Exhibit R-2, RDT&E Budget Item Justification: PB 2016 Army											Date: February 2015	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 7: *Operational Systems Development*					R-1 Program Element (Number/Name) PE 0708045A / *End Item Industrial Preparedness Activities*							
COST ($ in Millions)	**Prior Years**	**FY 2014**	**FY 2015**	**FY 2016 Base**	**FY 2016 OCO**	**FY 2016 Total**	**FY 2017**	**FY 2018**	**FY 2019**	**FY 2020**	**Cost To Complete**	**Total Cost**
Total Program Element	-	54.392	76.187	48.442	-	48.442	63.327	61.491	59.660	62.274	Continuing	Continuing
E25: *Mfg Science & Tech*	-	54.392	76.187	48.442	-	48.442	63.327	61.491	59.660	62.274	Continuing	Continuing

Note

FY16 reduced to support higher priority efforts.

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).

Exhibit R-2, RDT&E Budget Item Justification: PB 2016 Army					Date: February 2015
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 7: *Operational Systems Development*			R-1 Program Element (Number/Name) PE 0708045A / *End Item Industrial Preparedness Activities*		
B. Program Change Summary ($ in Millions)	**FY 2014**	**FY 2015**	**FY 2016 Base**	**FY 2016 OCO**	**FY 2016 Total**
Previous President's Budget	56.106	76.225	56.824	-	56.824
Current President's Budget	54.392	76.187	48.442	-	48.442
Total Adjustments	-1.714	-0.038	-8.382	-	-8.382
• Congressional General Reductions	-	-0.038			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.714	-			
• Adjustments to Budget Years	-	-	-8.382	-	-8.382

Exhibit R-2A, RDT&E Project Justification: PB 2016 Army			Date: February 2015
Appropriation/Budget Activity 2040 / 7	R-1 Program Element (Number/Name) PE 0708045A / *End Item Industrial Preparedness Activities*	Project (Number/Name) E25 / *Mfg Science & Tech*	

COST ($ in Millions)	Prior Years	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total	FY 2017	FY 2018	FY 2019	FY 2020	Cost To Complete	Total Cost
E25: *Mfg Science & Tech*	-	54.392	76.187	48.442	-	48.442	63.327	61.491	59.660	62.274	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

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, lethality, 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)	FY 2014	FY 2015	FY 2016
Title: Air Systems	3.100	2.000	5.446
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 2014 Accomplishments: Developed machining, finishing and assembly processes for propulsion system components; demonstrated and transitioned an automated production system for applying nanocrystalline diamond and amorphous carbon coatings to Army aviation systems;developed manufacturing techniques and tooling for ballistically tolerant fuel bladders, taking advantage of advanced modeling and simulation techniques, light-weight/high performance materials and flexible tooling concepts.			
FY 2015 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2016 Army		Date: February 2015
Appropriation/Budget Activity 2040 / 7	**R-1 Program Element (Number/Name)** PE 0708045A / *End Item Industrial Preparedness Activities*	**Project (Number/Name)** E25 / *Mfg Science & Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016
Continue development of manufacturing techniques and tooling for ballistically tolerant fuel bladders; developing direct digital manufacturing for use in aviation propulsion and power generation gas turbine engines allowing for enhanced component designs optimized for performance and weight savings. ***FY 2016 Plans:*** Will continue development of direct digital manufacturing for use in aviation propulsion and power generation gas turbine engines allowing for enhanced component designs optimized for performance and weight savings; will develop AH-64 composite sump manufacturing improvements; will complete the development and demonstration of manufacturing techniques and tooling for ballistically tolerant fuel bladders.			
Title: Ground Maneuver ***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 2014 Accomplishments:*** Transitioned processes for developing and using Digital Work Instruction to select depots to support production operations; demonstrated the use of MIL-STD-31000 for weapon system production data management; demonstrated successful application of Ta-10W liners for medium and small-caliber barrels through live-fire demonstrations and evaluation of liner wear, transitioned the Ta-10W liner application process to Watervliet Arsenal for implementation (This effort contained in the Lethality Portfolio starting in FY15); demonstrated increased yield and reduced missile antenna manufacturing cost through limited production runs and delivered process and technical data to the Cruise Missile Defense Systems Program Office for implementation on future missile systems; demonstrated safer and more cost effective processes for loading explosives in the 120mm Advanced Multi-Purpose munition through limited production runs and transitioned 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 EAPS system program; scaled up manufacturing of low-cost alumina-based ceramic tiles, improved 3D weaving technologies to integrate ceramic tiles of varying thicknesses and demonstrated production of large, single-piece underbody armor solutions to meet objective threat level ballistic requirements; demonstrated manufacturing process maturity for each technology through limited production runs; demonstrated selected high volume, cost effective, manufacturing processes for micro-electro-mechanical systems (MEMS) scale components to allow automated inspection and assembly for safety-and-arm systems (This effort contained in the Lethality Portfolio starting in FY15); developed an automated assembly process resulting in increased throughput and reduced cost of fuel cells for ground vehicle and soldier-born applications; develop gear machining and finishing processes and optimized assembly processes to increase throughput and yield while decreasing the cost for power-take-off systems; developed batch manufacturing of granular IMX-104 to demonstrate scaled-up manufacturing process that reduces	25.910	39.734	15.238

