Exhibit R-2, RDT&E Budget Item Justification: PB 2015 Army											Date: March 2014	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 2: *Applied Research*					R-1 Program Element (Number/Name) PE 0602303A / *MISSILE 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	-	43.277	59.500	46.194	-	46.194	45.382	40.962	41.770	43.277	-	-
214: *Missile Technology*	-	43.277	51.500	46.194	-	46.194	45.382	40.962	41.770	43.277	-	-
G05: *MISSILE TECHNOLOGY INITIATIVES (CA)*	-	-	8.000	-	-	-	-	-	-	-	-	-

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

Note

FY 13 decreases attributed to Congressional General reductions (-95 thousand); SBIR/STTR transfers (-770 thousand); and Sequestion reductions (-5.241 million)
FY 14 adjustment attributed to Congressional Increase (8.0 million); FFRDC reduction (-28 thousand)
FY15 funding realigned to support higher Army priorities.

A. Mission Description and Budget Item Justification

This program element (PE) designs, fabricates and evaluates advanced component technologies for tactical missiles, rockets, guided munitions, and their launch systems in order to increase lethality, precision, and effectiveness under adverse battlefield conditions while reducing system cost, size and weight. Major goals in Project 214 include enhancing the survivability of the munition, launch and fire control systems; and increasing kill probabilities against diverse targets.

The work in this PE is complimentary to PE 0603313A (Missile and Rocket Advanced Technology), and fully coordinated with PE 0602307A (Advanced Weapons Technology), PE 0602618A (Ballistics Technology, Robotics Technology), PE 0602624A (Weapons and Munitions Technology), PE 0603004A (Weapons and Munitions Advanced Technology), and PE 0708045A (End Item Industrial Preparedness Activities).

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

The work in this PE is performed by the Aviation and Missile Research, Development, and Engineering Center (AMRDEC), Huntsville, AL.

Exhibit R-2, RDT&E Budget Item Justification: PB 2015 Army					Date: March 2014
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 2: *Applied Research*		R-1 Program Element (Number/Name) PE 0602303A / *MISSILE TECHNOLOGY*			
B. Program Change Summary ($ in Millions)	**FY 2013**	**FY 2014**	**FY 2015 Base**	**FY 2015 OCO**	**FY 2015 Total**
Previous President's Budget	49.383	51.528	55.038	-	55.038
Current President's Budget	43.277	59.500	46.194	-	46.194
Total Adjustments	-6.106	7.972	-8.844	-	-8.844
• Congressional General Reductions	-0.095	-0.028			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	8.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.770	-			
• Adjustments to Budget Years	-	-	-8.844	-	-8.844
• Other Adjustments 1	-5.241	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army											Date: March 2014	
Appropriation/Budget Activity 2040 / 2					R-1 Program Element (Number/Name) PE 0602303A / *MISSILE TECHNOLOGY*				Project (Number/Name) 214 / *Missile 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**
214: *Missile Technology*	-	43.277	51.500	46.194	-	46.194	45.382	40.962	41.770	43.277	-	-

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

A. Mission Description and Budget Item Justification

This project designs, fabricates, and evaluates missile and rocket component technologies that support demonstration of affordable, lightweight, highly lethal missiles and rockets. Major areas of research include: guidance, navigation, and controls; target acquisition systems; multi-spectral seekers; high-fidelity simulations; sustainment; aerodynamics and structures; launch systems, fire control technologies; payloads; and propulsion including research to help solve the insensitive munitions requirements. A theme embedded throughout the efforts in this project is smaller, lighter, and cheaper (SLC) missile technology to reduce the cost and logistics burden of precision munitions.

This project supports the ground portfolio.

Major products of this PE transition to PE 0603313A (Missile and Rocket Advanced Technology).

The cited work is consistent with the Director, Defense Research and Engineering science and technology priority focus areas and the Army Modernization Strategy.

Work in this project is performed by the Aviation and Missile Research, Development, and Engineering Center (AMRDEC), Huntsville, AL.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Title: Smaller, Lighter, Cheaper Tactical Missile Technologies	10.319	6.450	8.809
Description: This effort designs and evaluates innovative smaller, lighter, and cheaper component technologies as well as system concepts to reduce ground tactical precision missile cost per kill and/or logistics burden to meet urban and emerging threats. These technologies transition to PE 0603313A for maturation.			
FY 2013 Accomplishments: Continued design and development of a small, light weight, low power navigation sensor for applications such as precision targeting and miniature precision munitions, based on trade studies for low cost, precision munition components and system concepts, designed, fabricated, and evaluated component technologies for the next generation of precision weapon systems including reduced cost, advanced light weight materials advanced sensor and tracking technologies for improved target acquisition, and advanced propulsion for multiple mission scenarios.			
FY 2014 Plans: Finalize design of a small, light weight, low power, robust navigation sensors developed for on-the-move targeting; complete integration and test of a lightweight composite housing for far target location systems; complete initial design of extended-range,			

