Exhibit R-2, RDT&E Budget Item Justification: PB 2014 Army											DATE: April 2013	
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 7: *Operational Systems Development*					R-1 ITEM NOMENCLATURE PE 0708045A: *End Item Industrial Preparedness Activities*							
COST ($ in Millions)	**All Prior Years**	**FY 2012**	**FY 2013#**	**FY 2014 Base**	**FY 2014 OCO ##**	**FY 2014 Total**	**FY 2015**	**FY 2016**	**FY 2017**	**FY 2018**	**Cost To Complete**	**Total Cost**
Total Program Element	-	57.607	59.908	56.136	-	56.136	60.866	59.787	60.006	60.592	Continuing	Continuing
E25: *MFG SCIENCE & TECH*	-	57.607	59.908	56.136	-	56.136	60.866	59.787	60.006	60.592	Continuing	Continuing

FY 2013 Program is from the FY 2013 President's Budget, submitted February 2012

The FY 2014 OCO Request will be submitted at a later date

A. Mission Description and Budget Item Justification

This program element (PE) develops and demonstrates manufacturing processes that enable improvements in producibility and affordability of emerging and enabling components and subsystems of Army air, ground, Soldier, and command/control/communications systems. Initiatives within the PE result in cost savings and reduced risk of transitioning military-unique manufacturing processes into production. Project E25 fosters the transfer of new/improved manufacturing technologies to the industrial base, including manufacturing efforts that have potential for high payoff across the spectrum of Army systems.

Work in this PE is related to, and fully coordinated with, PE 0603710A (Night Vision Advanced Technology), PE 0602303A (Missile Technology), PE 0602105A (Materials Technology), PE 0602618A (Ballistics Technology), PE 0602601A (Combat Vehicle and Automotive Technology), and PE 0603005A (Combat Vehicle and Automotive Advanced Technology) and PE 0602705A (Electronics and Electronic Devices).

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

Work in this PE is performed by the Army Research, Development, and Engineering Command (RDECOM) and efforts are executed by the Army Research Laboratory (ARL) and appropriate Army Research, Development, and Engineering Centers (RDECs).

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B. Program Change Summary ($ in Millions)	**FY 2012**	**FY 2013**	**FY 2014 Base**	**FY 2014 OCO**	**FY 2014 Total**
Previous President's Budget	59.297	59.908	59.952	-	59.952
Current President's Budget	57.607	59.908	56.136	-	56.136
Total Adjustments	-1.690	0.000	-3.816	-	-3.816
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.690	-			
• Adjustments to Budget Years	-	-	-3.816	-	-3.816

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COST ($ in Millions)	All Prior Years	FY 2012	FY 2013#	FY 2014 Base	FY 2014 OCO ##	FY 2014 Total	FY 2015	FY 2016	FY 2017	FY 2018	Cost To Complete	Total Cost
E25: *MFG SCIENCE & TECH*	-	57.607	59.908	56.136	-	56.136	60.866	59.787	60.006	60.592	Continuing	Continuing
Quantity of RDT&E Articles												

FY 2013 Program is from the FY 2013 President's Budget, submitted February 2012

The FY 2014 OCO Request will be submitted at a later date

A. Mission Description and Budget Item Justification

This project develops and demonstrates manufacturing processes that enable improvements in producibility and affordability of emerging and enabling components and subsystems of Army air, ground, Soldier and command/control/communications/intelligence systems. Focus is on components and subsystems such as advanced armor, power and energy devices, rotors, sensors, displays, propellants and gun tubes. In addition, work is conducted to advance the state of the art in processing and fabrication techniques for coatings, multifunctional materials and structural elements for Army specific applications.

Work supports all Army S&T portfolios. Work in this PE is related to and fully coordinated with PE 0602105A (Materials Technology), PE 0602211A (Aviation Technology, PE 0602303A (Missile Technology), PE 0602601A (Combat Vehicle and Automotive Technology), PE 0602618A (Ballistics Technology), PE 0602705A (Electronics and Electronic Devices), PE 0603003 (Aviation Advanced Technology), PE 0603005A (Combat Vehicle and Automotive Advanced Technology) and PE 0603710A (Night Vision Advanced Technology).

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

Work in this project is performed by the Army Research, Development and Engineering Command (RDECOM) and efforts are executed by the Army Research Laboratory (ARL) and appropriate Army Research, Development and Engineering Centers (RDECs).

