Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army											Date: March 2019	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 5: *System Development & Demonstration (SDD)*					R-1 Program Element (Number/Name) PE 0604746A *I Automatic Test Equipment Development*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	-	7.054	11.782	10.915	-	10.915	9.880	4.055	4.135	3.619	Continuing	Continuing
L59: *Diagnost/Expert Sys*	-	5.679	6.070	6.369	-	6.369	5.946	0.000	0.000	0.000	0.000	24.064
L65: *Test Equipment Development*	-	1.375	5.712	4.546	-	4.546	3.934	4.055	4.135	3.619	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program element (PE) provides for development and testing of general-purpose test equipment, state-of-the-art diagnostics and prognostics technologies, and software and systems to support the increasingly complex electronic components of the Army's new and upgraded weapon systems. It focuses on implementation of commercial test and diagnostic technologies across multiple weapon platforms to minimize the cost of troubleshooting and maintenance of Army equipment in the field. Funding supports modernization of the test equipment fleets by investigating technology insertions including, but not limited to condition based maintenance, instrument reduction/miniaturization, electro-optics (EO), radio frequency (RF), and other emerging technologies. Funding also supports development of initial prototypes to enable refinement of Operational Requirements and early user feedback to support future sustainment and testing capabilities required for emerging weapons platforms.

Modular, reconfigurable automatic and semi-automatic systems are being developed under this program to satisfy weapon system test and diagnostics requirements. The Next Generation Automatic Test System (NGATS) provides state-of-the-art test and diagnostic capabilities to support current and future weapon systems. It is the platform for transitioning Agile Rapid Global Combat Support System (ARGCS) technologies into the Army weapon system support structure, and it will replace several aging automatic test systems (ATS) that are becoming prohibitively expensive to operate and maintain.

This PE also provides for continued development and improvement of general-purpose test equipment and calibration standards with emphasis on the incorporation of digital electronics and tailoring of configurations to improve deployability, mobility and survivability of the support equipment. It includes development, demonstration and testing of calibration standards and techniques to support new Army test equipment requirements. It provides for feasibility studies, market research, inventory analyses, bid sample testing and prototyping to support acquisition of calibration systems and general-purpose test and diagnostics equipment.

FY 2020 Base funding for this PE continues incremental development of the Army's standard NGATS which will improve deployability and mobility of test and diagnostic equipment. The NGATS provides state-of-the-art test and diagnostic capabilities and a means for reducing the Army's test equipment operating and support costs and the costs for supporting a number of the Army's vital warfighting systems. The FY 2020 funding will develop or significantly modify test equipment to satisfy modular force and homeland security support requirements that cannot be accommodated with test equipment currently available in the commercial marketplace such as RF and EO testing capability. It will also provide for technology insertions to modernize the Army's standard at-system tester to meet test and diagnostic requirements of the supported weapon systems, develop/redesign test program sets and hardware for support of legacy and emerging weapon systems, develop a network centric software framework for NGATS, and develop and test general-purpose test equipment and calibration standards to meet Army weapon system support requirements.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Army					Date: March 2019
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 5: *System Development & Demonstration (SDD)*			R-1 Program Element (Number/Name) PE 0604746A *I Automatic Test Equipment Development*		
B. Program Change Summary ($ in Millions)	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**
Previous President's Budget	8.344	13.297	10.915	-	10.915
Current President's Budget	7.054	11.782	10.915	-	10.915
Total Adjustments	-1.290	-1.515	0.000	-	0.000
• Congressional General Reductions	-0.005	-0.015			
• Congressional Directed Reductions	-1.029	-1.500			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.256	-			

