Exhibit R-2, RDT&E Budget Item Justification: PB 2015 Army												Date: March 2014
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 3: *Advanced Technology Development (ATD)*					R-1 Program Element (Number/Name) PE 0603005A *I Combat Vehicle and Automotive Advanced Technology*							
COST ($ in Millions)	**Prior Years**	**FY 2013**	**FY 2014**	**FY 2015 Base**	**FY 2015 OCO #**	**FY 2015 Total**	**FY 2016**	**FY 2017**	**FY 2018**	**FY 2019**	**Cost To Complete**	**Total Cost**
Total Program Element	-	128.463	146.992	110.031	-	110.031	114.799	121.938	128.785	125.310	-	-
221: *Combat Veh Survivablty*	-	47.948	49.487	53.765	-	53.765	55.882	62.959	67.874	63.305	-	-
441: *Combat Vehicle Mobilty*	-	32.291	31.578	42.050	-	42.050	44.599	44.876	43.583	44.095	-	-
497: *Combat Vehicle Electro*	-	5.907	7.349	7.146	-	7.146	6.709	7.166	7.200	7.250	-	-
515: *Robotic Ground Systems*	-	7.466	8.578	7.070	-	7.070	7.609	6.937	10.128	10.660	-	-
533: *Ground Vehicle Demonstrations*	-	-	25.000	-	-	-	-	-	-	-	-	-
53D: *NAC Demonstration Initiatives (CA)*	-	34.851	25.000	-	-	-	-	-	-	-	-	-

The FY 2015 OCO Request will be submitted at a later date.

Note

FY13 adjustments attributed to Congressional Add funding (37.0 million); Congressional General Reductions (-223 thousands); SBIR/STTR transfers (-2.238 million); and Sequestration reductions (-10.435 million)
FY14 adjustments attributed to Congressional Add funding (50.0 million) and FFRDC reduction (-51 thousand)

A. Mission Description and Budget Item Justification

This program element (PE) matures, integrates and demonstrates combat and tactical vehicle automotive technologies that enable a lighter, more mobile and more survivable force. Project 221 matures and demonstrates protection and survivability technologies such as active protection systems, advanced vehicle armors, blast mitigation and safety devices to address both traditional and asymmetric threats to ground vehicles. Project 441 matures and demonstrates advanced ground vehicle power and mobility technologies such as powertrains, power generation and storage, water and fuel logistics, microgrids and running gear subsystems for military ground vehicles to enable a more efficient, mobile and deployable force. Project 497 matures, integrates, and demonstrates vehicle electronics hardware (computers, sensors, communications systems, displays, and vehicle command/control/driving mechanisms) and software that result in increased crew efficiencies, vehicle performance, reduced size, weight, and power (SWaP) burdens and vehicle maintenance costs. Project 515 matures and demonstrates unmanned ground vehicle (UGV) technologies with a focus on sensors, perception hardware and software, and robotic control algorithms that enable UGV systems to maneuver on- and off-road at speeds which meet mission requirements with minimal human intervention.

Work in this PE is coordinated with, PEs 0602105A (Materials), 0602120A (Sensors and Electronic Survivability, Robotics Technology), 0602601A (Combat Vehicle and Automotive Technology), 0602618A (Ballistics Technology), 0602624A (Weapons and Munitions Technology), 0602705A (Electronics and Electronic Devices), 0603004A (Weapons and Munitions Advanced Technology), 0603125A (Combating Terrorism – Technology Development), 0603270A (Electronic Warfare Technology), 0603313A (Missile and Rocket Advanced Technology), and 0708045A (Manufacturing Technology).

Exhibit R-2, RDT&E Budget Item Justification: PB 2015 Army	Date: March 2014
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603005A *I Combat Vehicle and Automotive Advanced Technology*

The cited work is consistent with the Assistant Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy.

Work in this PE is performed by the Tank Automotive Research, Development, and Engineering Center (TARDEC), Warren, Michigan.

B. Program Change Summary ($ in Millions)	FY 2013	FY 2014	FY 2015 Base	FY 2015 OCO	FY 2015 Total
Previous President's Budget	104.359	97.043	104.204	-	104.204
Current President's Budget	128.463	146.992	110.031	-	110.031
Total Adjustments	24.104	49.949	5.827	-	5.827
• Congressional General Reductions	-0.223	-0.051			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	37.000	50.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-2.238	-			
• Adjustments to Budget Years	-	-	5.827	-	5.827
• Sequestration	-10.435	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army			Date: March 2014
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603005A / *Combat Vehicle and Automotive Advanced Technology*	Project (Number/Name) 221 / *Combat Veh Survivablty*	

COST ($ in Millions)	Prior Years	FY 2013	FY 2014	FY 2015 Base	FY 2015 OCO #	FY 2015 Total	FY 2016	FY 2017	FY 2018	FY 2019	Cost To Complete	Total Cost
221: *Combat Veh Survivablty*	-	47.948	49.487	53.765	-	53.765	55.882	62.959	67.874	63.305	-	-

The FY 2015 OCO Request will be submitted at a later date.

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

This project matures, integrates and demonstrates protection and survivability technologies such as active protection systems (APS), advanced vehicle armors, blast mitigation and occupant safety devices to address both conventional and asymmetric threats to ground vehicles. This project integrates complimentary survivability technologies to enable advanced protection suites, providing greater survivability and protection against emerging threats. This project executes the Army's APS program to mature and demonstrate APS technologies to reduce vehicle weight by reducing reliance on armor through the use of other means such as sensing, warning, hostile fire detection and active countermeasures to achieve increased protection against current and emerging advanced threats. This project develops an APS Common Architecture that defines the component interface standards and component specifications enabling adaptable APS solutions that can be integrated across Army vehicle platforms as required.

Work in this project supports the Army S&T Ground Portfolio.

The cited work is consistent with the Assistant Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy.

