| Exhibit R-2, RDT&E Budget Item Justification: PB 2019 Army | | | | | | | | | | | Date: February 2018 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Appropriation/Budget Activity<br>2040: *Research, Development, Test & Evaluation, Army I* BA 5: *System Development & Demonstration (SDD)* | | | | | R-1 Program Element (Number/Name)<br>PE 0604746A *I Automatic Test Equipment Development* | | | | | | | |
| **COST ($ in Millions)** | **Prior Years** | **FY 2017** | **FY 2018** | **FY 2019 Base** | **FY 2019 OCO** | **FY 2019 Total** | **FY 2020** | **FY 2021** | **FY 2022** | **FY 2023** | **Cost To Complete** | **Total Cost** |
| Total Program Element | - | 8.503 | 8.344 | 13.297 | - | 13.297 | 10.915 | 9.880 | 10.039 | 9.506 | Continuing | Continuing |
| L59: *Diagnost/Expert Sys* | - | 5.831 | 5.883 | 7.579 | - | 7.579 | 6.369 | 5.946 | 5.984 | 5.371 | Continuing | Continuing |
| L65: *Test Equipment Development* | - | 2.672 | 2.461 | 5.718 | - | 5.718 | 4.546 | 3.934 | 4.055 | 4.135 | 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.

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 2019 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 2019 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 radio frequency (RF) and electro-optic (EO) testing capability. It will also provide for technology enhancements to 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 2019 Army | | | | | Date: February 2018 |
|---|---|---|---|---|---|
| Appropriation/Budget Activity<br>2040: *Research, Development, Test & Evaluation, Army* / BA 5: *System Development & Demonstration (SDD)* | | | R-1 Program Element (Number/Name)<br>PE 0604746A / *Automatic Test Equipment Development* | | |
| **B. Program Change Summary ($ in Millions)** | **FY 2017** | **FY 2018** | **FY 2019 Base** | **FY 2019 OCO** | **FY 2019 Total** |
| Previous President's Budget | 8.813 | 8.344 | 14.464 | - | 14.464 |
| Current President's Budget | 8.503 | 8.344 | 13.297 | - | 13.297 |
| Total Adjustments | -0.310 | 0.000 | -1.167 | - | -1.167 |
| • Congressional General Reductions | -0.004 | - | | | |
| • Congressional Directed Reductions | - | - | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -0.306 | - | | | |
| • Adjustments to Budget Years | - | - | -1.167 | - | -1.167 |

| Exhibit R-2A, RDT&E Project Justification: PB 2019 Army | | | Date: February 2018 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 5 | R-1 Program Element (Number/Name)<br>PE 0604746A / *Automatic Test Equipment Development* | Project (Number/Name)<br>L59 / *Diagnost/Expert Sys* | |

| COST ($ in Millions) | Prior Years | FY 2017 | FY 2018 | FY 2019 Base | FY 2019 OCO | FY 2019 Total | FY 2020 | FY 2021 | FY 2022 | FY 2023 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L59: *Diagnost/Expert Sys* | - | 5.831 | 5.883 | 7.579 | - | 7.579 | 6.369 | 5.946 | 5.984 | 5.371 | Continuing | Continuing |
| 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 upgrades to support technology advancements in the supported weapon systems. This Project funds development efforts to incorporate the most current relevant technology into the next generation MSD, supports capability enhancement of a 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 2017 | FY 2018 | FY 2019 Base | FY 2019 OCO | FY 2019 Total |
|---|---|---|---|---|---|
| ***Title:*** Next Generation Automatic Test System (NGATS) Radio Frequency (RF) Test Capability | 0.800 | 1.000 | 2.000 | - | 2.000 |
| ***Description:*** Develop and integrate NGATS RF test capability<br><br>***FY 2018 Plans:***<br>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.<br><br>***FY 2019 Base Plans:***<br>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 | | | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2019 Army | | Date: February 2018 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604746A / *Automatic Test Equipment Development* | **Project (Number/Name)**<br>L59 / *Diagnost/Expert Sys* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2017 | FY 2018 | FY 2019 Base | FY 2019 OCO | FY 2019 Total |
|---|---|---|---|---|---|
| Radio-Controlled Improvised Explosive Device (RCIED) Electronic Warfare (CREW)/Duke, TPQ-53 Radar and other emerging weapons systems.<br>***FY 2018 to FY 2019 Increase/Decrease Statement:***<br>Increase of $1.000 million from FY2018 to FY2019 to meet schedule requirements for availability of the capabilities needed for weapon system support. | | | | | |
| ***Title:*** NGATS Increment 2<br>***Description:*** Develop and test hardware and software for NGATS Increment 2 support capability<br>***FY 2018 Plans:***<br>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.<br>***FY 2019 Base Plans:***<br>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.<br>***FY 2018 to FY 2019 Increase/Decrease Statement:***<br>Increase of $0.118 million from FY2018 to FY2019 to accommodate required efforts. | 0.497 | 0.382 | 0.500 | - | 0.500 |
| ***Title:*** NGATS Electro-Optics (EO) Subsystem<br>***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)<br>***FY 2018 Plans:***<br>Continue integration/testing of EO subsystem.<br>***FY 2019 Base Plans:***<br>Complete integration/testing of EO subsystem.<br>***FY 2018 to FY 2019 Increase/Decrease Statement:*** | 0.500 | 0.700 | 1.000 | - | 1.000 |