Exhibit R-2A, RDT&E Project Justification: PB 2016 Army		Date: February 2015
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016
production costs and increases throughput and yield of IMX-104; developed mature Wide-Band Gallium Nitride MMIC (Monolithic Microwave Integrated Circuit) manufacturing process in the application of weapon system arrays. ***FY 2015 Plans:*** Developing a limited manufacturing capability in addressing solutions to make magnesium more affordable for lightweight weapon components; identifying and starting development of an economical mass production process for 7.62mm Advanced Armor Piercing (ADVAP) tungsten carbide penetrators with complex geometry systems; developing processing parameters for loading new ALIMX-101 reduced-sensitivity melt-pour and auxiliary charge explosive systems; developing a manufacturing process for producing low cost infrared signature management solutions; continue development of gear machining and finishing processes and optimized assembly processes to increase throughput and yield while decreasing the cost for power-take-off systems; develop equipment for automated assembly of ceramic tile-based armors, mature automated material consolidation techniques for vehicle armor solutions; demonstrate automated assembly process resulting in improved quality control, reduced assembly times and re-work issues, increased throughput and reduced cost of fuel cells for ground vehicle and soldier-born applications; demonstrate low-cost, mature manufacturing processes by conducting limited production runs and prototype builds of advanced armor systems using low-cost ceramics, cast and forged steel and aluminum alloys and hybridized 3D woven composites; demonstrate machining and post-processing techniques to drastically improve the yield and decrease the cost of tungsten-based penetrators; demonstrate batch manufacturing of granular IMX-104 to demonstrate scaled-up manufacturing process that reduces production costs and increases throughput and yield of IMX-104; develop the ability to rapidly and cost-effectively repair high-cost machined items; develop novel methods of producing and inspecting advanced armor system components for next generation ground vehicle applications; develop novel packaging and processing techniques to enable weight and cost reductions in ground-based systems; continue development of mature Wide-Band Gallium Nitride MMIC (Monolithic Microwave Integrated Circuit) manufacturing process in the application of weapon system arrays. ***FY 2016 Plans:*** Will continue development of a manufacturing capability in addressing solutions to make magnesium more affordable for lightweight weapon components; will develop an economical mass production process for 7.62mm Advanced Armor Piercing (ADVAP) tungsten carbide penetrators with complex geometry systems; will continue development of processing parameters for loading new ALIMX-101 reduced-sensitivity melt-pour and auxiliary charge explosive systems; will continue development of a manufacturing process for producing low cost infrared signature management solutions; will initiate development of a scaled up process to produce high energy density 5 volt lithium-ion batteries; will initiate development of a manufacturing pilot line capability for adaptive armor modules; will continue development and demonstration of gear machining and finishing processes and optimized assembly processes to increase throughput and yield while decreasing the cost for power-take-off systems; will develop equipment for automated assembly of ceramic tile-based armors, will mature automated material consolidation techniques for vehicle armor solutions; will demonstrate automated assembly process resulting in increased throughput and reduced cost of fuel cells for ground vehicle and soldier-born applications; will demonstrate machining and post-processing			

