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**Exhibit R-2, RDT&E Budget Item Justification:** PB 2023 Office of the Secretary Of Defense **Date:** April 2022

<b>Appropriation/Budget Activity</b> 0400: Research, Development, Test & Evaluation, Defense-Wide I BA 6: RDT&E Management Support	<b>R-1 Program Element (Number/Name)</b> PE 0604940D8Z I Central Test and Evaluation Investment Program (CTEIP)
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COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
Total Program Element	2,014.894	407.678	994.151	819.358	-	819.358	834.052	789.225	550.279	457.466	-	-
940: Central Test and Evaluation Investment Program (CTEIP)	2,014.894	407.678	994.151	819.358	-	819.358	834.052	789.225	550.279	457.466	-	-

**Note**

New Start (Y/N): No

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

This program supports the Department's initiatives to defend the homeland, deter strategic attacks and aggression while prevailing in conflict, building enduring advantage, and building a resilient Joint Force and defense ecosystem. Since its inception in FY 1990, Central Test and Evaluation Investment Program (CTEIP) provides the development of critically needed, high-priority Test and Evaluation (T&E) capabilities for joint/multi-Service requirements. CTEIP investments address strategic requirements related to Hypersonics, Directed Energy, Cyber, Electronic Warfare, Nuclear Effects, Space, Autonomy, and Multi-Domain Operations. Other Investments in test infrastructure align with objectives in the Strategic Plan for DoD T&E Resources for high priority test needs and common range Infrastructure. The CTEIP uses a corporate investment approach to combine T&E needs from Service, Defense, and other Government agencies in order to maximize opportunities for joint efforts and avoid unwarranted duplication of test capabilities. CTEIP evaluates and selects for execution, proposals that align to the NDS and USD(R&E) priorities, provide the greatest return on investment, make efficient use of limited test resources, leverage Service investment, and promote joint solutions to fill test capability gaps. CTEIP provides enterprise solutions that benefit the whole Department. These investments are needed so test capabilities keep pace with U.S. and adversary technical advances as well as, with quickly changing threats.

**B. Program Change Summary (\$ in Millions)**

	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023 Base</u>	<u>FY 2023 OCO</u>	<u>FY 2023 Total</u>
Previous President's Budget	407.678	550.140	0.000	-	0.000
Current President's Budget	407.678	994.151	819.358	-	819.358
Total Adjustments	0.000	444.011	819.358	-	819.358
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program adjustment	-	-	15.779	-	15.779
• Transfer to Air Force - Lab Arnold AFB, TN	-	-	-38.000	-	-38.000

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0400: <i>Research, Development, Test &amp; Evaluation, Defense-Wide I BA 6: RDT&amp;E Management Support</i>	PE 0604940D8Z I <i>Central Test and Evaluation Investment Program (CTEIP)</i>			
• Joint Electronic Warfare Dominance Test Infrastructure	-	-	276.200	276.200
• DoD Microelectronics Ecosystem	-	-	41.500	41.500
• Flight Test Instrumentation and Terminal Area Scoring	-	-	43.600	43.600
• High Speed Test Track	-	-	23.700	23.700
• Secure Telemetry and High Bandwidth Data Processing	-	-	15.000	15.000
• Congressional Adjustment	-	444.478	-	-
• FFRDC Adjustment	-	-0.467	-	-
• Budget Year Adjustment	-	-	441.579	441.579

**Change Summary Explanation**

FY 2023 funding increase reflects the fact that the FY 2022 President's Budget request did not include out-year funding.

