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Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Office of the Secretary Of Defense **Date:** February 2019

Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 6: RDT&E Management Support</i>	R-1 Program Element (Number/Name) PE 0604940D8Z I <i>Central Test and Evaluation Investment Program (CTEIP)</i>
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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	1,165.091	204.268	270.013	260.267	-	260.267	290.404	294.646	293.975	301.336	Continuing	Continuing
940: <i>Central Test and Evaluation Investment Program (CTEIP)</i>	1,165.091	204.268	270.013	260.267	-	260.267	290.404	294.646	293.975	301.336	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Since its inception in FY 1990, this program element (PE) has been used to fund the development of critically needed, high-priority Test and Evaluation (T&E) capabilities for joint/multi-Service requirements. The Central Test and Evaluation Investment Program (CTEIP) uses a corporate investment approach to combine Service, Defense, and other Government agencies T&E needs, maximize opportunities for joint efforts, and avoid unwarranted duplication of test capabilities. CTEIP focuses investments on projects that will have high productivity returns on investment. Projects under the CTEIP PE support two basic tasks: investments to improve and develop the test capabilities base (Joint Improvement and Modernization (JIM) projects) and development of near-term solutions to test capability shortfalls in support of ongoing operational test programs (Resource Enhancement Projects (REP)).

The JIM funds critically needed T&E investments in the major functional areas of air combat; autonomy; armament and munitions; Command, Control, Communications, Computers, and Intelligence (C4I) networks; common range instrumentation; directed energy; electronic combat; cyber warfare; land combat; sea combat; space combat; strategic warfare, target systems; and test environments. Examples of project subject matter include infrastructure developments needed for testing hypersonic weapon systems, electronic warfare test capability developments to address critical testing shortfalls against advanced threats, long range airborne telemetry, threat simulator development, mobile optical tracking, nuclear survivability, and unmanned and autonomous systems. CTEIP continues to serve as the focal point for fostering common architectures throughout the test and training communities to enhance the sharing of resources and linkages between test and training ranges.

CTEIP has provided special focus to institutionalize the use of modeling and simulation (M&S) as a practical test tool, to link ranges to enhance inter-range and inter-Service cooperation and resource sharing, and to ensure development and acquisition of common instrumentation necessary for a more efficient test infrastructure.

The REP funds development of near-term solutions for critical ongoing operational tests supporting decisions on major, high-priority defense acquisition programs. These unanticipated operational test (OT) capability requirements arise from several sources such as a new threat system identified during OT planning, acquisition of foreign military assets that are critical in determining weapon system operational effectiveness, short timelines between system design maturity and scheduled OT, and emerging technologies and test requirements resulting from operational concept changes mandated by Congress or Director, Operational Test & Evaluation (DOT&E), or system-of-systems testing. Funding these activities under the CTEIP provides the opportunity to coordinate and integrate these near-term test requirements with the total DoD test and evaluation investment planning, and ensures their availability for other programs that may have similar testing requirements.

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This Budget Activity 6 PE includes special studies, analyses, project improvements, quick reaction efforts, and strategic planning related to test capabilities and infrastructure, and supports the development and application of proven technologies to provide major test and evaluation capabilities required to meet DoD component weapon system test requirements.

The FY2020 CTEIP budget is described in detail below. The FY2020 includes increased investments in high-priority hypersonic ground and open air range test capability developments and increased investments for critically needed upgrades to DoD Threat Models and Simulations.

B. Program Change Summary (\$ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	211.325	258.796	261.529	-	261.529
Current President's Budget	204.268	270.013	260.267	-	260.267
Total Adjustments	-7.057	11.217	-1.262	-	-1.262
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	12.300			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-6.302	-			
• FFRDC Reduction	-0.755	-1.083	-	-	-
• Programmatic Change	-	-	-1.262	-	-1.262

Change Summary Explanation

FY2019: Congressional add of +\$12.3M provided in Department of Defense Appropriation Bill (P.L. 115-245) accommodates a program increase, to include funding for the Defense Threat Center of Excellence.

FY2020: Programmatic change (other program change).

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
Title: Central Test and Evaluation Investment Program	204.268	270.013	260.267
Description: JIM Projects:			
- Initiated requirements development and project planning for the Autonomous Systems Test Capability (ASTC) project that develops test capability for Service autonomous systems.			
- Initiated requirements development and project planning for the Advanced Durability Testing (AVDT) that develops a multi-axle vehicle chassis simulator and a drive train simulator at Aberdeen Proving Grounds, MD.			
- Initiated requirements development and project planning for the Mission System Test Capability (MSTC) project that develops the capability to support integration and interoperability testing for advanced 4th and 5th generation aircraft data links Multi-			