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2012	FY 2013	FY 2014
Title: Air Systems	11.632	13.112	4.000
Articles:	0	0	
Description: This effort funds manufacturing technology advances needed for more affordable manned and unmanned aircraft components and subsystems. Work focuses on addressing challenges in areas such as engine performance and life, rotor and blade durability, reliable component integration/attachment, structural durability at low weight, and reduced corrosion.			
FY 2012 Accomplishments: Applied erosion coating materials onto UH-60 and AH-64 rotor-blades to decrease the number of blades repaired from 48 to 24 a year and reduce coating costs from $18 thousands - $14 thousands per rotor-blade. Developed novel tooling approaches and manufacturing processes to increase UAV heavy fuel engine performance, fuel efficiency and reliability, which reduces			

Exhibit R-2A, RDT&E Project Justification: PB 2014 Army		DATE: April 2013
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2012	FY 2013	FY 2014
overall UAV life cycle costs. Integrated improved heavy fuel engine manufacturing processes into UAV platforms to demonstrate effectiveness. Developed cost effective processes for manufacturing nano-composite coatings which increases performance, durability and reliability of UH-60 and AH-64 components. Automated nano-composite application processes and equipment to reduce coating costs. Manufactured high performance flexible airborne antennas substrates using both chemical and riveting techniques. Improved auto clave, bonding lines and joints to increase yield rates which reduced antenna manufacturing costs. Demonstrated improved cost effective Environmental Barrier Coating (EBC) deposition methods and combined materials, process improvements to reduce fabrication labor and weight for T-700 helicopter engine shrouds. ***FY 2013 Plans:*** Demonstrate an advanced ceramic manufacturing process for the fabrication of Ceramic Matrix Composite (CMC) and Stage High Pressure Turbine (HPT) Shrouds for helicopter engines to reduce overall system weight and improve fuel consumption and reliability; develop manufacturing processes for the use of direct metal laser sintering to reduce cost and increase performance of complex components such as UAV turbine engine recuperators; demonstrate machining of rotary engine side seal grooves which will increase the reliability and performance of rotary engines for UAV applications; demonstrate a chemical etching technique for high performance flexible airborne antenna substrates by using lay-up processes to reduce touch labor and riveting issues resulting in significantly increased yield and reduced cost per missile; develop and demonstrate automated Plasma Assisted Chemical Vapor Deposition equipment and manufacturing procedures for the application of nanocrystalline diamond and amorphous carbon coatings for improved optical transmission for infrared devices, improved corrosion resistance, increased surface hardness, reduced friction, and increased wear performance on critical AH-64 and UH-60 helicopter components. ***FY 2014 Plans:*** Will develop machining, finishing and assembly processes for drive train and propulsion system components; will demonstrate and transition an automated production system for applying nanocrystalline diamond and amorphous carbon coatings to Army aviation systems; will develop advanced manufacturing and repair processes for composite structures; will develop and demonstrate cost-effective repair of high-value drive shafts and power-train components using additive manufacturing techniques.			
Title: Ground Systems	6.381	9.945	27.412
Articles:	0	0	
Description: This effort funds manufacturing technology advances needed for more affordable components and subsystems for tactical and combat vehicles and weapons systems. Work focuses on addressing challenges in areas such as advanced armor, gun barrel life, insensitive propellants, precision munitions and vehicle power devices. ***FY 2012 Accomplishments:*** Developed aluminum oxide manufacturing processes for sintered Spinel powder applications. Improved transparent armor production using a sintered technique which lowers the cost from $3k to $1.2k a square foot. Developed improved manufacturing			

Exhibit R-2A, RDT&E Project Justification: PB 2014 Army		DATE: April 2013
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2012	FY 2013	FY 2014
processes and process controls to lower the cost, weight and material flaws for low rate production of combat vehicle modular armor. ***FY 2013 Plans:*** Scale-up manufacturing of high optical clarity Spinel armor plates up to 14 x 14 in size by using a sintered process to address both size and cost; develop low cost production and assembly processes of complex passive kinetic energy armors for combat vehicle systems; exploit forming/forging/joining technologies to enable fabrication of a single under-body design of high performance/ strength alloys for a blast resistant lower hull and underbody kits for combat vehicle systems; develop explosive loading processes, requiring no post-machining, inside warhead molding of insensitive munitions and fragment generating sleeves for the EAPS and next generation cluster munitions; develop a manufacturing process to reduce the cost and time associated with applying Ta-10W liners for medium and large caliber Chromium free cannon barrels; develop initial manufacturing processes for automated production of low cost, high power battery and fuel cell systems for manned and unmanned ground systems. ***FY 2014 Plans:*** Will demonstrate successful application of Ta-10W liners for medium and small-caliber barrels through live-fire demonstrations and evaluation of liner wear, will transition the Ta-10W liner application process to Watervliet Arsenal for implementation; will demonstrate increased yield and reduced missile antenna manufacturing cost through limited production runs and deliver process and technical data to the Cruise Missile Defense Systems Program Office for implementation on future missile systems; will demonstrate safer and more cost effective processes for loading explosives in the 120mm Advanced Multi-Purpose munition through limited production runs and will transition robust processes for the use of nano-particle field assisted sintering technologies (FAST) to reduce variability and improve fragmentation and performance of warhead liners for the extended area protection system (EAPS) program; demonstrate a domestic production capability for producing Spinel powder materials and initiate pilot line production runs of sintered Spinel plates followed by integration of the Spinel plates into laminated transparent armor solutions for performance evaluation and production cost validation; will scale up manufacturing of low-cost alumina-based ceramic tiles, improve 3D weaving technologies to integrate ceramic tiles of varying thicknesses and demonstrate production of large, single-piece underbody armor solutions to meet objective threat level ballistic requirements, demonstrating manufacturing process maturity for each technology through limited production runs; develop mature manufacturing processes for utilizing metal and polymer-based additive manufacturing processes to reduce prototyping and production times through rapid manufacturing, multi-material structures and rapid tooling development for ground vehicles.			
Title: Precision Munitions and Armament Systems	9.699	6.568	0.000
Articles:	0	0	
Description: The Precision Munitions and Armament Systems focus area consists of Advanced Weapon Systems, Fire Control, Logistics, Emerging Technologies and Advanced Energetics and Warheads. Future efforts in this area are moved to the Ground Systems portfolio.			

