Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification										DATE: February 2010	
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 3: *Advanced Technology Development (ATD)*				R-1 ITEM NOMENCLATURE PE 0603313A: *Missile and Rocket Advanced Technology*							
COST ($ in Millions)	**FY 2009 Actual**	**FY 2010 Estimate**	**Base FY 2011 Estimate**	**OCO FY 2011 Estimate**	**Total FY 2011 Estimate**	**FY 2012 Estimate**	**FY 2013 Estimate**	**FY 2014 Estimate**	**FY 2015 Estimate**	**Cost To Complete**	**Total Cost**
Total Program Element	74.967	86.559	84.553	0.000	84.553	73.859	66.520	67.025	82.484	0	620.520
206: *MISSILE SIMULATION*	3.429	3.499	3.502	0.000	3.502	3.554	3.612	4.668	5.715	Continuing	Continuing
263: *FUTURE MSL TECH INTEGR(FMTI)*	35.800	42.271	42.002	0.000	42.002	44.241	42.145	39.356	42.785	Continuing	Continuing
550: *COUNTER ACTIVE PROTECTION*	14.940	8.085	8.547	0.000	8.547	8.137	5.719	7.805	11.860	Continuing	Continuing
704: *Advanced Missile Demo*	5.955	7.775	18.418	0.000	18.418	5.810	4.834	12.938	19.822	Continuing	Continuing
G03: *Area Defense Advanced Technology*	1.926	1.988	12.084	0.000	12.084	12.117	10.210	2.258	2.302	Continuing	Continuing
NA6: *Missile and Rocket Initiatives (CA)*	12.917	22.941	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program element (PE) matures and demonstrates advanced missile technologies to enhance weapon system lethality, survivability, agility, deployability, and affordability. The emphasis in this PE is on smaller, lighter weight, more affordable missiles. This PE supports high fidelity simulations including real-time Hardware-in-the-Loop (HWIL) for the design, demonstration and testing of advanced tactical missiles and interceptors (project 206); the maturation and demonstration of missile components with capabilities for locating targets in clutter, precision guidance, high speed missile flight, and missile communications, command, and control (project 263); development of a guided interceptor to work with the active protection system (APS) being developed for the ground combat vehicle (project 550); maturation and demonstration of tracking and fire control radar technologies against rocket, artillery, and mortar threats (project 704); and the maturation and demonstration of technologies required for force protection against Unmanned Aerial Vehicles and rotary wing aircraft (project G03). Project NA6 funds congressional special interest items. Work in this PE is related to, and fully coordinated with PE 0602303A (Missile Technology), PE 0603003A (Aviation Advanced Technology), PE 0603270A (Electronic Warfare Technology), PE 0602624A (Weapons and Munitions Technology), PE 0603004A (Weapons and Munitions Advanced Technology), PE 0602307A (Advanced Weapons Technology), and PE 0603005A (Combat Vehicle and Automotive Advanced Technology). 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 Aviation and Missile Research, Development, and Engineering Center (AMRDEC) located at Huntsville, AL.

Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification	DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 3: *Advanced Technology Development (ATD)*	**R-1 ITEM NOMENCLATURE** PE 0603313A: *Missile and Rocket Advanced Technology*

B. Program Change Summary ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
Previous President's Budget	76.702	63.951	63.683	0.000	63.683
Current President's Budget	74.967	86.559	84.553	0.000	84.553
Total Adjustments	-1.735	22.608	20.870	0.000	20.870
• Congressional General Reductions		-0.452			
• Congressional Directed Reductions					
• Congressional Rescissions		0.000			
• Congressional Adds		23.060			
• Congressional Directed Transfers					
• Reprogrammings	0.364	0.000			
• SBIR/STTR Transfer	-2.099	0.000			
• Adjustments to Budget Years	0.000	0.000	20.870	0.000	20.870

Change Summary Explanation

FY10 Congressionally directed increasesFY11 increases for Deployable Force Protection and force protection technologies.