Work in this project is performed by the Tank Automotive Research, Development, and Engineering Center (TARDEC), Warren, Michigan in collaboration with the Army Research Laboratory (ARL), Adelphi and Aberdeen Proving Grounds, MD, Armament Research, Development and Engineering Center (ARDEC), Picatinny, NJ, Aviation and Missile Research, Development and Engineering Center (AMRDEC), Huntsville, AL and Communications-Electronics Research, Development and Engineering Center (CERDEC), Aberdeen Proving Grounds, MD and Fort Belvoir, VA.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Title: Active Protection Systems (APS) against Kinetic Energy (KE) and Long-Range Threats:	0.376	-	-
Description: This effort conducts essential trade studies, technical evaluations, and demonstrations of APS components/ subsystems designed for protection against KE penetrators and long-range threats. Coordinated work is also being conducted under PEs 0602624A, 0603004A, and 0603313A.			
FY 2013 Accomplishments:			

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army		Date: March 2014
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603005A / *Combat Vehicle and Automotive Advanced Technology*	**Project (Number/Name)** 221 / *Combat Veh Survivablty*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Supported closeout of KE APS program including collection and archiving of documents and artifacts enabling knowledge preservation and transition feasibility.			
Title: Vision Protection: ***Description:*** This effort matures and integrates devices to protect occupant's eyes, vehicle cameras and electro-optic fire control systems against anti-sensor laser devices as well as reduce the sensor's optical signature. Anti-sensor laser devices can deny vision either temporarily by flooding the sensor with too much light (jamming) or permanently by damaging the sensor. These jamming or damaging effects can slow our battle tempo, disrupt fire control solutions, or prevent vehicles from completing their mission. This effort focuses on demonstrating the effectiveness of optical systems that protect sensors and Warfighter vision from pulsed, continuous wave and future laser threats to maintain fire control capability and situational awareness. Coordinated work is also being performed in PEs 0602120A, 0602705A, 0602712A, and 0602786A. ***FY 2013 Accomplishments:*** Fabricated a laser-protected optical design for the Abrams Gunner's Primary Sight providing protection for the gunner's eye; designed and integrated a laser-protected day camera solution for the gunner. ***FY 2014 Plans:*** Conduct vulnerability studies of electro-optical (day-camera) sensors against pulsed-laser energy threats to determine the laser energy required to render individual pixels, full pixel columns and the entire focal plane array of the sensor ineffective or damaged; and refine the integration technique required to apply the laser protection technology to electro-optical (day-camera) sensors. ***FY 2015 Plans:*** Will continue vulnerability studies to determine the energy levels required to make pixels, columns and the entire focal plane of an electro-optical (day-camera) ineffective. Will mature concepts for integrating protection materials into the optical path of electro-optical (day-camera) sensors, and evaluate the effects of sensor exposure to pulsed-laser threats on the survivability of the sensors to continue the fire control mission.	3.788	3.943	4.141
Title: Armor Technologies: ***Description:*** This effort matures, fabricates, integrates and evaluates advanced ground vehicle armor systems such as emerging base armor, applique armor, multifunctional armor systems (embedded antennas and health monitoring devices); matures scalable / modular / common armor system integration design standards; creates armor system test & evaluation standards; refines armor modeling and simulation system engineering process. This effort is done in coordination with efforts in PEs 0602105A, 0602601A, 0602618A, and 0708045A. ***FY 2013 Accomplishments:***	0.912	1.003	0.952

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army		Date: March 2014
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603005A / *Combat Vehicle and Automotive Advanced Technology*	**Project (Number/Name)** 221 / *Combat Veh Survivablty*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Evaluated various methods for reducing delamination and rock strike damage of transparent armor and demonstrated improved performance while maintaining armor visual transparency. ***FY 2014 Plans:*** Mature and integrate advanced tactical and combat vehicle armor technologies by performing environmental, armor attachment durability and ballistic testing; explore new integration techniques for armor systems and prepare for their future integrated armor attachment durability performance testing. ***FY 2015 Plans:*** Will evaluate the performance differences between different transparent armor solutions and determine if additional testing is required to ensure consistent performance.			
Title: Occupant Centric Survivability (OCS): ***Description:*** This effort matures and validates design philosophies, guidelines, military standards, handbooks, etc. that embody a focused, systems engineering approach to occupant-centric protection in vehicle design. This is accomplished using tools such as modeling and simulation (M&S), full vehicle and subsystem demonstrators, evaluations and component optimizations. This effort addresses and validates the products from requirements generation through design and build to incorporate occupant centric philosophies. This effort is done in coordination with efforts in PE 0602601A, Project C05. This effort supports the Occupant Centric Platform (OCP) program. ***FY 2013 Accomplishments:*** Established baseline of state-of-the-art commercial occupant protection components such as seats, restraints, and shock absorbing materials; developed baseline models and simulations to represent an OCP design demonstrator as well as legacy vehicles to optimize occupant centric philosophies, guidelines and processes; matured and demonstrated technologies such as energy absorbing materials and storage systems for securing equipment/gear for potential transition to tactical and combat vehicle producers. ***FY 2014 Plans:*** Integrate occupant protection technologies such as seats, restraints and energy absorbing materials onto demonstrators using an approach that focuses on protecting the occupants by designing from the inside out; mature processes for establishing occupant centric standards and guidelines developed in PE 0602601A; conduct assessments using physical models and proofs of concepts of occupant protection technologies such as seats, restraints and energy absorbing materials to validate M&S and to reduce risk for sub-system and integrated vehicle live-fire OCP test events; and mature and integrate solutions into vehicle demonstrators to reduce injuries from secondary effects such as loose cargo becoming flying hazards in blast, crash and rollover events. ***FY 2015 Plans:***	7.346	8.131	13.315