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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2012	FY 2013	FY 2014
FY 2012 Accomplishments: Developed a manufacturing process for molding the frag-sleeve into a warhead body for decreased manufacturing time and cost. Developed field assisted spark technology and embedded tungsten fragment molding processes which will reduce production man-hours and lower cost. Developed processes for residence time, temperature, agitation rate and order of feeds to optimize IMX 104 manufacturing process and transitioned to PM-CAS. Manufactured a crown breach design using a hexavalent chromium free cladding process for large and medium caliber gun barrels. Developed a tantalum tungsten alloy protective bore coating to enable higher performance ammunition. Demonstrated M-Charge liner improvements, billet fabrication and warhead case fabrication which reduces costs from $6 thousands to $5 thousands per warhead and increases yield from 75% to 98%. ***FY 2013 Plans:*** Develop the manufacturing process to reduce the cost and time associated with applying Ta-10W liners for medium and large caliber Chromium free cannon barrels. Develop explosive loading processes, requiring no post-machining, inside warhead molding of insensitive munitions and fragment generating sleeves for the EAPS and Next Generation Cluster Munitions.			
Title: Command, Control, Communications and Intelligence Systems	18.419	20.465	13.756
Articles:	0	0	
Description: This effort funds manufacturing technology advances needed for more affordable components and subsystems for intelligence, surveillance, reconnaissance and targeting sytems, mission command systems, electronic warfare and improved Explosive Device detect/defeat systems. Work focuses on addressing challenges in areas such as large format multi-color focal plane arrays, flexible displays, night vision sensors, target detectors, advanced antennas and sensors. ***FY 2012 Accomplishments:*** Developed a production capacity for low cost, very large, affordable infrared (IR) focal plane arrays (FPA) using III-V epitaxial materials. Improved HgCdTe pilot lines by increasing the diameters of substrates and reduce material waste, decreasing costs for FPA production. Developed single-layer crystal yield and demonstrated improved polishing processes for more uniformed FPA substrates. Reduced propagate density and decreased surface roughness of FPA substrate and transition to PEO. Manufactured the final components package, demonstrated limited production of chip scale atomic clock power sources and began transition to Air Force GPS Wing and PEO C3T. Developed full color organic light emitting diodes (OLEDS) from a fully integrated flexible display pilot production line for demonstrations to system integrators. Manufactured processing station for night vision sensor optimization to reduce costs and increase reliability from 1200 to 10000 hours per sensor. ***FY 2013 Plans:*** Optimize the production of the Automated Exhaust Station (AES) to increase yield and demonstrate increased median photocathode response for improved low-light-level sensor performance; demonstrate lot-sized production of 200 and 325 sqcm focal plane array (FPA) wafers, improving yield and small pixel processing/hybridization; manufacture and evaluate sample			