Exhibit R-2A, PB 2011 Army RDT&E Project Justification			DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603313A: *Missile and Rocket Advanced Technology*	PROJECT 206: *MISSILE SIMULATION*	

COST ($ in Millions)	FY 2009 Actual	FY 2010 Estimate	Base FY 2011 Estimate	OCO FY 2011 Estimate	Total FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
206: *MISSILE SIMULATION*	3.429	3.499	3.502	0.000	3.502	3.554	3.612	4.668	5.715	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project matures and demonstrates modeling and simulation tools for missile design and analysis and improved Hardware-in-the-Loop (HWIL) simulation capabilities. Evaluation of missile technology by means of HWIL provides a cost-effective method that supports missile maturation throughout weapon system life cycles and permits a reduction in the number of flight tests required, as well as improving the confidence of flight test readiness and probability of flight test success. 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 Aviation and Missile Research, Development, and Engineering Center, (AMRDEC) Huntsville, AL.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Program #1	3.429	3.405	3.502	0.000	3.502
Missile Simulation: This effort matures and demonstrates advanced simulation technologies to support missile design, analysis and test including Hardware-in-the-Loop (HWIL) simulation, missile component and system simulations and simulations to support missile design trade studies. In FY09, continued the common HWIL framework development by testing standard high bandwidth interfaces for an infrared (IR) seeker, 6-degree-of-freedom (6-DOF) simulation, and facility modules (clock, signal injection, and software). Investigated and developed passive IR projector with polarization capability to evaluate polarized infrared sensors ability to acquire and discriminate targets. Continued development of millimeter wave (MMW) synthetic aperture radar (SAR) integration and signal processing techniques for high-resolution characterization and validation database development. In FY10, integrate and test the following components: common HWIL capabilities including PC based scene generation, short-wave IR projector, facility monitor, 6-DOF simulation, signal injection system, and seeker hardware. Develop a sample interface for the HWIL laser radar (LADAR) projection system. Transition new IR solar source developed under PE 0602303A to analyze solar implications on missile system performance. Develop a visualization environment to parametrically evaluate art-of-the-possible missile component capabilities. In FY11, will enhance the common HWIL computing capability to support data-intensive					

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

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
LADAR and radar projection seeker simulations. Will continue development of seeker signal injection for active radar and LADAR seekers and improvements to the solar simulator. Continue development of a visualization environment developing capability to parametrically evaluate missile system performance. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #2 Small Business Innovative Research/Small Business Technology Transfer Programs *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base	0.000	0.094	0.000	0.000	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
OCO FY 2011 Plans: FY 2011 OCO					
Accomplishments/Planned Programs Subtotals	3.429	3.499	3.502	0.000	3.502

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

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

Exhibit R-2A, PB 2011 Army RDT&E Project Justification										DATE: February 2010	
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 3: *Advanced Technology Development (ATD)*				R-1 ITEM NOMENCLATURE PE 0603313A: *Missile and Rocket Advanced Technology*				PROJECT 263: *FUTURE MSL TECH INTEGR(FMTI)*			
COST ($ in Millions)	**FY 2009 Actual**	**FY 2010 Estimate**	**Base FY 2011 Estimate**	**OCO FY 2011 Estimate**	**Total FY 2011 Estimate**	**FY 2012 Estimate**	**FY 2013 Estimate**	**FY 2014 Estimate**	**FY 2015 Estimate**	**Cost To Complete**	**Total Cost**
263: *FUTURE MSL TECH INTEGR(FMTI)*	35.800	42.271	42.002	0.000	42.002	44.241	42.145	39.356	42.785	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project matures and demonstrates advanced tactical missile technologies such as seekers, controllable thrust motors (gels, pintle-controlled solids, and air breathing) for propulsion, airframes, and guidance and controls for tactical missiles. The project goal is to reduce the cost per kill of precision guided missiles. The project matures the technologies developed and funded under PE 0602303A and directly supports systems managed by the Program Executive Officer for Missiles and Space. 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 Aviation and Missile Research, Development, and Engineering Center (AMRDEC), Huntsville, AL.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	**FY 2010**	**Base FY 2011**	**OCO FY 2011**	**Total FY 2011**
Program #1	0.962	0.000	0.000	0.000	0.000

Enhanced Seeker Development: This effort matures seeker technology for the Non-Line-of-Sight Launch System (NLOS-LS). In FY09, performed two captive flight tests and continued evaluation and maturation of seeker technology, aided target acquisition, and electronics. Transitioned to PEO Missiles & Space as a spiral upgrade to NLOS-LS System Development and Demonstration program.