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C. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
<p>Function Advanced Data Link (MADL) and Tactical Targeting Network Technology (TTNT) in a ground test, simulation environment.</p> <ul style="list-style-type: none"> - Initiated the development of requirements and project planning for the Radar Air-to-Ground Environment (RAGE) project that develops an installed test facility, ground test capability for testing advanced aircraft radars in high density air-to-air and air-to-ground environments. - Initiated the development of requirements and project planning for the Unmanned Aircraft Systems Test and Evaluation Improvements (UAS-TEI) and integrated Autonomous System Test Tool Kits to develop the capability to safely operate Unmanned and Autonomous aerial vehicles in controlled airspace. - Initiated the development of requirements and project planning for the Mobile High Energy Laser Measurement (MHELM) project to support testing of directed energy weapon systems. - Completed preliminary design for the Advanced Range Tracking and Imaging System (ARTIS) project to provide an integrated next generation suite of optical tracking systems to increase performance, reduce costs, and establish secure reliable optical tracking capability on DoD open-air ranges. - Completed requirements development, risk reduction and preliminary design for key elements of the Fast Burst Reactor Upgrade (FBRU) project. - Completed acceptance of the green G550 AEW aircraft and awarded the development contract for the Commercial Derivative Aircraft Based Instrumentation Telemetry System (CBITS) project that provides expanded telemetry support for aircraft and missile defense testing in inter-range and broad ocean area weapons testing. - Completed system development and an Initial Operational Capability of the Cyber Test Analysis and Simulation Environment (CyberTASE) project that establishes the ability to test enterprise level IT systems against increasingly robust Cyber threats. Continued development toward Initial Operational Capability. - Completed testing and achieved full operational capability of the Joint Distributed Infrared Countermeasures (IRCM) Ground Test System (JDIGS) project that provides end-to-end ground testing of IRCM systems. - Completed Initial Operational Capability providing a DoD multi-level secure and cross-domain data management T&E network environment for the Multi-Level Secure Joint/Coalition Network Environment (MLS-JCNE) project. Continued Block 2 to provide a multi-level file transfer, and multi-level work station for cross-domain data management in a T&E network environment. - Completed critical design for the UAS based Scoring sub-project at Eglin AFB, FL and contractor demonstrations of early target boat control software at Port Hueneme, CA and continued system development for the Swarm Autonomy and Scoring project that upgrades existing High Speed Maneuverable Surface Targets (HSMST) with semi-autonomous control and establishes UAS overhead scoring capabilities for testing against representative surface swarming threats. - Completed design and continued development of the Mid-Pressure Arc Heater (MPAH) project to expand the H2 Hypersonic Test Facility at Arnold Engineering Development (AEDC) Complex, TN to provide higher enthalpy at the mid-pressure altitudes to enable ground materials testing of components of hypersonic systems. 			

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C. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
<ul style="list-style-type: none"> - Continued design activities for the Hypersonic Test Capability Improvement Project (Phoenix) to provide a clean air, variable Mach ground test capability for hypersonic system prototypes from Mach 4 to Mach 7.5. Heater pit construction and refractory brick procurement initiated. Source selection for the system integration contract completed. -Initiated the Unmanned Aerial Vehicle (UAV) Range project to provide Global Hawk UAVs equipped with telemetry, Light Detection and Ranging System (LIDAR) and optical tracking for inflight data collection of hypersonic systems. - Continued the development of the Tunnel 9 High Mach Number project that develops a Mach 18 test capability at the AEDC White Oak, MD facility to support aero/aerothermodynamic modeling and simulation supporting intermediate range and strategic boost glide vehicle and maneuvering system concepts. - Continued the development of requirements and started design activities for the High Altitude LIDAR Atmospheric Sensing (HALAS) system that provides DOD launch and flight test ranges with improved ability to measure atmospheric conditions to reduce flight test evaluation uncertainty and improve launch and recovery operations. - Continued design work to upgrade the Holloman AFB High Speed Test Track to provide a full scale rain erosion capability to validate vehicle structural designs and qualify hypersonic weapon systems for flight in an open air environment. - Continued design activities for the G-Range Weather Effects project that upgrade the 3 inch G-range test track at AEDC to provide a small scale dust, rain, and snow erosion test capability. - Continued development under the M&S for Weather Effects on Hypersonic Systems project that provides a database of realistic and relevant weather conditions as a basis for ground test requirements, and develops advanced material response models validated with improved ground test data to predict weather erosion in flight. - Continued the development of the Transient Thermal Analysis Software (TTAS) project that provides improved capabilities for predicting aerothermal and ablation response to high speed, high temperature flow in ground and flight test environments. - Initiated the Reconfigurable RF Target Simulator (RRFTS) project to upgrade an Eglin AFB facility to test prototype sensors in a simulated hypersonic target and scene environment. - Completed development and integration of 16 Radar Signal Emulators (RSE) at the Nevada Test and Training Range (NTTR), NV and Navy Land and Sea Ranges at China Lake and NAS Pt Magu, CA to provide open-loop, transmit-only simulators that are representative of threat radar systems operating in the C and S radio frequency (RF) bands. Initiated procurement for 5 classified threat devices to be integrated with RSEs. - Completed critical design and continued system development of the Closed Loop PESA Simulator (CLPS) project to develop a closed-loop radar system that will closely replicate the performance of a widely fielded Western Pacific (WESTPAC) long-range surface-to-air missile (SAM) system. - Completed integration of four threat command posts at the Electronic Combat Range, China Lake, CA and continued system development for the Integrated Air Defense System (IADS) Enhancements project that fields high-priority, threat-representative Command Post (CP) models to open-air test ranges. - Completed Initial Operating Capability for the Next Generation Electronic Warfare Environment Generator (NEWEG) Build B project at NAS Patuxent River, MD to provide electronic warfare simulation capabilities for testing future Electronic Attack and 			