Change Summary Explanation

FY 2018 - $1.029 million Congressional reduction due to historical underexecution; FY 2019 - $1.500 million Congressional reduction due to prior year carryover.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604746A / *Automatic Test Equipment Development*	Project (Number/Name) L59 / *Diagnost/Expert Sys*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
L59: *Diagnost/Expert Sys*	-	5.679	6.070	6.369	-	6.369	5.946	0.000	0.000	0.000	0.000	24.064
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project funds development of and system enhancements for the Next Generation Automatic Test System (NGATS) and the Maintenance Support Device (MSD). The NGATS is a general-purpose automatic test system (ATS) that provides test and diagnostic capabilities required to support current and future weapons and combat support systems and will facilitate retirement of aging and obsolete test equipment that is imposing increasing logistics and operations and support cost burdens. It is the platform for transitioning Agile Rapid Global Combat Support System (ARGCS) Advanced Concept Technology Demonstration (ACTD) technologies into the Army weapon system support structure. The ARGCS ACTD initiative was sponsored by the Department of Defense, and all Services are expected to transition demonstrated technologies into their ATS programs. The MSD is the Army's standard at-system tester and requires continuing technology insertions to support modernization of the supported weapon systems. This Project funds development efforts to insert the most current relevant technology into the next generation MSD, supports capability enhancement of wireless at-platform test set (WATS) connectivity, develops capabilities to minimize or eliminate Army dependency on expensive proprietary software to support tactical vehicles, and maintains compatibility with emerging platform hardware bus technology and software interface requirements. This Project also provides for continuing efforts in the development and testing of common procedures utilizing existing test program sets and software applications, and market surveys of commercially available test equipment, methods and procedures to determine applicability to Army requirements. The test and diagnostic systems and procedures developed under this Project are essential for ensuring the operational readiness, accuracy and effectiveness of the Army's warfighting systems.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Next Generation Automatic Test System (NGATS) Radio Frequency (RF) Test Capability	1.000	1.000	0.500	-	0.500
Description: Develop and integrate NGATS RF test capability ***FY 2019 Plans:*** Continue prototyping and integration of RF subsystem into the NGATS, specifically the RF Interface Unit and the full-rate production NGATS configuration. Develop RF software libraries to support programs such as Counter Radio-Controlled Improvised Explosive Device (RCIED) Electronic Warfare (CREW)/Duke, TPQ-53 Radar and other emerging weapons systems. ***FY 2020 Base Plans:*** Continue to develop RF software libraries to support communication, mapping and radar applications in fielded ground systems. Redesign RF interface to include new requirements and expanded mission capabilities. Evaluate and incorporate new state-of-the-art sources for more accurate measurements. ***FY 2019 to FY 2020 Increase/Decrease Statement:***					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 5	**R-1 Program Element (Number/Name)** PE 0604746A / *Automatic Test Equipment Development*	**Project (Number/Name)** L59 / *Diagnost/Expert Sys*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Decrease of $.500 million from FY2019 to FY2020 because of higher priority software development required for weapon system support.					
Title: NGATS Increment 2 ***Description:*** Develop and test hardware and software for NGATS Increment 2 support capability ***FY 2019 Plans:*** Continue development and testing of hardware and software for support of emerging required capabilities such as high-speed digital, fiber channel, high-speed Ethernet and serial busses, and high power test (600V). Develop new software libraries to utilize instrument functions. ***FY 2020 Base Plans:*** Continue development and testing of state-of-the-art hardware and software for support of emerging required capabilities to support the Armored Brigade Combat Teams (ABCT). New ABCT requirements include high-speed digital, fiber channel, high-speed Ethernet and serial busses, and high power test (600V). Develop new software libraries to utilize instrument functions. Develop and implement dynamic switching capability.	0.382	0.500	0.500	-	0.500
Title: NGATS Electro-Optics (EO) Subsystem ***Description:*** Develop and test hardware and software for NGATS electro-optics (EO) subsystem (to include the capability to support new ground and aerial sensors for unmanned air and ground vehicles) ***FY 2019 Plans:*** Complete integration/testing of EO subsystem. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** No funding required for this effort in FY2020.	0.700	0.700	-	-	-
Title: Additional Software Capabilities for Use with NGATS ***Description:*** Develop software capabilities to incorporate common logistics operating environment/netcentric and embedded diagnostics data collection and analysis for closed loop diagnostic maintenance in support of condition-based maintenance ***FY 2019 Plans:*** Continue development of new and emerging netcentric architecture. Continue development of software architecture that will define the transport protocol to interface to DoD common logistics environments and	0.127	0.200	0.200	-	0.200

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 5	**R-1 Program Element (Number/Name)** PE 0604746A / *Automatic Test Equipment Development*	**Project (Number/Name)** L59 / *Diagnost/Expert Sys*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Logistics Modernization Program (LMP). Continue development and improvement of data packages to include health management information. ***FY 2020 Base Plans:*** Continue development of new and emerging netcentric architecture. Continue development of software architecture that will define the transport protocol to interface to DoD common logistics environments and LMP. Continue development and improvement of data packages to include health management information. Develop software to support condition-based maintenance (CBM)+.					
Title: NGATS Performance Enhancement ***Description:*** NGATS core instrument/software modifications to increase NGATS performance ***FY 2019 Plans:*** Continue obsolescence identification and mitigation; continue analysis of system reliability and performance; identify bad actors and propose and integrate upgrades to increase readiness. Analyze new requirements from emerging weapons systems and implement system upgrades through hardware and software to meet platform testing requirements. Continue implementation and test of controller upgrade to increase processor speed to support Win10 implementation. Redesign cables for better logistic support and cost savings. ***FY 2020 Base Plans:*** Continue obsolescence identification and mitigation; continue analysis of system reliability and performance; identify bad actors and propose and integrate upgrades to increase readiness. Analyze new requirements from emerging weapons systems and implement system upgrades through hardware and software to meet platform testing requirements. Evaluate Peripheral Component Interconnect (PCI) Extensions for Instrumentation (PXI) technology incorporation to increase performance and reduce station life cycle cost. Develop programmable ethernet technology. Develop high speed 1553 bus technology to support line replaceable units. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase of $0.200 million from FY2019 to FY2020 to enable timely implementation of modifications needed to meet weapon system support requirements.	0.096	0.500	0.700	-	0.700
Title: Abrams/Bradley Test Program Set (TPS) Design ***Description:*** Design, test and evaluate Abrams/Bradley TPSs to utilize modern core NGATS instrumentation vice continuing to execute on single-purpose instrumentation specifically developed to emulate Abrams/Bradley legacy test equipment (i.e., Direct Support Electrical System Test Set (DSESTS))	1.800	1.000	2.400	-	2.400