FY 2009 Accomplishments:
FY 2009

FY 2010 Plans:
FY 2010

Base FY 2011 Plans:
FY 2011 Base

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
OCO FY 2011 Plans: FY 2011 OCO					
Program #2 Advanced Propulsion and Warheads: This effort matures propulsion and warhead technology for the Non-Line-of-Sight Launch System (NLOS-LS). In FY09, performed integrated system concept demonstrations and evaluations of an NLOS-LS cargo variant for rapid, precision deployment of submunitions. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO	1.923	0.000	0.000	0.000	0.000
Program #3 Modeling/Simulation and System Performance Evaluation: This effort matures Modeling and Simulation technology for the Non-Line-of-Sight Launch System (NLOS-LS). In FY09, performed many-on-many system trade studies and generated detailed simulation models for evaluation of NLOS-LS variants and Precision Attack Munitions upgrades. Continued to address manufacturing and affordability issues. Conducted excursions to expand the envelope of simulation evaluated conditions.	0.962	0.000	0.000	0.000	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
FY 2009 Accomplishments: FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #4 Technology for Non-Line-of-Sight Launch System (NLOS-LS) Variants: This effort focuses on demonstrating technologies that leverage the NLOS-LS Container Launch Unit (C/LU) to provide a versatile mix of fires for defeat of conventional and asymmetrical threats in all environments. This effort leverages technology development activities from PE602303A.In FY10, design and develop critical components to support concept refinement and sample fabrication of NLOS-LS variant missiles capable of rapid, precision deployment of lethal and non-lethal payloads. Perform subsystem and system-level testing in a laboratory environment. Perform an evaluation of payload delivery feasibility through proof-of-principle flight tests and high fidelity simulations. Investigate, identify and coordinate design interfaces for selected high payoff payload candidates and evaluate and mature the most promising interfaces to enable integration into the NLOS-LS variant. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010	0.000	4.296	0.000	0.000	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Base FY 2011 Plans: FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #5 Technology for Guided Missiles and Interceptors: This effort develops and demonstrates guidance and stable flight technologies for highly responsive missiles and interceptors. Efforts support Defense against Rockets, Artillery, and Mortar (PE 0603313, Project 263) and Kinetic Energy Active Protection System Guided Interceptor (PE 0603313, Project 550).In FY11, will develop and demonstrate guidance and control, seeker, propulsion, and aerodynamic technologies in support of tactical missile and interceptor design for force protection systems. Will develop technologies to support highly responsive guidance of tactical interceptors to the intended high velocity threat. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO	0.000	0.000	7.219	0.000	7.219
Program #6	7.489	7.221	11.656	0.000	11.656

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Applied Smaller, Lighter, and Cheaper (SLC) Missile Components: Matures and demonstrates technology developed in PE602303A that focuses on developing increasingly smaller, lighter, and cheaper missile components to enhance current system capabilities against asymmetric threats for transition to the next generation small precision munitions. Mature technologies will transition to PEO Missiles and Space. In FY09, conducted requirements analysis and trade studies for small, low cost electronics and seeker/sensor systems including height of burst sensor (HOBS), high-reliability Tube-launched, Optically-tracked, Wire-guided (TOW) rate sensor for missile guidance, and Joint Air-to-Ground Missile (JAGM) electronic safe and arm device (ESAD). Leveraged latest in nanotechnology and electronics packaging to achieve a reduction in size and weight of small, light, missile form factors to meet urban and emerging threats. Integrated the Multi-Purpose Warhead (MPW) with Javelin and conducted tandem/Insensitive Munition tests. In FY10, fabricate, integrate, and functionally test composite JAGM guidance electronics unit (GEU) housing for improving thermal dissipation; complete image-based stabilization/people tracking subsystems; conduct static/dynamic ESAD testing for JAGM and complete technical data package; and down-select and flight test TOW rate sensor package for missile guidance. In FY11, will demonstrate image-based stabilization/tracker using captive flight test simulated target imagery. Will conduct static/dynamic tests of high performance propulsion system with increased insensitive munition capabilities, will perform functional/environmental tests on composite JAGM sample guidance electronics unit housing, will demonstrate advanced interconnects in representative small precision munition processor, and will fabricate and field test form factored semi-active laser seeker. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
OCO FY 2011 Plans: FY 2011 OCO					
Program #7 Close Combat Networking of Weapons and Sensors: This effort matures and demonstrates enabling technology to provide network lethality capability for transition to Javelin and Tube-launched, Optically-tracked, Wire-guided (TOW) missile systems that increase warfighter lethality, survivability, and situational awareness. In FY09, continued maturation of mission software; conducted sample strap-on Far Target Locator (FTL) and network interface card development; integrated and demonstrated system level future force (Soldier Radio Waveform) radio interoperability; performed integration and testing with the Javelin Command Launch Unit (CLU). Conducted planning for a networked lethality demonstration employing current and future tactical radios. In FY10, complete and fully integrate all mission application enhancements with sample networked Improved Target Acquisition System (ITAS) and networked CLU with strap-on FTL and perform system-level tests, followed by CLU and ITAS network integration. Conduct cooperative networked TOW ITAS and Javelin CLU capability demonstration. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO	4.809	5.396	0.000	0.000	0.000
Program #8	2.318	4.726	3.382	0.000	3.382