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C. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
<p>Electronic Support Measures systems. Continued procurement and integration for the Full Operational Capability systems at 3 sites.</p> <ul style="list-style-type: none"> - Completed critical design and continued development of the initial unit for integration testing. Continued system development for the Advanced Dynamic Transmitter Array (ADTRA) project to provide a complex, dynamic radio frequency (RF) threat environment at the Benefield Anechoic Facility (BAF). - Continued Integrated Technical Evaluation and Analysis of Multiple Sources (ITEAMS) activities to provide detailed analysis and validation of threat system designs and operational techniques for integration into ongoing electronic warfare projects. - Completed preliminary design and risk reduction testing for the Advanced Weapons Effects Test Capability (AWETC) project to develop a capability to more accurately measure fragment characteristics of explosive weapons(2mm size and above)and more accurately estimate collateral damage distances. - Completed Lot 1 site activation at 6 ranges for the Common Range Integrated Instrumentation System (CRIIS) project that establishes a high dynamic, sub-meter, military standard (MILS) capable range instrumentation system. Continued fielding of Lots 2 and 3. Completed F-22 configuration deliveries. Initiated software upgrade to Windows 10 and continued sustainment. - Continued early operational capability fielding of the Integrated Network Enhanced Telemetry (iNET) Project Block I capability to develop a network-enhanced aeronautical telemetry capability for T&E ranges and facilities. The project will be evaluated after flight test in mid FY19 to determine the best approach to providing this capability. - Completed Initial Operational Capability for the Network Centric Weapon (NCW) T&E Environment project that established the capability to test and evaluate an NCW in a distributed end-to-end simulation environment. Continued system design and development for Increment 2. - Completed fielding of a upgraded Ka-Band radar at the Atlantic Test Range; new HF antenna and refurbished target support pylon at the National Radar Test Facility, and continued development for the Radar Cross Section Range Relevance (RCSRR) project that upgrades radar cross section measurement capabilities of advanced low observable technologies at the Atlantic Test Range, Patuxent River NAS, MD and the National RCS Test Facility, Holloman AFB, NM. - Continued the Joint Strike Fighter Knowledge Management (KM) project to establish a next-generation KM capability that utilizes the latest in virtualization technologies, methodologies, and best practices for efficient and effective use of T&E data. Completed development of small form factor instrumentation prototypes for data collection and data analytics systems to support F-35 Initial Operational Test and Evaluation. - Continued threat system simulator, modeling and simulation development efforts to improve integration; reduce potential duplication and ensure that accurate, cost-effective representations of threat systems are available to support testing. - Initiated risk reduction activities under the Enhanced Solutions Process (ESP) for eight potential FY20 multi-Service T&E developments recommended by Service Test and Evaluation Executives. - Initiated development of requirements and project planning for Radio Frequency and Infrared Modeling and Simulation development. 			

