Center for Countermeasures (CCM)

The Center for Countermeasures (the Center) is a joint activity that directs, coordinates, supports, and conducts independent countermeasure/counter-countermeasure (CM/CCM) test and evaluation (T&E) activities of U.S. and foreign weapons systems, subsystems, sensors, and related components. The Center accomplishes this work in support of the Director, Operational Test and Evaluation (DOT&E), Deputy Assistant Secretary of Defense for Developmental Test and Evaluation ((DASD(DT&E)), weapon systems developers, and the Services. The Center's testing and analyses directly support evaluations of the operational effectiveness and suitability of CM/CCM systems.

Specifically, the Center:

- Determines performance and limitations of missile warning and aircraft survivability equipment (ASE) used on rotary-wing and fixed-wing aircraft
- Determines effectiveness of precision guided weapon (PGW) systems and subsystems when operating in an environment degraded by CMs
- Develops and evaluates CM/CCM techniques and devices
- Operates unique test equipment that supports testing across the DOD
- Provides analyses and recommendations on CM/CCM effectiveness to Service Program Offices, DOT&E, DASD(DT&E), and the Services
- Supports Service member exercises, training, and pre-deployment activities

During FY15, the Center completed over 35 T&E activities. The Center's support to these activities resulted in analysis and reporting on more than 27 DOD electro-optical systems or subsystems, with special emphasis on rotary-wing survivability.

The Center participated in operational/developmental tests for rotary- and fixed-wing ASE, PGWs, hostile fire indicator (HFI) data collection, experimentation tests, and pre-deployment/exercise support using CM/CCM. To best represent the level of effort resourced to support T&E, the Center tracks funding expended in each test area:

- Approximately 51 percent of the Center's efforts were spent on ASE testing, with the majority of these efforts in support of rotary-wing aircraft
- About 22 percent of the Center's efforts were spent on PGW, foreign system, and other types of field testing not related to ASE
- Approximately 7 percent of the Center's efforts were dedicated to overseas contingency operations support, with emphasis on CM-based pre-deployment training for rotary-wing units
- Approximately 17 percent of the Center's efforts were spent on internal programs to improve test capabilities and to develop test methodologies for new types of T&E activities
  - The Center continued to improve, develop, and validate multiple test tools for evaluating ASE infrared countermeasure (IRCM) systems and HFI systems
  - In addition, the Center is improving its electronic warfare capability by developing and validating the high-power Portable Range Threat Simulator (PRTS) that will provide a more comprehensive, integrated ASE T&E environment
- The Center dedicated about 3 percent of its efforts to providing subject matter expertise to numerous working groups (WGs) and task forces

The activities conducted by the Center during the past year are detailed in the subsections that follow.

ASE AND HFI ACTIVITIES

RESEARCH AND DEVELOPMENT ACTIVITY

Foreign: Trial OXIDIZER 2

- Sponsor: The Center/Joint Countermeasures Test and Evaluation (JCMT&E) WG
- Activity: The Center collected radiometric signature data on weapon firings at the Mount Bundey Training Area, Northern Territory, Australia. Participation was under the provisions of the bilateral U.S./Australia ASE Cooperative Test and Evaluation Project Arrangement.
- Benefit: Data collected in the hot, humid environment during OXIDIZER 2 will be used to compare to data collected in less humid environments to better understand sensor performance in high humidity environments and to scale models for the effects of humidity.

Foreign: Infrared Threat Warning System Technical Demonstration Program

- Sponsor: The Center/JCMT&E WG
- Activity: The Center provided subject matter expertise and assisted with planning the collection of Time-Space-Position Information (TSPI) before the United Kingdom (UK) Defence Science and Technology Laboratory conducted hostile fire indication testing at the [UK's] Ministry of Defence Pendine facility.
- Benefit: The Center's advice helped Defence Science and Technology Laboratory to improve the quality of TSPI collected during the event while minimizing the cost to the program.