FY 2022 Congressional addition of \$444.478M improves the following capabilities: 1) enhanced hypersonic ground test capability and throughput by reactivating previously decommissioned synthetic air hypersonic propulsion test facilities, including the relocation of affected NASA capabilities or facilities; 2) acquires advanced C-band and S-band active electronically scanned array (AESA) radars with variable and reprogrammable multi-threat capabilities to better represent modern, complex EW test and training environments; 3) delivers and integrates C/X-band auxiliary systems necessary to simulate threat-representative integrated air defense system laydowns; 4) acquires modern, upgraded ground-based threat emulators (low, mid, and high-band) for USAF and Navy test ranges to enable realistic operational testing of F-35 and other airborne electronic attack platforms; 5) develop and fields mobile telemetry systems supporting long-range testing over the open ocean; 6) dynamic beam control measurement system for assessing performance of high energy laser (HEL) systems mounted on moving platforms in realistic shipboard and ground vehicle environments; 7) develop and fields an instrumented surrogate cruise missile target for the test and evaluation of directed energy engagements; 8) Upgrades portable broad open-ocean scoring system to include telemetry and SATCOM relay capability. FY 2023 funding increase reflects additional capabilities to the program in several high priority areas including: 1) acquisition of multiple advanced X-Band and VHF/UHF electronic warfare threat simulators to represent modern, complex EW test scenarios; 2) improve test capabilities at WSMR to evaluate impact of space environment and nuclear effects on microelectronics in realistic, controllable conditions; 3) broad ocean area RF and optical scoring capabilities to test lethality and impact location of hypersonic weapons in both Atlantic and Pacific oceans; 4) modernization of high speed test track at Holloman AFB and upgrades to tracks at China Lake and Eglin for testing hypersonic weapons; and 5) high-bandwidth, high-speed telemetry instrumentation at Kwajalein to enable high-speed data collection and fast turnaround of test data for hypersonic testing. FY 2023 decrease of \$38M reflects transfer of funds to USAF for MILCON associated with high capacity mid-pressure arc heater development at Arnold Engineering Development Complex, TN.

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<b>Appropriation/Budget Activity</b> 0400 / 6					<b>R-1 Program Element (Number/Name)</b> PE 0604940D8Z / <i>Central Test and Evaluation Investment Program (CTEIP)</i>				<b>Project (Number/Name)</b> 940 / <i>Central Test and Evaluation Investment Program (CTEIP)</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023 Base</b>	<b>FY 2023 OCO</b>	<b>FY 2023 Total</b>	<b>FY 2024</b>	<b>FY 2025</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
940: <i>Central Test and Evaluation Investment Program (CTEIP)</i>	2,014.894	407.678	994.151	819.358	-	819.358	834.052	789.225	550.279	457.466	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

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

The Central Test and Evaluation Investment Program (CTEIP) develops critically needed, high-priority Test and Evaluation (T&E) capabilities for joint/multi-Service requirements. CTEIP efforts include Hypersonics, Directed Energy, Cyber, Electronic Warfare, Nuclear Effects, Space, Autonomy and Multi-Domain Operations. Other Investments in test infrastructure align with objectives in the Strategic Plan for DoD T&E Resources for high priority test needs and common range Infrastructure.

The CTEIP uses a corporate investment approach to combine T&E needs from Service, Defense, and other Government agencies in order to maximize opportunities for joint efforts and avoid unwarranted duplication of test capabilities. CTEIP evaluates and selects for execution, proposals that align to the NDS and USD(R&E) priorities, provide the greatest return on investment, make efficient use of limited test resources, leverage Service investment; and promote joint solutions to fill test capability gaps. CTEIP provides enterprise solutions that benefit the Department as a whole.

The CTEIP provides critically needed T&E investments which align to USD(R&E) priorities and the Strategic Plan for DoD T&E Resources. These investments are needed so that test capabilities keep pace with U.S. and adversary technical advances as well as with quickly changing threats. The CTEIP includes special studies, analyses, project improvements, quick reaction efforts and strategic planning related to test capabilities and infrastructure. CTEIP investments increase efficiency and reduce the cost of testing on DoD's major ranges and test facilities. 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.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
<b>Title:</b> Central Test and Evaluation Investment Program	407.678	994.151	819.358
<b>Description:</b> Autonomous Systems Test Capability develops a Digital Robotic and Autonomous Systems Integrated Virtual Environment (DRIVE) for testing DoD autonomous ground vehicle systems and an open-air range Safety Environment, Engagement and Response (SEER) capability to safely test full scale autonomous vehicles.			
Autonomy Integration and Teaming develops a suite of capabilities furthering UAS systems integration into controlled airspace and the test tools for integrating manned-unmanned teaming between ranges. Early demonstration at Pax River, MD has been successful. Initial capabilities will be delivered to NAS Pax River, MD, Redstone Arsenal, AL and Edwards AFB, CA.			
Counter UAS Lethality Diagnostics will provide a shielded enclosure for flight controllers, lethality and HPM diagnostics for cUAS operations.			