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C. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
<p>Resource Enhancement Projects:</p> <ul style="list-style-type: none"> - Completed the Boosted Zombie Target (BZT) development of multi-stage economical targets for Patriot Advanced Capability – 3 (PAC-3), which integrated a Government Furnish Equipment (GFE) booster onto a blue "Zombie" maneuvering target. - Completed development of Joint Standard Instrumentation Suite (JSIS) Phase 1 that measured and collected signature, Time Space System Position Instrumentation (TSPI), and related data from key flight trajectory segments of threat missile and hostile fire munitions (e.g., small arms and RPG) firings to support evaluation of the missile/hostile fire warning systems such as the Advance Threat Warning (ATW) system. - Completed development of Submarine Launched Modular 3-inch Device (SLAM-3D), which provided a Cluster Duncan countermeasure emulator to help resolve the Anti-Submarine Warfare COI for the Mk 54 Mod 1 Torpedo. - Continued development of Advanced Communication Threat Testing Suites (ACTTS) Uplink Capability to develop an electronic warfare (EW) threat representative uplink jamming system to support test and evaluation of end to end satellite system responsiveness to threat systems operating in applicable bands. - Continued development of Airborne Early Warning Interoperability Simulator (AEIS) to develop the hardware and software necessary to generate a properly spaced, dense target and Electronic Counter Measure (ECM) environment for injection-mode Installed Systems Test Facility testing of the E-2D Hawkeye mission system. - Continued development of additional enhancements to Air Warfare Battle Shaping (AWBS) investments to improve air-to-air range infrastructure for NAWC-WD. - Continued development of Cognitive Electronic Warfare (Cognitive EW) Flight Test to evaluate an advanced EW system against emerging threat representations. - Continued development of Common Operational Test Vehicle and Engagement Real-Time Test Instrumentation (COVERT-I) to reduce the data collection footprint in Abrams tanks and Bradley fighting vehicles by reducing from three unique data collectors to one modular, scalable data collector with increased storage capacity. - Continued development of General Threat Torpedo (GTT) to develop a threat torpedo surrogate with upgradable interchangeable segments as an upgrade replacement for the current threat surrogate torpedo. - Continued development of Integrated Digital Acquisition Radar Environment - Upgrade (IDARE-U) to upgrade two NAWCWD Electronic Combat Range OEM Radars' analog output with digital upgrade for downstream digital messaging. - Continued development of Joint Standard Instrumentation Suite (JSIS) Phase 2 to measure and collect missile attitude (6DOF) as well as signature, TSPI, and related data for a larger portion of the threat MANPADS trajectory at the required accuracies within a single firing to support evaluation of the missile/hostile fire warning systems such as the Advance Threat Warning (ATW) system. - Continued development of the Medium Range Target Engagement Radar (MR-TER) Radar System Emulator (RSE) to develop and integrate TER waveform replication capability into C-Band RSEs. 			

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<ul style="list-style-type: none"> - Continued development of the Pulsed Doppler Emitter Capability Payload for Aerial Targets (PDEC-163) to develop kinematic threat representations and threat representative emissions to provide the DDG-1000 OT SUT with the ability to collect data necessary for COTF to accredit the DDG-1000's fire control loop weapons system response to threat targets. - Continued development of Space Fence Evaluation of Radar Effectiveness (SFERES) to fabricate a 3-axis stabilized CubeSat which will launch two spheres to support accurate evaluation of the Space Fence radar. - Initiated the development of Ultra Low-band Time Difference Of Arrival (UT) to develop the capability for a time difference of arrival (TDOA) multi-aircraft test configuration to support three aircraft under test in both the Air Combat Environment Test and the Evaluation Facility (ACETEF) and Electronic Combat Simulation and Evaluation Lab (ECSEL). <p>FY 2019 Plans: JIM Projects:</p> <ul style="list-style-type: none"> - Award design contract and complete a prototype system for the Advanced Range Tracking and Imaging System (ARTIS) project to provide the next generation of optical tracking mounts on DoD open-air ranges. - Complete requirements and project planning, and initiate design and concept development for the Autonomous Systems Test Capability (ASTC) project that develops test capability for Service autonomous systems. - Complete requirements and project planning, and award design contract for the Advanced Durability Testing (AVDT) that develops a multi-axle vehicle chassis simulator and a drive train simulator at Aberdeen, MD. - Complete planning, prototype test, and fabrication of safety blocks for the Fast Burst Reactor Upgrade (FBRU) project. Work includes development of an alumina coating process to reduce wear on the High Enriched Uranium (HEU) components and initiation of planning process for the fabrication of ring components. - Complete requirements and project planning, and initiate design and concept development for Mobile High Energy Laser Measurement (MHELM) project to support testing of directed energy weapon systems. - Complete design and initiate development for the Commercial Derivative Aircraft Based Instrumentation Telemetry System (CBITS) project that provides expanded telemetry support for aircraft and missile defense testing in inter-range and broad ocean area weapons testing. - Continue system development of the Cyber Test Analysis and Simulation Environment (CyberTASE) project that establishes the ability to test enterprise level IT systems against increasingly robust Cyber threats. - Complete development of the multi-level work station for cross-domain data management and continue development of a standardized, multi-level file transfer capability for the Multi-Level Secure Joint/Coalition Network Environment (MLS-JCNE) project that provides an enterprise-level multi-level secure and cross-domain data management T&E network environment. - Complete requirements and project planning, and initiate design and concept development for the Mission System Test Capability (MSTC) project that develops the capability to support integration and interoperability testing for advanced 4th and 5th generation aircraft data links (MADL and TTNT) in a ground test, simulation environment. 			
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<ul style="list-style-type: none"> - Complete requirements and project planning, and initiate design and concept development for the Radar Air-to-Ground Environment (RAGE) project that develops an installed test facility, ground test capability for testing advanced aircraft radars in high density air-to-air and air-to-ground environments. - Complete development and initiate integration of the UAS based Scoring sub-project at Eglin AFB, FL and award development contract for semi-autonomous control High Speed Maneuverable Surface Targets (HSMST) for the Swarm Autonomy and Scoring project that upgrades HSMST with semi-autonomous control and establishes UAS overhead scoring capabilities for testing against representative surface swarming threats. - Complete requirements and project planning, and initiate design and concept development for the Unmanned Aircraft Systems Test and Evaluation Improvements (UAS-TEI) and integrated Autonomous System Test Tool Kits to develop the capability to safely operate Unmanned and Autonomous aerial vehicles in controlled airspace. - Continue development, fabrication, and testing of the Mid-Pressure Arc Heater (MPAH) system to expand the H2 Hypersonic Test Facility at Arnold Engineering Development Complex, TN to provide higher enthalpy at the mid-pressure altitudes to enable ground materials testing of components of hypersonic systems. - Continue design and fabrication activities for the Hypersonic Test Capability Improvement Project (Phoenix) to provide a clean air, variable Mach ground test capability for hypersonic system prototypes from Mach 4 to Mach 7.5. Heater pit construction and refractory brick procurement completed. Heater assembly and bottle procurement started. -Continue the UAV Range (UAV Range) project to provide Global Hawk UAVs equipped with Telemetry, LIDAR and Optical tracking for inflight data collection of hypersonic systems. - Complete installation and test, and achieve Initial Operational Capability of the Tunnel 9 High Mach Number project that develops a Mach 18 test capability at the AEDC White Oak, MD facility to support aero/aerothermodynamic modeling and simulation to support intermediate range and strategic boost glide vehicle and maneuvering system concepts. - Complete the design and build stationary and transportable prototypes of the High Altitude LIDAR Atmospheric Sensing (HALAS) system that provides DOD launch and flight test ranges with improved ability to measure atmospheric conditions to reduce flight test evaluation uncertainty and improve launch and recovery operations. - Complete the design, fabrication, and achieve Initial Operational Capability of the Holloman AFB High Speed Test Track upgrade to provide full scale rain erosion capability to validate vehicle structural designs and qualify hypersonic weapon systems for flight in an open air environment. - Complete fabrication and test, and achieve Initial Operational Capability of the rain components of G-Range Weather Effects project that upgrades the 3 inch G-range test track at AEDC to provide a small scale dust, rain, and snow erosion test capability. Start development of the 8 inch track capability - Continue development under the M&S for Weather Effects on Hypersonic Systems project that provides a database of realistic and relevant weather conditions as a basis for ground test requirements, and develops advanced material response models validated with improved ground test data to predict weather erosion in flight. 				