| Exhibit R-2A, RDT&E Project Justification: PB 2019 Army | | Date: February 2018 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604746A / *Automatic Test Equipment Development* | **Project (Number/Name)**<br>L59 / *Diagnost/Expert Sys* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2017 | FY 2018 | FY 2019 Base | FY 2019 OCO | FY 2019 Total |
|---|---|---|---|---|---|
| Increase of $0.300 million from FY2018 to FY2019 to allow completion of this effort as scheduled. | | | | | |
| ***Title:*** Developmental and Operational Follow-on Testing of NGATS Increment 1 Capability (provides Abrams/ Bradley/Stryker support capability)<br>***Description:*** Complete developmental and operational follow-on testing activities | 0.800 | - | - | - | - |
| ***Title:*** Additional Software Capabilities for Use with NGATS<br>***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<br>***FY 2018 Plans:***<br>Develop new and emerging netcentric architecture. Develop software architecture that will define the transport protocol to interface to DoD common logistics environments and Logistics Modernization Program (LMP). Develop and improve data packages to include health management information.<br>***FY 2019 Base Plans:***<br>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 Logistics Modernization Program (LMP). Develop and improve data packages to include health management information.<br>***FY 2018 to FY 2019 Increase/Decrease Statement:***<br>Increase of $0.073 million from FY2018 to FY2019 to accommodate required efforts. | 0.270 | 0.127 | 0.200 | - | 0.200 |
| ***Title:*** NGATS Performance Enhancement<br>***Description:*** NGATS core instrument/software modifications to increase NGATS performance<br>***FY 2018 Plans:***<br>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 | 0.730 | 0.300 | 0.500 | - | 0.500 |

| Exhibit R-2A, RDT&E Project Justification: PB 2019 Army | | Date: February 2018 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604746A / *Automatic Test Equipment Development* | **Project (Number/Name)**<br>L59 / *Diagnost/Expert Sys* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2017 | FY 2018 | FY 2019 Base | FY 2019 OCO | FY 2019 Total |
|---|---|---|---|---|---|
| testing requirements. Implement and test controller upgrade to increase processor speed to support Win10 implementation. Redesign cables for better logistic support and cost savings.<br>***FY 2019 Base Plans:***<br>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.<br>***FY 2018 to FY 2019 Increase/Decrease Statement:***<br>Increase of $0.200 million from FY2018 to FY2019 to enable timely identification and implementation of modifications needed to meet weapon system support requirements.. | | | | | |
| ***Title:*** Abrams/Bradley Test Program Set (TPS) Design<br>***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))<br>***FY 2018 Plans:***<br>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).<br>***FY 2019 Base Plans:***<br>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).<br>***FY 2018 to FY 2019 Increase/Decrease Statement:***<br>Decrease of $0.800 million from FY2018 to FY2019 because of higher priority funding requirements. | 0.750 | 1.800 | 1.000 | - | 1.000 |
| ***Title:*** Electro-Optic (EO) TPS Development | 0.450 | 0.250 | 0.500 | - | 0.500 |

| Exhibit R-2A, RDT&E Project Justification: PB 2019 Army | | Date: February 2018 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604746A / *Automatic Test Equipment Development* | **Project (Number/Name)**<br>L59 / *Diagnost/Expert Sys* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2017 | FY 2018 | FY 2019 Base | FY 2019 OCO | FY 2019 Total |
|---|---|---|---|---|---|
| ***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<br><br>***FY 2018 Plans:***<br>Continue development of re-hosted EO TPSs to include 2 each CROWS and 2 each Stryker Remote Weapons Station.<br><br>***FY 2019 Base Plans:***<br>Continue development of re-hosted EO TPSs to include 2 each Common Remotely Operated Weapons Station (CROWS) and 2 each Stryker Remote Weapons Station.<br><br>***FY 2018 to FY 2019 Increase/Decrease Statement:***<br>Increase of $0.250 million from FY2018 to FY2019 to accommodate weapon system support schedules. | | | | | |
| ***Title:*** NGATS Logistics Support Products<br><br>***Description:*** Develop NGATS initial logistics support products (including provisioning, technical manuals and calibration)<br><br>***FY 2018 Plans:***<br>Continue development of NGATS EO and RF logistics products for use with the full-rate production NGATS.<br><br>***FY 2019 Base Plans:***<br>Complete development of NGATS EO and RF logistics products for use with the full-rate production NGATS.<br><br>***FY 2018 to FY 2019 Increase/Decrease Statement:***<br>Increase of $0.050 million from FY2018 to FY2019 to accommodate efforts needed to complete products according to schedule. | 0.500 | 0.200 | 0.250 | - | 0.250 |
| ***Title:*** Maintenance Support Device (MSD) Technology Enhancements<br><br>***Description:*** Incorporate current relevant technology into the next-generation MSD and support capability enhancement of the wireless at-platform test set (WATS). Develop 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.<br><br>***FY 2018 Plans:*** | 0.234 | 0.633 | 0.633 | - | 0.633 |

