Center for Countermeasures

The Center for Countermeasures (CCM) executes testing of the operational effectiveness of countermeasures (CM) employed by a range of U.S. DOD and foreign weapon systems.

The Center for Countermeasures (CCM) accomplishes its mission by operating and deploying mobile test equipment capable of simulating an array of adversarial threats throughout the country. The transportability of CCM test tools and personnel provides the requisite test agility and efficiency for the DOD to develop and field warfighting capability at operationally-relevant speeds. It minimizes the deployment of aircraft and Program Office staff to test locations, preserving their schedules and resources. In FY21, CCM: 1) executed 30 test events supporting the successful evaluation and deployment of upgraded missile warning systems and CMs to combat theaters, 2) provided high threat environments for pre-deployment training, 3) equipped DOD test ranges with joint instrumentation required to expedite the development and fielding of directed energy weapons (DEWs), including directed energy (DE)-based CMs, and 4) leveraged project arrangements with Allies to advance the testing and evaluation of countermeasures.

CCM Expedites the Development and Fielding of Countermeasure Systems

In FY21, to keep pace with the advancing threat and expedite testing, development, and fielding of countermeasures needed to dominate and survive in an increasingly complex, multi-domain environment, CCM continued to upgrade the following test infrastructure and capabilities:

- **The Joint Mobile Infrared Countermeasure Test System and Multi-Spectral Sea and Land Target Simulator** – dual-band, infrared (IR), and ultraviolet (UV) simulator emitters used to replicate threat missile plumes. Upgrades to missile simulator emitters include improved bandwidth and processing capabilities to adequately represent the threat and evaluate advanced missile warning sensor (MWS) systems and directed infrared countermeasures (DIRCMs). The first upgraded simulator is expected in FY22.
- **The Towed Airborne Plume Simulator (TAPS)** – an airborne-towed body that generates a plume to simulate the IR temporal characteristics of a threat missile approaching an aircraft. It 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 MWS. CCM is executing the following TAPS projects to support the use of this capability for rotorcraft testing and further increase its capabilities:
  - The Phase 1 TAPS-Helicopter (TAPS-Helo) project to test the TAPS towing stability under various flight conditions and verify that the tow payload had no adverse effects on aircraft operation. Development of the TAPS-Helo is expected in FY23.
  - The Towed Optical Plume Simulator (TOPS) project focused on replacing the pyrophoric, fuel-based burner subsystem of the current TAPS with solid-state, optical emitter sources to simultaneously emit energy in two independently-controlled IR bands and one UV band. The Critical Design Review was completed in September 2021.
- **The Joint Standard Instrumentation Suite (JSIS)** – a suite of instrumentation used to collect missile plume and hostile fire threat signatures, and Time-Space-Position Information data during live fire events. These data are used to improve threat signature models developed by the Missile Space and Intelligence Center used to support MWS and CM development and evaluation. The JSIS baseline was developed from FY13 – FY18. JSIS 2.0 began in FY19 to add the capability to collect missile attitude data by FY23, needed to increase the fidelity of common threat models. JSIS Final Operational Capability Block 1, currently in progress, will provide additional radiometric imagers in emerging electromagnetic spectrum bands that the current JSIS baseline does not contain. It will improve the capability of measuring IR radiation generated from the missile throughout flight and is expected to be completed by February 2022. JSIS Blocks 2 and 3 intend to provide all remaining JSIS instrumentation equipment requirements, including radiometers, spectrometers, and tracked imagery to complete the JSIS suite. CCM continues to generate threat missile plume signatures required for open-air missile simulator testing and validation of signature models.
- **The High Power Portable Range Threat Simulator** – a ruggedized, deployable, ground-based, open-loop radio frequency (RF) threat radar simulator designed to provide open space emulation of threat radar signals and full threat modulations. It currently utilizes a legacy signal generator that CCM is upgrading to replicate new, high-fidelity threat radar signals. Upgrades are expected to take effect in FY22.

In FY21, CCM used unique capabilities, generating more than 17,000 missile plume signatures, to execute 19 total tests that supported the expedited development and fielding of eight Quick Reaction Capability, Urgent Operational Needs Statement, and Joint Urgent Operational Needs Statement CM programs as well as 11 tests that supported hardware and software upgrades of fielded systems against single and multiple IR-guided threats. Testing included the following:

- Advanced Threat Warner (ATW) and Common Infrared Countermeasures installed on Army rotary wing aircraft, demonstrating readiness for fielding
- Large Aircraft IR Countermeasures (LAIRCM) Next Generation System Processor Replacement (LSPR), in direct support of ongoing Navy efforts to improve aircraft survivability of fixed-wing aircraft
- Department of the Navy LAIRCM ATW Processor Upgrade Flight Test, as an initial evaluation of the software performance capabilities
- Common Missile Warning System and Common Infrared Countermeasures as integrated on the AH-64E and UH-60M, to evaluate their effects on aircraft survivability
- Limited Interim Missile Warning System, to determine its effectiveness in support of a fielding decision intended to increase the survivability of the UH-60M, CH-47F, and AH-64E
- Distributed Aperture Infrared Countermeasure, in direct support of ongoing Air Force efforts to improve the survivability of tactical HH-60G rotorcraft
- LAIRCM system upgrade performance, in direct support of ongoing Air Force Life Cycle Management Center efforts to improve survivability of C-5M and C-130J strategic transport platforms