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army		Date: March 2014
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603005A / *Combat Vehicle and Automotive Advanced Technology*	**Project (Number/Name)** 221 / *Combat Veh Survivablty*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Will continue integration and demonstration of occupant protection components such as seats, restraints and energy absorbing materials into subsystem demonstrators and OCP vehicle demonstrators. Will continue analysis of performance of OCP subsystems and demonstrators; begin subsystem and integrated OCP vehicle live-fire testing to simulate under-body blast events and identify and document a rigorous analytical approach to balance protection with mobility/weight goals; continue development and refinement of occupant centric standards, guidelines and procedures/processes.			
Title: Blast Mitigation: ***Description:*** This effort fabricates and matures advanced survivability and protection components, tools and subsystems for enhanced protection against vehicle mines, improvised explosive devices (IEDs) and other underbody blast threats, and vehicle collision and rollover events that result from blast events. This effort also integrates and improves occupant protection technologies such as seats and restraints. This effort creates the laboratory capability needed to enable expeditious performance evaluation through M&S, experimentation and instrumented test of blast-mitigating technologies in such areas as active and passive exterior/hull/cab/kits, interior energy absorbing capabilities for seats, floors, restraints, and sensors for active technologies. This effort is done in coordination with efforts in 0602601A, project C05. This effort supports the OCP program. ***FY 2013 Accomplishments:*** Fabricated, matured and integrated energy absorbing technologies on the interior and exterior of vehicle systems to mitigate the effects of underbody blast and during collision or rollover. Interior technologies included padding for walls and floors, energy absorbing seats, integrated restraints and airbags, and sensors for active components. Exterior technologies included unique hull shaping and energy absorbing materials. For blast mitigation M&S, produced data requirements needed to validate models and improved modeling capabilities; matured and integrated sensors and instrumentation capabilities to support active technologies as well as collect higher fidelity blast/crash/impact data in live fire, test, and evaluation (LFT&E) and in theater attacks; fabricated and integrated lab evaluation capabilities such as a linear impact sled system to refine experimentation methodologies and standards for occupant protection technologies; designed lab devices for simulating fuller effects of blast/crash/impact events; created methodologies and protection standards for crash, rollover and side improvised explosive device (IED) events; conducted component and sub-system level evaluation of blast mitigation technologies. ***FY 2014 Plans:*** Continue to mature and demonstrate interior and exterior technologies such as energy absorbing materials in structural design, hull shaping and floor designs to mitigate injuries due to underbody blast events, vehicle collisions and rollovers; improve test methods to validate existing M&S models; design methodologies and assessments of blast mitigation products; improve lab and instrumentation capabilities to assess components, sub-system and system level blast mitigation capabilities; and create and maintain standards, guidelines and methodologies for specific blast mitigation technologies. ***FY 2015 Plans:***	21.158	12.207	1.799

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army		Date: March 2014
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603005A / *Combat Vehicle and Automotive Advanced Technology*	**Project (Number/Name)** 221 / *Combat Veh Survivablty*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Will integrate advanced passive and active technologies such as active blast countermeasures, energy absorbing materials and floor designs to mitigate the effects of underbody blast threats; will conduct tests to evaluate the integration methods for exterior and interior blast mitigation technologies onto components, and sub-systems; will characterize performance to build greater knowledge for occupant centric blast mitigation design guidelines/standards, M&S tools, test procedures, laboratory processes, experimentation capabilities.			
Title: Vehicle Fire Protection: ***Description:*** This effort matures, integrates and demonstrates technologies to minimize vehicle and crew vulnerabilities to fires in current and future military ground vehicles. Supporting technologies include M&S, sensor systems, software, chemical agents, fire-resistant materials and hardware components. This effort is done in coordination with efforts in 0602601A, project C05. This effort supports the Occupant Centric Platform program. ***FY 2013 Accomplishments:*** Demonstrated better fire protection for vehicles and crews by improving designs and form/fit/function of existing and new chemical extinguishing agents: matured, fabricated, and integrated common crew Automatic Fire Extinguishing System (AFES) components for evaluation in combat and tactical vehicles; enhanced modeling and simulation tools for common crew AFES; optimized common crew AFES detection and response to vehicle fire events based on evaluation. ***FY 2014 Plans:*** Continue to demonstrate enhanced fire protection technologies for military platforms; evaluate and verify optimized common crew Automated Fire Extinguishing System (AFES) components to establish compliance to the crew AFES requirements; integrate design of the common crew AFES into a vehicle platform demonstrator to validate integration, test, safety, and fielding requirements for common crew AFES on vehicle demonstrators designed for Occupant Centric Platforms; validate and improve common crew AFES M&S based on test results,; and enhance in-house laboratory capabilities to improve assessment and demonstration of vehicle fire protection technologies. ***FY 2015 Plans:*** Will conduct system-level evaluation of common crew AFES technologies and utilize the analysis to develop component specifications for common crew AFES; will continue to investigate integration opportunities of common crew AFES to enable AFES commonality across vehicle fleet; and will demonstrate technologies to mitigate injuries and improve damage mitigation due to thermal events.	3.892	4.468	2.063
Title: Hit Avoidance Architecture: ***Description:*** This effort establishes, matures and demonstrates the Army's Active Protection System (APS) Common Architecture that defines the component interface standards and component specifications enabling adaptable APS solutions that can	10.476	19.735	8.507