Exhibit R-2A, RDT&E Project Justification: PB 2014 Army		DATE: April 2013
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2012	FY 2013	FY 2014
batches of 640x480, 1920x1280 and 1280x720 pixel FPAs to validate improved yield for affordable high definition, multi-band, multi-color FPAs grown on low-cost substrate for target acquisition and vision systems; demonstrate lot-sized production of 49 sqcm wafers for high-operating temperature FPAs, reducing surface defects and improving contrast ratio for wide area coverage of persistent surveillance systems; integrate OLEDS into the Gen II production line for 6.4-12 inch diagonal flexible displays to achieve a resolution of 600x800 super video graphics array (SVGA). ***FY 2014 Plans:*** Will demonstrate improved yield and reliability for low light level sensor over multiple production runs; will demonstrate manufacturing of large sized high-operating temperature FPAs, will increase growth, processing and hybridization yields and will deliver 640x480 FPAs for system integration; will develop manufacturing processes for reducing the cost and improving performance and reliability of short wave infrared sensors.			
Title: Flexible Display Technology ***Articles:*** ***Description:*** Future efforts in this area are moved to the Command, Control, Communications and Intelligence Systems portfolio. ***FY 2012 Accomplishments:*** Developed full color OLEDS from fully integrated GEN II pilot line for demonstrators to system integrators.	5.011 0	0.000	0.000
Title: Soldier Systems ***Articles:*** ***Description:*** This effort funds manufacturing technology advances needed for more affordable components and subsystems for combat feeding, aerial delivery of supplies, expeditionary basing, Soldier-borne sensors, clothing and protective equipment. Work focuses on addressing challenges in areas such as multifunctional fabrics for shelters, uniforms and portage equipment; affordable, non-contaminating packaging for rations; and lightweight materials for body armor. ***FY 2012 Accomplishments:*** Developed manufacturing processes for nano-pigment and additives and improved dispersion of the resins to increase performance and reliability of chemical/biological (CB) resistant shelters. Fabricated and demonstrated multiple 600 ft tent structures that meet joint expeditionary collective protection requirements. Developed new generation of scalable and affordable manufacturing processes for lightweight body armor. Demonstrated stacked tooling which reduces costs for bulk manufacturing of organic composite materials and co-curing processes for the X-SAPI body armor system. ***FY 2013 Plans:***	3.386 0	3.966 0	6.500

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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2012	FY 2013	FY 2014
Complete the manufacturing of T6 laminate at 14oz/yd2 for Low Rate Initial Production of shelter fabric; complete and demonstrate the low rate initial production (LRIP) process for lightweight x-SAPI plates for a flexible hybridized body armor solution; demonstrate low-cost rapid prototyping and injection molding techniques for protective mask systems. ***FY 2014 Plans:*** Will demonstrate mature manufacturing processes supporting the production of light-weight x-SAPI plates for flexible hybridized body armor and transition process data to PM SPIE for procurement; will develop manufacturing processes to reduce the cost of developing and producing advanced field medical systems; will develop novel processing techniques for utilizing advanced materials to reduce the weight and increase the performance of Soldier-born systems.			
Title: Advanced Manufacturing Initiatives	3.079	5.852	4.468
Articles:	0	0	
Description: This effort funds manufacturing technology advances needed for affordable model based manufacturing, network centric manufacturing data environments, collaborative manufacturing modeling and simulation, and advanced manufacturing technologies. Work focuses on addressing challenges in areas such as 3D technical data packages for armor systems; providing digital manufacturing capabilities to depots and laboratories, processes and models for data transfer and prototype production; and advanced laser manufacturing techniques for repairing components. ***FY 2012 Accomplishments:*** Developed fully annotated 3D digital technical data packages (TDP) for vehicle passive and protective armor systems that can be used in design and manufacturing production lines. Supported the digital capabilities to depots and labs to facilitate integration, refit and rebuild operations. Developed advanced manufacturing environment. ***FY 2013 Plans:*** Integrate depot planning and rebuild operations within a 3Dimensional TDP; establish interactive S1000D publications (International specification for technical publications utilizing a Common Source Database), manuals and work instructions; identify Type 1 NSNs to link with the 3D TDPs; develop processes and models for demonstrating data transfer and prototype production within a collaborative environment. ***FY 2014 Plans:*** Will transition process for developing and using Digital Work Instruction to select depots to support production operations, will demonstrate the use of MIL-STD-31000 for weapon system production data management; will demonstrate integration of manufacturing planning and machining technologies at select Army organic manufacturing sites.			
Accomplishments/Planned Programs Subtotals	57.607	59.908	56.136

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C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Not applicable for this item.

D. Acquisition Strategy

Not applicable for this item.

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-3, RDT&E Project Cost Analysis: PB 2014 Army		DATE: April 2013
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	All Prior Years	FY 2012 Cost	FY 2012 Award Date	FY 2013 Cost	FY 2013 Award Date	FY 2014 Base Cost	FY 2014 Base Award Date	FY 2014 OCO Cost	FY 2014 OCO Award Date	FY 2014 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
TBD	TBD	TBD:TBD	0.000	57.607	Mar 2013	59.908		56.136	Mar 2014	-		56.136	Continuing	Continuing	Continuing
		Subtotal	0.000	57.607		59.908		56.136		0.000		56.136			

	All Prior Years	FY 2012		FY 2013		FY 2014 Base		FY 2014 OCO		FY 2014 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	57.607		59.908		56.136		0.000		56.136			

Remarks