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 5	**R-1 Program Element (Number/Name)** PE 0604746A / *Automatic Test Equipment Development*	**Project (Number/Name)** L59 / *Diagnost/Expert Sys*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
FY 2019 Plans: Continue redesign of Abrams/Bradley TPSs to execute on core commercial NGATS instrumentation versus continuing to execute on single-purpose instrumentation specifically developed for testing Abrams/Bradley line replaceable units (LRU). ***FY 2020 Base Plans:*** Continue redesign of Abrams/Bradley TPSs to execute on core commercial NGATS instrumentation versus continuing to execute on single-purpose instrumentation specifically developed for testing Abrams/Bradley LRUs. Redesign interconnect devices (ICD) to incorporate printed circuit boards and ribbon cables to reduce cost and maintenance. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase of $1.400 million from FY2019 to FY2020 to accommodate priority of elimination of single purpose hardware to achieve cost avoidances in production and sustainment.					
Title: Electro-Optic (EO) TPS Development ***Description:*** Develop Increment 2 and 3 EO TPSs for use with NGATS EO asset to utilize (Army standard) core NGATS instrumentation vice legacy automatic test systems such as DSESTS and Base Shop Test Facility (BSTF)(V)5 ***FY 2019 Plans:*** Continue development of re-hosted EO TPSs to include 2 each Common Remotely Operated Weapons Station (CROWS) and 2 each Stryker Remote Weapons Station. ***FY 2020 Base Plans:*** Develop and rehost EO TPSs in support of the ABCT to include CROWS low profile in improved gunners primary site, laser range finding and forward looking infrared (FLIR).. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase of $0.050 million from FY2019 to FY2020 to allow completion of this effort as scheduled.	0.250	0.250	0.300	-	0.300
Title: NGATS Logistics Support Products ***Description:*** Develop NGATS initial logistics support products (including provisioning, technical manuals and calibration)	0.200	0.250	0.200	-	0.200

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 5	**R-1 Program Element (Number/Name)** PE 0604746A / *Automatic Test Equipment Development*	**Project (Number/Name)** L59 / *Diagnost/Expert Sys*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
FY 2019 Plans: Continue development of NGATS EO and RF logistics products for use with the full-rate production NGATS. ***FY 2020 Base Plans:*** Continue development of NGATS EO and RF logistics products for use with the full-rate production NGATS. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Decrease of $0.050 million from FY2019 to FY2020 to account for availability of funding.					
Title: Maintenance Support Device (MSD) Technology Enhancements ***Description:*** Modernizes the current MSD fleet by investigating and Incorporating relevant technology into the next-generation MSD and supporting capability enhancement of the wireless at-platform test set (WATS). Develops capabilities to minimize or eliminate Army dependency on proprietary software to support tactical vehicles and maintain compatibility with emerging platform hardware bus technology and software interface requirements. ***FY 2019 Plans:*** Investigate and validate the emerging hardware and software technology and suitability for use in the next generation of MSD and WATS. Test, develop technical data package, and insert innovative technology into the Army's at-platform test and diagnostic requirements to support new weapon systems and engineering changes to existing weapon system/platform interface. ***FY 2020 Base Plans:*** Initiate next generation MSD market research. Incorporate greater range of supported weapons system diagnostic code fault detection into diagnostic software to support tactical vehicle sustainment concepts and ensure data bus compatibility and readability. Investigate emerging interactive electronic technical manual (IETM) viewer environments for use with future generation MSD.	0.633	0.633	0.633	-	0.633
Title: NGATS Simulation Environment ***Description:*** Develop a simulation environment that will allow development and testing of TPSs on a desktop environment ***FY 2019 Plans:***	-	0.200	0.500	-	0.500

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 5	**R-1 Program Element (Number/Name)** PE 0604746A / *Automatic Test Equipment Development*	**Project (Number/Name)** L59 / *Diagnost/Expert Sys*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Initiate development of an NGATS simulation environment to allow TPS developers and contractors to develop and test TPSs on a desktop environment. Environment will allow for a cost-effective way to develop, maintain and troubleshoot TPSs off station. Develop desktop training environment for TPS developers and maintainers. ***FY 2020 Base Plans:*** Continue development of an NGATS simulation environment to allow TPS developers and contractors to develop and test TPSs on a desktop environment. Environment will allow for a cost-effective way to develop, maintain and troubleshoot TPSs off station. Develop desktop training environment for TPS developers and maintainers. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase of $0.300 million from FY2019 to FY2020 to account for availability of funding and priority of this effort.					
Title: TPS Development Environment ***Description:*** Develop a standardized TPS development environment for NGATS ***FY 2019 Plans:*** Continue development on the C-Oriented Test Executive (COTE) TPS development software for NGATS. Continue development of test executive that is standard and compliant with DoD initiatives, framework working group and the Automatic Test Equipment Management Board (AMB). Standardized test executive will promote long-term maintainability of TPSs. ***FY 2020 Base Plans:*** Continue development on the COTE TPS development software for NGATS. Continue development of test executive that is standard and compliant with DoD initiatives, framework working group and the AMB. Standardized test executive will promote long-term maintainability of TPSs. Develop graphical (visual) capability for TPS development which includes graphical libraries. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Decrease of $0.148 million from FY2019 to FY2020 because of higher priority funding requirements.	0.300	0.484	0.336	-	0.336
Title: Anti-Tamper/Cyber Security ***Description:*** Develop an Anti-Tamper/Cyber Security software capability for NGATS ***FY 2019 Plans:***	0.191	0.078	0.100	-	0.100