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army		Date: March 2014
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603005A / *Combat Vehicle and Automotive Advanced Technology*	**Project (Number/Name)** 221 / *Combat Veh Survivablty*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
be integrated into multiple Army vehicle platforms. This effort matures an evaluation test-bed to enable maturation of the APS Common Architecture. This effort helps inform requirements of fielding APS including to: develop safety release criteria, identify vehicle integration constraints and engage the User to determine how hit avoidance will impact techniques, tactics and procedures. This effort is done in coordination with efforts in PEs 0602601A, 0602618A, 0603004A, 0603270A, and 0603313A. ***FY 2013 Accomplishments:*** Conducted evaluation of hardkill and softkill APS components and established component level compliance to technology system requirements; determined technology gaps in existing APS based on Department of Defense test results and previous lessons learned; evaluated the safety, integration, test, and fielding requirements for integrating hard-kill APS onto a military vehicle platform; began establishment of an open software architecture for future component and system development. ***FY 2014 Plans:*** Conduct evaluation of APS technologies and utilize the analysis to develop component specifications for APS; develop fuze board-compliant common APS command and control processor and fire control module to enable APS commonality across vehicle fleet; develop and provide bus protocols, common interface specifications and standards to industry for APS Common Architecture; conduct hardware in the loop analyses of APS components during development and integration of APS component technologies with the common processor; incorporate a laser decoy countermeasure (CM) capability into an existing infrared soft-kill CM; test and mature soft-kill countermeasure. ***FY 2015 Plans:*** Will continue APS Common Architecture maturation to include of an APS common controller. Will integrate and fabricate software and hardware for the common controller, enabling integration of active protection components that accommodate varying performance and vehicle needs. Will begin integration with Hit Avoidance Technologies and conduct hardware in the loop analyses to validate common controller meets APS interface requirements. Will conduct soft-kill countermeasure environmental and live-fire assessments.			
Title: Hit Avoidance Technologies: ***Description:*** This effort matures, integrates and demonstrates hard-kill and soft-kill Active Protection System (APS) components and integrated systems to verify the APS Common Architecture described above. In demonstrating hard-kill and soft kill-active protection technologies, requirements and specifications will be matured for future integration onto tactical and combat vehicle platforms. This effort is coordinated with efforts in PEs 0602601A, 0602618A, 0603004A, 0603270A, and 0603313A. ***FY 2015 Plans:*** Will begin maturation and integration of the soft-kill countermeasure with the APS Common Architecture and APS common controller to demonstrate soft-kill defeat of anti-tank guided missiles on a combat vehicle. Will verify the soft-kill countermeasure	-	-	22.988

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army		Date: March 2014
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603005A / *Combat Vehicle and Automotive Advanced Technology*	**Project (Number/Name)** 221 / *Combat Veh Survivablty*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
is compliant with the APS Common Architecture interface standards. Will begin maturation and integration of a hard-kill active protection system demonstrator using the APS Common Architecture and APS common controller and hard-kill tracking sensors and countermeasures that are matured and compliant with the architecture interfaces and protocols. Will enhance hard-kill and soft-kill simulation and hardware-in-the-loop evaluation capability to exercise and test software and hardware components to inform requirements and determine trade space for hit avoidance technologies.			
Accomplishments/Planned Programs Subtotals	47.948	49.487	53.765

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army			Date: March 2014
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603005A / *Combat Vehicle and Automotive Advanced Technology*	Project (Number/Name) 441 / *Combat Vehicle Mobilty*	

COST ($ in Millions)	Prior Years	FY 2013	FY 2014	FY 2015 Base	FY 2015 OCO #	FY 2015 Total	FY 2016	FY 2017	FY 2018	FY 2019	Cost To Complete	Total Cost
441: *Combat Vehicle Mobilty*	-	32.291	31.578	42.050	-	42.050	44.599	44.876	43.583	44.095	-	-

The FY 2015 OCO Request will be submitted at a later date.

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

This project matures and demonstrates advanced mobility and electric technologies for advanced propulsion, power, and electrical components and subsystems to enable lightweight, agile, deployable, fuel efficient, and survivable ground vehicles. This project will also mature and demonstrate advanced mechanical and electrical power generation systems to ensure that future capabilities such as next generation communications and networking, improvised explosive device (IED) jamming systems and next generation sensor devices that can be integrated onto combat and tactical vehicles. This project also matures and demonstrates water and fuel logistics technologies.

Work in this project supports the Army S&T Ground Portfolio.

The cited work is consistent with the Assistant Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy.

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 2013	FY 2014	FY 2015
Title: Hybrid Electric Component Development:	4.256	4.987	4.278
Description: This effort focuses on meeting the Army's demand for more onboard vehicle electric power to enable technologies such as advanced survivability systems, situational awareness systems and the Army network. This effort matures, integrates and demonstrates electrical power generation machines and their associated power conversion boxes such as inverters and converters, advanced control algorithms, and high efficiency power conversion (mechanical to electrical) components. Additionally, it matures and integrates advanced electric machines such as integrated starter generators and their controls for mild hybrid (system that integrates electric machines to assist internal combustions engines for propulsion) electric propulsion and high power electric generation. Coordinated work is also being conducted under PE 0602601A, project H91 and PE 0603005A, project 497.			
FY 2013 Accomplishments:			

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army		Date: March 2014
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603005A / *Combat Vehicle and Automotive Advanced Technology*	**Project (Number/Name)** 441 / *Combat Vehicle Mobilty*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Matured and demonstrated on board vehicle power (OBVP) components, high temperature inverters, and controls for Integrated Starter Generator (ISG) and mild hybrid power-trains. These demonstration efforts were used to validate combat vehicle OBVP component models and the effectiveness of high power / high temperature inverters to reduce high power electronics cooling burden. These activities validated high voltage architecture and power quality required to support growing combat vehicle electric power requirements for future communications, networking, IED jamming and sensors. ***FY 2014 Plans:*** Integrate onboard vehicle power (OBVP) components onto the vehicles to demonstrate increased vehicle power generation capabilities; evaluate performance of vehicle with OBVP against baseline vehicle performance; evaluate reliability of hybrid vehicle components, including electric motors and controllers; and demonstrate bidirectional vehicle-to-grid power flow and mobile microgrid capability. ***FY 2015 Plans:*** Will evaluate combat vehicle performance with integrated onboard vehicle power (OBVP) technologies that verify they provide adequate onboard electrical power to enable future communications, networking, IED jamming and sensors; will implement OBVP and hybrid component control approaches to minimize vehicle performance impacts while generating significant electrical power.			
Title: Advanced Running Gear: ***Description:*** This effort matures and demonstrates running gear components and advanced suspension technologies to increase vehicle mobility and durability in response to increased ground vehicle platform weights. Components and subsystems include new elastomer compounds, lightweight, survivable track systems and road wheels, advanced compensating track tensioners, advanced damping suspension technologies, Electronic Stability Control (ESC) systems, and preview sensing technologies linked to advanced suspension designs. Coordinated work is also being conducted under PE 0602601A, project H91 and PE 0603005A, projects 221 and 497. In FY13 and FY14, this effort supports the Occupant Centric Platform program. ***FY 2013 Accomplishments:*** Integrated and demonstrated performance of an energy regenerative suspension system for a large combat wheeled vehicle platform in a controlled environment; installed, tuned, and evaluated (ESC) systems for tactical vehicles to mitigate vehicle rollover events; matured lightweight materials for track systems to reduce platform weight; demonstrated high durability, and fire resistant elastomers for combat tracked vehicle systems. ***FY 2014 Plans:*** Fabricate, evaluate and qualify lightweight track technology improvements for the Bradley Fighting Vehicle in direct support of improving vehicle occupant survivability; investigate, baseline and characterize low rolling resistance tire compounds for tactical military applications with the goal of increased fuel efficiency; mature, fabricate and laboratory test track width adjusting	5.832	5.620	2.672