Navy: Distributed Aperture Infrared Countermeasure 2 (DAIRCM2) Laser Warning, Phase 1
- Sponsors: Naval Research Laboratory
- Activity: The Center conducted static ground tests of the laser warning function in the DAIRCM2 sensors.
- Benefit: The data collected from this effort allowed the sponsor to improve laser detection algorithms and reduce the risks associated with a follow-on flight test of the DAIRCM system.

ROTARY-WING AND FIXED-WING TEST EVENTS

Air Force: Large Aircraft Infrared Countermeasures (LAIRCM) Next Generation HC/MC-130J Flight Test
- Sponsor: 46th Test Wing Test Squadron, Defensive Systems and Mobility Directorate, Air Force Life Cycle Management Center
- Activity: The Center provided one Joint Mobile IRCM Testing System (JMITS), one Multi-spectral Sea and Land Target Simulator (MSALTS) missile simulator, and personnel to perform two-color, infrared (IR) simulations to collect system response data to assess the LAIRCM system, as installed on the HC/MC-130J. The Air Force conducted the test at Eglin Air Force Base (AFB), Florida.
- Benefit: The testing provided the Air Force with a cost-effective test venue to collect critical data needed to assess performance of the LAIRCM system installed on a new platform, the HC/MC-130J.

Air Force: LAIRCM System Processor Replacement Altitude Reference Unit Replacement Flight Test
- Sponsor: 46th Test Wing Test Squadron, Defensive Systems and Mobility Directorate, Air Force Life Cycle Management Center
- Activity: The Center provided an MSALTS missile simulator and personnel to perform two-color, IR, and ultra-violet (UV) simulations to collect system response data needed to assess the upgraded system software with the new altitude reference unit. The Air Force conducted the tests at Eglin AFB, Florida.
- Benefit: The testing provided the Air Force with critical data needed to assess performance of the upgraded LAIRCM system.

Army: Reduced Optical Signature Emissions Solution Infrared CM Test 8.1
- Sponsors: U.S. Army Technology Application Program Office (TAPO) and 160th Special Operations Aviation Regiment Systems Integration and Maintenance Office
- Activity: The Center provided subject matter expertise and a JMITS van with four reactive-configured IR seekers during the IRCM effectiveness test for the MH-60M and MH-47G aircraft. These tests evaluated new flare CM sequences and variations of current flare CM sequences using improved flares, or different flares within the sequences. The Center provided near real-time data reduction and flare sequence analysis to assist the sponsor in making test decisions on flare sequence performance and to provide recommendations on flare sequence timing and/or pattern adjustments. After the test, the Center provided an independent assessment and a briefing of test results to TAPO leadership.
- Benefit: The data collected from this effort allowed TAPO to use the test results to procure new flares needed to enhance protection of the MH-60M and MH-47 aircraft against IR Man Portable Air Defense Systems (MANPADS).

Army: Evaluation of IRCM during Missile Simulations Flight Testing
- Sponsor: U.S. Army Project Management Office, Aircraft Survivability Equipment (PMO-ASE), Program Manager, Countermeasures Sensors
- Activity: The Center provided a JMITS for UV simulations, four reactive-configured IR seekers, and subject matter expertise during the testing for the UH-60M, AH-64E, and CH-47F aircraft. These tests evaluated the performance of each IRCM (laser jammer and/or flare sequence) installed on the aircraft against the static IR seekers.
- Benefit: The data collected from this effort allowed PMO-ASE to assess the performance of the common missile warning sensor and IRCM installed on the UH-60M, AH-64E, and CH-47F aircraft.

Navy: MV-22 Universal Urgent Needs Statement, Department of the Navy (DoN), LAIRCM Integration Test Phase 1
- Sponsor: Navy Program Executive Office (PEO), Advanced Tactical Aircraft Protection Systems Program Office
- Activity: The Center provided the MSALTS two-color IR missile simulations, along with jam beam radiometers, threat-representative laser beamriders, a designator, rangefinder, and radar threat simulations using the PRTS.
- Benefit: The testing provided the critical data needed to support a fleet introduction decision for the DoN LAIRCM Advanced Threat Warning (ATW) as installed on the U.S. Navy MV-22 aircraft.