| Exhibit R-2A, RDT&E Project Justification: PB 2019 Army | | Date: February 2018 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604746A / *Automatic Test Equipment Development* | **Project (Number/Name)**<br>L59 / *Diagnost/Expert Sys* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2017 | FY 2018 | FY 2019 Base | FY 2019 OCO | FY 2019 Total |
|---|---|---|---|---|---|
| Design a modern vehicle data bus development tool, leveraging the new WATS design. The development tool will minimize the costs of connecting directly to vehicles. This tool allows for quicker and more complete functional testing, along with serving as a much more comprehensive tool for new equipment training. Gather Army test requirements related to MIL-STD-1553 that maintain compatibility with emerging platform hardware bus technology.<br>***FY 2019 Base Plans:***<br>Investigate and validate the emerging hardware and software suitability for use in the next generation of MSD and WATS. Test, develop technical data package, and incorporate innovative technology for use to support the Army's at-platform test and diagnostic requirements of new weapon systems and engineering changes to existing weapon system/platform interface. | | | | | |
| ***Title:*** NGATS Simulation Environment<br>***Description:*** Develop a simulation environment that will allow development and testing of TPSs on a desktop environment<br>***FY 2019 Base Plans:***<br>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.<br>***FY 2018 to FY 2019 Increase/Decrease Statement:***<br>Development initiation delayed from FY2018 to FY2019 because of funding availability. | - | - | 0.418 | - | 0.418 |
| ***Title:*** TPS Development Environment<br>***Description:*** Develop a standardized TPS development environment for NGATS<br>***FY 2018 Plans:***<br>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.<br>***FY 2019 Base Plans:*** | 0.300 | 0.300 | 0.500 | - | 0.500 |

| Exhibit R-2A, RDT&E Project Justification: PB 2019 Army | | Date: February 2018 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604746A / *Automatic Test Equipment Development* | **Project (Number/Name)**<br>L59 / *Diagnost/Expert Sys* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2017 | FY 2018 | FY 2019 Base | FY 2019 OCO | FY 2019 Total |
|---|---|---|---|---|---|
| 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.<br>***FY 2018 to FY 2019 Increase/Decrease Statement:***<br>Increase of $0.200 million from FY2018 to FY2019 to accommodate required efforts. | | | | | |
| ***Title:*** Anti-Tamper/Cyber Security<br>***Description:*** Develop an Anti-Tamper/Cyber Security software capability for NGATS<br>***FY 2018 Plans:***<br>Initiate 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.<br>***FY 2019 Base Plans:***<br>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.<br>***FY 2018 to FY 2019 Increase/Decrease Statement:***<br>Decrease of $0.113 million from FY2018 to FY2019 to account for availability of funding. | - | 0.191 | 0.078 | - | 0.078 |
| **Accomplishments/Planned Programs Subtotals** | 5.831 | 5.883 | 7.579 | - | 7.579 |

**C. Other Program Funding Summary ($ in Millions)**

| Line Item | FY 2017 | FY 2018 | FY 2019 Base | FY 2019 OCO | FY 2019 Total | FY 2020 | FY 2021 | FY 2022 | FY 2023 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|
| • MB4000: *Integrated Family of Test Equipment* | 35.737 | 37.644 | 76.295 | 9.495 | 85.790 | 44.180 | 49.961 | 61.827 | 59.321 | Continuing | Continuing |

**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

| Exhibit R-2A, RDT&E Project Justification: PB 2019 Army | | Date: February 2018 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604746A / *Automatic Test Equipment Development* | **Project (Number/Name)**<br>L59 / *Diagnost/Expert Sys* |

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 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 2019 Army | | | Date: February 2018 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 5 | R-1 Program Element (Number/Name)<br>PE 0604746A / *Automatic Test Equipment Development* | Project (Number/Name)<br>L59 / *Diagnost/Expert Sys* | |

**Management Services ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2017 Cost | FY 2017 Award Date | FY 2018 Cost | FY 2018 Award Date | FY 2019 Base Cost | FY 2019 Base Award Date | FY 2019 OCO Cost | FY 2019 OCO Award Date | FY 2019 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Project Management | Various | Various : Various | 0.150 | 0.200 | Jan 2017 | 0.246 | | 0.253 | Dec 2018 | - | | 0.253 | Continuing | Continuing | Continuing |
| | | **Subtotal** | 0.150 | 0.200 | | 0.246 | | 0.253 | | - | | 0.253 | Continuing | Continuing | N/A |

**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2017 Cost | FY 2017 Award Date | FY 2018 Cost | FY 2018 Award Date | FY 2019 Base Cost | FY 2019 Base Award Date | FY 2019 OCO Cost | FY 2019 OCO Award Date | FY 2019 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Software Development/ Verification/Validation | Various | Various, : Various | 36.853 | 1.435 | Apr 2017 | 2.110 | | 3.015 | Feb 2019 | - | | 3.015 | Continuing | Continuing | Continuing |
| Hardware/Support Items Development | Various | Various, : Various | 66.419 | 2.696 | Feb 2017 | 2.547 | | 3.561 | Jan 2019 | - | | 3.561 | Continuing | Continuing | Continuing |
| | | **Subtotal** | 103.272 | 4.131 | | 4.657 | | 6.576 | | - | | 6.576 | Continuing | Continuing | N/A |

**Support ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2017 Cost | FY 2017 Award Date | FY 2018 Cost | FY 2018 Award Date | FY 2019 Base Cost | FY 2019 Base Award Date | FY 2019 OCO Cost | FY 2019 OCO Award Date | FY 2019 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Technical Support | Various | Various, : Various | 50.035 | 0.450 | Feb 2017 | 0.540 | | 0.550 | Dec 2018 | - | | 0.550 | Continuing | Continuing | Continuing |
| Other Direct | Various | Various, : Various | 4.190 | 0.200 | Feb 2017 | 0.240 | | 0.200 | Dec 2018 | - | | 0.200 | Continuing | Continuing | Continuing |
| | | **Subtotal** | 54.225 | 0.650 | | 0.780 | | 0.750 | | - | | 0.750 | Continuing | Continuing | N/A |