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army		Date: March 2014
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602303A / *MISSILE TECHNOLOGY*	**Project (Number/Name)** 214 / *Missile Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
reduced time-of-flight, smaller form-factor insensitive propulsion technology for multiple-mission applications; continue trade studies of the next-generation close-combat, precision weapon systems for performance against increased target sets (e. g., lethality, guidance); develop advanced sensor and tracking technologies for improved target acquisition. ***FY 2015 Plans:*** Will complete design, fabricate, and test advanced composite housing for Javelin Light Weight Command Launch Unit (LW CLU); fabricate and test small, light weight, low power inertial navigation sensor developed for robust man-portable close-combat targeting performance, and complete design of an increased accuracy modular inertial navigation sensor with reduced size, weight, and power (SWaP) and on-the-move capabilities (both targeting and navigation); fabricate and test reduced SWaP, increased range acquisition sensor for LW CLU; integrate components into CLU housing and evaluate; continue trade studies of the next-generation close combat, precision weapon systems for performance against increased target sets; develop and test advanced guidance and tracking technologies for improved target acquisition at increased range; investigate, develop and evaluate applications for novel methods and tools to provide increased weapon precision and reduce target location error.			
Title: Missile Seeker Technology ***Description:*** This effort focuses on the design and maturation of missile seekers, sensors, and software. The goal is to increase affordability and performance of missile seekers through improvement of algorithms, imaging, and thermal management. ***FY 2013 Accomplishments:*** Addressed thermal issues for phased array seekers; optimized operating power levels; integrated components into seeker sub-arrays; designed, fabricated, and demonstrated lower cost imaging infrared seekers with advanced cooling technologies; designed and fabricated an autonomous radar frequency seeker for miniature guided munitions and evaluated in a laboratory; fabricated evaluation test-bed to demonstrate radio frequency seekers in tactical missile applications; designed algorithms to improve image processing, tracking, and handover from air platform capabilities for missile seekers; and evaluated nanotechnology for power storage, sensors, and guidance in small guided munitions. ***FY 2014 Plans:*** Integrate and demonstrate sub-components for beam steering, power generation, and thermal management of phased array seeker designs; develop, integrate, and evaluate affordable phased array seeker solutions that enable all-weather operation; complete fabrication and integration of seeker components for very small interceptors to counter unmanned aviation systems (UAS) and integration into reduced-weight weapons to arm small U.S. UAS designs; characterize and field-test novel infra-red camera microcooler technology with performance comparable to current uncooled seekers. ***FY 2015 Plans:*** Will continue technology maturation of novel microcooler technologies for a tactical sensor to increase range performance and improve size, weight, and power; test ultra small and low cost semi-active laser seeker technology for improved flexibility and use on a variety of missile platforms including aviation and long range fires missiles; integrate programmable laser proximity	8.686	8.860	7.631

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army		Date: March 2014
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602303A / *MISSILE TECHNOLOGY*	**Project (Number/Name)** 214 / *Missile Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
sensor components and filter algorithms that will maintain operation in the presence of obscurants; complete the development of advanced technologies for affordable phased array sensors that enable all-weather operation of missile seekers and fire control.			
Title: Missile Guidance, Navigation and Controls Technologies ***Description:*** This effort designs, fabricates and evaluates guidance, navigation, and control systems and software, as well as information and signal processing systems for rocket and missile applications. Goals of this effort include more affordable missile guidance; miniaturization of guidance electronics; maintaining performance in global positioning system denied environments; improved image processing; improved missile power systems; improved communication with ground and other systems; technologies to track and respond to swarms of incoming and outgoing munitions; and electrical connections embedded in missile structures. ***FY 2013 Accomplishments:*** Evaluated and demonstrated the image gyro navigation solution for image based navigation; continued design of an enhanced miniaturized image stabilization and tracker hardware module; evaluated reduced size, weight, and power inertial navigation systems with increased accuracy and guidance technologies to reduce reliance on global positioning system for missiles; and continued to design and develop structural electronics in missile subsystems and apply to the missile as a whole. ***FY 2014 Plans:*** Continue the design, development, integration and evaluation of high-precision inertial components and systems that allow faster/higher-accuracy positional alignment of far target location systems, and missile navigation in environments of high dynamic-maneuvers as well as environments where reliance on the Global Positioning System (GPS) cannot be assured; develop and evaluate emerging low-cost terrain/stellar navigation technologies (including algorithms) for application to precision long-range stand-off fires that have the capability to operate in an environment where reliance on the GPS is not assured; design, and evaluate second-iteration embedded structural electronics that enable smaller, lower-cost airframe designs. ***FY 2015 Plans:*** Will develop, integrate and evaluate navigation technologies and algorithms capable of providing accuracy in GPS available and GPS denied/challenged environments to include: vision-aided, enhanced navigation-grade gyros, accelerometers, unique inertial systems and GPS Anti-Jam /Anti-Spoofing systems; continue to develop, integrate and demonstrate state-of-the-art integration techniques for COTS inertial sensors representing low cost, high accuracy navigation systems for extremely dynamic missile environments; develop, integrate, and demonstrate inertial technologies aimed at reducing size, weight, power and cost, while increasing accuracy.	6.237	6.745	6.809
Title: Missile Sustainment, Simulations, Launchers, and Fire Control Systems	5.149	3.398	3.085