Exhibit R-2A, RDT&E Project Justification: PB 2016 Army		Date: February 2015
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016
techniques to improve the yield and decrease the cost of tungsten-based warhead penetrators; will demonstrate mature Wide-Band Gallium Nitride MMIC (Monolithic Microwave Integrated Circuit) manufacturing process in the application of weapon system arrays.			
Title: Lethality (Formerly Precision Munitions and Armament Systems) ***Description:*** The Lethality Systems focus area consists of Advanced Weapon Systems, Fire Control, Logistics, Emerging Technologies and Advanced Energetics and Warheads. ***FY 2015 Plans:*** Validates the manufacturing process to reduce the cost and time associated with applying Ta-10W liners for medium and small caliber chromium-free gun barrels (This effort contained in the Ground Systems portfolio in FY14); continue the demonstration of selected high volume, cost effective, manufacturing processes for micro-electro-mechanical systems (MEMS) scale components (This effort contained in the Ground Systems portfolio in FY14). ***FY 2016 Plans:*** Will develop affordable manufacturing solutions for complex missile seeker components that will shape the missile industry towards cost effective all weather seekers; will develop lower cost material fabrication processes and superior material performance as insulation for rocket nozzles; will demonstrate selected high volume, cost effective, manufacturing processes for micro-electro-mechanical systems (MEMS) scale safe-and-arms components.	-	5.387	1.250
Title: Command, Control, Communications and Intelligence Systems ***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 2014 Accomplishments:*** Demonstrated improved yield and reliability for low light level sensor over multiple production runs; demonstrated manufacturing of large sized high-operating temperature FPAs, increased growth, processing and hybridization yields and delivered 640x480 FPAs for system integration; developed manufacturing processes for reducing the cost and improving performance and reliability of short wave infrared sensors; developed manufacturing processes for reducing the cost and improving performance and reliability of flexible electronics for large area sensors. ***FY 2015 Plans:*** Developing cost-effective manufacturing techniques of high definition class cameras for sniper weapon sights and ground vehicles; continue development of processes, tooling and automation techniques to increase yield, decrease fabrication and	13.691	15.009	8.150

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016
assembly times and reduce cost of miniaturized short-wave infrared cameras; continue development of manufacturing processes for reducing the cost and improving performance and reliability of short wave infrared sensors; continue development of manufacturing processes to fabricate low-defect flexible digital radiography panels, demonstrate techniques for integrating flexible sensors and electronics into circuits for system demonstration; transition growth processing with improved yield for high operating temperature focal plane arrays to ground and airborne platforms; developing packaging improvements of a millimeter wave devices used in radio frequency threat warning applications in air combat platforms; developing optimized process improvements in the manufacturing of large format long-wave, dual -band infrared focal plane arrays. ***FY 2016 Plans:*** Will develop an improved CMOS (complimentary metal-oxide semiconductor) image sensor manufacturing process using PMOS(P-type metal oxide semiconductor) pixel technology at a domestic foundry for the next generation of digital night vision goggles; will execute pilot line runs and refine manufacturing process to reduce cost and power of miniaturized short-wave infrared cameras; will investigate design revisions for cost-effective manufacturing techniques of high definition cameras for sniper weapon sights and ground vehicles; will develop optimized process improvements in the manufacturing of large format longwave, dual -band infrared focal plane arrays; will continue developing packaging improvements of a millimeter wave devices used in radio frequency threat warning applications in air combat platforms; will demonstrate manufacturing processes to fabricate low-defect, flexible digital radiography panels and electronics for system demonstration.			
Title: Soldier Systems ***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 2014 Accomplishments:*** Demonstrated mature manufacturing processes supporting the production of light-weight, next generation small arms protective insert (XSAPI) plates for flexible hybridized body armor and transition process data to PM Soldier Protection and Individual Equipment for procurement; developed novel processing techniques for utilizing advanced materials to reduce the weight and increase the performance of soldier-born systems. ***FY 2015 Plans:*** Developing process control techniques based on unique thermal and mechanical properties of polyethylene films;; establishing a domestic manufacturing base for high efficiency, lightweight and foldable solar panel production in order to reduce unit cost with	3.730	6.000	2.630