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Multi-Mission/Multi-Purpose Single Missile Propulsion: This effort matures and demonstrates enhanced capability missile propulsion that provide longer ranges, increasing mission flexibility, and shorter flight times while increasing system insensitive munitions capability and mission robustness in air-to-ground, ground-to-ground, and ground-to-air roles for transition to PEO Missiles & Space. In FY09, completed concept designs for the best candidate motor and fabricated critical components (including propellants, engine, expulsion systems, and controls) for variable propulsion motors. Began validation of critical components of these designs. In FY10, complete testing of missile motor critical components, select best technical approach and begin design, analysis and fabrication of flight-ready motor hardware for static testing. In FY11, will complete static testing of missile motors over operational temperature range and begin fabrication of flight-weight hardware assets in order to conduct flight testing. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #9 Defense against Rockets, Artillery, and Mortars (RAM): This effort develops and demonstrates an integrated system capable of countering multiple simultaneous RAM threats. The integrated system consists of two missile interceptor concepts, integration with the vertical launch Non-Line-of-Sight Launch System (NLOS-LS) Container Launch Unit, a Technical Fire Control node to provide the firing solution and launch command, and	17.337	4.881	4.891	0.000	4.891

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

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Tracking and Fire Control radar to track the threat RAM and feed the target location to the Technical Fire Control. In order to provide more clarity, starting in FY10, this effort has been moved to two additional relevant efforts within PE 0603313AEnhanced Precision Interceptor Technology and Technical Fire Control Technology, PE 0603313A, Project 704. This effort transitions activities from Defense against RAM Interceptor, PE 0602303A.In FY09, initiated final designs of two interceptor designs, pitch-over apparatus, launcher, and technical fire control brassboard component technologies. Began fabrication of two interceptor designs, pitch-over apparatus, launcher, and technical fire control components to be used in Hardware-in-the-Loop (HWIL) testing. Updated and verified system-level RAM Interceptor simulations based on test results. In FY10, complete final designs of vertical launch and pitch-over components. Integrate the launcher, pitch-over apparatus, interceptor, and technical fire control components for system level HWIL testing. Update the vertical launch and pitch-over component designs, software, and simulations based on test results. In FY11, will continue system-level HWIL testing to verify required performance and develop components and integrate for guided flight tests against single RAM targets. Will update the vertical launch and pitch over designs and system simulation based on test results. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #10	0.000	7.785	7.922	0.000	7.922

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Enhanced Precision Interceptor Technology: This effort develops and demonstrates interceptor concepts and technology with the required accuracy and lethality to defeat rocket, artillery, and mortar (RAM) threats.. This effort is in collaboration with the task entitled Defense against RAM. In FY10, complete final designs, fabricate, and perform testing of interceptor components. Integrate interceptor components and conduct system-level Hardware-in-the-Loop (HWIL) testing. Update the interceptor designs and simulations based on the test results. In FY11, will fabricate flight test interceptors for guided flight tests against single RAM targets and will perform pre-flight HWIL testing on each interceptor. Will continue system-level HWIL testing and prepare interceptors for guided flight tests by verifying correct fire control solution and launch command are generated. Will update the interceptor design and system simulation based on test results. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #11 Technical Fire Control Technology: This effort develops and demonstrates technical fire control hardware and software necessary to generate and execute a firing solution for an interceptor to defeat rocket, artillery, and mortar (RAM) threats. This effort is in collaboration with the task entitled Defense against RAM. In FY10, complete final designs, fabricate, and perform testing of technical fire control components and software. Integrated with interceptor to support system-level Hardware-in-the-Loop (HWIL) testing. Update the technical	0.000	6.812	6.932	0.000	6.932