**Test and Evaluation ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2017 Cost | FY 2017 Award Date | FY 2018 Cost | FY 2018 Award Date | FY 2019 Base Cost | FY 2019 Base Award Date | FY 2019 OCO Cost | FY 2019 OCO Award Date | FY 2019 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Developmental/ Operational Testing | Various | Various, : Various | 2.046 | 0.850 | Nov 2017 | 0.200 | | - | | - | | - | 0.000 | 3.096 | - |
| | | **Subtotal** | 2.046 | 0.850 | | 0.200 | | - | | - | | - | 0.000 | 3.096 | N/A |

**Remarks**

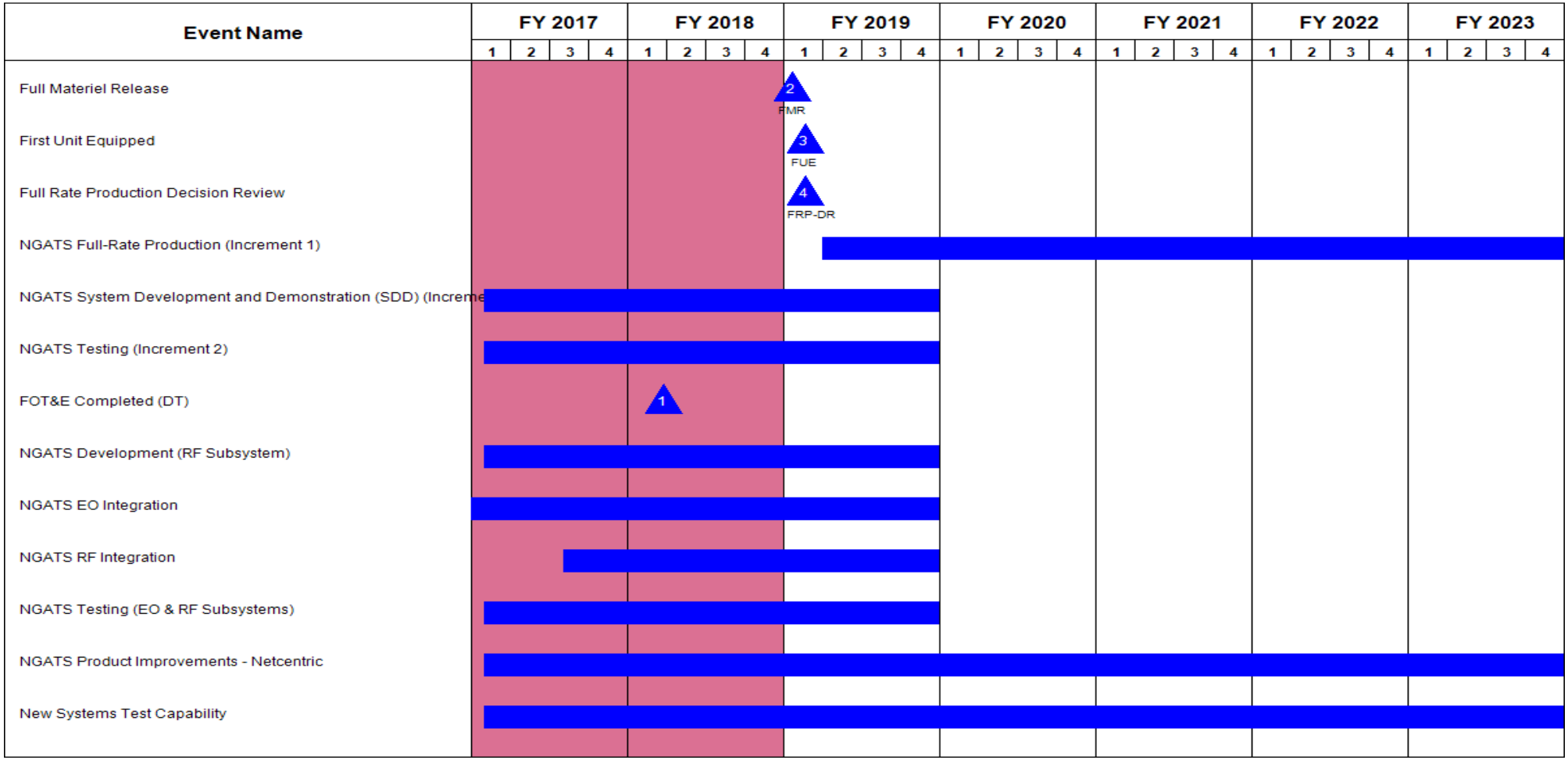
Test program set (TPS) and contractor developmental test and evaluation are included in the product development cost.

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Army | | | Date: February 2018 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 5 | R-1 Program Element (Number/Name)<br>PE 0604746A / *Automatic Test Equipment Development* | Project (Number/Name)<br>L59 / *Diagnost/Expert Sys* | |

