Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army										DATE: February 2011	
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*				R-1 ITEM NOMENCLATURE PE 0602601A: *Combat Vehicle and Automotive 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	79.649	64.740	64.306	-	64.306	62.264	66.001	67.521	67.360	Continuing	Continuing
C05: *ARMOR APPLIED RESEARCH*	19.083	25.660	25.839	-	25.839	23.348	24.437	25.851	25.559	Continuing	Continuing
H77: *National Automotive Center*	15.739	16.515	15.144	-	15.144	15.489	16.285	16.729	17.152	Continuing	Continuing
H91: *Ground Vehicle Technology*	21.548	22.565	23.323	-	23.323	23.427	25.279	24.941	24.649	Continuing	Continuing
T26: *Ground Vehicle Technologies (CA)*	21.686	-	-	-	-	-	-	-	-	Continuing	Continuing
T31: *NAT'L AUTO CENTER APP RES INIT (CA)*	1.593	-	-	-	-	-	-	-	-	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

This program element (PE) researches and develops automotive technologies that enable Army transformation. The PE supports the research and development of components and subsystems for ground combat/tactical vehicles in the areas of survivability (project C05), advanced automotive technology (project H77), and tank and automotive technology (project H91). Projects T26 and T31 fund congressional special interest items.

Work in this PE is related to, and fully coordinated with, PE 0603005A (Combat Vehicle and Automotive Advanced Technology), PE 0602618A (Ballistics Technology, Robotics Technology, PE 0602105A (Materials Technology), PE 0602716A (Human Factors Engineering Technology), PE 0602705A (Electronics and Electronic Devices), and PE 0708045A (Manufacturing Technology). Work in this PE is coordinated with the U.S. Marine Corps, the Naval Surface Warfare Center, and other ground vehicle developers within the Defense Advanced Research Projects Agency (DARPA) and the Departments of Energy, Commerce, and Transportation.

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, MI.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army	DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	**R-1 ITEM NOMENCLATURE** PE 0602601A: *Combat Vehicle and Automotive Technology*

B. Program Change Summary ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Previous President's Budget	78.923	64.740	62.571	-	62.571
Current President's Budget	79.649	64.740	64.306	-	64.306
Total Adjustments	0.726	-	1.735	-	1.735
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	1.500	-			
• SBIR/STTR Transfer	-0.774	-			
• Adjustments to Budget Years	-	-	1.735	-	1.735

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602601A: *Combat Vehicle and Automotive Technology*	PROJECT C05: *ARMOR APPLIED RESEARCH*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
C05: *ARMOR APPLIED RESEARCH*	19.083	25.660	25.839	-	25.839	23.348	24.437	25.851	25.559	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project investigates, designs, and evaluates advanced armor concepts, ballistic defeat mechanisms, and armor packaging concepts to achieve lightweight, ballistically-superior armors/structures for combat and tactical vehicles. Armors are being investigated to meet anticipated ground combat and tactical vehicle survivability objectives. Additionally, this project focuses on analysis, modeling, and characterization of potential survivability solutions that could protect against existing and emerging threats. This analysis is used to aid in the identification of technologies to enter maturation and development in PE 0603005A/project 221.