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<ul style="list-style-type: none"> - Continue the development of the Transient Thermal Analysis Software (TTAS) project that provides improved capabilities for predicting aerothermal and ablation response to high speed, high temperature flow in ground and flight test environments. Achieve Initial Operational Capability of Fluid Thermal Structural Interaction (PTSI) model #1 of three planned releases. - Continue development of the Reconfigurable RF Target Simulator (RRFTS) project to upgrade an Eglin AFB facility to test prototype sensors in a simulated hypersonic target and scene environment. - Initiate the Workforce Development project to improve the depth and breadth of DoD hypersonic workforce skills. - Initiate other hypersonic improvement projects based need and maturity of the technologies. - Complete procurement and integration of 5 classified threat devices for use with Radar Signal Emulators (RSE) at the Nevada Test and Training Range (NTTR), NV and Navy Land and Sea Ranges providing simulators that are representative of threat radar systems operating in the C and S radio frequency (RF) bands. - Complete manufacturing and integration for the first system of the Closed Loop PESA Simulator (CLPS) project that provides a closed-loop radar system that replicates the performance of a widely fielded Western Pacific (WESTPAC) long-range surface-to-air missile (SAM) system. Continue development and integration of the second system. - Continue development and integration of additional threat command posts at the Electronic Combat Range, China Lake, CA for the Integrated Air Defense System (IADS) Enhancements project that fields high-priority, threat-representative Command Post (CP) models to open-air test ranges. - Continue procurement and integration of the Next Generation Electronic Warfare Environment Generator (NEWEG) Build B project at NAS Patuxent River, MD, Pt Mugu, CA and Edwards AFB, CA to provide electronic warfare simulation capabilities for testing future Electronic Attack and Electronic Support Measures systems. - Complete unit 1 for integration testing. Continue development units 2 and 3 for the Advanced Dynamic Transmitter Array (ADTRA) project to provide a complex, dynamic radio frequency (RF) threat environment at the Benefield Anechoic Facility (BAF). Continue system development. - Continue Integrated Technical Evaluation and Analysis of Multiple Sources (ITEAMS) activities to provide detailed analysis and validation of threat system designs and operational techniques for integration into ongoing electronic warfare projects. - Complete the critical design and the start system demonstration and test phase of the Advanced Weapons Effects Test Capability (AWETC) project to develop a capability to more accurately measure fragment characteristics of explosive weapons (2mm size and above) and more accurately estimate collateral damage distances. - Complete Lot 3 deliveries and the Windows 10 upgrade for the Common Range Integrated Instrumentation System (CRIIS) project that establishes high dynamic, sub-meter, MILS capable range instrumentation system. Continue sustainment. - Complete early operational capability fielding of the Integrated Network Enhanced Telemetry (iNET) Project Block I capability to develop a network-enhanced aeronautical telemetry capability for T&E ranges and facilities. - Continue system development of Increment 2 for the Network Centric Weapon (NCW) T&E Environment project that establishes the capability to test NCW in a distributed end-to-end simulation environment. 			