Exhibit R-2A, RDT&E Project Justification: PB 2016 Army		Date: February 2015
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016
higher throughput production; developing a scaled manufacturing process to lower costs and achieve high volume production of the lower-cost flame retardant materials with biocidal modular insulation panels. ***FY 2016 Plans:*** Will continue developing process control techniques based on unique thermal and mechanical properties of polyethylene films; will continue development of a scaled manufacturing process to lower costs and achieve high volume production of the lower-cost flame retardant materials with biocidal modular insulation panels.			
Title: Innovation Enablers (Formerly Advanced Manufacturing Initiatives) ***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 2014 Accomplishments:*** Demonstrated integration of manufacturing planning and machining technologies at select Army organic manufacturing sites. ***FY 2015 Plans:*** Demonstrating digital data driven manufacturing of prototype systems; deploying the use of standard machine language and protocols to monitor machine performance to predict quality issues and optimize production rates for high-volume items; establishing and demonstrating the use of a common machine tool library for cross-Army utilization; developing and qualifying additive fabrication and reclamation processes for use on Army components; developing additive manufacturing techniques to establish a validated repair procedure for high value aviation components; developing a flexible and agile common fuze manufacturing process utilizing 2D and 3D printing and additive manufacturing technologies as applied to energetic materials with integrated electronics. ***FY 2016 Plans:*** Will begin development to expand existing MBE efforts in techniques to capture, standardize and reuse tech data across weapon system product life cycles; will continue developing additive manufacturing techniques to establish a validated repair procedure for high value aviation components; will continue developing a flexible and agile common fuze manufacturing process utilizing 2D and 3D printing and additive manufacturing technologies as applied to energetic materials with integrated electronics; will continue to develop and qualify additive fabrication and reclamation processes for use on Army components; will demonstrate digital data driven manufacturing of prototype systems, deploy the use of standard machine language and protocols to monitor machine	7.961	8.057	15.728

Exhibit R-2A, RDT&E Project Justification: PB 2016 Army		Date: February 2015
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016
performance to predict quality issues and optimize production rates for high-volume items, and establish and demonstrate the use of a common machine tool library for cross-Army utilization.			
Accomplishments/Planned Programs Subtotals	54.392	76.187	48.442

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

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2016 Army		Date: February 2015
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2014 Cost	FY 2014 Award Date	FY 2015 Cost	FY 2015 Award Date	FY 2016 Base Cost	FY 2016 Base Award Date	FY 2016 OCO Cost	FY 2016 OCO Award Date	FY 2016 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
TBD	Various	TBD : TBD	57.607	54.392		76.187		48.442	Mar 2016	-		48.442	-	236.628	-
		Subtotal	57.607	54.392		76.187		48.442		-		48.442	-	236.628	-

	Prior Years	FY 2014		FY 2015		FY 2016 Base		FY 2016 OCO		FY 2016 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	57.607	54.392		76.187		48.442		-		48.442	-	236.628	-