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, MI and is fully coordinated with work at the Army Research Laboratory (ARL), Aberdeen Proving Ground, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Vehicle Armor Protection for Lightweight Combat Systems:	9.774	10.881	10.007
Description: This effort designs, fabricates, and investigates add-on lightweight armor packages to protect combat systems against projectiles, warheads, penetrators and blast fragments.			
FY 2010 Accomplishments: Performed initial assessment of ground vehicle armor and third generation mine kits to meet emerging threats; analyzed and evaluated material/recipes performance for various armor/mine protection areas; and provided initial characterization of next generation armor materials to identify risks for maturation; and matured improved ballistic performance armor with embedded health monitoring.			
FY 2011 Plans: Perform armor recipe optimization to establish armor efficiency; complete ballistic testing of selected armor systems to validate the armor design; downselect materials/armor systems for entire vehicle protection and procure long lead items for future demonstration builds; and mature and validate performance of multifunctional armor.			
FY 2012 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602601A: *Combat Vehicle and Automotive Technology*	PROJECT C05: *ARMOR APPLIED RESEARCH*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Will complete armor design and fabrication; and will perform shaker and ballistic assessment to validate and improve armor design, armor attachment durability, and ballistic performance for combat vehicles. This work is done in conjunction with program elements 0602105A, 0602618A, and 0603005A.			
Title: Advanced Armor Development: ***Description:*** The objective of this effort is to investigate advanced armors for combat and tactical vehicle applications to defeat single and multiple chemical and kinetic energy (CE and KE) emerging threats. ***FY 2010 Accomplishments:*** Continued investigation and maturation of candidate reactive and passive armor concepts for single emerging threat(s) (KE) and downselected solutions for maturation with respect to capability, weight, and ease of integration. ***FY 2011 Plans:*** In FY11, validate advanced armor designs at the panel level while reducing armor weight; improve armor recipe to meet threshold areal density while defeating threshold threat. ***FY 2012 Plans:*** Will develop advanced armor designs at the panel level that will reduce areal density from the threshold level while still defeating threshold threat. Will investigate integration of select C4ISR equipment into armor recipe and design. This work is done in conjunction with program elements 0602105A, 0602618A and 0603005A.	4.378	8.772	7.160
Title: Blast Mitigation: ***Description:*** This effort matures modeling and simulation (M&S) tools and blast mitigation technologies to improve ground vehicle structural performance against blast threats. Assessments are conducted to validate the M&S tools. ***FY 2010 Accomplishments:*** Developed advanced crew protection technologies for land mine/explosive events; investigated potential techniques for 3-dimensional vehicle models and crew protection methods for land mine/explosive events; validated survivability enhancements of integral fuel tanks against objective threats; began development of external fire suppression methods to address fuel, track, and stowage fire vulnerabilities for combat vehicles; and improved blast tolerance of automatic fire extinguishing systems. ***FY 2011 Plans:*** In FY11, develop techniques for complete vehicle structure design and crew protection methods for landmine/explosive events; investigate performance and integration of extinguishing mechanisms; enhance fire M&S tools to incorporate new extinguishing	4.931	6.007	8.672

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602601A: *Combat Vehicle and Automotive Technology*	PROJECT C05: *ARMOR APPLIED RESEARCH*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
agents, delivery systems, and predictive capabilities for ballistic events; increase cook-off resistance of small arms ammunition via improved stowage without compromising accessibility. ***FY 2012 Plans:*** Will increase fidelity in end-to-end M&S tools for occupant protection and vehicle underbody and Soldier blast protection. Will validate live fire test and evaluation events with M&S to reduce program risk and expense, and will use high fidelity models to identify quick reaction solutions to the Warfighter. Will mature techniques to reduce flammability of vehicle tires, track, and composite materials and protect lithium-ion batteries against fire events			
Accomplishments/Planned Programs Subtotals	19.083	25.660	25.839

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 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602601A: *Combat Vehicle and Automotive Technology*	PROJECT H77: *National Automotive Center*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
H77: *National Automotive Center*	15.739	16.515	15.144	-	15.144	15.489	16.285	16.729	17.152	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project researches and develops automotive component technologies to meet ground combat and tactical vehicle objectives. The project funds the National Automotive Center (NAC), which conducts shared government and industry technology programs to leverage commercial investments in automotive technology research and development for Army ground combat and tactical vehicle applications.