CCM Provides the Threat Environment for Pre-Deployment Training

In FY21, CCM provided its unique test capability – a missile plume simulator, an instrumented man-portable air defense surrogate system, and the Portable Range Threat Simulator – to support the following two training exercises by providing data to the trainers to develop and refine their tactics, techniques, and procedures, enhancing their survivability potential in a combat environment:

- U.S. Army Special Operations Aviation Command Validation Exercise, where the aircrews executed electronic warfare (EW) threat identification, CM deployment, and evasive maneuvers. CCM helped validate the combat capabilities of the Battalion staff and aircrews.
- Joint interoperability training exercise (Neptune Falcon), designed to evaluate aircrews' CM employment capabilities in a realistic threat environment. This joint interoperability large-force exercise was conducted by aircrew planners and staff in a realistic, contested, and near-peer environment. The training included combat search and rescue activities for the A-10 Combat Air Force and the CV-22 Air Force Special Operations Command aircrews with the latest IRCM technology on a high-fidelity electronic combat range.

CCM Enables Credible T&E of Directed Energy-based CMs

DEWs have been emerging as a capability that could be integrated with kinetic fires to counter more advanced adversaries. In FY21, CCM made significant progress in equipping the DOD with tools and methods needed to adequately test and evaluate the effectiveness and lethality of DEWs and DE-based CMs. Specifically, CCM:

- Supported the development of a credible Mobile High Energy Laser Measurement system, in partnership with the Test Resource Management Center and the High Energy Laser Systems Test Facility, White Sands Missile Range (WSMR), New Mexico, intended to evaluate the lethal effects of DEWs. Specific advances include:
    - Target boards capable of directly measuring the High Energy Laser's (HEL) performance while stationary and while mounted on an inflight, operationally-representative cruise missile and small unmanned aerial systems.
    - Diagnostic suites capable of imaging, characterizing, and measuring the HEL as it is propagated in an open-air environment.

- Led the development of the HEL Remote Target Scoring (HRTS) system, in coordination with the Program Executive Office for Simulation, Training, and Instrumentation, to enable the tracking and scoring of a variety of targets during HEL engagements, including light boats, rocket-artillery-mortars, unmanned aircraft systems, and subsonic and supersonic cruise missiles. The HRTS system will extend CCM and WSMR testing capabilities with two such systems by FY22.
- Introduced four interim instrumentation suites in FY21 to support DEW rapid acquisition programs. These instrumentation suites were developed to collect the necessary data to adequately characterize the HEL beam, track target trajectory, collect environmental atmospheric conditions, and provide calibrated target imagery to determine HEL lethality against aerial munitions in both land and maritime conditions. CCM conducted various tests in FY21 that successfully demonstrated the instrumentation suites' capabilities. Further development of instrumentation to complement these capabilities are ongoing and expected to be completed by FY22.
- Supported DE High Power Microwave (HPM) effectiveness testing in collaboration with the WSMR Survivability, Vulnerability, and Assessment Directorate. CCM operated the HPM threat simulators and supported the effectiveness of ground combat vehicle assessment in the presence of congested electromagnetic spectrum environments.
- Participated in nine DE and Counter-Small Unmanned Aircraft Systems test events.

CCM Leverages Allies' Support to Advance T&E of IR and RF Threat CMs

In FY21, CCM supported the execution of the Australia, Canada, Great Britain, and U.S. Airborne EW Cooperative T&E Project Arrangement intended to advance EW T&E capabilities, resulting in:

- An exchange of RF CM modeling & simulation (M&S) plans between the four member nations.
- Advances in plans to execute a demonstration of integrated aircraft survivability equipment T&E methodologies using the Redstone Test Center Aviation Systems Test and Integration Laboratory, including a man-in-the-loop flight simulator.
- Advances in 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 a core architecture, the System of Systems Architecture Design, which allows the integration of multiple evaluation tools and provides a larger scale (battlespace-wide) synthetic evaluation capability. Specifically:
    - The nations will develop and integrate complex Airborne EW scene generation tools. Significant progress has been made both with the System of Systems Architecture Design integration of a Canadian-developed electro-optical scene generator, as well as the development and integration of a parallel, complex RF scene generator.
    - The United Kingdom will execute a series of tests for the development of two new Airborne EW T&E M&S capabilities in FY22, with remote participation by the other three nations. It will deliver a combined electro-optical and RF synthetic test at a high-level fidelity.
    - Canada will execute a series of tests to demonstrate an improved level of electro-optical/IR and RF fidelity in Airborne EW system of systems M&S, with remote participation by the other three nations.
    - The U.S. will lead development and testing of multiple new Airborne EW T&E capabilities, incorporating inputs from the other three nations. Starting in FY22, the U.S. will hold a series of annual tests focusing on the requirements, capabilities, and tools needed for RF CM technique evaluation at the system of systems level.