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 5	**R-1 Program Element (Number/Name)** PE 0604746A / *Automatic Test Equipment Development*	**Project (Number/Name)** L59 / *Diagnost/Expert Sys*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Continue development of Anti-Tamper/Cyber Security (AT/CS) software capability for NGATS. Continue to upgrade existing hardware and software with constantly changing security and information assurance requirements. Upgrade to Win10 operating system to include Trusted Platform Module (TPM) 2.0. ***FY 2020 Base Plans:*** Continue development of AT/CS software capability for NGATS. Continue to upgrade existing hardware and software with constantly changing security and information assurance requirements. Upgrade to Win10 operating system to include TPM 2.0. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Increase of $0.022 million from FY2019 to FY2020 to account for availability of funding.					
Title: FY 2019 SBIR/STTR Transfer ***Description:*** FY 2019 SBIR/STTR Transfer ***FY 2019 Plans:*** SBIR/STTR ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Adjusted for FY 2019 SBIR/STTR Transfer.	-	0.275	-	-	-
Accomplishments/Planned Programs Subtotals	5.679	6.070	6.369	-	6.369

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• MB4000: *Integrated Family Of Test Equipment (IFTE)*	36.644	82.037	76.980	1.395	78.375	78.661	78.227	-	-	0.000	353.944

Remarks

D. Acquisition Strategy

This developmental Project consists of organic and contractual actions. When the necessary expertise and capability are available within the Department of Defense, services required for the individual development projects are ordered from the government source; otherwise, commercial contracts are used. Equipment required for developmental projects is obtained by contract from the commercial supplier. Developmental efforts for the Next Generation Automatic Test System (NGATS) are being completed under a number of contracts awarded to the prime contractor for the Integrated Family of Test Equipment off-platform testers and other contractors with

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
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automatic test equipment (ATE) and test program set development capabilities. NGATS is following an evolutionary acquisition strategy using incremental development to satisfy Army depot and field testing requirements for new and existing systems. It will replace existing legacy Army ATE (i.e., Base Shop Test Facility (BSTF)(V)3, BSTF(V)5, and Direct Support Electrical System Test Set) as well as Army depot system-specific ATE.

E. Performance Metrics

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army			Date: March 2019
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Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Management	Various	Various : Various	0.350	0.246		0.253	Jan 2019	-		-		-	0.000	0.849	-
		Subtotal	0.350	0.246		0.253		-		-		-	0.000	0.849	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Software Development/ Verification/Validation	Various	Various, : Various	38.288	2.110		2.015	Feb 2019	3.420	Feb 2020	-		3.420	Continuing	Continuing	Continuing
Hardware/Support Items Development	Various	Various, : Various	69.115	2.343		2.777	Jan 2019	2.319	Jan 2020	-		2.319	Continuing	Continuing	Continuing
FY 2019 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.275		-		-		-	0.000	0.275	-
		Subtotal	107.403	4.453		5.067		5.739		-		5.739	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Technical Support	Various	Various, : Various	50.485	0.540		0.550	Jan 2019	0.460	Dec 2019	-		0.460	Continuing	Continuing	Continuing
Other Direct	Various	Various, : Various	4.390	0.240		0.200	Jan 2019	0.170	Dec 2019	-		0.170	Continuing	Continuing	Continuing
		Subtotal	54.875	0.780		0.750		0.630		-		0.630	Continuing	Continuing	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental/ Operational Testing	Various	Various, : Various	2.896	0.200		-		-		-		-	0.000	3.096	-
		Subtotal	2.896	0.200		-		-		-		-	0.000	3.096	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army			Date: March 2019
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Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract

Remarks

Test program set (TPS) and contractor developmental test and evaluation are included in the product development cost.

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	165.524	5.679		6.070		6.369		-		6.369	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 5	**R-1 Program Element (Number/Name)** PE 0604746A / *Automatic Test Equipment Development*	**Project (Number/Name)** L59 / *Diagnost/Expert Sys*

