

# Center for Countermeasures (CCM)



In FY23, the Center for Countermeasures (CCM) performed 39 test events in support of the following: 1) evaluation of aircraft-based countermeasures (CMs) and vehicle protection systems, 2) evaluation of counter-unmanned aircraft systems (C-UASs), 3) development and evaluation of directed energy weapons (DEW) for potential use as CMs and counter-CMs, 4) pre-deployment training with CMs, 5) data collection for threat characterization to advance the threat representation to CMs, and 6) development and fielding of unique instrumentation for CM testing. CCM also partnered with allies on project arrangements to advance the infrared (IR) and radio frequency (RF) threat CMs development and testing.

## PROGRAM OVERVIEW

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CCM was established and chartered in 1972 by OSD to address the emergence of more technologically advanced weapons systems, including rapid development of terminally guided weapons and CMs. In 1999, management and responsibility of the CCM program was transferred to DOT&E from the Deputy Director, Defense Research Engineering Test and Evaluation. Today, CCM operates and deploys mobile testing instrumentation capable of simulating an array of threats to measure and evaluate the operational effectiveness of CMs employed by DoD and foreign weapon systems. The portability of CCM test tools and personnel provide the test agility and efficiency required by DoD to develop and field critical CMs at operationally relevant speeds, minimizing the logistical burden on each program office and preserving schedules and resources.

## MISSION

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CCM expedites the development and fielding of CMs and counter-CMs employed by U.S. systems by supporting T&E activities with portable instrumentation. CCM supports the T&E community by preparing for future needs in DoD emerging technology areas, such as DEWs, cyber, hypersonic, and space CMs. Additionally, CCM leverages allies' support to advance T&E of IR and RF threat CMs. CCM also provides the threat environment for pre-deployment training to ensure warfighters are trained in a combat representative environment.

## FY23 KEY ACTIVITIES

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### » T&E OF AIRCRAFT AND VEHICLE PROTECTION CMs

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In FY23, CCM generated more than 20,000 threat missile plume signatures and executed 14 tests (12 aircraft and 2 vehicle protection system tests). These efforts expedited development and fielding of several Quick Reaction Capability programs as well as hardware and software upgrades of



fielded systems against IR-guided, RF-guided, and/or laser threats. Testing included the following:

### Common Infrared Countermeasure (CIRCM)

CCM facilitated testing that resulted in the fielding of upgraded CIRCM solutions. CCM supported a CIRCM Jupiter risk reduction test with the Common Missile Warning System (CMWS) required to increase the survivability of rotary-wing aircraft. CCM also tested software upgrades to the CIRCM system integrated with the Advanced Threat Warner (ATW) in support of Army and Navy efforts to improve survivability of rotary-wing aircraft. Additionally, CCM supported an initial integration verification flight test of the CIRCM as installed on the HH-60V aircraft.

### Common Missile Warning System (CMWS)

CCM supported the HH-60W IOT&E equipped with the CMWS that evaluated the aircraft's operational effectiveness.

### Limited Interim Missile Warning System (LIMWS)

CCM supported two events with LIMWS Quick Reaction Capability flight testing: 1) a test to provide the data necessary to support a fielding decision on rotary-wing aircraft, and 2) a tower test to support a preliminary operational assessment of missile warning systems (MWSs) in development.



## Large Aircraft Infrared Countermeasure (LAIRCM)

CCM supported initial integration verification flight test of the Department of Navy LAIRCM ATW, as installed on the CH-53K. Additionally, CCM supported the LAIRCM ATW system upgrade performance testing to evaluate changes to the survivability of C-40A aircraft. CCM also participated in a pre-deployment test event to evaluate the systems' operational effectiveness.

## Distributed Aperture Infrared Countermeasure (DAIRCM)

CCM supported a pre-deployment test to evaluate the DAIRCM's operational effectiveness.

## Future Missile Warning System (MWS) Development Testing

CCM facilitated the assessment of the current state of next generation electro-optical and IR sensors and threat detection capabilities. CCM also supported the testing of the Pilotage Distributed Aperture System 2.0 MWS to assess additional operational capabilities.

## Vehicle Protection System

CCM supported the testing of the Layered Soft-Kill System (LSKS) and Controlling Access using Proximity-focused Semantic Analysis (CAPSA) system. Testing of the LSKS, as installed on the Model 2 Bradley Fighting Vehicle, evaluated its ability to defeat anti-tank guided missile threats. The CAPSA test assessed the CAPSA system's interoperability with multiple off- and on-board sensors, their ability to locate and identify threats, and the transference of threat information from the CAPSA system to the integrated Vehicle Protection System.