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army		Date: March 2014
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603005A / *Combat Vehicle and Automotive Advanced Technology*	**Project (Number/Name)** 441 / *Combat Vehicle Mobilty*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
suspension systems to improve vehicle stability; and assess flush backed track designs to establish baseline data on design improvements. ***FY 2015 Plans:*** Will fabricate, install and test an external suspension system for a 60-70 ton combat application to evaluate system durability and reliability as well as vehicle performance characteristics; will mold high capacity, lightweight track compounds for heavy (60-70 ton) combat vehicle systems and perform vehicle testing to demonstrate the durability and rolling resistance reductions of these compounds; will model suspension control architectures for system control of vehicle dynamics, ride and handling.			
Title: Combat Vehicle Subsystem Demonstrations ***Description:*** This effort contributes to the Army's ground platform risk reduction efforts which seek to address technical and integration challenges in the areas of mobility, survivability, vehicle architecture and systems integration. The primary focus of this activity is to mature and demonstrate a series of subsystem demonstrators building off of previous investment in ground combat acquisition and technology programs with the purpose of maturing key technologies to refine and inform future platform requirements and reduce risks in critical ground combat vehicle technology areas. Specifically, this effort focuses on maturing and demonstrating ground combat vehicle mobility and systems integration technologies such as powertrain subsystems, vehicle structures and concept demonstrators. This effort seeks to optimize platform efficiency and growth potential to ensure the combat fleet is able to accept new technologies as they are developed to bring advanced capability for the Warfighter. This effort is executed in coordination with PEs 0602601A, 0602618A, 0603004A, and 0603125A. ***FY 2015 Plans:*** Will mature, integrate and evaluate emerging ground vehicle subsystem and component technologies for mobility, survivability and systems integration such as advanced transmission, flooring and vehicle structures to establish subsystem and component performance baselines. Will analyze the influence of emerging ground vehicle subsystem technologies on future integrated combat vehicle designs and concepts. Will conduct modeling, analysis and trade studies for next-generation ground vehicle subsystems. Will assess developmental and existing critical technology areas such as mobility, survivability and vehicle structures for optimal platform configuration. Will conduct laboratory assessment of multiple vehicle powertrain subsystems and configurations such as engines and transmissions including both conventional and hybrid powertrain approaches.	-	-	15.022
Title: Energy Storage Systems Development: ***Description:*** The goal of this work is to enable silent watch capability and increased survivability through energy storage components for electro-magnetic armor. This is accomplished through the maturation and demonstration of advanced ground vehicle energy storage devices such as advanced chemistry batteries and high energy density capacitors. This effort leverages commercial industry battery development efforts to reduce battery volume and weight while improving their energy and power densities. This effort also matures and optimizes a common specification for battery management systems to improve the battery	3.469	2.876	3.627

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army		Date: March 2014
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603005A / *Combat Vehicle and Automotive Advanced Technology*	**Project (Number/Name)** 441 / *Combat Vehicle Mobilty*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
state of charge indicator accuracy and battery state of health information to reduce the frequency of battery replacement and optimize starting, lighting, and ignition functions. Coordinated work is also being conducted under PEs 0602601A and 0602705A. ***FY 2013 Accomplishments:*** Demonstrated and integrated a battery monitoring and battery management system for combat and tactical vehicles to determine accurate state of charge and state of health information. Matured and demonstrated a second generation power brick battery to provide energy storage for advanced armors by optimizing volume, power density and extreme temperature performance. ***FY 2014 Plans:*** Mature and optimize an advanced vehicle battery system with improved energy and power density; validate the battery system's performance in military mission scenarios to evaluate reduction on logistics footprint; test the system to military specifications; integrate battery system onto a vehicle platform; conduct performance characterization; and integrate second generation power brick battery into pulse power electro-magnetic armor system. ***FY 2015 Plans:*** Will optimize the improved second generation power brick battery for pulse power electro-magnetic armor system to evaluate power brick battery performance and ensure it meets military specifications; will leverage power brick battery design and testing to create concepts for modular, standardized new high energy, high voltage advanced batteries for mobility applications; and will generate common performance specifications for power brick and standardized high voltage battery systems.			
Title: Pulse Power: ***Description:*** This effort matures and demonstrates high energy, compact pulse power components, subsystems and systems that enable significantly improved survivability and lethality applications comprising of elements such as Direct Current (DC) to DC chargers, high energy batteries, pulse chargers, high density capacitors, solid state-switches, control systems and electro-magnetic armor panels. Coordinated work is also being conducted under PEs 0602601A, 0602618A, and 0602705A. ***FY 2013 Accomplishments:*** Demonstrated first generation power brick based electro-magnetic armor system, began maturation of a second generation power brick based electro-magnetic armor system (reduced form factor) and continued development of the second generation high energy laser programmable pulse power supply. ***FY 2015 Plans:*** Will demonstrate a second generation power brick and mission module based electro-magnetic armor module. Will demonstrate multi-hit defeat with fast re-charge time capabilities in a lab environment with an electrical surrogate load. Will conduct follow-on	2.212	-	3.500