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<ul style="list-style-type: none"> - Complete preliminary design and continue development for the Atlantic Test Range next generation Advanced Dynamic Aircraft Measurement System (ADAMS-3). Complete the Digital Signal Processing development, Target Preparation upgrade and C2 System upgrade, and initiate development of the Semi-automated Target Rollover and Calibration Pit refurbishment for the National Radar Test Facility. The Radar Cross Section Range Relevance (RCSRR) project upgrades radar cross section measurement capabilities of advanced low observable technologies at the Atlantic Test Range, Patuxent River NAS, MD and the National RCS Test Facility, Holloman AFB, NM. - Initiate development of requirements and project planning for the Next Generation Turbine Engine (NGTE) Sea Level RAM project that upgrades turbine engine capability to test advanced, larger volume engines at Arnold Engineering Development Center, TN. - Continue the Joint Strike Fighter - Knowledge Management (KM) project to establish a next-generation KM capability that utilizes the latest in virtualization technologies, methodologies, and best practices for efficient and effective use of T&E data. - Complete risk reduction activities under the Enhanced Solutions Process (ESP) for eight potential FY20 multi-Service T&E developments recommended by Service Test and Evaluation Executives. - Complete requirements development and project planning and initiate preliminary design for priority Radio Frequency and Infrared Modeling and Simulation development projects. - Continue threat system simulator, modeling and simulation development efforts to improve integration; reduce potential duplication and ensure that accurate, cost-effective representations of threat systems are available to support testing. <p>Resource Enhancement Projects:</p> <ul style="list-style-type: none"> - Complete development of Airborne Early Warning Interoperability Simulator (AEIS) to develop the hardware and software necessary to generate a properly spaced, dense target and ECM environment for injection-mode Installed Systems Test Facility testing of the E-2D Hawkeye mission system. - Complete development of additional enhancements to Air Warfare Battle Shaping (AWBS) investments to improve air-to-air range infrastructure for NAWC-WD. - Complete development of Cognitive Electronic Warfare (Cognitive EW) Flight Test to evaluate an advanced EW system against emerging threat representations. - Complete development of Common Operational Test Vehicle and Engagement Real-Time Test Instrumentation (COVERT-I) to reduce the data collection footprint in Abrams tanks and Bradley fighting vehicles by reducing from three unique data collectors to one modular, scalable data collector with increased storage capacity. - Complete development of Integrated Digital Acquisition Radar Environment - Upgrade (IDARE-U) to upgrade two NAWCWD Electronic Combat Range OEM Radars' analog output with digital upgrade for downstream digital messaging. - Complete development of Joint Standard Instrumentation Suite (JSIS) Phase 2 to measure and collect missile attitude (6DOF) as well as signature, TSPI, and related data for a larger portion of the threat man-portable air defense systems (MANPADS) 			
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Appropriation/Budget Activity 0400: <i>Research, Development, Test & Evaluation, Defense-Wide I BA 6: RDT&E Management Support</i>	R-1 Program Element (Number/Name) PE 0604940D8Z I <i>Central Test and Evaluation Investment Program (CTEIP)</i>
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C. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
<p>trajectory at the required accuracies within a single firing to support evaluation of the missile/hostile fire warning systems such as the Advance Threat Warning (ATW) system.</p> <ul style="list-style-type: none"> - Complete development of the Medium Range Target Engagement Radar (MR-TER) Radar System Emulator (RSE) to develop and integrate TER waveform replication capability into C-Band RSEs. - Complete development of Space Fence Evaluation of Radar Effectiveness (SFERES) to fabricate a 3-axis stabilized CubeSat which will launch two spheres to support accurate evaluation of the Space Fence radar. - Complete development of Ultra Low-band Time Difference Of Arrival (UT) to develop the capability for a time difference of arrival (TDOA) multi-aircraft test configuration to support three aircraft under test in both the Air Combat Environment Test and the Evaluation Facility (ACETEF) and Electronic Combat Simulation and Evaluation Lab (ECSEL). - Continue development of Advanced Communication Threat Testing Suites (ACTTS) Uplink Capability to develop an electronic warfare (EW) threat representative uplink jamming system to support test and evaluation of end to end satellite system responsiveness to threat systems operating in applicable bands. - Continue development of General Threat Torpedo (GTT) to develop a threat torpedo surrogate with upgradable interchangeable segments as an upgrade replacement for the current threat surrogate torpedo. - Continue development of the Pulsed Doppler Emitter Capability Payload for Aerial Targets (PDEC-163) to develop kinematic threat representations and threat representative emissions to provide the DDG-1000 OT SUT with the ability to collect data necessary for COTF to accredit the DDG-1000's fire control loop weapons system response to threat targets. <p>FY 2020 Plans: JIM Projects:</p> <ul style="list-style-type: none"> - Initiate up to eight New Start CTEIP development projects based on nomination by the Service Test and Evaluation Executives. - Continue development of the Advanced Range Tracking and Imaging System (ARTIS) project to provide the next generation of optical tracking mounts on DoD open-air ranges. - Complete design and continue development for the Autonomous Systems Test Capability (ASTC) project that develops test capability for Service autonomous systems. - Complete design and continue development for the Advanced Durability Testing (AVDT) that develops a multi-axle vehicle chassis simulator and a drive train simulator at Aberdeen, MD. - Complete the delivery and test of safety blocks for the Fast Burst Reactor Upgrade (FBRU) project. Continue development and fabrication of the ring components. - Transition development from the Test and Evaluation/Science and Technology (T&E/S&T) Program to CTEIP for the Dense Plasma Focus (DPF) project that that provides very short pulse nuclear weapons effects test capability for certification and testing new circuit designs. - Complete design and continue development for the Mobile High Energy Laser Measurement (MHELM) project to support testing of directed energy weapon systems. 			