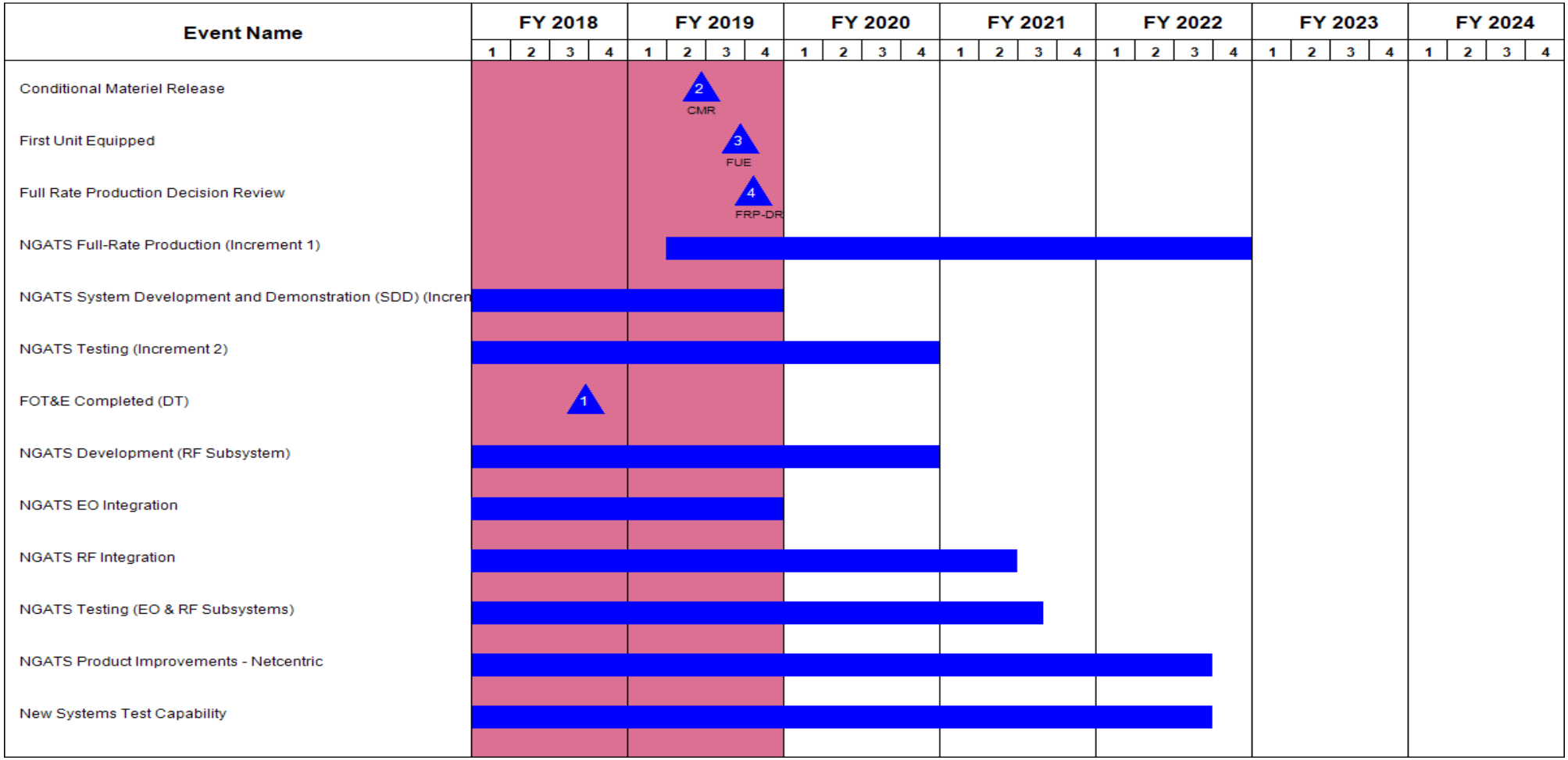

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 5	**R-1 Program Element (Number/Name)** PE 0604746A / *Automatic Test Equipment Development*	**Project (Number/Name)** L59 / *Diagnost/Expert Sys*