Navy: Verification of Correction of Deficiencies Test of the CH-53E DoN LAIRCM ATW Sensor
- Sponsor: Navy PEO, Advanced Tactical Aircraft Protection Systems Program Office
- Activity: The Center provided the MSALTS two-color IR missile simulators and jam beam radiometers.
- Benefit: The testing allowed the Navy to collect critical data needed to assess the performance of the DoN LAIRCM ATW hardware and software upgrades.

Navy: Follow-On Operational T&E of the CH-53E DoN LAIRCM ATW Sensor Phase I & II
- Sponsor: Navy PEO, Advanced Tactical Aircraft Protection Systems Program Office
- Activity: The Center provided the MSALTS two-color IR missile simulations, along with jam beam radiometers, threat-representative laser beamriders, a designator, and rangefinder systems during the CH-53E DoN LAIRCM ATW system flight testing.
- Benefit: The testing provided a cost-effective test venue for collecting critical missile warning sensor and laser warning

sensor data needed to evaluate and assess the readiness of the CH-53E DoN LAIRCM ATW system for fleet deployment in theatre.

Navy: P-8A Poseidon LAIRCM Flight Test
- Sponsor: Navy Air T&E Squadron 20
- Activity: The Center provided the MSALTS two-color IR missile simulator for flight testing of the P-8A ASE. The Center provided all data collected to the sponsors for assessment.
- Benefit: The testing provided the Navy with the data necessary to assess the performance of the LAIRCM system as installed on the P-8A.

Navy: KC-130J Integration Flight Test
- Sponsor: Navy PEO, Advanced Tactical Aircraft Protection Systems Program Office
- Activity: The Center provided MSALTS two-color IR missile simulations during flight testing of the KC-130J Integration Flight Test. The Center provided all data collected to the sponsor for assessments.
- Benefit: The testing provided the critical data needed to support a fleet introduction decision for the DoN LAIRCM ATW as installed on the KC-130J aircraft.

National Atlantic Treaty Organization (NATO): Trial MACE XVI
- Sponsor: The Center/JCMT&E WG
- Activity: The Center provided three analysts to help process data and produce reporting products during Trial MACE XVI at the Military Training Area in Lešť, Slovakia.
- Benefit: Trial MACE provided the Center and DOD with an opportunity to understand the current NATO radio-frequency (RF) test methodologies and to review actual threat capabilities.

LIVE FIRE TEST EVENTS

Navy: DoN LAIRCM Dugway Live Fire 2015
- Sponsor: Navy PEO, Advanced Tactical Aircraft Protection Systems Program Office
- Activity: The Center provided MSALTS UV and two-color IR missile simulations and laser threats to support updates to the DoN LAIRCM system, MV-22, KC-130J, and CH-53E configurations.
- Benefit: The testing provided critical data needed to assess DON LAIRCM missile and laser warning performance against various threats, including missiles in free flight, and to support the Validation and Verification of the Digital System Module.

PGW CM ACTIVITIES

Army: Joint Air-to-Ground Missile (JAGM) Obscurants Test
- Sponsor: U.S. Army JAGM Product Office
- Activity: The Center, in conjunction with the sponsor and the Army Missile and Aviation Research and Development Center, coordinated, directed, and conducted tower-mounted seeker tests of the JAGM seeker in obscurant environments against static ground targets.
- Benefit: This effort was designed to mature seeker tactical designs supporting the Technology Development program and provided an opportunity for the JAGM Product Office to verify the modeling and simulation tools for JAGM.

OSD: Vigilant Hammer 1
- Sponsor: Assistant Secretary of Defense for Research & Engineering
- Activity: The Center participated in a Joint Electronic Advanced Technology RF experiment. The Center provided a Millimeter-wave Electronic Attack Simulator to support range detection and susceptibility experiments with the Naval Air Warfare Center, Weapons Division.
- Benefit: Including the Millimeter-wave Electronic Attack Simulator in the experiment helped create a complex and dense RF environment that challenges participant systems to detect, classify, and geo-locate emitters.