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, Michigan and is coordinated with PE 0602705A (Electronics and Electronic Devices).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Alternative Energy:	8.541	8.859	9.086
Description: This effort leverages opportunities from industry to develop alternative energy technologies for Army applications. ***FY 2010 Accomplishments:*** Investigated waste to energy technologies for application in power generation devices; pursued dual-use power and energy component development; investigated vehicle platform with high output power capabilities tied to power grid and the modeling tools needed to understand this interaction; expanded development and commercialization of dual-use simulation-based tools that incorporate 3D terrain topology modeling for validation and verification of vehicle designs; and designed and developed an energy storage system on hybrid electric vehicles for forward operations applications utilizing renewable energy sources and/or generator set(s). ***FY 2011 Plans:*** Continue development of waste to energy technologies to reduce fuel consumption in power generation; continue to conduct experiments with synthetic and renewable fuel blends for alternative fuels qualification program for ground vehicle systems; expand development and commercialization of dual-use Modeling and Simulation (M&S) tools by conducting high-density hybrid engine modeling and vehicle thermal management modeling. ***FY 2012 Plans:*** Will conclude development of dual-use M&S tools for advanced high-density hybrid engine powered non-tactical vehicle business case analysis; will begin planning for large scale investigation of vehicle-to-grid and grid-to-vehicle capabilities integrated into			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602601A: *Combat Vehicle and Automotive Technology*	PROJECT H77: *National Automotive Center*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
a power grid with a high proportion of renewable generation; will continue to pursue qualification of alternative fuels for use in ground vehicle systems; will conduct system level assessments of synthetic and renewable fuel blends supporting their implementation into military fleets. This work is being done in conjunction with program element 0602705A.			
Title: Conditioned Based Maintenance (CBM) and Intelligent Systems: ***Description:*** This effort advances condition based maintenance and intelligent systems technologies for dual use applications, including the investigation of commercial hybrid electric non-tactical vehicles on military bases to gather performance, reliability and maintainability data. ***FY 2010 Accomplishments:*** Continued to develop and evaluate dual-use CBM tools by conducting lithium-ion and lead acid battery characterization experiments and thermo electric power unit studies. ***FY 2011 Plans:*** Expand development and investigation of dual-use CBM tools by developing battery prognostics and diagnostics M&S tools, as well as investigating on-board vehicle health awareness tools. ***FY 2012 Plans:*** Will pursue fleet level evaluation of dual-use CBM tools for battery prognostics and diagnostics and begin development and investigation of dual-use CBM tools for additional vehicle subsystem prognostics and diagnostics.	2.136	2.212	2.272
Title: Power, Energy and Mobility: ***Description:*** This effort investigates dual use power, energy, and mobility technologies. ***FY 2010 Accomplishments:*** Investigated performance capabilities of commercially available technologies applied to military ground vehicle platforms in suspension, torque vectoring differentials, batteries, brakes, electrical subsystems, and alternative chassis structures; developed hybrid electric vehicle requirements and software integration to facilitate the design and development of a communication system between vehicle and the power control using intelligent software; and continued M&S efforts by modeling advanced diesel and hybrid powertrains by developing predictive M&S modeling tools and validation methodologies . ***FY 2011 Plans:*** Develop dual-use automotive subsystems and components that can be modified for application to military platforms and alternative chassis structures; pursue power and energy component development; design high-yield renewable energy generation	2.312	3.690	3.786

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602601A: *Combat Vehicle and Automotive Technology*	PROJECT H77: *National Automotive Center*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
technology architecture and prepare distributed generation transition criteria for PM Mobile Electric Power; and expand development of methodologies to validate and explore true potential of proposed advanced engine technologies. ***FY 2012 Plans:*** Continue the pursuit of dual-use power and energy component development and integrate initial products into non-tactical vehicles for assessment on military installations. Continue to support transition of distributed generation hardware to PM Mobile Electric Power or other materiel developers.			
Title: Joint Recovery and Distribution System (JRaDS): ***Description:*** Provides a Family of Systems (FoS) which enables execution of multiple mission profiles via a small number of trailer variants vs. the large inventory of distinct type trailer systems currently in the service trailer inventory. Will offer high reliability and parts commonality, thus, reducing Service logistics and maintenance requirements; associated costs of ownership, and requirements for supplementary Materiel Handling Equipment and supporting personnel may be reduced. ***FY 2010 Accomplishments:*** Four 40 ton, four 34 ton and one 13 ton trailer have been produced and reviewed; the 34T and 13T trailers began evaluation performance; 40 ton trailers underwent capability, safety confirmation and limited durability testing; team conducted an Operational Demonstration with Soldiers from the 101st Sustainment Brigade in which they performed seven recovery scenarios on various versions and levels of disabled Mine Resistant Ambush Protected (MRAP) vehicles ***FY 2011 Plans:*** Reduce risk for DoD Joint Recovery and Distribution System (JRaDS) JCTD by enabling the purchase of additional prototype trailer systems and support the broader scoped Operational Military Utility Assessment.	2.750	1.754	-
Accomplishments/Planned Programs Subtotals	15.739	16.515	15.144