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
fire control design and software and update simulations based on the test results. In FY11, will fabricate one technical fire control node for guided flight tests against single RAM targets, Will developtechnical fire control software and integrate technical fire control with the interceptor components to support system-level HWIL testing verifying correct fire control solution and launch command are generated. Will update the technical fire control design and system simulation based on test results. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #12 Small Business Innovative Research/Small Business Technology Transfer Programs *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010	0.000	1.154	0.000	0.000	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Base FY 2011 Plans: FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Accomplishments/Planned Programs Subtotals	35.800	42.271	42.002	0.000	42.002

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

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

Exhibit R-2A, PB 2011 Army RDT&E Project Justification			DATE: February 2010
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COST ($ in Millions)	FY 2009 Actual	FY 2010 Estimate	Base FY 2011 Estimate	OCO FY 2011 Estimate	Total FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
550: *COUNTER ACTIVE PROTECTION*	14.940	8.085	8.547	0.000	8.547	8.137	5.719	7.805	11.860	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project matures and demonstrates integrated survivability technologies and techniques for lightweight combat platforms including light armored vehicles, tactical wheeled vehicles, and helicopters. Efforts include the development of guided interceptors for active protection systems (APS) capable of defeating tank-fired large caliber anti-armor threats, anti-tank guided missiles and long range rocket propelled grenades (RPGs). Work in this project on APS is in collaboration with PE 0602624A (Weapons and Munitions Technologies), project H28, PE 0603004 (Advanced Munitions Demonstration) and PE 0603005A (Combat Vehicle and Automotive Advanced Technology), project 221. This project complements work done on adaptive infrared suppressor and acoustic signature technologies matured in the PE 0603003A (Aviation Advanced Technology), project 313. This effort is building on the expertise developed in support of rockets, missile, sensors, and active control to develop innovative solutions for survivability. The cited work is consistent with the Department of 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 Aviation and Missile Research, Development, and Engineering Center (AMRDEC), Huntsville, AL.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Program #1	14.940	7.877	8.547	0.000	8.547
Kinetic Energy Active Protection System (KEAPS) Guided Interceptor: This effort develops and demonstrates an interceptor to defeat threats to combat vehicle survivability focusing on tank fired kinetic energy threats. This effort demonstrates interceptor performance against kinetic energy tank rounds through a series of up to ten guided flight tests incrementally integrating key components as their designs mature and updating interceptor design. Goals of the KEAPS effort remain constant, but efforts in FY10 have been revised to synchronize with the needs of the Army's new ground combat vehicle program.In FY09, completed integration of interceptor components and conducted three successful controlled flight tests guiding the interceptor through preprogrammed maneuvers. Completed field testing of the seeker and tested it in Hardware-in-the-Loop (HWIL) to evaluate seeker dynamic performance against kinetic energy threats. Conducted one guided flight test which demonstrated that the interceptor has sufficient guidance accuracy to defeat live threats. Integrated seeker into guided					

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

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
interceptor for flight testing. Began fabrication of additional interceptors for guided flight tests. In FY10, conduct up to five guided flight tests against live threats to evaluate guidance accuracy under increasing degrees of launch error and evaluate electronic safe and arm device (ESAD) performance. Integrate target detection device (TDD) into guided interceptor for flight testing. Conduct dynamic/dynamic warhead testing to verify warhead performance against kinetic energy tank round. In FY11, will conduct up to two guided flight tests against live threats to evaluate TDD performance limits. Will integrate pop-up-pitch-over (PUPO) apparatus into interceptor and conduct up to two guided flight tests to verify the interceptor can navigate through PUPO maneuver. Integrate warhead into interceptor and conduct up to two full end-to-end flight tests from PUPO through threat defeat. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #2 Small Business Innovative Research/Small Business Technology Transfer Programs *FY 2009 Accomplishments:* FY 2009	0.000	0.208	0.000	0.000	0.000

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

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
FY 2010 Plans: FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Accomplishments/Planned Programs Subtotals	14.940	8.085	8.547	0.000	8.547