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2016 Army		Date: February 2015
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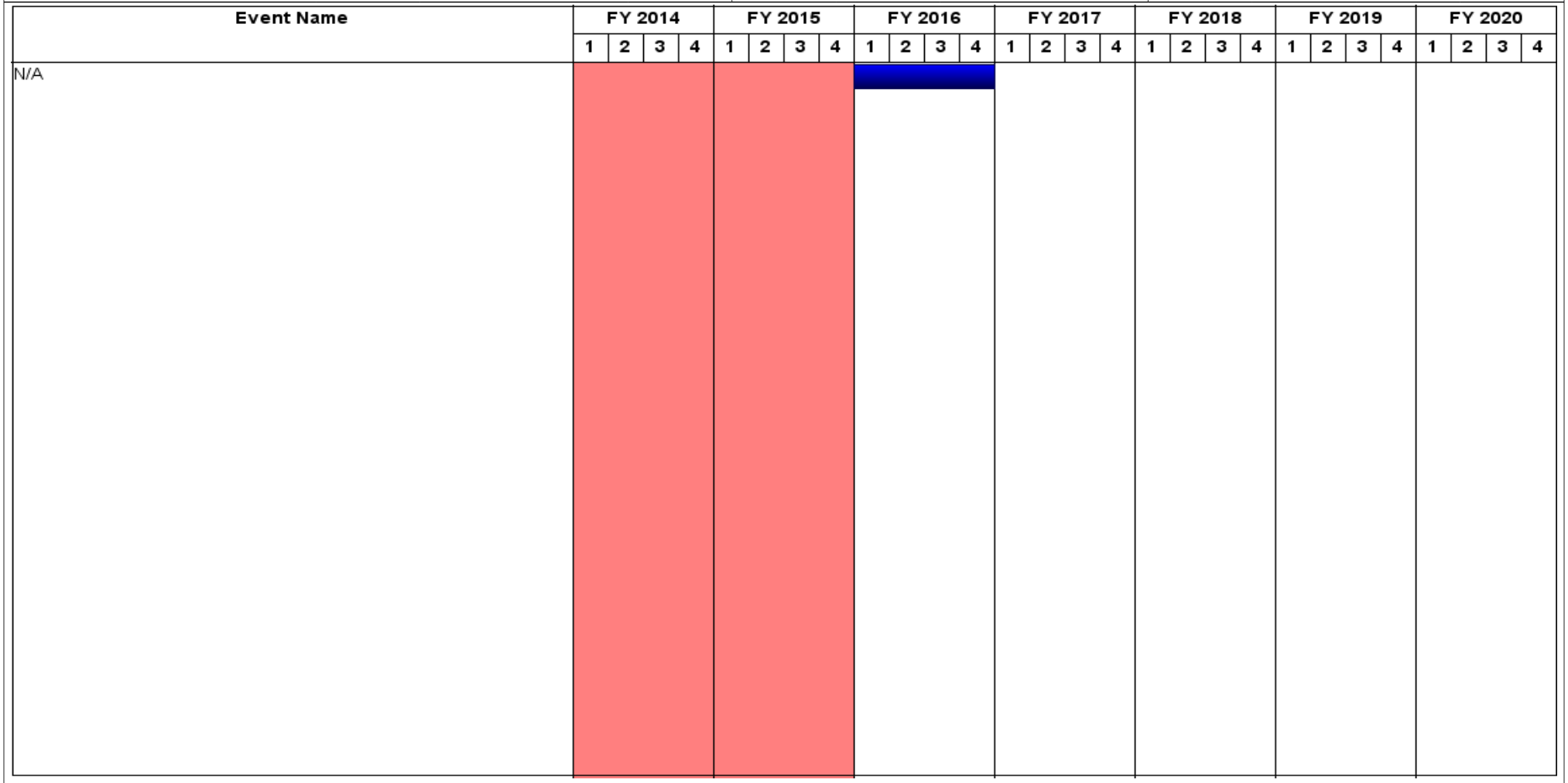

Exhibit R-4A, RDT&E Schedule Details: PB 2016 Army		Date: February 2015
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Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
N/A	1	2016	4	2016