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 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602601A: *Combat Vehicle and Automotive Technology*	PROJECT H91: *Ground Vehicle 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
H91: *Ground Vehicle Technology*	21.548	22.565	23.323	-	23.323	23.427	25.279	24.941	24.649	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project designs, develops, and evaluates a variety of innovative and enabling technologies in the areas of vehicle concepts, virtual prototyping, power, thermal management, propulsion, mobility, survivability, vehicle diagnostics, fuels, lubricants, water purification, intelligent systems, and other component technologies for application to combat and tactical 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 the Tank Automotive Research, Development, and Engineering Center (TARDEC), Warren, Michigan.

Efforts in this project are closely coordinated with the Army Research Laboratory (ARL), the Defense Advanced Research Projects Agency (DARPA), the U.S. Army Engineer Research, Development, and Engineering Center, Edgewood Chemical Biological Center, and the Army Medical Department.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Pulse Power: ***Description:*** This effort focuses on growing technology for compact, high frequency/high energy/high power density components and devices, which are enablers for several advanced electric-based weapon systems. ***FY 2010 Accomplishments:*** Designed and fabricated improved gate and bus structure design for high power applications; designed and developed Super Gate Turn-Off (SGTO) switch technology using Silicon Carbide (SiC) for high power applications. ***FY 2011 Plans:*** Investigate full up Si and SiC based SGTO applications such as high power microwaves, electrified armors, and directed energy weapons applications. ***FY 2012 Plans:*** Will investigate SiC based SGTO switches for electro-mechanical armor applications; will investigate SiC components in DC-DC chargers, and pulse chargers; will investigate improvements in fast high energy density capacitors with improved clearing agents using newly developed films for directed energy weapons (DEW).	6.615	6.123	3.820
Title: JP-8 Reformation for Military Fuel Cells:	2.065	2.104	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602601A: *Combat Vehicle and Automotive Technology*	PROJECT H91: *Ground Vehicle Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: This effort investigates JP-8 reformer and desulfurization technologies so that JP-8 may be utilized as a fuel source for fuel cells used in future military vehicle power applications. ***FY 2010 Accomplishments:*** Began tracking sulfur handling capacity and operational temperatures of JP-8 reformer, desulfurization devices, and fuel cell system; and began design and development on all major reformer fuel cell system components to determine functionality within the claim space limitations. ***FY 2011 Plans:*** Mature major JP-8 reforming fuel cell system components performance and interoperability; design and develop balance of components for the JP-8 reforming fuel cell system and ensure program specifications meet user capability requirements. This effort is done in coordination with efforts in PE 0603005A, project 441. For FY12, this effort is continued under title Auxiliary Power.			
Title: Propulsion-Prime Power: ***Description:*** The goal of this effort is to design and develop engines and generators and their components with significantly improved performance characteristics, efficiencies, and power densities. ***FY 2010 Accomplishments:*** Investigated the performance of modified commercial diesel engines with a control strategy to enable operation of JP-8 fuel; and assessed compact, high power density hybrid electric components performance. ***FY 2011 Plans:*** Complete common rail fuel pump development and conduct durability experiments with JP-8; complete the design and fabrication of closed-loop fuel injection system; conduct initial fuel injection system performance tests; begin advanced drivetrain efficiency design and development; and advance powertrain noise abatement technology development. ***FY 2012 Plans:*** Will investigate the durability and reliability of advanced fuel systems operating on JP-8 fuel at high temperatures; will examine engine performance when using military grade fuels; will complete powertrain analysis for efficiency and thermal heat rejection; will examine designs to improve the mechanical efficiency of advanced transmissions while increasing ratio spread and electronic controls; will investigate and develop components to reduce engine cooling burden and assessed hybrid electric components performance.	2.018	1.834	5.201
Title: Non-primary Power System (NPS):	2.605	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602601A: *Combat Vehicle and Automotive Technology*	PROJECT H91: *Ground Vehicle Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: This effort investigates component technologies for energy storage and generation. ***FY 2010 Accomplishments:*** Developed system controls for advanced power and energy system demonstrator; investigated strategies to reduce non-primary power generation system exhaust noise; and developed techniques to mitigate safety challenges for advanced energy storage devices on vehicles. This effort is done in coordination with efforts in PE0603005A, project 441.			
Title: Power & Thermal Management: ***Description:*** This effort investigates power and thermal management components, including traction motors, inverters, dc-dc converters, new motor and generator concepts and control strategies to meet objective power requirements. ***FY 2010 Accomplishments:*** Developed combined power and thermal management system level architecture from modeling and simulation toolset; designed and developed integrated electronic power and thermal management device/component level technology; and investigated advanced intelligent (learning and adaptive) power management control algorithms using artificial intelligence techniques. ***FY 2011 Plans:*** Develop advanced intelligent (learning and adaptive) control architecture to control multiple vehicular power sources and loads; initiate development of reliable, cost effective, high temperature power electronic components to reduce system cooling burden. This effort is done in coordination with efforts in 0603005A. For FY12, this effort is continued under titles Power Management and Power Electronics and On-Board Vehicle Power Components.	3.094	6.295	-
Title: Power Management: ***Description:*** This effort investigates technologies to more effectively distribute power within military vehicle platforms. ***FY 2012 Plans:*** Will enhance advanced intelligent (learning and adaptive) control architecture to control multiple vehicular power sources and loads.	-	-	1.016
Title: Power electronics and On-Board Vehicle Power Components: ***Description:*** This effort will develop high temperature and more efficient power conversion components using Silicon Carbide (SiC) switching devices. ***FY 2012 Plans:***	-	-	6.446