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

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

Exhibit R-2A, PB 2011 Army RDT&E Project Justification			DATE: February 2010
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COST ($ in Millions)	FY 2009 Actual	FY 2010 Estimate	Base FY 2011 Estimate	OCO FY 2011 Estimate	Total FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
704: *Advanced Missile Demo*	5.955	7.775	18.418	0.000	18.418	5.810	4.834	12.938	19.822	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project matures advanced state-of-the-art missile system concepts and related hardware to enhance weapon system lethality, survivability, agility, versatility, deployability, and affordability for defense against the future force air and ground, armored and non-armored threats. The cited work is consistent with the Department of 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 Aviation and Missile Research, Development, and Engineering Center (AMRDEC), Huntsville, AL.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Program #1	5.955	7.558	11.918	0.000	11.918
Counter Rockets, Artillery, Mortars (CRAM) Tracking and Fire Control: This effort matures and demonstrates radar technology to provide 360 degree, near hemispherical coverage for tracking and command intercept of RAM threats. This effort determines the trajectory and location of the threat and feeds that information to the Technical Fire Control to generate a firing solution. This task supports Defense Against Rocket, Artillery, and Mortar, PE0603313A Project 263 to perform system-level demonstration. In FY09, completed the fabrication and integration of a sample surveillance sensor. Tested the integrated surveillance sensor in an open air environment to verify the technology can acquire and track small mortar and rocket targets with very low radar cross sections. Completed final design and began fabrication and integration of fire control sensor components. In FY10, complete fire control sensor assembly fabrication and begin to integrate with the other system components developed. Conduct laboratory testing to demonstrating the fire control sensor can track RAM targets with the required accuracy. In FY11, will complete fabrication of the fire control sensor hardware and software to support guided flight testing of interceptors. Will verify tracking and fire control radar accuracy through modeling and simulation and testing to verify it meets the required performance. Will update the tracking and fire control fire control design and system simulation based on test results.					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
FY 2009 Accomplishments: FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #2 Counter Rocket, Artillery, and Mortar (RAM) Interceptor Integration: This effort integrates technologies from Defense against Rockets, Artillery, and Mortars, PE 0603313A, Project 263 and performs system-level Hardware-in-the-Loop (HWIL) testing to verify system performance.In FY11, will support system-level HWIL testing. Will integrate technologies for two missile concept designs to perform guided flight testing against single RAM threats. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base	0.000	0.000	6.500	0.000	6.500

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
OCO FY 2011 Plans: FY 2011 OCO					
Program #3	0.000	0.217	0.000	0.000	0.000
Small Business Innovative Research/Small Business Technology Transfer Program *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Accomplishments/Planned Programs Subtotals	5.955	7.775	18.418	0.000	18.418

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

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

Exhibit R-2A, PB 2011 Army RDT&E Project Justification			DATE: February 2010
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COST ($ in Millions)	FY 2009 Actual	FY 2010 Estimate	Base FY 2011 Estimate	OCO FY 2011 Estimate	Total FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
G03: *Area Defense Advanced Technology*	1.926	1.988	12.084	0.000	12.084	12.117	10.210	2.258	2.302	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project matures and demonstrates Air Defense Missile technology to support brigade force protection capability against the following potential threats: Unmanned Aerial Vehicles, rotary wing aircraft and Large Caliber Rockets, Cruise Missiles, etc. and to expand the protection envelope to a division/corps area. The cited work is consistent with the Department of 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 Aviation and Missile Research, Development, and Engineering Center (AMRDEC), Huntsville, AL.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Program #1	1.926	1.932	2.084	0.000	2.084
Air Defense Advanced Technology: This effort matures and demonstrates missile technology to provide capability for warfighter force protection against low and slow flying air vehicle threats in all environments without increasing the force structure. This effort leverages activities from PE 0602303A, project 214.In FY09, continued to perform trade studies and lethality analysis through modeling and simulation of air defense concepts, selected the most favorable concepts for further development, and began maturation and demonstration of associated underlying critical component technologies. In FY10, mature and develop critical components for an air defense capability, perform component testing in a laboratory environment, and develop high fidelity simulations. In FY11, will continue development and demonstration of critical components and perform integration and demonstration of an air defense system capability in a relevant environment.					
FY 2009 Accomplishments: FY 2009					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
FY 2010 Plans: FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #2 Deployable Force Protection Missile Technology: This effort demonstrates affordable missile technology to provide force protection for smaller forward operating bases (FOB). This effort will integrate existing and developmental missile technology and develop novel fire control and guidance and control systems to use missiles for a deployable force protection role. In FY11, will demonstrate missile system technologies for affordable effects to provide area protection for smaller FOBs. Will develop guidance, control, actuation, and propulsion technology to enable 360 degree protection. Will develop fire control systems to provide 360 degree protection to a re-configurable protected area using multiple missiles and launchers. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base	0.000	0.000	10.000	0.000	10.000

