

# Center for Countermeasures (CCM)



The Center for Countermeasures (CCM) accomplishes its mission by operating and deploying specialized mobile test instrumentation capable of simulating an array of threats to measure and evaluate operational effectiveness of countermeasures (CMs) employed by U.S. DOD and foreign weapon systems. The portability of CCM test tools and personnel provide the necessary test agility and efficiency for the DOD to develop and field warfighting capabilities at operationally relevant speeds, minimizing the logistical burden requirements of the Program Office, and preserving schedules and resources. In FY22, CCM executed 42 test events in support of the following: 1) successful development of instrumentation for characterizing directed energy weapons (DEWs) operational performance; 2) delivery of missile plume simulators to test Aircraft Survivability Equipment (ASE), including fixed- and rotary-wing platforms;

3) high-threat environments for pre-deployment training; 4) Counter-Unmanned Aerial Systems (C-UASs) programs; and 5) project arrangements with allies to advance CM testing and evaluation. Overall, CCM expedited the development and fielding of CM systems; enabled credible T&E of directed energy (DE)-based CMs, C-UASs, and survivability equipment; provided a threat environment for pre-deployment training; and leveraged partnerships with allies to advance T&E of infrared (IR)- and radio frequency (RF)-based CMs (IRCMs and RFCMs).

## **CCM Expedites the Development and Fielding of CM Systems**

In FY22, CCM continued to upgrade the following test infrastructure and capabilities to keep pace with adversary advances, data management demands, as well as expedited testing, development, and

fielding of CMs needed to dominate and survive in an increasingly complex, multi-domain environment:

- **The Joint Mobile IRCM Test System (JMITS) and Multi-Spectral Sea and Land Target Simulators** – five dual-band IR and ultraviolet simulators capable of replicating threat missile plumes. Upgrades to the missile simulator emitters include improved bandwidth and processing capabilities to adequately represent threats and evaluate advanced missile warning sensors (MWSs) and directed IR countermeasures (DIRCMs). Upgrades to the simulators will be completed by 4QFY23.
- **The Towed Airborne Plume Simulator (TAPS)** – an airborne-towed body missile plume simulator that replicates the IR temporal characteristics of a threat missile approaching an aircraft. TAPS can also approximate the spectral and spatial behavior of threat missiles, simulating the movement of a threat in different backgrounds to more adequately evaluate aircraft MWSs. A Quick Reaction Test Capability, termed TAPS-Helicopter, will expand the TAPS test capabilities for rotary-wing aircraft. Flight validation testing will be completed in 2QFY23.
- **The Joint Standard Instrumentation Suite (JSIS)** – a suite of instrumentation used to collect missile plume/hostile fire threat signatures and Time-Space-Position Information data during threat live fire events. This data collection and management of threat signatures will further develop the Missile Space and Intelligence Center’s threat models to support MWS and CM development and evaluation. The JSIS baseline was developed from FY13 – FY18. JSIS Full Operational Capability will provide all remaining JSIS equipment requirements, including radiometers, spectrometers, and tracked imagery by 3QFY23.
- **The High-Power Portable Range Threat Simulator** – a ruggedized, deployable, ground-based, open-loop RF threat radar simulator designed to provide open-space emulation of threat radar signals and full threat modulations. The upgrade, completed in 2QFY22, replaced a legacy signal generator and increased CCM’s capabilities with new, higher-fidelity threat radar signals.
- **The JMITS Seeker Instrumentation Suite** – a suite capable of operating up to four IR Man-Portable Air Defense System (MANPADS) seekers to provide real-time data collection of actual seeker signals required to determine effectiveness trends of current CM expendable flares and/or DIRCM laser jammers. The JMITS Seeker Instrumentation Suite simulates a missile engagement and collects seeker responses to provide end-to-end ASE testing. Upgrades will be completed in 2QFY23.
- **The High Energy Laser (HEL) Remote Target Scoring (HRTS) System** – an integrated optical and sensor suite that will provide radiometric and multi-spectral imaging of targets, starting at the systems acquisition and including HEL engagement up to target flight path termination. HRTS enables the tracking and scoring of a variety of targets during HEL engagements, including light boats, rocket-artillery-mortars, unmanned aircraft systems, and subsonic/supersonic cruise missiles. HRTS will be available by 2QFY23.
- **DOD Space T&E Instrumentation Initiatives** – investments in space capabilities increase the effectiveness of operations in every other domain. To ensure the United States continues building an enduring advantage, the DOD must accelerate the delivery of space systems and ensure they are adequately tested and have the appropriate infrastructure and resources needed to assess effectiveness. In collaboration with the Test and Evaluation Threat Resources Activity (TETRA), CCM is participating in DOT&E’s Space Electronic Warfare (EW) and Cyber Working Group (WG). The objectives are to identify gaps in space EW T&E capabilities and actions/ investments required to fill those gaps. This WG will undergo a yearlong effort and will provide the DOD findings and recommendations in 4QFY23. CCM is supporting this initiative by collecting data, conducting the gap analysis, and working with TETRA to report the results.