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<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
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Counter UAS develops a prototype high-fidelity X-band radar for tracking cUAS capabilities against commercially available small UAS. This provides a Common Operating Picture system for real-time awareness, data collection and analysis.

Counter UAS Jamming Operations develops an open-air capability for creating a mission relevant RF test environment for testing CUAS systems at NAWCAD Webster Field, MD.

Naval Autonomous Systems Test Capability establishes an M&S capability to test the performance of Naval surface ship autonomous systems software.

Advanced Range Tracking and Imaging System develops the next generation suite of optical tracking systems to increase performance, reduce costs and establish secure reliable optical tracking capability on DoD open-air ranges.

Short-Wave Infrared Zoom Lens develops a short-wave IR metric zoom lens to be mounted on multiple DoD tracking systems to track, determine effects phenomenology, and TSPI of aerial directed energy targets at night and in obscuration.

Common Vehicle and Engagement Real-Time Test Instrumentation will reduce the size, weight and power for vehicle test data collection by replacing three unique data collectors with one modular, scalable data collector with increased storage capacity. This capability supported Abrams M1A2 System Enhancement Package (SEP) V3 and Bradley M2/M3A4 FOT&E and will support future vehicle tests.

Hybrid Tracking System will develop a modular system of sensors to provide a range of capabilities for providing time, space position information, in GPS denied environments, for aircraft and weapon testing.

Joint Standard Instrumentation Suite (JSIS) Phase 2 acquires a missile attitude instrument suite used to capture 6-DOF TSPI and validate RF and IR missile models, while meeting requirements associated with OCONUS transport and operation.

Littoral Electromagnetic Range establishes a secure, well-instrumented coastal test environment at NIWC, San Diego to validate emerging commercial and government electromagnetic systems and tactics.

Maritime Tomahawk Range Safety Upgrade provides an additional telemetry frequency to Block V Tomahawk test assets enabling range safety control and telemetry in support of stream raid/simultaneous engagements.

<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>

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<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
<p>Open-Air Multi-Spectral Data Collection develops a test capability for T&amp;E of integrated multi-spectral threat warning receivers and infrared countermeasures against complex multi-spectral threats. This effort will field co-located RF and IR mobile threat simulators and a portable C2 node for realistic threat presentation to engage the SUT.</p> <p>Over Water Impact and Location Scoring System develops an open ocean weapons impact scoring system to provide persistent, relocatable range capability for beyond line of sight, high precision weapon scoring and range surveillance.</p> <p>Directed Energy High Speed Data Recorder develops a ruggedized, shielded, man-portable high-speed data recording system for HPM directed energy testing.</p> <p>Government Radiometrically-Accurate Instrument for Laser Evaluation develops a diagnostic system for confirming performance of current and future HEL systems.</p> <p>Directed Energy Remote Target Status Sensor develops a system capable of measuring HPM effects on internal components attacked by HPM systems.</p> <p>Directed Energy S-Band Threat Source develops a frequency agile S-band HPM threat source for MIL-STD 464C vulnerability testing.</p> <p>Directed Energy Tethered HPM Recorder and Electronic Attack Target effort accelerates development of instrumentation necessary for testing UAS vulnerabilities in an HPM threat environment.</p> <p>Directed Energy System Placement Analysis Tool upgrades existing capability to provide 3D outdoor effects test planning tool with safety assessments needed to support testing of Counter UAS HPM systems.</p> <p>HPM E-Field Sensor develops a portable wide area measurement system to characterize the HPM E-field and test blue HPM effectiveness against airborne threats.</p> <p>HPM VHF Threat Simulator develops a test source to support wideband VHF MIL STD 464C testing of a full-sized target such as an aircraft.</p> <p>Closed Loop PESA Simulator develops two transportable, closed-loop threat radar systems replicating the performance of a classified, widely fielded long-range surface-to-air missile system.</p>			