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Will investigate the feasibility of increasing the operating temperature of the power devices to reduce the thermal management burden of the total vehicle system that incorporates power generation for internal and external use; will develop Integrated Starter Generator controls to provide on-board and export power; will investigate and evaluate thermal systems to increase Heating Ventilation Air Conditioning (HVAC) efficiency; will evaluate electronics cooling technologies to reduce the system cooling burden.			
Title: Auxiliary Power : ***Description:*** This effort investigates small engines for on-board vehicle auxiliary power; power sources for small unmanned ground vehicles, and JP-8 reformer and desulfurization technologies for use with fuel cell-based auxiliary power applications onboard military ground vehicles. ***FY 2012 Plans:*** Will begin investigating JP-8 reformer/fuel cell system models and component level evalution data; will finalize JP-8 reformer/fuel cell system design; will investigate small engine technologies for use on small unmanned ground vehicles.	-	-	2.119
Title: Mobility: ***Description:*** This effort focuses on improving drive component performance and reliability through elastomer component development, to reduce the logistics burden associated with the sustainment of manned and unmanned tactical and combat vehicles. ***FY 2010 Accomplishments:*** Validated high performance bushings on a standard Abrams track through simulated endurance assessment; analyzed suspension loads and the effects of suspension loading into the track elastomer systems; developed computer model which determined new camber angle to reduce energy into elastomer components from suspension loading; fabricated enhanced bushings and backer stock elastomers for Abrams on vehicle evaluations.	1.015	-	-
Title: Intelligent Systems Technology Research: ***Description:*** This effort assesses improved operations of manned platforms through the application of sensing and autonomy technologies developed for unmanned systems. ***FY 2010 Accomplishments:*** Determined the sensor data required to allow for safe unmanned ground system operations in an urban environment; developed embedded real-time dynamic mobility models that predicted manned and unmanned vehicle responses and prevented unsafe mobility situations while under robotic control. ***FY 2011 Plans:***	2.894	4.628	4.721

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Analyze the integration of robotic sensor data into a network communication model to validate accurate vehicle operations; develop algorithms from the fused sensor data that allow more accurate and precise vehicle manipulation within various virtual environments and predict vehicle payload effects; develop and evaluate approaches to enhance the capabilities for unmanned systems to work in a dynamic environment; and -develop interoperability profiles and architectures to facilitate command and control of the unmanned systems from a common warfighter machine interface. ***FY 2012 Plans:*** Will conduct initial trade studies in the areas of intelligence, perception, communications, robotic control and payload integration for a weaponized robotic system; will advance technologies for manned/unmanned collaboration and teaming, unmanned tactical behaviors, command and control of the unmanned systems from a common warfighter machine interfaces, intelligence agents, and develop intelligent architectures for systems level weaponized robotic control.			
Title: Diagnostics/Prognostics for Condition Based Maintenance: ***Description:*** This effort focuses on reduction of maintenance time and cost by developing the tools to gather data from ground vehicles to allow more accurate diagnoses of problems, leading to prediction of failures before they occur. ***FY 2010 Accomplishments:*** Initiated characterization studies on powertrain and electrical power generation components to determine existing diagnostic capabilities and assessed opportunities for enhanced diagnostic/prognostic development. ***FY 2011 Plans:*** Leverage past algorithm development to create diagnostics and prognostics on power and energy components (batteries, power converters, alternators). This includes failure mode effects and analysis development, model development, root cause analysis, and algorithm updates.	1.242	1.581	-
Accomplishments/Planned Programs Subtotals	21.548	22.565	23.323