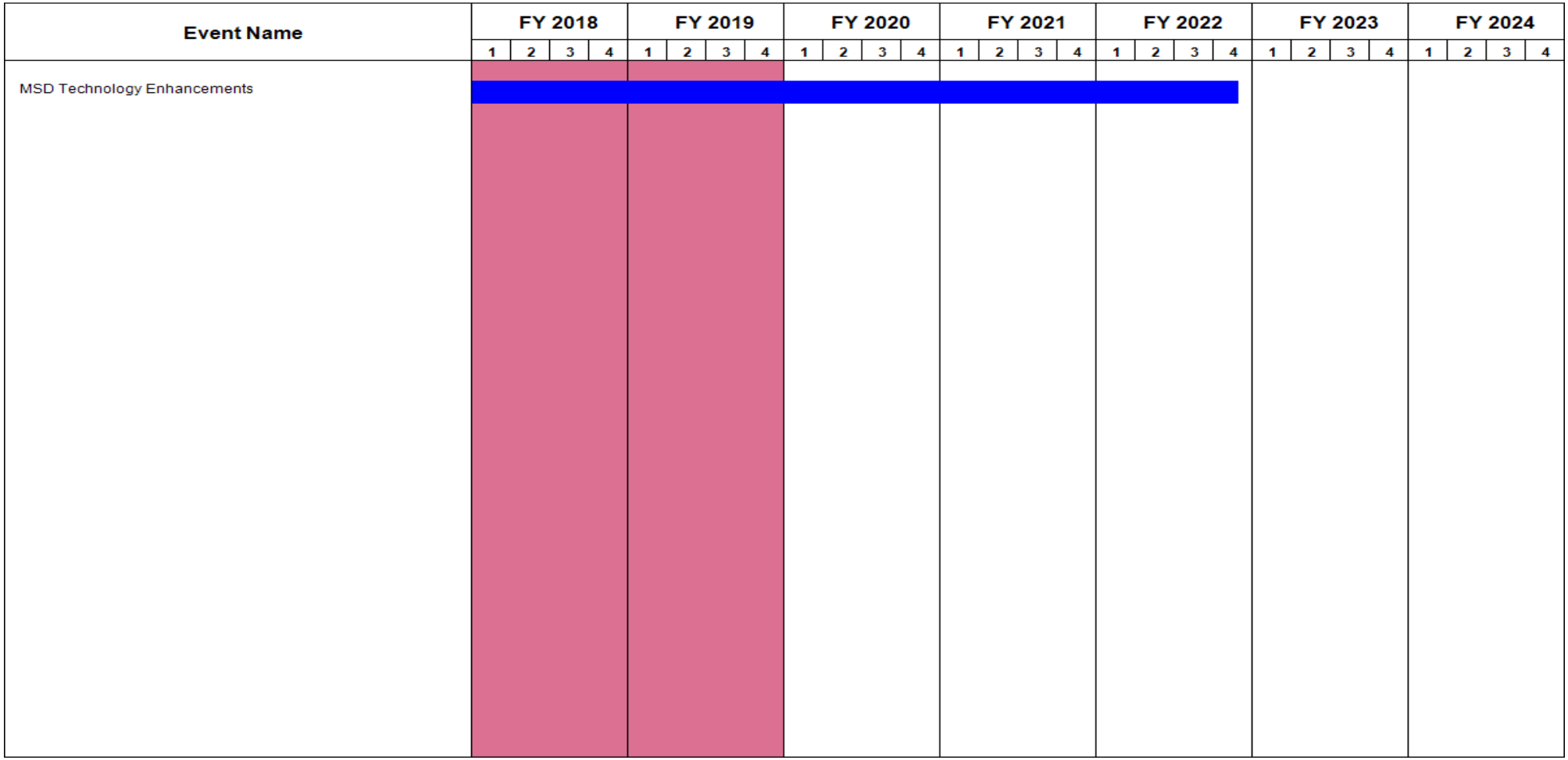

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 5	**R-1 Program Element (Number/Name)** PE 0604746A / *Automatic Test Equipment Development*	**Project (Number/Name)** L59 / *Diagnost/Expert Sys*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
NGATS Testing (Increment 1)	1	2011	1	2012
Production for First Article	1	2015	2	2017
Conditional Materiel Release	2	2019	2	2019
First Unit Equipped	3	2019	3	2019
Full Rate Production Decision Review	4	2019	4	2019
NGATS Testing (Increment 1 Follow-On DT/OT)	1	2016	3	2016
NGATS Full-Rate Production (Increment 1)	2	2019	4	2022
NGATS System Development and Demonstration (SDD) (Increment 2)	1	2016	4	2019
NGATS Testing (Increment 2)	1	2016	4	2020
FOT&E Completed (DT)	3	2018	3	2018
NGATS Development (EO Subsystem)	4	2010	4	2015
NGATS Development (RF Subsystem)	1	2016	4	2020
NGATS EO Integration	3	2016	4	2019
NGATS RF Integration	3	2017	2	2021
NGATS Testing (EO & RF Subsystems)	1	2016	3	2021
NGATS Product Improvements - Netcentric	1	2016	3	2022
New Systems Test Capability	1	2016	3	2022
MSD Technology Enhancements	1	2016	4	2022

Note

Test program set (TPS) compatibility testing runs continually throughout the product development process.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army			Date: March 2019
Appropriation/Budget Activity 2040 / 5	R-1 Program Element (Number/Name) PE 0604746A / *Automatic Test Equipment Development*	Project (Number/Name) L65 / *Test Equipment Development*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
L65: *Test Equipment Development*	-	1.375	5.712	4.546	-	4.546	3.934	4.055	4.135	3.619	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project supports modernization of calibration instruments, techniques, and existing Army calibration systems by investigating technology insertions including automated and autonomous operations and other emerging technologies. Funding also supports developing initial prototypes to enable refinement of Operational Requirements and early user feedback to support future calibration systems and general-purpose test, measurement and diagnostic equipment (TMDE) acquisitions. This project develops calibration software and calibration capability for electro-optical, chemical, biological agent, radiation sourcing and detection systems, signal measurement from direct current to microwave ranges, physical and mechanical measurements such as torque, pressure, and temperature, and improvements in test and measurement performance envelopes. This Project provides for product improvements and development/evaluation of advanced technologies to increase reliability of calibration systems and general-purpose TMDE. The product improvements eliminate gaps in existing organic capabilities and ensure operational readiness and safety of Army weapons and combat support systems. These improvements employ reconfigurable open-electronics architecture and computer-based instrumentation where feasible and focus on reduced test equipment footprints to improve deployability and mobility in areas of operation.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: Calibration Sets (CALSETS) Software Environment and Calibration Procedures	0.200	0.351	0.306	-	0.306
Description: Develop and test an Army automated calibration environment and develop calibration procedures. Test and evaluate automated calibration equipment software efforts in support of the Army risk management framework (RMF).					
FY 2019 Plans: Conclude development of calibration procedures and enhanced calibration environment. Continue test and evaluation of RMF compliance.					
FY 2020 Base Plans: Develop Army calibration enterprise data collection and analysis for obsolescence planning gaps and TMDE readiness.					
FY 2019 to FY 2020 Increase/Decrease Statement:					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 5	**R-1 Program Element (Number/Name)** PE 0604746A / *Automatic Test Equipment Development*	**Project (Number/Name)** L65 / *Test Equipment Development*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
FY2020 decrease of $0.045 million accounts for reduction in Army calibration environment code development and focuses on enterprise connectivity efforts.					
Title: Physical Instruments ***Description:*** Research, develop, and test physical parameter calibration instrumentation to support areas such as force, torque, radiological, chemical/biological agent detection systems, night vision testers, small arms gages, pneumatic pressure systems, and temperature related to target detection in the infrared spectrum.. ***FY 2019 Plans:*** Complete development and testing of prototype small arms gage calibration standards. Complete development and testing of calibration systems for biological agent detectors and protective equipment. Initiate tests of pneumatic standards to support avionics systems. Perform market research, evaluate commercial equipment, and complete specifications for acquisition. ***FY 2020 Base Plans:*** Perform air speed correlation study; develop infrared emissivity corrections for infrared systems calibration; develop radiation sources for NexGen radiation detector calibration; test and evaluate high torque multipliers for ground and aviation platforms. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY2020 increase of $1.240 million required for development of calibration capability for emerging Army radiation detection systems.	0.648	0.791	2.031	-	2.031
Title: Electrical Instruments ***Description:*** Research, develop, and test electrical parameter calibration instrumentation to support areas such as intrinsic electrical standards, electrical transport standards and electro-optic standards. ***FY 2019 Plans:*** Complete development and test of electro-optic sources. Continue development and test of calibration standards and techniques for automated high accuracy calibration of attenuation, power, resistance, and phase noise. ***FY 2020 Base Plans:***	0.348	1.943	1.824	-	1.824