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<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
EO/IR direct injection will develop test capability in which EO/IR imagery is directly injected into the systems' core computer via sensor emulators.			
Electronic Attack Drone for Army T&E develops a package for BQM-167 drone target that can target multiple radar systems under test (SUT)s at multiple frequency bands.			
IADS Enhancements and Networked Threat Emulation develops a comprehensive threat-representative IADS capability at Electronic Combat Range, China Lake and other facilities providing four threat-representative Command Posts to existing EW capabilities.			
Interactive CNI RF Environment Simulator will address ISTF shortfalls in CNI RF testing on modern aircrafts by expanding upon current ISTF capability to provide an operationally relevant ground test environment.			
Joint Electronic Warfare Cyber Techniques, Effects and Characteristics development provides an RF and cyber effects test environment for Electromagnetic Maneuver Warfare.			
Joint Electronic Warfare Airborne Instrumentation Interoperability development was initiated to maximize airborne instrumentation interoperability between the CTEIP developed Common Range Integrated Instrumentation Systems and Air Force/Navy Tactical Combat Training System II, and established a blueprint for merging baselines into a common system. Development will continue from FY 2021-2026 which includes upgrading CRIIS encryption to NSA requirements as well as data link and ground software upgrades to increase interoperability between CRIIS and TCTS-II on test and training ranges.			
Joint Electronic Warfare DIADS Integration upgrades DIADS M&S capacities to support expansion of EW testing across western test ranges.			
Joint Electronic Warfare Open Air Battle Shaping will establish an enterprise architecture and approach to implement multi-range aircraft instrumentation interoperability and network connectivity to meet test and training needs for air warfare missions. This includes upgrading aircraft instrumentation and multi-range aircraft compatibility and simulated effects needed to provide enlarged, realistic, interoperable battlespace as aircraft transit multiple ranges during a large-scale test and training scenario.			
Radar Air-to-Ground Environment will develop capabilities for testing high-density air-to-air, air-to-ground,) and advanced signals (AS) in an ISTF environment. The radar environment simulator will provide digital RF memory devices that capture, store, delay, scale, and return radar signals to the radar under test.			

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**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
Ultra-Low Band Time Difference of Arrival (provides Next-Generation Electronic Warfare Environment Generator hardware to enable multi-ship correlation of simulated signals to a specific emitter or emitters.			
Hypersonic Test Capability Improvement develops a clean air, variable Mach ground test capability from Mach 4 to Mach 6 for DT&E of full-scale hypersonic boost glide and scramjet weapon systems. Procurement and detailed design continued in FY 2021.			
Mid-Pressure Arc Heater development expands the DoD H2 Hypersonic Test Facility to provide higher enthalpy at the mid-pressure altitudes to enable ground testing of Prompt Global Strike, Maneuvering Reentry Vehicles, and SCRamJet components such as nose cones, fins, and other leading-edge surfaces.			
The next generation aeroshell test capability develops an arc heater facility that increases DoD's capacity to conduct aerothermal materials testing in support of hypersonic missiles, ballistic missiles, and other high altitude ballistic/maneuvering munitions. The system will more than double the annual test capacity.			
G-Range Weather Effects upgrades the current test track to provide a small-scale rain and snow erosion test capability to validate vehicle structural design.			
High Energy Laser Dynamic Environment develops 6 DoF vibration tables for HEL systems mounted on ships, ground vehicles, and aircraft.			
High Pressure Air Compressor provides additional air compressor capability at AEDC to reduce recharge time resulting in more test runs per week at the Aerodynamic and Propulsion Test Unit and J5.			
Joint Economical Sled Track Rocket develops a new modular rocket propulsion system for the three DoD high speed test tracks including an improved capability to ground test full scale components at hypersonic speeds.			
Diagnostic Scoring System (Radar on a Raft) Motion Compensation develops a radar pedestal motion compensation mechanism and test and verification system to support weapon lethality testing in broad open ocean environments.			
Mach 7 test capability at the AEDC tunnel 9 return to service provides a full-scale aerothermal structural capability for seeker aperture development.			
M&S for Maneuvering Boost Glide Vehicles - Transient Thermal Analysis Software upgrades a tool set improving capabilities for predicting aerothermal and ablation response to high speed, high temperature flow in ground and flight test environments.			