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 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602601A: *Combat Vehicle and Automotive Technology*	PROJECT T26: *Ground Vehicle Technologies (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
T26: *Ground Vehicle Technologies (CA)*	21.686	-	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for Ground Vehicle Technology applied research.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Nanofluids for Advanced Military Mobility ***Description:*** This is a Congressinal Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item investigated military grade petroleum, lubricant and oil products with nanoparticles for improvements to properties.	0.497	-	-
Title: Turbo Fuel Cell Engine ***Description:*** This is a Congressional Interest Item ***FY 2010 Accomplishments:*** This Congressional Interest Item developed a scalable solid oxide fuel cell (SOFC) power system, fueled with commercial diesel fuel or JP-8.	3.182	-	-
Title: Automotive Tribology Center ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item developed a comprehensive tribological model which utilized stresses and strains from contact mechanics analysis, temperature rise calculations, base oil characteristics and additive chemistry, including nanofluids, to predict output data such as friction coefficient, wear, scuffing, surface film chemistry and thickness.	1.592	-	-
Title: Smart Oil Sensor ***Description:*** This is a Congressional Interest item ***FY 2010 Accomplishments:***	2.388	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
This Congressional Interest Item developed military grade oil quality sensing hardware for engine/drive-train lubricant monitoring, to include the sensing elements themselves and the necessary electronics packaging for vehicle integration and the creation of a suite of analysis algorithms and electrochemical models to translate measured fluid electrical properties into fluid health information.			
Title: Automotive Technology Tactical Metal Fabrication System ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item completed integration of phase three of the Tac Fac Mobile cast part production system.	2.487	-	-
Title: Advanced Composite Materials Research for Air and Ground Vehicles. ***Description:*** This is a Congressional Interest item ***FY 2010 Accomplishments:*** This Congressional Interest Item performed research on composite materials and the accompanying science of ballistics, modeling, and non-destructive evaluation.	2.785	-	-
Title: Vehicle Systems Engineering and Integration Activities ***Description:*** This is a Congressional Interest item ***FY 2010 Accomplishments:*** This Congressional Interest Item reviewed existing systems engineering tools from the perspective of replacing stand-alone tools with integrated suite of tools and processes. Evaluated current training programs and analyzed systems engineering needs; examined systems engineering-related course contents at various universities to determine if those needs are covered. Developed case studies and other supporting material to address current systems engineering curriculum/training deficiencies.	7.959	-	-
Title: Tactical Metal Fabrication System (TacFab) ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** This Congressional Interest Item in the Tac Fabs mobile cost part production capability casts parts in the field faster by reverse engineering broken parts into a 3D model needed to create a new part.	0.796	-	-
Accomplishments/Planned Programs Subtotals	21.686	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602601A: *Combat Vehicle and Automotive Technology*	PROJECT T26: *Ground Vehicle Technologies (CA)*

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 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602601A: *Combat Vehicle and Automotive Technology*	PROJECT T31: *NAT'L AUTO CENTER APP RES INIT (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
T31: *NAT'L AUTO CENTER APP RES INIT (CA)*	1.593	-	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for National Automotive Center applied research.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Ultra Light Weight Transmission for FCS	1.593	-	-
Description: This is a Congressional Interest item ***FY 2010 Accomplishments:*** This Congressional Interest Item developed hydraulic hybrid drivetrain technology for military tactical vehicle applications.			
Accomplishments/Planned Programs Subtotals	1.593	-	-

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.