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Develop precision DC volt standards; develop test equipment for 5G communications networks; test and evaluate TMDE prototypes for ultraviolent irradiance, high energy laser and fiber-optic networks. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY2020 funding enables test and evaluation of systems developed in FY2019 and is decreased by $0.119 million to provide funding for higher priority projects.					
Title: Test Equipment Modernization (TEMOD) ***Description:*** Perform market research, bid sample testing and evaluation of commercial general-purpose electronic test equipment (GPETE), and develop performance specifications for TEMOD acquisitions. ***FY 2019 Plans:*** Perform market research and evaluation of commercial GPETE and validate performance specifications for improved test equipment. The market research will be expanded to cover emerging synthetic instrumentation to potentially replace multiple pieces of GPETE within one platform. Conduct bid sample testing to support acquisition program. Funding of $2.400 million is slated for six Other Transaction Authority (OTA) prototype TS-4549 Radio Test Sets that will be used for testing and down select to final vendor. ***FY 2020 Base Plans:*** Perform market research and evaluation of commercial GPETE and validate performance specifications for improved test equipment. The market research will be expanded to cover emerging synthetic instrumentation to potentially replace multiple pieces of GPETE within one platform. Conduct bid sample testing to support acquisition program. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** Decrease in FY2020 accounts for completion of RDTE funding requirement for the OTA prototype TS-4549 Radio Test Set.	0.179	2.423	0.385	-	0.385
Title: FY 2019 SBIR/STTR Transfer ***Description:*** FY 2019 SBIR/STTR Transfer ***FY 2019 Plans:*** SBIR/STTR ***FY 2019 to FY 2020 Increase/Decrease Statement:***	-	0.204	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2020 Army		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Adjusted for FY 2019 SBIR/STTR Transfer.					
Accomplishments/Planned Programs Subtotals	1.375	5.712	4.546	-	4.546

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• N10000: *Calibration Sets Equipment*	5.564	4.270	3.030	-	3.030	2.514	9.882	2.650	2.326	Continuing	Continuing
• N11000: *Test Equipment Modernization (TEMOD)*	7.771	9.806	16.415	-	16.415	7.868	10.100	7.164	6.403	Continuing	Continuing

Remarks

D. Acquisition Strategy

Projects focus on commercial and nondevelopmental item technologies. Department of Defense services provide programmatic, engineering expertise and capability for individual development projects; otherwise, commercial service contracts are used to obtain required capabilities. Equipment required for development projects is obtained from commercial suppliers. Candidate commercial equipment and nondevelopmental items are identified and evaluated through market research and government test and evaluation.

E. Performance Metrics

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army			Date: March 2019
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Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
In-house Engineering	SS/ Various	Various : Various	6.376	0.129		0.162	Dec 2018	-		-		-	0.000	6.667	-
		Subtotal	6.376	0.129		0.162		-		-		-	0.000	6.667	N/A

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
CALSETS Software Environment and Calibration	Various	Various : Various	7.052	0.074		0.139	Jan 2019	0.121	Feb 2020	-		0.121	Continuing	Continuing	-
Physical Instruments	Various	Various : Various	7.839	0.343		0.403	Feb 2019	1.156	Feb 2020	-		1.156	Continuing	Continuing	-
Electrical Instruments	Various	Various : Various	10.361	0.163		1.094	Feb 2019	1.032	Mar 2020	-		1.032	Continuing	Continuing	-
Test Equipment Modernization	Various	Various : Various	0.995	0.107		1.454	Jan 2019	0.231	Feb 2020	-		0.231	Continuing	Continuing	-
FY 2019 SBIR/STTR Transfer	TBD	Various : Various	-	-		0.204		-		-		-	0.000	0.204	-
		Subtotal	26.247	0.687		3.294		2.540		-		2.540	Continuing	Continuing	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Contract Engineering	C/FFP	Various : Various	2.538	0.100		0.195	Feb 2019	0.311	Feb 2020	-		0.311	Continuing	Continuing	-
		Subtotal	2.538	0.100		0.195		0.311		-		0.311	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Army			Date: March 2019
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Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
CALSETS Software Environment and Calibration	Various	Various : Various	1.554	0.049		0.093	Apr 2019	0.081	Feb 2020	-		0.081	Continuing	Continuing	-
Physical Instruments	Various	Various : Various	2.507	0.229		0.269	Mar 2019	0.772	Feb 2020	-		0.772	Continuing	Continuing	-
Electrical Instruments	Various	Various : Various	2.376	0.109		0.730	Mar 2019	0.688	Mar 2020	-		0.688	Continuing	Continuing	-
Test Equipment Modernization	Various	Various : Various	0.895	0.072		0.969	Feb 2019	0.154	Feb 2020	-		0.154	Continuing	Continuing	-
		Subtotal	7.332	0.459		2.061		1.695		-		1.695	Continuing	Continuing	N/A