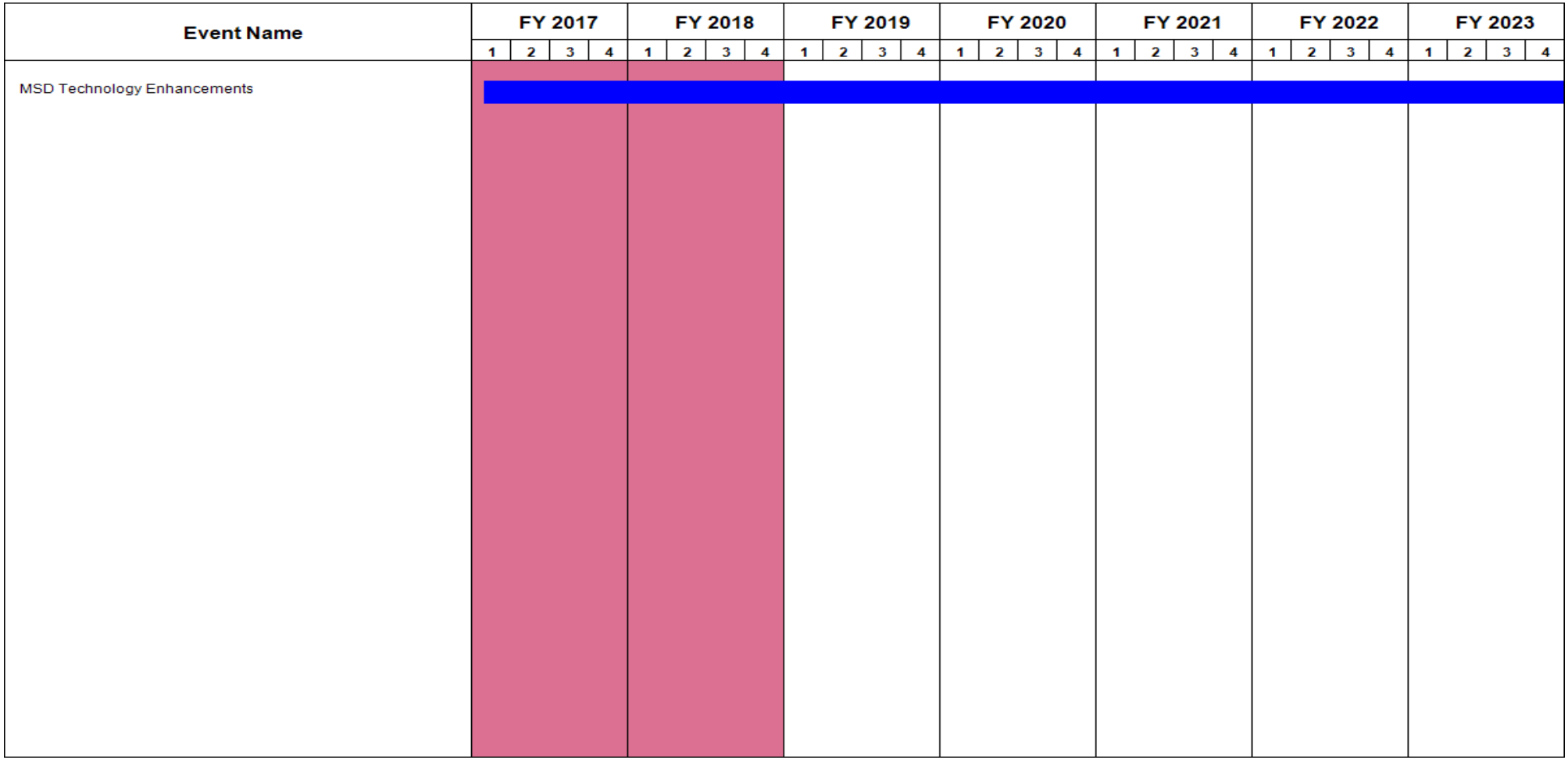
| | Prior Years | FY 2017 | | FY 2018 | | FY 2019 Base | | FY 2019 OCO | | FY 2019 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 159.693 | 5.831 | | 5.883 | | 7.579 | | - | | 7.579 | Continuing | Continuing | N/A |

**Remarks**

| Exhibit R-4, RDT&E Schedule Profile: PB 2019 Army | | Date: February 2018 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604746A / *Automatic Test Equipment Development* | **Project (Number/Name)**<br>L59 / *Diagnost/Expert Sys* |



| Exhibit R-4, RDT&E Schedule Profile: PB 2019 Army | | Date: February 2018 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604746A / *Automatic Test Equipment Development* | **Project (Number/Name)**<br>L59 / *Diagnost/Expert Sys* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2019 Army | | Date: February 2018 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604746A / *Automatic Test Equipment Development* | **Project (Number/Name)**<br>L59 / *Diagnost/Expert Sys* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events** | **Quarter** | **Year** | **Quarter** | **Year** |
| Full Materiel Release | 1 | 2019 | 1 | 2019 |
| First Unit Equipped | 1 | 2019 | 1 | 2019 |
| Full Rate Production Decision Review | 1 | 2019 | 1 | 2019 |
| NGATS Testing (Increment 1 Follow-On DT/OT) | 1 | 2016 | 3 | 2016 |
| NGATS Full-Rate Production (Increment 1) | 2 | 2019 | 4 | 2023 |
| NGATS System Development and Demonstration (SDD) (Increment 2) | 1 | 2016 | 4 | 2019 |
| NGATS Testing (Increment 2) | 1 | 2016 | 4 | 2019 |
| FOT&E Completed (DT) | 1 | 2018 | 1 | 2018 |
| NGATS Development (RF Subsystem) | 1 | 2016 | 4 | 2019 |
| NGATS EO Integration | 3 | 2016 | 4 | 2019 |
| NGATS RF Integration | 3 | 2017 | 4 | 2019 |
| NGATS Testing (EO & RF Subsystems) | 1 | 2016 | 4 | 2019 |
| NGATS Product Improvements - Netcentric | 1 | 2016 | 4 | 2023 |
| New Systems Test Capability | 1 | 2016 | 4 | 2023 |
| MSD Technology Enhancements | 1 | 2016 | 4 | 2023 |

