotals	2.348	4.304	-

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.