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	42.493	1.375		5.712		4.546		-		4.546	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Army		Date: March 2019
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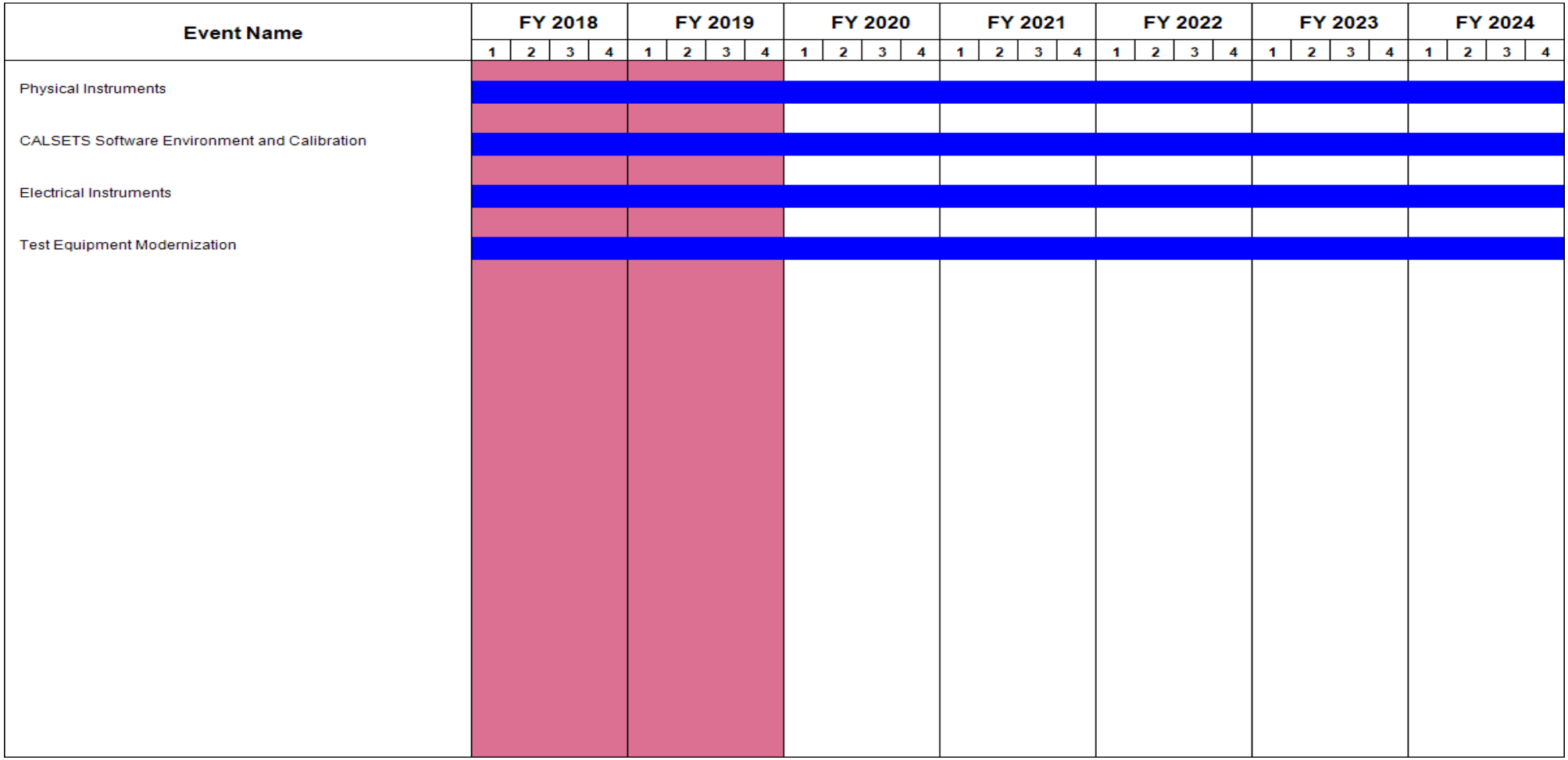

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Army		Date: March 2019
Appropriation/Budget Activity 2040 / 5	**R-1 Program Element (Number/Name)** PE 0604746A / *Automatic Test Equipment Development*	**Project (Number/Name)** L65 / *Test Equipment Development*

Schedule Details

	Start		End	
Events	**Quarter**	**Year**	**Quarter**	**Year**
AN/GSM-421(V2) User Testing	2	2007	4	2012
Physical Instruments	1	2016	4	2024
CALSETS Software Environment and Calibration	1	2016	4	2024
Electrical Instruments	1	2016	4	2024
Test Equipment Modernization	1	2016	4	2024