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army		Date: March 2014
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603005A / *Combat Vehicle and Automotive Advanced Technology*	**Project (Number/Name)** 441 / *Combat Vehicle Mobilty*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
ballistic testing of the electro-magnetic armor module to demonstrate multi-hit defeat capabilities enabled by the integrated power brick and mission module.			
Title: Non-Primary Power Systems: ***Description:*** This effort exploits, matures, and demonstrates Auxiliary Power Unit (APU) technologies such as a small modular/ scalable engine based APUs, a fuel cell reformer system to convert JP-8 to hydrogen, a sulfur tolerant JP-8 fuel cell APU, and novel engine based APUs for military ground vehicles and unmanned ground systems. This effort also establishes interface control documents for simplified integration of current and future APUs, improves reliability to reduce logistic burdens, as well as reduces acoustic signature for silent operation. Additionally, this effort exploits JP-8 fuel cell and engine APUs to optimize prime power in unmanned ground systems. Coordinated work is also being conducted under PE 0602601A, Project H91. ***FY 2013 Accomplishments:*** Demonstrated a JP-8 fuel cell APU system in a laboratory environment; improved small engine based APU performance for operational environments (shock, vibration and cooling) integrated and demonstrated technologies such as advanced muffler designs, air flow and mounting hardware to reduce APU acoustic signature; performed vehicle integration and demonstration of small engine APUs. ***FY 2014 Plans:*** Demonstrate a small engine based APU on an unmanned ground system; evaluate and select a modular/scalable small engine for use in a high power APU (25-45kW); integrate and evaluate active noise control hardware on an engine-based APU; and evaluate performance of various APU technologies for higher power applications. ***FY 2015 Plans:*** Will demonstrate a JP-8 fueled small power system integrated onto an unmanned ground system. Will integrate and demonstrate acoustic improvements of high power rotary engines for APU use. Will perform testing on high power small engines for rotary APU use. Will demonstrate the improvements of an integrated APU and Battery system to meet engine off power needs, such as power demands for silent watch, vehicle starting and communications and surveillance equipment. Will integrate a fuel cell power system onto a mobile platform to demonstrate silent mobility.	4.251	3.529	2.664
Title: Propulsion and Thermal Systems: ***Description:*** This effort matures and evaluates high power density engines and transmission systems needed to offset increasing combat vehicle weights (armor), increased electrical power generation needs (onboard communications, surveillance and exportable power), improved fuel economy (fuel cost & range), enhanced mobility (survivability), and reduced cooling system burden (size, heat dissipation).This effort also matures thermal management technologies and systems including heat energy recovery, propulsion and cabin thermal management sub-systems to utilize waste heat energy and meet objective power and	7.908	9.382	5.607

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army		Date: March 2014
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603005A / *Combat Vehicle and Automotive Advanced Technology*	**Project (Number/Name)** 441 / *Combat Vehicle Mobilty*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
mobility requirements on combat and tactical vehicles. Lastly, this effort maximizes efficiencies within propulsion and thermal systems to reduce thermal burden on the vehicle while providing the same or greater performance capability. ***FY 2013 Accomplishments:*** Matured, fabricated and integrated components for high output, power-dense combat and tactical vehicle powertrain subsystems; conducted evaluation of advanced powertrain systems utilizing highly efficient transmissions and advanced algorithms and control strategies for combat and tactical vehicles; evaluated the integration of energy recovery components onto powertrain subsystems to determine system performance characteristics and engine performance issues associated with integration; matured power take off (PTO) system and fan control strategies for increased efficiency in combat vehicle engine cooling performance. ***FY 2014 Plans:*** Perform advanced powertrain subsystems integration and validation testing to include energy efficiencies and performance capabilities by utilizing highly efficient transmissions and engines incorporating advanced algorithms and control strategies, low heat rejection and high power density systems; evaluate waste heat recovery technologies at a system level in a laboratory environment for performance validation; complete the power take off (PTO) system and fan control strategies for increased efficiency in engine cooling performance. ***FY 2015 Plans:*** Will mature and model an advanced powertrain system utilizing a highly efficient transmission and engine and incorporating advanced algorithms and control strategies to enhance energy efficiencies and performance capabilities for future combat vehicles.			
Title: Force Projection: ***Description:*** This effort focuses on reducing the logistics footprint, improving fuel efficiency, and ensuring mobility by maturing and demonstrating technologies in areas such as water purification, generation, quality monitoring, storage and distribution and wastewater treatment and reuse; petroleum quality monitoring, filtration, storage and distribution, hydraulic fluids; alternative fuels and fuel additives; lubricants, oil, power train fluids and coolants. This effort is done in coordination with efforts in PE 0602601A. ***FY 2013 Accomplishments:*** Matured wastewater treatment and recycling technology for demonstration in a field environment; demonstrated successful in-line water quality monitoring capability in a lab environment; characterized alternative fuels and fuel additives that improve performance and diversify energy sources; assessed the impact of using emerging alternative fuels in tactical equipment to identify and address potential changes needed in military fuel specifications; created and evaluated Petroleum, Oils and Lubricants to meet new military technology requirements such as anti-lock brakes and semi-active suspension, while exceeding	4.363	5.184	4.680

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army		Date: March 2014
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603005A / *Combat Vehicle and Automotive Advanced Technology*	**Project (Number/Name)** 441 / *Combat Vehicle Mobilty*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
future and legacy equipment performance and technical requirements; evaluated nanocoolants, gear oils and hydraulic fluids which promote improved energy efficiencies and are longer lasting. ***FY 2014 Plans:*** Conduct performance assessments of waste water treatment and recycling technologies; further mature and demonstrate in-line water quality and process monitoring capability equivalent to the Water Quality Analysis Set - Purification; characterize selected alternative fuels and fuel additives to improve performance and diversify energy sources; assess the suitability of candidate alternative fuels in military ground systems; evaluate lower viscosity gear oils and hydraulic fluids that increase fuel efficiency through a reduction in hydro-dynamic friction; and continue evaluation of candidate Petroleum, Oil, Lubricants and coolants to meet new military technology requirements. ***FY 2015 Plans:*** Will conduct demonstrations of waste water treatment and recycling technologies in a field environment. Will demonstrate expanded in-line water quality and process monitoring capability to address pathogens and toxins such as giardia, cryptosporidium, and pesticides. Will characterize selected alternative fuels and fuel additives to improve performance and diversify energy sources; will evaluate candidate long life coolants designed to reduce the overall logistics burden and meet emerging requirements of military ground systems; and will evaluate fluid distribution composite hose technologies to improve logistical burdens of deploying fuel and water pipeline systems.			
Accomplishments/Planned Programs Subtotals	32.291	31.578	42.050