**Note**

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

| Exhibit R-2A, RDT&E Project Justification: PB 2019 Army | | | Date: February 2018 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 5 | R-1 Program Element (Number/Name)<br>PE 0604746A / *Automatic Test Equipment Development* | Project (Number/Name)<br>L65 / *Test Equipment Development* | |

| COST ($ in Millions) | Prior Years | FY 2017 | FY 2018 | FY 2019 Base | FY 2019 OCO | FY 2019 Total | FY 2020 | FY 2021 | FY 2022 | FY 2023 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L65: *Test Equipment Development* | - | 2.672 | 2.461 | 5.718 | - | 5.718 | 4.546 | 3.934 | 4.055 | 4.135 | Continuing | Continuing |
| Quantity of RDT&E Articles | - | - | - | - | - | - | - | - | - | - | | |

**A. Mission Description and Budget Item Justification**

This Project supports development and demonstration of state-of-the-art calibration standards and techniques, and it upgrades/improves existing Army calibration systems. The Project provides feasibility studies, market research, inventory analyses, bid sample testing, and prototyping to support calibration systems and general-purpose test, measurement, and diagnostic equipment (TMDE) acquisitions. Primary effort of this Project is development of calibration software; calibration capability for electro-optical, chemical, biological agent, radiation sourcing and detection systems, signal measurement and generation from direct current to microwave ranges, and physical and mechanical measurements such as torque, pressure and temperature; and improvements in test and measurement equipment 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, accuracy, effectiveness, 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 footprint to improve deployability and mobility in areas of operation.

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2017 | FY 2018 | FY 2019 Base | FY 2019 OCO | FY 2019 Total |
|---|---|---|---|---|---|
| ***Title:*** Calibration Sets (CALSETS) Software Environment and Calibration Procedures | 0.774 | 0.093 | 1.104 | - | 1.104 |
| ***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 2018 Plans:***<br>Continue development and evaluation of automated calibration procedures and enhanced calibration environment to version 2.0. Continue development and test of ISO 17025 accreditation reporting capability of the calibration software environment and calibration procedures. Continue test and evaluation of RMF compliance | | | | | |
| ***FY 2019 Base Plans:***<br>Conclude development of calibration procedures and enhanced calibration environment. Continue test and evaluation of RMF compliance. | | | | | |
| ***FY 2018 to FY 2019 Increase/Decrease Statement:*** | | | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2019 Army | | Date: February 2018 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604746A / *Automatic Test Equipment Development* | **Project (Number/Name)**<br>L65 / *Test Equipment Development* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2017 | FY 2018 | FY 2019 Base | FY 2019 OCO | FY 2019 Total |
|---|---|---|---|---|---|
| Reduced funding in FY2018 requires shift to critical Army requirements for weapon systems maintenance in physical and electrical standards. FY2019 allows catch-up level of effort for 800 automated calibration procedures used by the Army Calibration Environment (ACE). Army RMF compliance workload increases significantly with the conclusion of development effort and move to field testing on Army networks. | | | | | |
| ***Title:*** Physical Instruments<br><br>***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..<br><br>***FY 2018 Plans:***<br>Continue development and test of prototype small arms gage calibration standards. Continue development and test of calibration systems for biological agent detectors and protective equipment. Complete development and test of hydrocarbon flow calibration and test standards. Perform market research, evaluate commercial equipment, and complete specifications for acquisition.<br><br>***FY 2019 Base Plans:***<br>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.<br><br>***FY 2018 to FY 2019 Increase/Decrease Statement:***<br>Funding in FY2019 provides for additional development and testing for pneumatic pressure standards to support critical requirements for avionics systems that measure differential pressure to indicate onboard altitude, airspeed, rate of climb and rate of descent computations. | 0.807 | 1.059 | 1.544 | - | 1.544 |
| ***Title:*** Electrical Instruments<br><br>***Description:*** Research, develop, and test electrical parameter calibration instrumentation to support areas such as deployable recertification set, intrinsic electrical standards, electrical transport standards and electro-optic standards.<br><br>***FY 2018 Plans:*** | 0.662 | 0.924 | 2.685 | - | 2.685 |

| Exhibit R-2A, RDT&E Project Justification: PB 2019 Army | | Date: February 2018 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604746A / *Automatic Test Equipment Development* | **Project (Number/Name)**<br>L65 / *Test Equipment Development* |

| B. Accomplishments/Planned Programs ($ in Millions) | FY 2017 | FY 2018 | FY 2019 Base | FY 2019 OCO | FY 2019 Total |
|---|---|---|---|---|---|
| Complete development and test of electrical transport standards. Continue development and test of electro-optic sources for aviation systems maintenance. Develop calibration standards and techniques for automated high accuracy calibration of attenuation, power, resistance, and phase noise.<br>***FY 2019 Base Plans:***<br>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.<br>***FY 2018 to FY 2019 Increase/Decrease Statement:***<br>Multiple individual development efforts, some of relatively short duration, are funded through this Project; and, funding is allocated based on the priority of the individual efforts. This results in increases or decreases within the various categories from year to year. FY2019 funding enables development of working prototype systems aimed at closing gaps left by obsolete and unsupportable Army equipment in the measurement areas of attenuation, power, resistance and phase noise. | | | | | |
| ***Title:*** Test Equipment Modernization (TEMOD)<br>***Description:*** Perform market research, bid sample testing, and evaluation of commercial general-purpose electronic test equipment (GPETE) and develop performance specifications for TEMOD acquisitions.<br>***FY 2018 Plans:***<br>Perform market research and evaluation of commercial GPETE and validate performance specifications for improved spectrum analysis test equipment. Conduct bid sample testing to support acquisition program.<br>***FY 2019 Base Plans:***<br>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. | 0.429 | 0.385 | 0.385 | - | 0.385 |
| **Accomplishments/Planned Programs Subtotals** | 2.672 | 2.461 | 5.718 | - | 5.718 |

| Exhibit R-2A, RDT&E Project Justification: PB 2019 Army | | Date: February 2018 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604746A / *Automatic Test Equipment Development* | **Project (Number/Name)**<br>L65 / *Test Equipment Development* |