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army		Date: March 2014
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602303A / *MISSILE TECHNOLOGY*	**Project (Number/Name)** 214 / *Missile Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Description: This effort designs and evaluates advanced health monitoring technologies to increase missile useful life; advanced simulations to increase performance and reduce size, weight, and cost in missile systems; launchers to deliver effects from the air and ground platforms; and fire control systems for area protection and air defense. ***FY 2013 Accomplishments:*** Continued development of integrated missile design tool for system-level analysis; designed, evaluated, and demonstrated next generation of health monitoring technologies for current fielded applications and future missile system needs; analyzed advanced interfaces between launcher and weapon to provide more targeting information to the missile; designed and demonstrated small signature, slow air target classification algorithms for fire control radars; and integrated and demonstrated a state-of-the-art, affordable active electronically steered aperture architecture with enhanced target range and classification into a radar test bed. ***FY 2014 Plans:*** Develop application-ready missile health monitoring technologies for shelf-life sensing of high-payoff components that improves the quality and quantity of missile health source data, reduces missile sustainment costs, and increases readiness; further develop the Non Cooperative Target combat identification algorithms and integrate into air defense radars; evaluate and quantify performance of Electronic Steered Arrays for air defense radars. ***FY 2015 Plans:*** Will develop phased array radar technology for fire control systems and supporting thermal management, to include small, low-cost, lightweight designs using commercially-available components and commercial processes with integrated thermal structures to enable effective power levels; further develop target identification algorithms for integration with radar systems to increase targeting fidelity. Continue development of health monitoring unit to improve user interface to assess health of missile systems; optimize health monitoring units for reduced cost, power, and volume and operation in dynamic vibration environments using micro-electromechanical system.			
Title: Missile Propulsion, Structures, Lethality, and Aerodynamic Technology ***Description:*** This effort designs, fabricates, evaluates, and demonstrates missile enabling technologies including: advanced missile propulsion with reduced launch signatures; increased lethality and range of lethality options; improved structural integrity of light weight missile cases; and increased understanding of missile aerodynamic interactions. ***FY 2013 Accomplishments:*** Formulated, synthesized, and evaluated higher performance energetic materials for minimum smoke missile propulsion while improving insensitive munitions performance; designed, fabricated, and evaluated lightweight thermal barriers for next generation extended range propulsion systems; evaluated and simulated the integration of first iteration variable effects warhead in a missile system form factor; evaluated energetic technologies to enable effects against electronic devices; continued design, fabrication,	5.235	5.158	5.754

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army		Date: March 2014
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602303A / *MISSILE TECHNOLOGY*	**Project (Number/Name)** 214 / *Missile Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
and evaluation of composite structural components for missile systems and their launchers; continued to design simulations to evaluate high speed missile aerodynamics and separation effects of missiles on weaponized unmanned aircraft. ***FY 2014 Plans:*** Fully characterize the most promising minimum-signature propellants with enhanced cold temperature strain capability that can be used in operational-environment temperature extremes encountered by unmanned aviation systems; based on the testing in FY13, conduct static tests of advanced thermal barriers for pulsed-motors; design novel ignition systems that reduce propulsion system ignition delay and increase the energy release efficiency; continue rocket motor survivability/reliability assessments and prediction modeling; evaluate high performance compact warhead designs in collaboration with the Armaments Research, Development, and Engineering Center. ***FY 2015 Plans:*** Will test novel propulsion structures to increase missile range and decrease time of flight of minimum signature propulsion systems; develop vibration-induced material degradation models of propulsion systems for stockpile reliability models to extend missile life; develop new methodologies that accurately characterize base flow predictions for complex aft bodies to improve aerodynamic predictability; continue modeling and analysis to determine the vulnerability of UAVs to fragment impact and blast effects to enable the design of counter UAS missiles; continue to evaluate high performance compact warhead designs in collaboration with the Armaments Research, Development, and Engineering Center.			
Title: Multi-Role Missile Technology ***Description:*** This effort evaluates critical technology and designs component for future affordable rockets and missiles to provide overwhelming defeat of conventional and asymmetrical threats in all environments. Successful technologies are matured and demonstrated in PE 0603313A Project 263. ***FY 2013 Accomplishments:*** Performed system and component level trade studies to design a long range missile; designed and evaluated modular components for a lightweight missile system with multiple configurations launched from manned and unmanned aircraft, and refined the design of the lightweight air launched missile based on evaluation of critical components and began integration for a system-level demonstration; and designed and evaluated guidance and tracking algorithms as well as sensor technology to support attack of a large array of targets. ***FY 2014 Plans:*** Continue identification of critical component technology for next-generation air defense and long-range fires systems, conduct component performance trade studies and begin the component designs, conduct initial laboratory evaluations of the component technologies, and finalize an integrated system architecture; update the all-digital simulation to reflect new navigation component technology designs and propulsion energy management technologies for long-range stand-off missiles; complete evaluation of component designs for lightweight multi-role (air-to-ground/air-to-air) missiles that can be integrated onto all sizes of unmanned	7.651	11.039	8.106