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army			Date: March 2014
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603005A / *Combat Vehicle and Automotive Advanced Technology*	Project (Number/Name) 497 / *Combat Vehicle Electro*	

COST ($ in Millions)	Prior Years	FY 2013	FY 2014	FY 2015 Base	FY 2015 OCO #	FY 2015 Total	FY 2016	FY 2017	FY 2018	FY 2019	Cost To Complete	Total Cost
497: *Combat Vehicle Electro*	-	5.907	7.349	7.146	-	7.146	6.709	7.166	7.200	7.250	-	-

The FY 2015 OCO Request will be submitted at a later date.

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

This project matures, integrates, and demonstrates vehicle electronics hardware such as computers, sensors, communications systems, displays, and vehicle command/control/driving mechanisms as well as vehicle software to enhance crew performance, increase vehicle fuel efficiency, reduced Size, Weight, and Power (SWAP) burdens and reduce vehicle maintenance costs. This project also advances open system architectures (power and data) for military ground vehicles to enable common interfaces, standards and hardware implementations. Additionally this project matures integrated condition based maintenance technologies that reduce the operation and sustainment costs of vehicle electronics and electrical power devices. Technical challenges include: increased levels of automation for both manned and unmanned systems, secure data networks, interoperability of intra-vehicle systems, and advanced user interfaces. Overcoming these technical challenges enables improved and increased span of collaborative vehicle operations, efficient workload management, commander's decision aids, embedded simulation for battlefield visualization and fully integrated virtual test/evaluation.

Work in this project supports the Army S&T Ground Portfolio.

The cited work is consistent with the Assistant Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy.

Work in this project is performed by the Tank Automotive Research, Development, and Engineering Center (TARDEC), Warren, MI.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Title: Vehicle Electronics Integration Technologies:	2.200	4.342	3.288
Description: This effort matures, demonstrates and implements next generation military ground vehicle electronics and electrical power open architectures for future ground combat vehicle systems. Technologies matured and demonstrated include: next generation video/data networking and computing equipment, Silicon Carbide (SiC) high voltage power electronics and low voltage smart power distribution. Technologies will reduce currently fielded vehicle overall SWAP concerns for vehicle electronics. This effort is coordinated with efforts in PE 0602601A, project H91.			
FY 2013 Accomplishments:			

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army		Date: March 2014
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603005A / *Combat Vehicle and Automotive Advanced Technology*	**Project (Number/Name)** 497 / *Combat Vehicle Electro*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Finalized analysis of multiple combat vehicle architectural requirements; determined applicable power and electronics architectural vehicle functions; defined combat vehicle system states/modes; allocated functions to the states/modes and data and electrical power subsystems; fabricated a reconfigurable combat vehicle cab with simulation capability to house the next generation hardware and software technologies in a laboratory environment. ***FY 2014 Plans:*** Complete preliminary power and data maturation activities; continue to mature the architecture design such as activity and sequence diagrams, use cases, and mission scenarios, as well as produce system operation descriptions and define both physical and data component interfaces for the network and power hardware and software subsystems; begin optimization activities for electronics and electrical power component selection and/or fabrication for reconfigurable combat vehicle cab simulation. ***FY 2015 Plans:*** Will further mature and begin implementation of next generation military ground vehicle electronics and electrical power open architectures; conduct market/trade analysis and integrate applicable high and low voltage vehicle power components, command, control, communications, and combat vehicle computing hardware and software necessary for full architecture system functionality into a reconfigurable combat vehicle cab simulation.			
Title: Vehicle Electronics Architecture and Standards:	3.707	3.007	3.858
Description: This effort matures technologies and standards for existing and future combat and tactical ground vehicles. Open commercial standards will be evaluated and modified for use in military ground vehicles and possible inclusion in the Army's open, non-proprietary intra-vehicle data network e.g., Vehicular Integration for C4ISR/EW Interoperability (VICTORY). This effort will also test and evaluate standards and components for suitability of integration into vehicle platforms. This effort also supplements the design of electronic architectures to support the efficient integration of electronic components into vehicle systems through the use of open standards. Additionally, this effort matures and expands the VICTORY effort to interface with the Modular APS Architecture. This effort is coordinated with PEs 0602601A, Project H91 and 0603005, Projects 221 and 441. ***FY 2013 Accomplishments:*** Continued maturation of open vehicle electronics architectures and standards (VICTORY) to address future component integration requirements for military ground vehicles; completed VICTORY System Integration Laboratory (SIL) development to enable component compliance and interoperability evaluation against VICTORY version 1.4 standards. ***FY 2014 Plans:*** Continue to mature and refine the VICTORY standards and open architecture; begin improvement of the VICTORY SIL for compatibility with VICTORY standard version 1.6 to support component compliance testing to the latest VICTORY standard			

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army		Date: March 2014
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603005A / *Combat Vehicle and Automotive Advanced Technology*	**Project (Number/Name)** 497 / *Combat Vehicle Electro*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
release; mature next generation open vehicle architecture by performing analysis of current VICTORY standards for application to combat vehicle architectures. ***FY 2015 Plans:*** Will complete update of VICTORY SIL to version 1.6 and begin update of VICTORY SIL to VICTORY standard version 1.7 to demonstrate component compliance testing to latest VICTORY release. Mature and demonstrate current VICTORY interfaces (1.6 vs. 1.7) to support next generation open vehicle architectures in preparation for a data and computing architecture demonstration in FY16.			
Accomplishments/Planned Programs Subtotals	5.907	7.349	7.146

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army			Date: March 2014
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603005A / *Combat Vehicle and Automotive Advanced Technology*	Project (Number/Name) 515 / *Robotic Ground Systems*	

COST ($ in Millions)	Prior Years	FY 2013	FY 2014	FY 2015 Base	FY 2015 OCO #	FY 2015 Total	FY 2016	FY 2017	FY 2018	FY 2019	Cost To Complete	Total Cost
515: *Robotic Ground Systems*	-	7.466	8.578	7.070	-	7.070	7.609	6.937	10.128	10.660	-	-

The FY 2015 OCO Request will be submitted at a later date.