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<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
<p>M&amp;S Enhancements Weather Effects develops advanced material response models validated with ground test data to predict weather erosion in flight.</p> <p>Reconfigurable RF Target Simulator upgrades an Eglin AFB facility to test prototype sensors in a simulated hypersonic target and scene environment.</p> <p>Reagan Test Site Non-Ballistic Radar Tracking develops advanced, non-ballistic tracking algorithms and the supporting infrastructure to track non-ballistic hypersonic vehicles.</p> <p>Reagan Test Site Kiernan Reentry Measurements Site Technology Refresh will refresh KREMS Radar hardware and software systems to increase system functionality and system capability.</p> <p>Accelerated Vehicle Durability Testing develops a multi-axle vehicle chassis simulator and a drive train simulator to test heavy 4 and 5 axle vehicle performance and reliability.</p> <p>Radar Cross Section Range Relevance is comprised of eleven development efforts providing upgraded and new RCS measurement capabilities to measure and evaluate advanced low observable technologies in increasingly complex and cluttered environments.</p> <p>Scene Projector will improve high fidelity, high temperature scene protectors for installed system and hardware in the loop laboratory testing of sensors and seekers for high speed weapons and missile engagements.</p> <p>Dense Plasma Focus develops an ultra-short pulse simulation capability to test the vulnerability of missile components to very short, intense bursts of neutrons from a fusion-based nuclear weapon.</p> <p>Fast Burst Reactor Upgrade develops new high purity, high enriched uranium rings and safety blocks for the fast burst reactor at White Sands Missile Range, NM to conduct neutron vulnerability testing of missile and other components.</p> <p>Heavy Ion Test Facility Upgrade for Single Event Effects (SEE) testing. A Single Event Effects (SEE) adds an additional SEE Beamline to increase capacity of testing natural space radiation.</p> <p>White Sands Test Center Survivability and Vulnerability Rarefaction Waveform Eliminator Upgrade provides an improved louver system for the large blast simulator to prevent debris hitting the test object.</p>			

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<p>White Sands Test Center Survivability and Vulnerability Xenon Lamp Facility Upgrade provides an improved control system and subsonic wind capability for this system.</p> <p>X-Ray Simulator for Test and Evaluation of Nuclear Survivability replaces and upgrades three DoD X-ray simulators that measure the susceptibility of missile components to damage from high dose warm and cold x-rays experienced in space.</p> <p>Advanced Communication Threat Testing Suites Uplink Capability develops an EW threat representative uplink jamming system for T&amp;E of satellite system responsiveness against threat systems.</p> <p>General Threat Torpedo develops a threat representative torpedo vehicle that tactically and acoustically emulates threat torpedoes that are not currently available for surface or sub-surface ship testing.</p> <p>IR and RF Threat M&amp;S upgrades 10 RF and 10 IR authoritative Intelligence Community missile models supporting the DoD Threat Model Analysis Program (TMAP), Enhanced Missile SIGnature (EMSIG) and other high-fidelity seeker models.</p> <p>Maritime Survivability Library Threat M&amp;S Tool evaluates the lethality of emerging anti-ship weapons, using artificial intelligence/ machine learning techniques.</p> <p>Multispectral Sea and Land Target Simulator Emitter Upgrades modernizes IR Missile plume simulator emitters to meet current and future systems' fidelity requirements, as well as improve the simulators' availability and sustainability replacing obsolete equipment and augmenting the available standby emitters.</p> <p>Towed Array Threat Emulator (TATE) Threat Representation will provide a modular towed array/architecture to add to the Submarine Launched Countermeasure Emulator for full duplex submarine countermeasure testing.</p> <p>Tactical Aerospace Laser Optical Simulator – High Altitude will develop a dual laser threat simulation capability to evaluate space-based ISR sensors against surrogate ground- and air-based laser threats.</p> <p>Adaptable Multi-Band Asset for Global Navigation Satellite System develops a threat representative multi-modal global navigation satellite system jammer to provide denial and deception jamming of PNT information during operational test and training.</p> <p>Army Threat Force Geospatial System completes development of the Common Operational Picture system for management of Threat Force assets.</p>			