## » T&E OF COUNTER-UNMANNED AIRCRAFT SYSTEMS (C-UAS)

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Because of the rapid technological advancements and growth of UAS threats, CCM supported operational performance assessments of a select set of C-UASs as installed, integrated, and employed

in an operationally representative environment. In FY23, CCM provided certified UAS operators and analysts for four test events to evaluate and improve C-UAS systems for the protection of U.S. forces, facilities, and assets. The FY23 test events included one Family of Counter Unmanned System (FoCUS) test, two U.S. Special Operations Command (USSOCOM) tests, and one Sentinel A4 test. The FoCUS and USSOCOM tests evaluated the capabilities of C-UAS to detect, classify, identify, track, and defeat Group 1 and 2 UAS threats (systems less than 55 pounds, operate under 3500 feet above ground level, and fly less than 250 knots). The Sentinel A4 test evaluated next-generation, passive UAS detection with man-out-of-the-loop operations.

## » T&E OF DIRECTED ENERGY WEAPONS (DEWs)

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In FY23, CCM supported the rapid capabilities development and fielding of prototype DEWs and made significant progress in equipping the DoD with the tools and methods needed to adequately test and evaluate the operational effectiveness of DEWs and directed energy (DE)-based CMs. CCM supported 15 DE-based tests in four test series:

### DE Maneuver Short Range Air Defense Performance Capabilities

This testing evaluated the ability of the DE Maneuver Short Range Air Defense prototype to detect, track, and engage rocket, artillery, and mortar (RAM) targets. Testing also facilitated new equipment training, enabling soldiers to gain hands-on experience with prototype systems in multiple operationally representative vignettes.

### Air Force DE Prototype Materiel Solution Analysis

This testing evaluated DE beam diagnostics and performed system analyses, including beam characterization and system performance, across various prototype systems developed to defeat adversary UASs.

## High Energy Laser (HEL) with Integrated Optical Dazzler and Surveillance Integration and Tracking

This testing collected and evaluated beam diagnostics and atmospheric characterizations to determine the system's ability to execute its counterintelligence, surveillance, and reconnaissance mission.

## Probability of Weapon Effectiveness Experimentation

The objective of this test series is to determine HEL weapon effectiveness against a series of dynamic targets and compare results to model predictions.

### » PRE-DEPLOYMENT TRAINING

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In FY23, CCM provided its unique assets — such as a missile plume simulator, an instrumented Man-Portable Air Defense System (MANPADS) surrogate system, and an RF threat simulator — to support four pre-deployment exercises. During the following exercises, CCM provided data to the trainers to assist with their tactics, techniques, and procedures development intended to enhance their survivability potential in a combat environment:

#### EMERALD WARRIOR 23

This exercise was a joint interoperability large force exercise 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 infrared countermeasure (IRCM) technology.

#### 160th Special Operations Aviation Regiment (Airborne) Field Test Exercises

The objective of these two exercises was to train aircrews on threat identification, notification to headquarters, CMs, and evasive maneuvering.

#### NEPTUNE FALCON 22

This exercise was a joint interoperability series of exercises designed to maintain readiness and

evaluate combat search and rescue employment capabilities in a realistic training environment at night.

### » DATA COLLECTION FOR THREAT CHARACTERIZATION

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In FY23, CCM provided data collection support during two test events. CCM utilized signature measurement instrumentation for the collection of imaging and radiometric data of threat missiles. These data improved signature models for MANPADS and RAM to enhance digital representation of MANPADS and hardware-in-the-loop models used for evaluating MWS and CM performance. CCM's support and instrumentation were also used to detect, identify, and characterize unknown objects in or near military installations, operating areas, training areas, and special-use airspace to improve threat awareness and mitigate risks to U.S. forces, facilities, and assets.

### » DEVELOPING AND FIELDING OF UNIQUE INSTRUMENTATION FOR CM SYSTEMS

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In FY23, CCM continued to develop and upgrade the following test instrumentation and capabilities to keep pace with adversary advances and T&E needs to expedite testing, development, and fielding of CMs needed to dominate and survive in increasingly complex, multi-domain environments:

#### HEL Remote Target Scoring (HRTS) System

HRTS is an integrated optical and sensor suite that will provide radiometric and multi-spectral imaging of targets, starting at the system's acquisition and HEL engagement until target flight path termination. HRTS enables the tracking and scoring of a variety of targets during HEL engagements — including light boats, RAM, UASs, and subsonic and supersonic cruise missiles. CCM, in collaboration with White Sands Missile Range – Army Test and Evaluation Command, accepted delivery of the land-based HRTS in 2QFY23. Delivery of the maritime-based HRTS system did not occur in FY23 due to supply chain delays and cost overruns. The continued development of the maritime HRTS system is anticipated to continue in FY24.

## Joint Mobile IRCM Test System (JMITS) and Multi-Spectral Sea and Land Target Simulators (MSALTS)

JMITS and MSALTS consist of five dual-band IR and ultraviolet simulators capable of replicating threat missile plumes. CCM continues to work on upgrades to the simulators to include enhanced bandwidth and processing capabilities — which provide high-fidelity threats to evaluate advanced MWSs and Directed Infrared Countermeasures — and improvements to automated mission-based data collection and reduction. Only one simulator was successfully upgraded in FY23 due to software delays and the unavailability of simulator hardware caused by CCM's busy test schedule. All remaining simulator upgrades are estimated to be completed by 4QFY24.