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C. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
<ul style="list-style-type: none"> - Complete development and integration testing for the Commercial Derivative Aircraft Based Instrumentation Telemetry System (CBITS) project to provide expanded capability and capacity telemetry support for aircraft and missile defense testing in inter-range and broad ocean area test scenarios. - Complete Full Operational Capability for the Cyber Test Analysis and Simulation Environment (CyberTASE) project that establishes the ability to test enterprise level IT systems against increasingly robust Cyber threats. - Complete Full Operational Capability for the Multi-Level Secure Joint/Coalition Network Environment (MLS-JCNE) project file transfer cross domain solution at the Joint Mission Environment Test Capability (JMETC) SYSCON and the Multi-level Desktop at the Man Flight Simulator Facility, NAS Patuxent River, MD. Initiate sustainment. - Complete design and continue development for the Mission System Test Capability (MSTC) project that develops the capability to support integration and interoperability testing for advanced 4th and 5th generation aircraft data links in a ground test, simulation environment. - Complete design and continue development for the Radar Air-to-Ground Environment (RAGE) project that develops an installed test facility, ground test capability for testing advanced aircraft radars in high density air-to-air and air-to-ground environments. - Complete Full Operational Capability for the Swarm Autonomy and UAV Scoring project to upgrade existing High Speed Maneuverable Surface Targets (HSMST) with semi-autonomous control for testing against representative surface swarming threats. - Continue development for the Unmanned Aircraft Systems Test and Evaluation Improvements (UAS-TEI) and integrated Autonomous System Test Tool Kits to develop the capability to safely operate Unmanned and Autonomous aerial vehicles in controlled airspace. - Complete testing and achieve the Initial Operational Capability of the Mid-Pressure Arc Heater (MPAH) system to expand the H2 Hypersonic Test Facility at Arnold Engineering Development Complex, TN to provide higher enthalpy at the mid-pressure altitudes to enable ground materials testing of components of hypersonic systems. - Continue fabrication and test activities for the Hypersonic Test Capability Improvement Project (Phoenix) to provide a clean air, variable Mach ground test capability for hypersonic system prototypes from Mach 4 to Mach 7.5. Complete installation on five of the six major subsystems. -Continue the UAV Range project to provide Global Hawk UAVs equipped with Telemetry, LIDAR and Optical tracking for inflight data collection of hypersonic systems. - Complete the testing and achieve Initial Operational Capability on the stationary and transportable prototypes of the High Altitude LIDAR Atmospheric Sensing (HALAS) system that provides DOD launch and flight test ranges with improved ability to measure atmospheric conditions to reduce flight test evaluation uncertainty and improve launch and recovery operations. - Complete testing and achieve Final Operational Capability of the Holloman AFB High Speed Test Track upgrade to provide full scale rain erosion capability to validate vehicle structural designs and qualify hypersonic weapon systems for flight in an open air environment. 			