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<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2021</b>	<b>FY 2022</b>
<p>Electronic Attack-5G development provides a threat representative Electronic Attack capability against 5G systems for denial, degradation and deception of service attacks during operational test and training.</p> <p>Towed Airborne Plume Simulator Helicopter will provide an infrared threat missile plume-simulator to support rotary wing Aircraft Survivability.</p> <p>Cyber Test Tools</p> <ul style="list-style-type: none"> <li>* Avionics Test Bed 2.0 develops a common framework to allow embedded avionics components to engage in an error-free state while component level cybersecurity T&amp;E is performed.</li> <li>* Bindle Linux Harness Automation automates the construction of harnesses that the fuzzer can then use to launch and feed inputs to a Linux based system under test.</li> <li>* Full Authority Digital Engine Control (FADEC) Tool develops a test bench and cyber tools to assess the cyber vulnerabilities of the main communication and control channels and data links.</li> <li>* Network, System Integration and Test Environment Cyber Test Capabilities expands the NSITE application to include cyber capabilities to monitor, check for, alert on, identify messaging, and identify the source of the messaging that is modified, or indicates a modification “tip-off” capability.</li> <li>* Non-IP Cybersecurity Suite will provide a Non-IP threat attack tool suite for Navy vessel cyber testing.</li> </ul> <p><b>FY 2022 Plans:</b></p> <p>Autonomous Systems Test Capability will complete development in FY 2022 and IOC in FY 2023. ASTC will enable evaluation of autonomy software in a distributed M&amp;S environment and will provide an instrumented open air range to validate algorithm performance.</p> <p>Autonomy Integration and Teaming capability will IOC in FY 2022 providing instrumented open air test ranges at Pax River, Redstone Arsenal, and Edwards AFB to test Detect and Avoid technologies and evaluate the ability of unmanned aircraft operation in and traverse civil airspace.</p> <p>Counter UAS jamming environment for maritime operations will IOC in FY 2022. This capability will produce threat realistic electromagnetic and EW environments at St. Inigoes for testing CUAS in littoral and maritime environments.</p> <p>Advanced Range Tracking and Imaging System capability will IOC at WSMR. This capability will replace aging and obsolescent optical tracking capabilities at multiple Service test ranges.</p>			

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<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
<p>Short-Wave Infrared Zoom Lens capability will FOC in FY 2022. This capability will augment ARTIS and enable EO/IR tracking in adverse weather condition and during night operations.</p> <p>Common Range Integrated Instrumentation System will continue compatibility/interoperability initiatives with the Tactical Combat Training SystemII. CRIIS is the underlying architecture being used by TCTS-II. This effort will ensure test and training ACMI systems can operate on one another's ranges.</p> <p>Joint Standard Instrumentation Suite Phase 2 will achieve IOC in FY 2022 enabling high accuracy, 6-DOF measurements of threat missile characteristics in-flight. This data is necessary to validate IR and RF threat models being developed for our HWIL and OAR threat simulators.</p> <p>Over Water Impact and Location Scoring System will IOC in FY 2022. OWIL will enable broad open area ocean scoring of conventional and hypersonic missile impacts.</p> <p>Directed Energy High Speed Data Recorder will IOC in FY 2022. DEHSDR will provide man portable, ruggedized data recorders to capture RF data in HPM environments.</p> <p>Government Radiometrically-Accurate Instrument for Laser Evaluation capability will IOC in FY 2022. This capability will enable HEL programs and tech demonstrators to evaluate laser performance (power, beam size, near-field irradiance, etc.) in a controlled environment.</p> <p>Directed Energy Remote Target Status Sensor will IOC in FY 2022 providing an ability to remotely assess and report the functional status of electronic response to target engagement when it is unsafe for personnel to be in the target area.</p> <p>HPM E-Field Sensor will IOC in FY 2022 enabling remote HPM field data collection and characterization as well as remote data transfer to the base station.</p> <p>HPM VHF Threat Simulator will IOC in FY 2022 providing a generic HPM source for testing blue systems against VHF threats.</p> <p>Closed Loop PESA Simulator will complete FAT and IOC/FOC at Eglin AFB and Nellis Test and Training Range providing first-of-kind operationally realistic threat representations of a classified WESTPAC SAM threat for testing airborne electronic attack platforms. CLPS will IOC at Nevada Test and Training Range in FY 2022.</p>			