CM-BASED PRE-DEPLOYMENT TRAINING FOR SERVICE MEMBER EXERCISES

1-6 CAVALRY MANPADS RF Training – Fort Riley, Kansas
Joint Forcible Entry/Advanced Integration – Nellis AFB, Nevada
3D Marine Aircraft Wing (Part 1) – Camp Pendleton, California
Red Flag 15-1 – Nellis AFB, Nevada
Red Flag 15-2 – Nellis AFB, Nevada
509th Weapons Squadron KC-135 Support (Part 2) – Roswell, New Mexico
Emerald Warrior 15 – Hurlburt Field, Florida
3D Marine Aircraft Wing (Part 2) – Camp Pendleton, California
- Sponsors: Various
- Purpose: The Center's equipment and personnel provided a simulated threat environment and subject matter expertise to observe aircraft sensor/ASE systems and crew reactions to this environment. Specifically, the Center emphasized simulated MANPADS and RF threat engagements for participating aircraft. The Center also provided MANPADS capabilities and limitations briefings to pilots and crews and conducted "hands-on" training at the end of the briefings.
- Benefit: These exercises provided realism to the training threat environment for the Service member pilots and crews to facilitate understanding and use of CM equipment, especially ASE. The Center provided the data collected to the trainers to assist units in developing and refining techniques, tactics, and procedures to enhance survivability.

T&E TOOLS

The Center has continued to develop tools for IRCM systems T&E funded by the Undersecretary of Defense (Acquisition, Technology and Logistics); the Test Resource Management Center; and the Central T&E Investment Program. Currently, the Center is leading the development of the MSALTS and the Joint Standard Instrumentation Suite (JSIS).

- The MSALTS is a small, mobile missile simulator that can fire while moving and simulate all current, Tier 1 missile threats. The Center has designed the MSALTS to provide simulated signatures for the new and more capable missile-warning systems, such as LAIRCM Next Generation, DoN LAIRCM, and the DoN ATW. The Center initiated development of the first two systems in FY11 and the third system in FY12. The developer completed fabrication, assembly, integration, and government acceptance testing in December 2014. The Center successfully transitioned all three systems in 1QFY15 to reach an Initial Operational Capability. In October 2014, the Center proposed an enhancement of the UV emitter to Undersecretary of Defense (Acquisition, Technology and Logistics) to support Common IRCM System operational testing slated for 2QFY17. The Common IRCM System is a component of the integrated IRCM suite planned to defend U.S. aircraft from advanced IR-guided missiles. The system will initially be employed on the Army UH-60 and Marine MV-22 aircrafts.
- The JSIS is a transportable, fully-integrated instrumentation suite that will be used to collect signature, TSPI, acoustic, and related threat missile and hostile fire munitions metadata. The transportability of JSIS will allow it to be used both in the United States and abroad to reduce costs and expand the types of threat data available in the United States. The JSIS has been endorsed by the U.S. Navy (PMA – 272), Army (PMO – ASE), and the Air Force (LAIRCM System Program Office) and will be an integral part of each Program Office's ASE development. In FY14, the Center partnered with the Arnold Engineering Development Center and actively created program plans, refined requirements from the ASE T&E community, created and refined a concept of operations, and began identifying specific instrumentation that meets JSIS requirements. The Center conducted a successful Critical Design Review in May 2014. In FY15, the Center conducted two integrated project reviews to check the status of the technical performance, schedule, and financial health of the development. Development of an Initial Operational Capability is expected to be completed in FY16, with a risk reduction demonstration slated for 1QFY16. In FY15, the Center developed and received the Doppler Scoring Radar under the JSIS program. The radar is capable of providing three-dimensional TSPI on hostile, live-fire activities, including small arms, anti-aircraft, rockets, and MANPADS. The system also could be used to report position information on aircraft flight tracks.

Additionally, as a result of an internal electronic warfare study conducted by the Center in FY13, and the increasing demands for test tools that support multi-spectral, integrated ASE threat environments, the Center internally funded the procurement of two RF threat emitters. A low-powered PRTS system was delivered and started validation testing in late FY15 and a high-powered PRTS capability is scheduled to be delivered in early FY16. These systems are being designed to replicate short-range acquisition and targeting radar systems. Both systems will be validated to support operational testing of the APR-39 B/D.