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

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
OCO FY 2011 Plans: FY 2011 OCO					
Program #3 Small Business Innovative Research/Small Business Technology Transfer Programs *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO	0.000	0.056	0.000	0.000	0.000
Accomplishments/Planned Programs Subtotals	1.926	1.988	12.084	0.000	12.084

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

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

Exhibit R-2A, PB 2011 Army RDT&E Project Justification									DATE: February 2010		
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 3: *Advanced Technology Development (ATD)*				R-1 ITEM NOMENCLATURE PE 0603313A: *Missile and Rocket Advanced Technology*				PROJECT NA6: *Missile and Rocket Initiatives (CA)*			
COST ($ in Millions)	**FY 2009 Actual**	**FY 2010 Estimate**	**Base FY 2011 Estimate**	**OCO FY 2011 Estimate**	**Total FY 2011 Estimate**	**FY 2012 Estimate**	**FY 2013 Estimate**	**FY 2014 Estimate**	**FY 2015 Estimate**	**Cost To Complete**	**Total Cost**
NA6: *Missile and Rocket Initiatives (CA)*	12.917	22.941	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for Missile and Rocket advanced technology development.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	**FY 2010**	**Base FY 2011**	**OCO FY 2011**	**Total FY 2011**
Program #1	4.146	2.547	0.000	0.000	0.000
Rapid Response System for Protection of Air and Ground Vehicles: In FY09, this Congressional Interest Item supported development of a high data rate passive infrared (IR) sensor technology. This technology has direct application to future active protection technology for aircraft and ground vehicles in detecting, cueing, and tracking the IR signatures of threat weapons. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #2	1.595	0.000	0.000	0.000	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
High Fidelity Virtual Simulation and Analysis (HFVSA): In FY09, this Congressional Interest Item supported extending, leveraging, and preparing the existing vast aviation and missile modeling & simulation capabilities in the Advanced Prototyping, Engineering and Experimentation (APEX) Labs to the larger Army. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #3 Heavy Fuel High Efficiency Turbine Engine: In FY09, this Congressional Interest Item supported building flight weight high efficiency turbine engine (HETE). *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base	1.994	0.000	0.000	0.000	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
OCO FY 2011 Plans: FY 2011 OCO					
Program #4 Long Range Hypersonic Interceptor: This In FY09, this Congressional Interest Item supported a study that concentrates on investigating technologies that apply to countering the emerging threat posed to the US and its allies by very high speed strike weapons. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO	0.797	1.592	0.000	0.000	0.000
Program #5 Advanced Commercial Technology Insertion for Aviation & Missile Research, Development, & Engineering: In FY09, this Congressional Interest Item supported development of a system architecture to standardize/renovate graphical scene generation for Hardware-in-the-Loop. *FY 2009 Accomplishments:* FY 2009	2.392	3.084	0.000	0.000	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
FY 2010 Plans: FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #6 Army Responsive Tactical Space System Exerciser (ARTSSE): In FY09, this Congressional Interest Item developed a system simulation testbed key to the performance analysis and evaluation of Operationally Responsive Space (ORS) technologies. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO	1.993	2.985	0.000	0.000	0.000
Program #7 Foil Bearing Supported UAV Engine. This is a Congressional Interest Item.	0.000	0.796	0.000	0.000	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
FY 2009 Accomplishments: FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #8 Captive Carry Sensor Test-Bed. This is a Congressional Interest Item. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO	0.000	2.388	0.000	0.000	0.000
Program #9	0.000	3.024	0.000	0.000	0.000

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

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Anti-Tamper Research and Development. This is a Congressional Interest Item. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #10 Waterside Wide Area Tactical Coverage & Homing (WaterWATCH). This is a Congressional Interest Item. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO	0.000	3.182	0.000	0.000	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Program #11	0.000	3.343	0.000	0.000	0.000
Scenario Generation for Integrated Air and Missile Defense Evaluation. This is a Congressional Interest Item. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Accomplishments/Planned Programs Subtotals	12.917	22.941	0.000	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

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