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<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
<p>Joint Electronic Warfare DIADS Integration Upgrades (Phase I) will IOC in FY 2022 for Navy Sea and Land Ranges.</p> <p>Many-on-Many EW test capability will begin in FY 2022. This capability will reside within the ACETEF at Pax River, MD and will enable single and multi-ship engagements against dense RF threat environments which cannot be replicated in the open air.</p> <p>Large scale hypersonic full body test capability will complete final design in FY 2022. This facility will enable full-scale ground testing at hypersonic air speeds for extended durations.</p> <p>Mid-pressure Arc Heater complex will test thermal protection systems and materials survivability for hypersonic weapons and is expected to begin and reach PDR in FY 2022. This facility will greatly improve test capacity and enhance the enthalpy envelope with which vehicle testing occurs ultimately providing critical feedback to hypersonic weapon developers.</p> <p>Ground Based Radar Upgrade for key tracking radars at Kwajalein Atoll will deliver the required radome design drawings in FY 2022 to enable fabrication to begin. The radome is critical to keeping this asset operational during the next 4 years as hypersonic testing at RTS increases.</p> <p>G-Range Weather Effects will IOC in FY 2022 enabling AEDC to evaluate effects of rain, sand, and other atmospheric conditions on hypersonic projectiles.</p> <p>High Speed Test Track Weather Effects will conduct full system demonstration runs and IOC in FY 2022. The capability will be implemented on the High Speed Test Track at Holloman AFB and will enable controlled weather effects testing for hypersonic and conventional weapons.</p> <p>Joint Economical Sled Track Rocket capability will be awarded in FY 2022. JESTR is a modular rocket motor development effort to meet ground test propulsion needs for hypersonic weapons testing (both recoverable and impact testing).</p> <p>Diagnostic Scoring System via Radar on a Raft Motion Compensation will complete in FY 2022. This capability will provide motion compensation and stabilization of existing radar trackers to provide more accurate TSPI/tracking of incoming hypersonic weapons.</p> <p>Reagan Test Site Non-Ballistic Radar Tracking capability will IOC in FY 2022. This capability will apply novel tracking software algorithms to existing KREMS radars at RTS to allow tracking of low flying, highly maneuverable hypersonic weapons.</p> <p>Accelerated Vehicle Durability Testing capability will FOC in FY 2022. AVDT will provide a ground based simulator to perform drivetrain and chassis testing on 98% of the DOD's vehicle fleet.</p>			

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<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
<p>The National RCS Test Facility at WSMR completed the Target Preparation Facility Upgrade and initiated the Target Rollover and Dynamic Signal Processing efforts. These capabilities facilitated quicker test turnaround and safer operations for personnel.</p> <p>White Sands Test Center Survivability and Vulnerability Rarefaction Waveform Eliminator Upgrade will IOC in FY 2022.</p> <p>White Sands Test Center Survivability and Vulnerability Xenon Lamp Facility Upgrade will IOC in FY 2022 increasing coupon size, thermal flux uniformity, and airflow over the test article to enable more accurate testing of electronics exposed to nuclear environments.</p> <p>Advanced Communication Threat Suite for Uplink Jamming Capability will FOC in FY 2022. The capability will enable testing of AEHF and other advanced satellite programs already in orbit by simulating red force jamming signals at non-destructive scaled levels.</p> <p>Ground Unattended Threat Sensor Suite will FOC in FY 2022 providing threat representative ground sensor networks for evaluation of blue force movements and operations in large scale test events.</p> <p>Pulsed Doppler Emitter Capability Payload for Aerial Targets (PDEC-163) develops threat representative pulse doppler emitter packages for GQM-163A supersonic sea-skimming targets. PDEC-163 continued development will achieve IOC by the end of FY 2022.</p> <p>Towed Array Threat Emulator (TATE) Threat Representation will provide a modular towed array/architecture to add to the Submarine Launched Countermeasure Emulator for full duplex submarine countermeasure testing. TATE will achieve IOC in FY 2022.</p> <p>Avionics Test Bed 2.0 will be initiated in FY 2022 and develop a common framework to allow embedded avionics components such as line replaceable units to engage in an operational and error-free state while component level cybersecurity T&amp;E is performed. Planned IOC is FY 2023.</p> <p>Cyber Tools for Aviation Threat Triggers will begin in FY 2022 and develop a cybersecurity test tool for exploiting unencrypted Radio Frequency (RF) datalinks found on various weapon platforms. Planned IOC is FY 2023.</p> <p>Fiber Channel Test Tools are beginning development in FY 2022 and will produce test capability to evaluate vulnerability of weapon system and subsystem data transfer and digital communication channels. Planned IOC is FY 2023.</p>			