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C. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
<ul style="list-style-type: none"> - Complete testing and achieve Final Operational Capability of the snow and ice components of G-Range Weather Effects project that upgrades the 3 inch test track at AEDC to provide a small scale dust, rain, and snow erosion test capability. Continue development of the 8 inch track capability. - Continue development under the M&S for Weather Effects on Hypersonic Systems project that provides a database of realistic and relevant weather conditions as a basis for ground test requirements, and develops advanced material response models validated with improved ground test data to predict weather erosion in flight. - Continue the development of the Transient Thermal Analysis Software (TTAS) project that provides improved capabilities for predicting aerothermal and ablation response to high speed, high temperature flow in ground and flight test environments. Achieve Initial Operational Capability of Fluid Thermal Structural Interaction (PTSI) model #2 of three planned releases. - Continue development of the Reconfigurable RF Target Simulator (RRFTS) project to upgrade an Eglin AFB facility to test prototype sensors in a simulated hypersonic target and scene environment. - Continue activities to improve capabilities of the hypersonic workforce with industry and academia. - Initiate requirements development and planning for projects that support hypersonic ground and open air range test capabilities consistent with need and technical maturity. - Complete development and integration testing for the second Closed Loop PESA Simulator (CLPS) that provides closed-loop radar systems that replicates the performance of a widely fielded Western Pacific (WESTPAC) long-range surface-to-air missile (SAM) system. - Complete integration of additional threat command posts at the Electronic Combat Range, China Lake, CA for the Integrated Air Defense System (IADS) Enhancements project that fields high-priority, threat-representative Command Post (CP) models to open-air test ranges. - Complete Full Operational Capability at the ECSEL, NAS Point Mugu, CA and BAF, Edwards AFB, CA for the Next Generation Electronic Warfare Environment Generator (NEWEG) Build B project to provide electronic warfare simulation capabilities for testing future Electronic Attack and Electronic Support Measures systems. - Complete units 2 and 3, integration testing with the Next Generation EW Environment system and continue development for the Advanced Dynamic Transmitter Array (ADTRA) project that provides a dense, complex, dynamic radio frequency (RF) signal threat environment at the Benefield Anechoic Facility (BAF). - Continue Integrated Technical Evaluation and Analysis of Multiple Sources (ITEAMS) activities that provide detailed analysis and validation of threat system designs and operational techniques for integration into ongoing electronic warfare projects. - Complete development and integration with full operational capability at 3 sites for the Advanced Weapons Effects Test Capability (AWETC) project to develop a capability to more accurately measure fragment characteristics of explosive weapons(2mm size and above)and more accurately estimate collateral damage distances. - Complete Windows 10 upgrade for the Common Range Integrated Instrumentation System (CRIIS) project that establishes high dynamic, sub-meter, MILS capable range instrumentation system. Transition sustainment to Services. 			

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C. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
<ul style="list-style-type: none"> - Complete Increment 2, RF and scene generation development, with Full Operational Capability established at 4 sites for the Network Centric Weapon (NCW) T&E Environment project that establishes the capability to test NCW in a distributed end-to-end simulation environment. - Complete requirements development and project planning and initiate design for the Next Generation Turbine Engine (NGTE) Sea Level RAM project that upgrades turbine engine capability to test advanced, larger volume engines at Arnold Engineering Development Center, TN. - Continue development of the ADAMS-3 radar facility for the Atlantic Test Range, Patuxent River NAS, MD. Complete development of Semi-automated target rollover, new fiber optics and perimeter security at the National Radar Test Facility. The Radar Cross Section Range Relevance Project (RCSRR) upgrades radar cross section measurement capabilities to measure and evaluate advanced low observable technologies. - Complete design and continue development for priority Radio Frequency and Infrared Modeling and Simulation development projects. - Continue ongoing threat system simulator, modeling and simulation development efforts, and initiate new threat simulator, modeling and simulation efforts in coordination with the Director, Operational Test and Evaluation (DOTE) Test and Evaluation Threat Resource Activity (TETRA). <p>Resource Enhancement Projects:</p> <ul style="list-style-type: none"> - Complete development of Advanced Communication Threat Testing Suites (ACTTS) Uplink Capability to develop an electronic warfare (EW) threat representative uplink jamming system to support test and evaluation of end to end satellite system responsiveness to threat systems operating in applicable bands. - Complete development of General Threat Torpedo (GTT) to develop a threat torpedo surrogate with upgradable interchangeable segments as an upgrade replacement for the current threat surrogate torpedo. - Complete development of the Pulsed Doppler Emitter Capability Payload for Aerial Targets (PDEC-163) to develop kinematic threat representations and threat representative emissions to provide the DDG-1000 OT SUT with the ability to collect data necessary for COTF to accredit the DDG-1000's fire control loop weapons system response to threat targets. - Initiate development of instrumented facilities to evaluate our next generation of sensors, weapons, platforms, and C4ISR systems in a realistic urban environment. - Initiate development of hardware simulators to test missile warning systems of new generation electronic warfare (EW) suites in a dynamic environment. - Initiate the development of non-intrusive instrumentation to address near term OT capability shortfalls to evaluate advanced sensor system performance in harsh environments. <p><i>FY 2019 to FY 2020 Increase/Decrease Statement:</i></p>			

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C. Accomplishments/Planned Programs (\$ in Millions)	FY 2018	FY 2019	FY 2020
Department Program Adjustments. Increased investments for high-priority hypersonic ground and open air range test capability developments and increased investments for critically needed upgrades to DoD Threat Models and Simulations.			
Accomplishments/Planned Programs Subtotals	204.268	270.013	260.267

D. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

E. Acquisition Strategy

N/A

F. Performance Metrics

A portion of CTEIP projects that were developed and delivered to the DoD test community over the past five years.