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army		Date: March 2014
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602303A / *MISSILE TECHNOLOGY*	**Project (Number/Name)** 214 / *Missile Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
aviation systems as well as manned rotary wing platforms; perform laboratory testing to determine feasibility to support attack of a larger target set. ***FY 2015 Plans:*** Will utilize data fusion to incorporate new navigation technology components into missile navigation algorithms, evaluate propulsion energy management technologies, and perform trade studies of new payload technologies for long-range missiles; conduct component performance trade studies; continue laboratory testing of component designs for lightweight multi-role modular missiles that can be integrated onto various sizes of unmanned aviation systems as well as manned rotary wing platforms; investigate alternate component technologies for seeker and guidance electronic unit design cost reduction and with no performance degradation; evaluate and assess new alternate lightweight/high strength materials to increase weapon survivability and reduce soldier weight burden.			
Title: Large Long Range Future Fires ***Description:*** This effort evaluates and develops technologies and performs necessary trade studies to provide the key components for maturation and demonstration for a large long range future fires missile in PE 0603313A Project 263. ***FY 2014 Plans:*** Develop a simulation and conduct analyses of large long-range fires propulsion system requirements; develop candidate propulsion system designs and perform trade studies to distinguish the most promising technologies; develop detailed propulsion system design(s) of the most promising technology. ***FY 2015 Plans:*** Will continue to update propulsion models and conduct analyses of large long-range fires propulsion system requirements; design, fabricate, and perform initial testing of propulsion sub-systems that will enable Large Long Range Future Fires capability.	-	5.000	3.000
Title: Micro Inertial Navigation Sensor for Networked Javelin Command Launch Unit (CLU) with External Far Target Locator (FTL) ***Description:*** This effort focuses on the design, fabrication, and evaluation of reduced size, weight, and power advanced inertial sensor technology for use in highly-accurate robust targeting by a man-portable system. ***FY 2014 Plans:*** Finalize initial design of a small, light weight, low power navigation sensor developed for robust man-portable close-combat targeting performance with on-the-move capabilities (both targeting and navigation) to include operation in environments where reliance on the Global Positioning System cannot be assured. (This work was initiated in FY 13 under the Smaller, Lighter, Cheaper Tactical Missile technologies effort.)	-	2.000	-
Title: Counter Unmanned Aerial Systems and Counter Cruise Missile	-	2.850	3.000

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army		Date: March 2014
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602303A / *MISSILE TECHNOLOGY*	**Project (Number/Name)** 214 / *Missile Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Description: This effort evaluates and develops technologies and performs necessary trade studies to provide the key components for maturation and demonstration of counter unmanned aerial systems and counter cruise missile systems in PE 0603313A Project 263 & 704. ***FY 2014 Plans:*** Identify, characterize, and test effects of lethality mechanisms against potential UAS threats. Develop models based on results to predict effectiveness of lethal mechanisms against UAS. Evaluate other components, such as power sources, tracker algorithms, and fire control for counter UAS mission. ***FY 2015 Plans:*** Will evaluate and analyze component technologies to support the counter UAS mission and expand efforts to include tactical level air threats with 360 degree coverage. Begin component level modeling and simulation and evaluate system architecture concepts.			
Accomplishments/Planned Programs Subtotals	43.277	51.500	46.194

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 / 2	R-1 Program Element (Number/Name) PE 0602303A / *MISSILE TECHNOLOGY*	Project (Number/Name) G05 / *MISSILE TECHNOLOGY 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
G05: *MISSILE TECHNOLOGY INITIATIVES (CA)*	-	-	8.000	-	-	-	-	-	-	-	-	-

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

A. Mission Description and Budget Item Justification

This is a Congressional Interest Item.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Title: Program Increase	-	8.000	-
Description: This is a Congressional Interest Item.			
FY 2014 Plans: This is a Congressional Interest Item.			
Accomplishments/Planned Programs Subtotals	-	8.000	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A