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<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
<p>Linkjacker will begin in FY 2022 and develop cybersecurity test tools for exploiting unencrypted RF datalinks currently being used on multiple platforms. Planned IOC is FY 2023.</p> <p>Network, System Integration and Test Environment will begin development in FY 2022 and deliver ubiquitous cyber test tools to evaluate LINK-16 performance in contested environments. Planned IOC is FY 2023.</p> <p><b>FY 2023 Plans:</b>                      Joint EW Dominance capability to acquire multiple advanced X-Band and VHF/UHF electronic warfare threat simulators to faithfully represent modern, complex EW test scenarios and provide necessary threat density. Deliver and integrate threat representative open and closed loop capabilities at the Joint Pacific Alaska Range Complex, Nellis Test and Training Range, China Lake, and Point Mugu to enable evaluation of advanced airborne electronic attack platforms and electronic support aircraft including F-35, EA-18G, F/A-18, NGJ, B-1, B-2, and B-21.</p> <p>Capability to test and evaluate vulnerability and susceptibility of microelectronics to effects encountered in nuclear and space environments. Test capability will develop and field instrumentation to simulate realistic neutron and gamma environments in a controlled environment.</p> <p>Transportable instrumentation suite to assess lethality and determine terminal area scoring location and profile of hypersonic weapons in the broad open area ocean. Capability will be capable of operating in both Pacific and Atlantic oceans.</p> <p>Develop and build next generation sled track at Holloman AFB to enable controlled, repeatable, and recoverable testing of hypersonic weapons (Mach 5+). Capability will install over 9 miles of 3-rail sled track and will extend current water trays to enable safe recovery of test vehicles. Effort will also make necessary spot repairs at China Lake SNORT test track and Eglin high speed test track to ensure additional capacity for all weapon testing.</p> <p>Secure Telemetry and High-bandwidth Data Processing will enable near-real time telemetry collection and data distribution for hypersonic weapon endgame testing. SATCOM and ground-based TM networks will be installed at Reagan Test Site (Kwajalein Atoll) as well fiber connectivity between data collection sites at individual islands around the atoll. Capability will enable immediate collection and processing of data from the test vehicle and will result in vastly improved turnaround time for test results.</p> <p><b>FY 2022 to FY 2023 Increase/Decrease Statement:</b>                      The TRMC initiated a transfer of CTEIP funding to AF MILCON to jump-start building a critical aeroshell test facility for hypersonics, missile defense, and strategic systems at Arnold AFB, TN, starting in FY 2023.</p>				

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<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
<p>FY 2023 funding increase reflects improving the Department's test infrastructure to support testing in several high priority areas which include:</p> <p>(1) Joint Electronic Warfare Dominance Test Infrastructure – acquiring multiple threat-representative wideband radars to adequately test and assess our fifth-generation aircraft in a contested environment.</p> <p>(2) DoD Microelectronics Ecosystem – hardening our next generation of microelectronics for survivability against nuclear effects (neutrons, x-ray, gamma, etc.) on the battlefield, and accelerate the testing of microelectronics used in strategic systems and space systems.</p> <p>(3) Flight Test Instrumentation and Terminal Area Scoring – broad ocean area precision scoring capabilities to test lethality and impact location of nuclear modernization systems (Ground Based Strategic Deterrent, Trident, etc.).</p> <p>(4) High Speed Test Track – upgrading capabilities to realistically test end-game missile lethality (seeker, warhead detonation, intercept effectiveness, etc.) at DoD high speed test tracks which are located at Holloman, China Lake, and Eglin.</p> <p>(5) Secure Telemetry and High Bandwidth Data Processing – improving cybersecurity and accelerating test analysis at numerous long-range missile test ranges to support faster acquisition of hypersonic and nuclear modernization systems.</p>				
<b>Accomplishments/Planned Programs Subtotals</b>		407.678	994.151	819.358
<b>C. Other Program Funding Summary (\$ in Millions)</b>				
N/A				
<b>Remarks</b>				
<b>D. Acquisition Strategy</b>				
N/A				