## Joint Standard Instrumentation Suite (JSIS)

This suite of instrumentation is used to collect missile plume and hostile fire threat signatures and time-space-position information data during live-fire events. The JSIS-collected data will further develop the Missile Space and Intelligence Center's threat models to support MWS and CM development and evaluation. In FY23, the JSIS Missile Attitude Subsystem for tracking imagery and time-space-position information continued to be developed and is on track to be delivered by 2QFY24. In FY23, JSIS equipment requirements were solidified, and all remaining instrumentation is scheduled to be delivered by

4QFY24, completing all three phases of the JSIS project providing full operational capability to the T&E community. JSIS personnel continue to update and improve automated mission-based data collection and reduction features and are investigating the feasibility of using enterprise engineering platforms for artificial intelligence and machine learning to enhance data analysis of target tracking capabilities.

## High Elevation Target Simulator (HETS)

HETS is a new test capability developed to provide a low-cost, portable IR target simulation to collect missile signature data at elevation angles up to 65 degrees to enhance current Threat Modeling and Analysis Program fly-out models. Existing models were developed from limited static and very low-angle-of-attack live missile firings. This new high-elevation capability will improve current and future IRCM T&E effectiveness.

## Towed Airborne Plume Simulator (TAPS)

TAPS is a towable airborne, fixed-wing body missile plume simulator intended to replicate the IR temporal characteristics and approximate the spectral and spatial behavior of threat missiles approaching an aircraft. By simulating a threat's movement in different backgrounds, TAPS can more effectively evaluate aircraft MWSs. Upgrades include a TAPS airframe that can be towed by a rotary-wing platform (TAPS-Helo) and augmentation of the baseline capability with emitter-based IR and ultraviolet source (Towed Optical Plume Simulator). CCM completed Flight Validation Testing on TAPS-Helo in 3QFY23 and expects the system to be operational in FY24. The Towed Optical Plume Simulator emitter performance will be evaluated in 1QFY24 to determine suitability for supporting testing of advanced MWSs.

## DoD Space T&E Instrumentation Initiatives

In collaboration with the Test and Evaluation Threat Resource Activity (TETRA), CCM continues to identify gaps in space CM T&E capabilities and actions or investments required to fill those gaps. CCM has been collecting data, conducting the gap analysis, and working with TETRA to report the results by 3QFY24.

## DE-based Projects to Fulfill T&E Instrumentation Capability Gaps

DE-based efforts assist in the development and implementation of tools to support HEL and High-Power Microwave (HPM) testing. Specifically, CCM supports projects that include airborne free-flying and tethered UAS with HEL target boards, dynamic UAS detect and track radar systems, HEL beam characterization equipment, and HPM diagnostic instrumentation. In FY23, CCM conducted the developmental and acceptance testing for the following joint DE T&E tools and instrumentation:

- Target boards for directly measuring HEL performance (stationary or mounted on an inflight, operationally representative cruise missile and UAS).
- Beam characterization sensor suite to compare data outputs of the various T&E HEL power and irradiance measurements systems across the U.S. Airforce, CCM, and HEL community.
- HEL beam capture and safe heat dissipation system to provide a backstop for HEL testing.
- Portable and compact multi-mission hemispheric radar system to detect and track air threats (traditional and unmanned) while conducting DEW engagements.
- UAS-mounted HPM instrumentation for measurement and characterization of HPM beam on target.
- 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.

### » SUPPORTING PROJECT ARRANGEMENTS WITH ALLIES TO ADVANCE CM T&E

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In FY23, CCM and TETRA continued to support the execution of the Australia, Canada, Great Britain, and U.S. Airborne Electronic Warfare (EW) Cooperative T&E Project Arrangement which is advancing and

standardizing coalition Air EW T&E capabilities. The following working groups (WGs) support all four nations in advancing and standardizing T&E:

## Modeling and Simulation (M&S) and Threat Environment Representation WG

This WG continued validation of the Australia High-Fidelity Chimera Chaff model. The WG completed and incorporated Air EW M&S tools into optimization algorithms and distributed the Double MANPADS M&S tool. The WG also developed new level of confidence qualifications for Air EW CM effectiveness.

## Air EW T&E Methodology WG

This WG completed both the standardized T&E terminology and the T&E methodology documentation. It is expected to be distributed in 2QFY24.

## Integrated Aircraft Survivability Equipment (IASE) WG

This WG developed Air EW T&E infrastructure, methodologies, processes, and procedures to enable future IASE T&E and establish acceptance of survivability levels for blue air platforms. It also matured blue platform survivability and IASE performance test objectives and plans to manage all Air EW T&E activities.

## RF Threats & CM WG

This WG is preparing for a trial, scheduled for 3QFY24, that will incorporate updated Air EW M&S tools into an overarching battlespace environment simulation hub using an Air EW scenario to evaluate CM effectiveness. It is also developing follow-on goals and objectives for a trial scheduled for FY26, which will develop a wider Air EW scenario battlespace.