**C. Other Program Funding Summary ($ in Millions)**

| Line Item | FY 2017 | FY 2018 | FY 2019 Base | FY 2019 OCO | FY 2019 Total | FY 2020 | FY 2021 | FY 2022 | FY 2023 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|
| • N10000: *Calibration Sets Equipment* | 4.963 | 5.564 | 4.270 | - | 4.270 | 3.030 | 2.514 | 9.882 | 2.650 | Continuing | Continuing |
| • N11000: *Test Equipment Modernization (TEMOD)* | 7.482 | 7.771 | 9.806 | - | 9.806 | 8.915 | 7.868 | 10.100 | 8.459 | 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 2019 Army | | | Date: February 2018 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 5 | R-1 Program Element (Number/Name)<br>PE 0604746A / *Automatic Test Equipment Development* | Project (Number/Name)<br>L65 / *Test Equipment Development* | |

**Management Services ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2017 Cost | FY 2017 Award Date | FY 2018 Cost | FY 2018 Award Date | FY 2019 Base Cost | FY 2019 Base Award Date | FY 2019 OCO Cost | FY 2019 OCO Award Date | FY 2019 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| In-house Engineering | SS/ Various | Various : Various | 5.929 | 0.447 | Jan 2017 | 0.541 | | 0.554 | Dec 2018 | - | | 0.554 | Continuing | Continuing | - |
| | | **Subtotal** | 5.929 | 0.447 | | 0.541 | | 0.554 | | - | | 0.554 | Continuing | Continuing | N/A |

**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2017 Cost | FY 2017 Award Date | FY 2018 Cost | FY 2018 Award Date | FY 2019 Base Cost | FY 2019 Base Award Date | FY 2019 OCO Cost | FY 2019 OCO Award Date | FY 2019 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CALSETS Software Environment and Calibration | Various | Various : Various | 6.687 | 0.365 | Apr 2017 | 0.293 | | 0.290 | Jan 2019 | - | | 0.290 | Continuing | Continuing | - |
| Physical Instruments | Various | Various : Various | 7.476 | 0.363 | Feb 2017 | 0.266 | | 0.855 | Feb 2019 | - | | 0.855 | Continuing | Continuing | - |
| Electrical Instruments | Various | Various : Various | 10.085 | 0.276 | Apr 2017 | 0.185 | | 1.546 | Feb 2019 | - | | 1.546 | Continuing | Continuing | - |
| Test Equipment Modernization | Various | Various : Various | 0.738 | 0.257 | Feb 2017 | 0.231 | | 0.231 | Jan 2019 | - | | 0.231 | Continuing | Continuing | - |
| | | **Subtotal** | 24.986 | 1.261 | | 0.975 | | 2.922 | | - | | 2.922 | Continuing | Continuing | N/A |

**Support ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2017 Cost | FY 2017 Award Date | FY 2018 Cost | FY 2018 Award Date | FY 2019 Base Cost | FY 2019 Base Award Date | FY 2019 OCO Cost | FY 2019 OCO Award Date | FY 2019 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Contract Engineering | C/FFP | Various : Various | 2.487 | 0.051 | Jul 2017 | 0.296 | | 0.304 | Feb 2019 | - | | 0.304 | Continuing | Continuing | Continuing |
| | | **Subtotal** | 2.487 | 0.051 | | 0.296 | | 0.304 | | - | | 0.304 | Continuing | Continuing | N/A |

**Test and Evaluation ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2017 Cost | FY 2017 Award Date | FY 2018 Cost | FY 2018 Award Date | FY 2019 Base Cost | FY 2019 Base Award Date | FY 2019 OCO Cost | FY 2019 OCO Award Date | FY 2019 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CALSETS Software Environment and Calibration | Various | Various : Various | 1.311 | 0.243 | Apr 2017 | 0.195 | | 0.194 | Apr 2019 | - | | 0.194 | Continuing | Continuing | - |

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2019 Army | | | Date: February 2018 |
|---|---|---|---|
| Appropriation/Budget Activity<br>2040 / 5 | R-1 Program Element (Number/Name)<br>PE 0604746A / *Automatic Test Equipment Development* | Project (Number/Name)<br>L65 / *Test Equipment Development* | |