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

This project matures and demonstrates autonomy enabling Unmanned Ground Vehicle (UGV) technologies including sensor technologies, perception hardware and software, and control technologies that allow the Soldier to perform other mission tasks more efficiently. 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 autonomy enabled vehicles protecting themselves and their surroundings from intruders. Mature technologies are incorporated onto existing, Army-owned UGV technology demonstrators so that performance of the enabling technologies can be evaluated.

The approach builds upon, complements, and does not duplicate previous and ongoing investments conducted under the Joint Robotics Program Office.

The cited work is consistent with the Assistant Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy.

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 2013	FY 2014	FY 2015
Title: Unmanned Ground Systems Technology:	7.466	8.578	7.070
Description: This project matures, integrates and demonstrates advanced robotic and autonomous technologies for the tactical and combat vehicle fleets. Unmanned ground systems technologies can be employed to overcome critical Army challenges to include automated resupply and sustainment, improved tactical intelligence, and reduced physical and cognitive burden. Challenges can be met by utilizing relevant technologies such as maneuver and tactical behavior algorithms, autonomy kits, sensor and weapons integration, advanced navigation and planning, vehicle self-protection, object and local environment manipulation, local situational awareness, advanced perception, vehicle and pedestrian safety, and robotic command and control. This effort is coordinated with efforts in PEs 0602601A, project H91 and 0603005, projects 441 and 497. In FY13 and FY14, this effort supports the Occupant Centric Platform program.			
FY 2013 Accomplishments:			

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army		Date: March 2014
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603005A / *Combat Vehicle and Automotive Advanced Technology*	**Project (Number/Name)** 515 / *Robotic Ground Systems*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Integrated scalable autonomy kits and control interfaces into tactical wheeled vehicles to increase Soldier safety, operational efficiency and effectiveness and culminated with technical demonstrations of this technology in a relevant environment; began integration of scalable autonomy kits and control interfaces onto wheeled combat vehicles to increase Soldier and system performance, operational tempo and mission effectiveness. ***FY 2014 Plans:*** Mature and integrate advanced autonomous maneuver, active safety and Soldier load reduction hardware, software, algorithms, control interfaces, and sensor payloads onto demonstrator vehicles to substantiate optionally manned/unmanned vehicle missions and validate emerging safety methodology and tactics, techniques and procedures; expand integration of scalable autonomy kits and control interfaces onto representative tactical wheeled vehicles to increase Soldier safety, operational efficiency and effectiveness and culminate with technical demonstrations and robust data analysis in a relevant operational environment; begin integration of interoperability standards-compliant components and systems onto manned/unmanned robotic platforms to increase re-use and reduce costs of current/future systems. ***FY 2015 Plans:*** Will mature and integrate autonomy-enabling technologies to include: drive-by-wire systems, vehicle active safety technologies, mission packages, and related software, algorithms and control interfaces. Will validate emerging safety methodologies and tactics, techniques and procedures. Will mature and integrate higher level intelligent behaviors to increase Soldier safety, operational efficiency, effectiveness, and manned/unmanned teaming. Will further integration of components and systems compliant with interoperability standards onto manned/unmanned platforms to increase re-use and reduce costs of current/future systems.			
Accomplishments/Planned Programs Subtotals	7.466	8.578	7.070

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army			Date: March 2014
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603005A / *Combat Vehicle and Automotive Advanced Technology*	Project (Number/Name) 533 / *Ground Vehicle Demonstrations*	

COST ($ in Millions)	Prior Years	FY 2013	FY 2014	FY 2015 Base	FY 2015 OCO #	FY 2015 Total	FY 2016	FY 2017	FY 2018	FY 2019	Cost To Complete	Total Cost
533: *Ground Vehicle Demonstrations*	-	-	25.000	-	-	-	-	-	-	-	-	-

The FY 2015 OCO Request will be submitted at a later date.

A. Mission Description and Budget Item Justification

These are Congressional Interest Items

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Title: Program Increase ***Description:*** This is a Congressional Interest Item. ***FY 2014 Plans:*** Program Increase	-	25.000	-
Accomplishments/Planned Programs Subtotals	-	25.000	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army												Date: March 2014
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603005A / *Combat Vehicle and Automotive Advanced Technology*				Project (Number/Name) 53D / *NAC Demonstration Initiatives (CA)*			
COST ($ in Millions)	**Prior Years**	**FY 2013**	**FY 2014**	**FY 2015 Base**	**FY 2015 OCO #**	**FY 2015 Total**	**FY 2016**	**FY 2017**	**FY 2018**	**FY 2019**	**Cost To Complete**	**Total Cost**
53D: *NAC Demonstration Initiatives (CA)*	-	34.851	25.000	-	-	-	-	-	-	-	-	-

The FY 2015 OCO Request will be submitted at a later date.

A. Mission Description and Budget Item Justification

These are Congressional Interest Items

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Title: Alternative Energy Research	34.851	25.000	-
Description: This is a Congressional Interest Item. ***FY 2013 Accomplishments:*** Matured and demonstrated Grid Services Optimization; Non-Rare-Earth Materials for Motors; Thermoelectric Enabled Engine; Light Weight Vehicle Structures; Roll-up/Roll-away vehicle based power distribution & management system; Computer Aided Engineering for Batteries; novel lubricant formulations; Multi Material Joining; Advanced high efficiency flexible solar generation; Deployable Metering and Monitoring System; Alternative Fuel Certification for Aviation ***FY 2014 Plans:*** Alternative Energy Research			
Accomplishments/Planned Programs Subtotals	34.851	25.000	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A