The Center continues to develop and improve tools for threat, live-fire IRCM testing. In FY14, the Missile and Space Intelligence Center began development on a new remote-missile launcher for the Center. This launcher system was developed to support remote firing of larger vehicle-launched IR surface-to-air missiles. The system was delivered and operationally deployed in FY15 for a number of live-fire events. In FY16, continued improvements will be considered to increase the number of threat types due to sponsor's requests.

The Center continued leading the development of the Hostile Fire Signature (HSIG) model enhancements to support HFI T&E activities. The baseline HSIG Model project has developed a validated, physics-based electro-optic model that produces signatures for the 12.7 mm Armor Piercing Incendiary Tracer round and a rocket-propelled grenade (RPG 7) tracer and hard body, sponsored by the Threat Systems WG with oversight by the T&E Threat Resource Activity. The Center initiated spiral enhancements in 1QFY15 to incorporate RPG back blast and small-arm muzzle flash features to the models. This effort will include data certification by the Intelligence Community and an updated validation report.

JOINT COUNTERMEASURES TEST AND EVALUATION WORKING GROUP

The JCMT&E WG is co-chartered by DOT&E and DASD(DT&E) to measure, test, and assess:

- Aircraft self-protection, countermeasures, and supporting tactics
- Live-fire threat weapons and open-air T&E
- System performance in operationally relevant aircraft installations and combat environments
- T&E methodologies, instrumentation, analysis, and reporting
- Overseas threat and air electronic warfare systems performance and effectiveness data in coalition warfare environments

The JCMT&E WG includes participation by DOT&E, DASD(DT&E), all four of the U.S. Services, Australia, Canada, New Zealand, the UK, and the NATO Air Force Armaments Group Sub-Group 2 (SG/2). The WG is tasked

with actively-seeking mutually-beneficial T&E opportunities to measure performance and suitability data necessary to provide relevant operational information to deploying joint/coalition Service members and for U.S. acquisition decision makers. Specific efforts include:

- The JCMT&E WG was the U.S. Technical Advisor to the official negotiations of the Multinational T&E Program Memorandum of Understanding with Australia, Canada, New Zealand, the UK, and the United States that was signed into effect for the U.S. by the HON Dr. J. Michael Gilmore, DOT&E, in 2015.
- The JCMT&E WG conducted exploratory meetings to identify interest in developing bilateral or multinational T&E program agreements with the following nations in order to conduct mutually advantageous development of T&E instrumentation, methodology, and installed performance testing and to measure live threat weapon firing data: Denmark, Finland, Norway, Sweden, Germany, Italy, Spain, and Switzerland.
- The JCMT&E WG worked with the Office of the Deputy Assistant Secretary of the Army Defense Exports and Cooperation to develop the four-nation Aircraft Electronic Warfare Cooperative T&E Project Arrangement to coalesce much of the redundant testing conducted by Australia, Canada, the UK, and the U.S. to significantly expand performance and to collect suitability data to improve aircraft survivability and reduce cost for all four nations. Initiated identification of required T&E infrastructure, personal, training, and funding required to conduct expected Project Arrangement activities.
- The JCMT&E WG worked with Australia to plan a combined MANPAD/RF threat trial at the Woomera Test Range, South Australia, in September 2016, to further expand the integrated ASE test methodology to the open-air environment using captive seekers and actual and simulated emitters for fixed- and rotary-wing aircraft equipped with flares and decoys.

The JCMT&E WG is cooperating with U.S. allies to provide opportunities that obtain and expand operationally relevant data useful for U.S. operating forces, programs of record, and intelligence organizations to reduce costs and field new capabilities rapidly. Of particular interest is obtaining validated data on simultaneous RF/electro-optical/IR surface-to-air missiles, HFI, and anti-tank guided missile firings by active air-defense units and test organizations. The JCMT&E WG is building on the successful NATO Trial PULSATILLA of May 2014, by coordinating live weapons firings in Bulgaria, Finland, and Slovakia. These efforts will provide measured operational performance of actual, modern, multi-function radars and integrated air defense systems that will likely be used against U.S. forces.