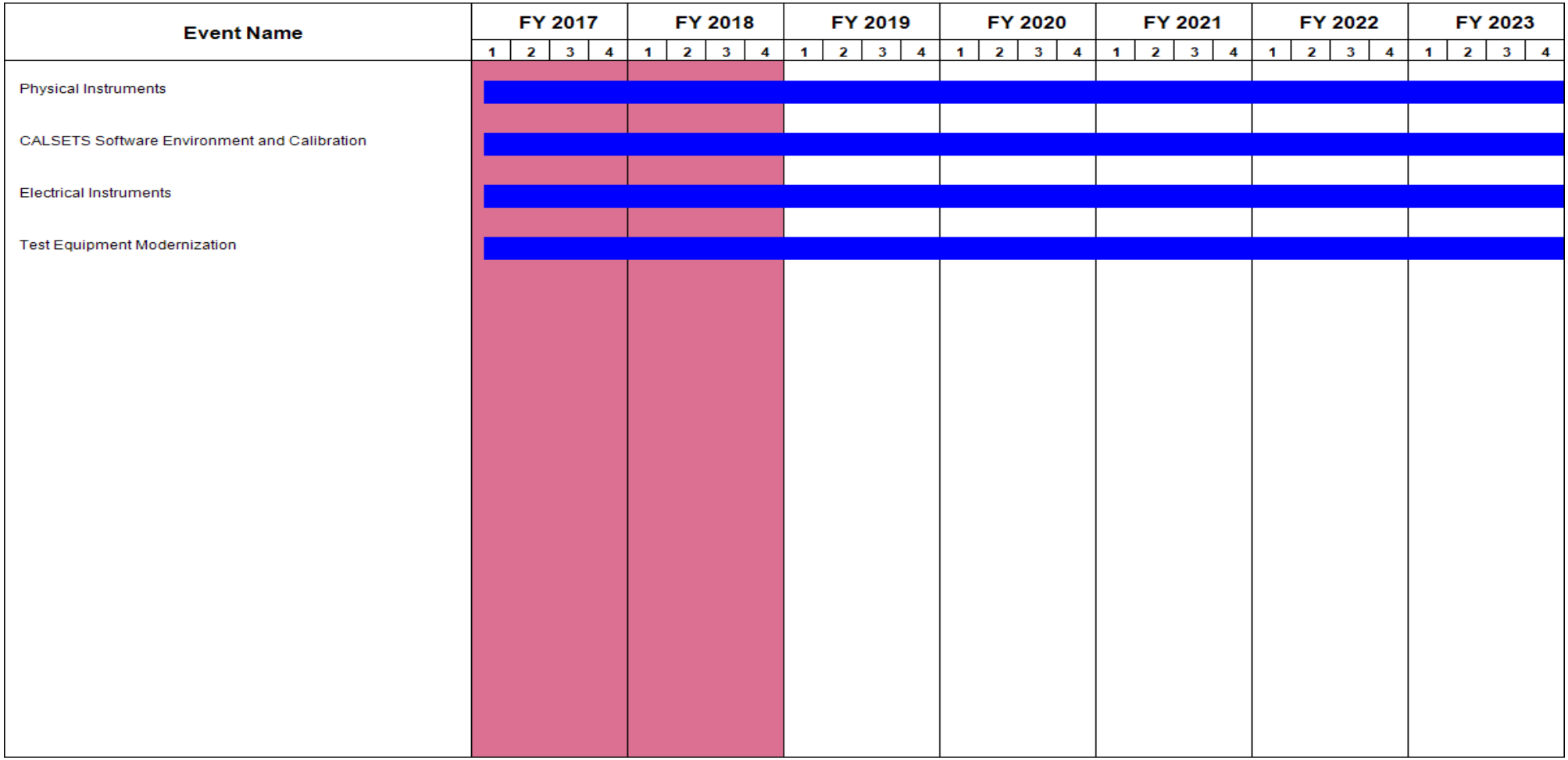
**Test and Evaluation ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2017 Cost | FY 2017 Award Date | FY 2018 Cost | FY 2018 Award Date | FY 2019 Base Cost | FY 2019 Base Award Date | FY 2019 OCO Cost | FY 2019 OCO Award Date | FY 2019 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Physical Instruments | Various | Various : Various | 2.229 | 0.278 | Apr 2017 | 0.177 | | 0.570 | Mar 2019 | - | | 0.570 | Continuing | Continuing | - |
| Electrical Instruments | Various | Various : Various | 2.156 | 0.220 | Apr 2017 | 0.123 | | 1.020 | Mar 2019 | - | | 1.020 | Continuing | Continuing | - |
| Test Equipment Modernization | Various | Various : Various | 0.723 | 0.172 | Feb 2017 | 0.154 | | 0.154 | Feb 2019 | - | | 0.154 | Continuing | Continuing | - |
| | | **Subtotal** | 6.419 | 0.913 | | 0.649 | | 1.938 | | - | | 1.938 | Continuing | Continuing | N/A |

| | Prior Years | FY 2017 | | FY 2018 | | FY 2019 Base | | FY 2019 OCO | | FY 2019 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 39.821 | 2.672 | | 2.461 | | 5.718 | | - | | 5.718 | Continuing | Continuing | N/A |

**Remarks**

| Exhibit R-4, RDT&E Schedule Profile: PB 2019 Army | | Date: February 2018 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604746A / *Automatic Test Equipment Development* | **Project (Number/Name)**<br>L65 / *Test Equipment Development* |



| Exhibit R-4A, RDT&E Schedule Details: PB 2019 Army | | Date: February 2018 |
|---|---|---|
| **Appropriation/Budget Activity**<br>2040 / 5 | **R-1 Program Element (Number/Name)**<br>PE 0604746A / *Automatic Test Equipment Development* | **Project (Number/Name)**<br>L65 / *Test Equipment Development* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events** | **Quarter** | **Year** | **Quarter** | **Year** |
| Physical Instruments | 1 | 2016 | 4 | 2023 |
| CALSETS Software Environment and Calibration | 1 | 2016 | 4 | 2023 |
| Electrical Instruments | 1 | 2016 | 4 | 2023 |
| Test Equipment Modernization | 1 | 2016 | 4 | 2023 |