## CCM Enables Credible T&E of DE-based CMs

DEW capabilities that could be integrated with kinetic fires to counter more advanced adversaries have

continued to emerge. In FY22, CCM continued to build its portfolio of DE-based projects to fulfill T&E instrumentation capability gaps in developing and implementing credible tools to support High Power Microwave (HPM) and HEL testing. Specifically, CCM supports projects that include airborne free-flying and tethered Unmanned Aerial System (UAS) with HEL target boards, HPM diagnostic instrumentation, dynamic HEL beam characterization equipment, and UAS detect and track radar systems.

In FY22, CCM executed the following test series supporting the rapid capabilities development and fielding of prototype DEWs and has made significant progress in equipping the DOD with tools and methods needed to adequately test and evaluate the operational effectiveness of DEWs and DE-based CMs:

- Army DE Maneuver Short Range Air Defense Developmental T&E (DT&E) with CCM-developed, multi-spectral tracking and scoring imagers.
- Air Force DE prototype DT&E programs by collecting and evaluating beam diagnostics and system analysis to include beam characterization and system performance.
- Experimentation integration and developmental testing to evaluate the probability of weapon effectiveness and measure HEL lethality against dynamic targets.
- Electromagnetic environmental effects assessments of ground combat vehicles against HPM simulators.
- Development and acceptance testing of the following joint DE T&E tools and instrumentation under the Mobile HEL Measurement system and DE Instrumentation Initiative portfolios led by the Test Resource Management Center:
  - Target boards for directly measuring HEL performance (stationary or mounted on an inflight, operationally representative cruise missile and UAS).
  - Range safety tools for measuring nominal ocular hazard distances for use in HEL test preparation.

- Diagnostic suites for imaging, characterizing, and measuring HEL and atmospheric effects as they are propagated in an open-air environment.
- Diagnostic suites for measuring HPM fields using an ad-hoc network of sensor nodes enabling a flexible and mobile measurement system for remote locations and moving targets.
- Beam evaluation tools for providing relative field mapping at source-to-target distances and visual determination of HPM system beam profiles for test decision-making, verification of safety constraints, and compliance with rules of engagement.

### CCM Enables Credible T&E of C-UAS

Because of the rapid technological advancements and growth of UAS threats, CCM supported operational performance assessments of a select set of C-UAS as installed, integrated, and employed in an operationally representative environment. In FY22, CCM provided certified UAS operators for the following six test events to evaluate and improve C-UAS systems for the protection of U.S. forces, facilities, and assets:

- Three tests that evaluated the capabilities of C-UAS to detect, classify, identify, track, and defeat Group 1 and 2 UAS threats.
- One test to evaluate next generation passive, medium-range UAS detection systems with man-out-of-the-loop operations.
- One test to demonstrate the capabilities of system architecture (i.e., a radar, a fire distribution center, and a HEL weapons system) to detect, track, and destroy small UAS threats.
- One test to evaluate the ability of a layered laser defense system to engage and destroy rockets, mortars, and UAS threats at close ranges.

### CCM Enables Credible T&E of Survivability Equipment

In FY22, CCM used unique capabilities to generate more than 20,000 threat missile plume signatures and executed 17 tests (1 ground system test and 16 ASE test events) supporting the expedited development

and fielding of several Quick Reaction Capability and Joint Urgent Operational Needs Statement CM programs, as well as hardware and software upgrades of fielded systems against IR-guided, RF-guided, and/or laser threats. Testing included the following:

- HH-60W IOT&E that evaluated the aircraft and an HH-60W-equipped unit's ability to conduct operational missions in a realistic environment. Aircrews utilized appropriate tactics, techniques, and procedures (TTPs) and CMs during different flight modes and sorties to assess the HH-60W's operational effectiveness, suitability, and survivability while also addressing crewmember and maintainer feedback from the missions.
- Initial integration verification flight test of Advanced Threat Warner Missile Warning System as installed on the CH-53K.
- Common Missile Warning System (CMWS) and Common IRCMs operational test to support a fielding decision intended to increase the survivability for rotary-wing aircraft.
- Limited Interim MWS quick reaction capability test to support a fielding decision intended to increase survivability for rotary-wing aircraft.
- Army and Navy Distributed Aperture IRCM operational test to determine system effectiveness and improve survivability for small rotary-wing aircraft.
- Large Aircraft IRCM (LAIRCM) Next Generation integration test to support Air Force efforts to improve survivability of fixed-wing aircraft.
- Advanced Threat Warner software upgrade testing to support Navy efforts to improve survivability for fixed- and rotary-wing aircraft.
- LAIRCM system upgrade performance testing to support Air Force Life Cycle Management Center efforts to improve survivability for C-130J transport aircraft.
- Integration verification flight test of LAIRCM as installed on the Allied Head of State aircraft.
- Testing of the Radar Warning Receiver (AN/APR-39C[V]1), as installed on the UH-60V, to provide a realistic, RF threat environment for basic identification, threat reaction, and counter-maneuver training/testing and

provide data to the trainers to assist with the development and refinement of their TTPs.

- Layered Soft-Kill System, as installed on the M2 Bradley vehicle, to evaluate the integrated Modular Active Protection System Framework Layered Soft-Kill System's performance to defeat current and emerging anti-tank guided missile threats and deliver multiple coordinated survivability and awareness capabilities that include shot detection, laser warning, and soft-kill of moving anti-tank guided missiles.

## CCM Provides Threat Environments for Pre-Deployment Training

In FY22, CCM provided its unique assets – such as a missile plume simulator, an instrumented MANPADS surrogate system, and the Portable Range Threat Simulator – to support the Emerald Warrior test/training exercise. Emerald Warrior was a Joint interoperability large force exercise that was conducted by aircrew planners and staff in a realistic, contested, and near-peer environment. The training included multiple U.S. military Services and Allied forces with the latest IRCM technology. CCM provided data to the trainers to assist in developing and refining their TTPs, thus enhancing their survivability potential in a combat environment.

## CCM Leverages Allies' Support to Advance T&E of ASE

In FY22, CCM and TETRA continued to support the execution of the Australia, Canada, Great Britain, and U.S. Airborne EW Cooperative T&E Project Arrangement (Air EW CTE PA) intended to advance coalition EW T&E capabilities, resulting in the following:

- All Air EW CTE PA Project Officers and Steering Committee members from the four nations met to review advances made by the four PA WGs;
  - Modeling and simulation (M&S) and Threat Environment Representation WG
  - T&E Methodology WG
  - Integrated Aircraft Survivability Equipment WG
  - RF Threats & Countermeasure WG

- The Virtual Rider Series Hydra 1 Trial Event, conducted at the Redstone Test Center Aviation Systems Test and Integration Laboratory, Huntsville, Alabama, demonstrated the integrated ASE T&E methodologies using a man-in-the-loop flight simulator. Classified results were shared with the four participating nations.
- WGs advanced the development of M&S evaluation capabilities required for combat aircraft survivability assessment within complex threat environments. This work focused on the four nations' joint development of the system-of-systems architecture design, which allowed the integration of multiple evaluation tools and provided a larger scale (battlespace-wide) synthetic evaluation capability. Specifically, the WGs:
  - Developed plans and requirements for integrated system-of-systems test events for complex airborne EW RF and electro-optical (EO) combined scene generation. Canada hosted a trial in Ottawa, with participation by the four nations, to further develop EO digital modeling tools and integration into airborne EW battlespace-wide simulation environments.
  - Developed a high-speed classified network, which provided the ability to share large amounts of classified data among the four nations.
  - Conducted a series of trials (executed by the United Kingdom in 1QFY22 with remote participation by the other three nations) to support the development of two new airborne EW T&E M&S capabilities. These trials successfully combined EO and RF synthetic tests at a high level of fidelity.
  - Conducted of a series of tests (executed by Canada throughout FY22 with remote participation by the other three nations) to demonstrate an improved level of EO/IR and RF fidelity in airborne EW system-of-systems M&S.
  - Held the annual test (executed by the United States in 1QFY22 with remote participation by the other three nations) focusing on the requirements, capabilities, and tools needed for RFCM technique evaluation at the system-of-systems level.