

Center for Countermeasures

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 weapon systems, subsystems, sensors, and related components. The Center accomplishes this work in support of DOT&E, Deputy Assistant Secretary of Defense for Developmental Test and Evaluation DASD(DT&E), weapon system developers, and the Services.

The Center's testing and analyses directly support evaluation of the operational effectiveness and suitability of CM/CCM systems. Specifically, the Center:

- Performs early assessments of CM effectiveness against threat and DOD systems and subsystems.
- 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.
- Develops and tests new CMs in operationally realistic environments.
- Provides analysis 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 FY14, the Center completed over 36 T&E activities. The Center's support of these activities resulted in analysis and reporting on more than 30 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 involving the use of CM/CCM. To best represent the level of effort resourced to support T&E, the Center tracks funding expended in each test area.

- Approximately 55 percent of the Center's efforts were spent on ASE testing, with the majority of these efforts in support of rotary-wing aircraft.
- Approximately 21 percent of the Center's efforts were spent on PGW, foreign system, and other types of field testing not related to ASE.
- Approximately seven 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 15 percent of the Center's efforts were spent on internal programs to improve test capabilities and develop test methodologies for new types of T&E activities.
 - The Center continued to develop multiple test tools for evaluating ASE infrared countermeasure (IRCM) systems and HFI systems.
 - In addition, the Center is improving its electronic warfare capability with the development of the high-power Portable Range Threat Simulator that will provide a more comprehensive integrated ASE T&E environment.
- The Center dedicated about two percent of its efforts to providing subject matter expertise to numerous working groups (WGs) and task forces.

The following activities are representative of those conducted by the Center during the past year.

ASE AND HFI ACTIVITIES

RESEARCH AND DEVELOPMENT ACTIVITY

Army: Phase 2 Hostile Fire Tower Test for Sensor Upgrade Technology

- **Sponsors:** Program Management Office Aircraft Survivability Equipment (PMO-ASE) and Navy Program Executive Officer, Advanced Tactical Aircraft Protection Systems Program Office (Program Manager Air (PMA)-272)
- **Activity:** The Center provided Joint Mobile IRCM Testing System (JMITS), ultraviolet, and infrared (IR) missile simulations. The sensors under test were the Common Missile Warning System-Generation 3/4A, Enhanced Ultraviolet Sensor, Passive Infrared Cueing System-A, Electro-Optic Missile Sensors, and Advanced Threat Warner (ATW). All sensors were mounted on a tower at a distance of 1.5 kilometers from the JMITS.

- **Benefit:** The data collected allowed PMO-ASE to evaluate the sensors under test in support of their sensor technology upgrade efforts. The data also allowed PMA-272 to evaluate ATW algorithm updates.

ROTARY-WING TEST EVENTS

Navy: Distributed Aperture Infrared Countermeasure (DAIRCM) MH-6 Test

- **Sponsors:** Naval Research Laboratory, the U.S. Army Technology Applications Program Office (TAPO), and 160th Special Operations Aviation Regiment Systems Integration and Maintenance Office

- **Activity:** The Center provided JMITS two-color, IR simulations and static IR seekers to verify the performance of the DAIRCM laser as installed on the MH-6 Little Bird.
- **Benefit:** The data collected from this effort allowed the sponsors to assess the performance of the DAIRCM laser against threat seekers. The data also allowed the Naval Research Laboratory to identify any needed improvements for the DAIRCM system.

Army: Special Operations Aircraft Flight Testing and Training

- **Sponsors:** U.S. Army TAPO and 160th Special Operations Aviation Regiment Systems Integration and Maintenance Office
- **Activity:** The Center provided JMITS ultraviolet missile simulations and a threat-representative laser beamrider during flight testing of the MH-60M and MH-47G aircraft.
- **Benefit:** The data collected from this effort allowed TAPO to gather information on their advanced ASE suite, the Common Missile Warning System, acoustic HFI, and AN/AVR-2B laser-detecting set.

Navy: CH-53E Department of the Navy (DoN) Large Aircraft Infrared Countermeasures (LAIRCM) Advanced Threat Warner (ATW) Sensor Upgrade Weapons and Tactics Instructor Flight Test

- **Sponsor:** Navy Program Executive Officer, Advanced Tactical Aircraft Protection Systems Program Office
- **Activity:** The Center provided the Multi-spectral Sea and Land Target Simulator (MSALTS) and JMITS two-color, IR missile simulators along with jam beam radiometers, threat-representative laser beamriders, and a designator and rangefinder.
- **Benefit:** The testing provided a cost-effective test venue for collecting critical data needed to assess the performance of the DoN LAIRCM ATW upgrade.

Navy: CH-53E DoN LAIRCM ATW Sensor Integrated Test and Evaluation Phase I

- **Sponsor:** Navy Program Executive Officer, Advanced Tactical Aircraft Protection Systems Program Office
- **Activity:** The Center provided threat-representative laser beamriders and a designator and rangefinder during flight testing of the CH-53E DoN LAIRCM ATW system.
- **Benefit:** The testing provided a cost-effective test venue for collecting critical data needed to evaluate and update DoN LAIRCM ATW laser-warning receiver algorithms.

Navy: CH-53E DoN LAIRCM ATW Sensor Integrated Test and Evaluation Phase II

- **Sponsor:** Navy Program Executive Officer, Advanced Tactical Aircraft Protection Systems Program Office
- **Activity:** The Center provided JMITS and MSALTS two-color, IR missile simulations and jam beam radiometers

during flight testing of the CH-53E DoN LAIRCM ATW system.

- **Benefit:** The testing provided a cost-effective test venue for collecting critical data needed to evaluate and update DoN LAIRCM ATW missile-warning algorithms.

Navy: CH-53E DoN LAIRCM Super Backend Processor Regression Flight Testing

- **Sponsor:** Navy Program Executive Officer, Advanced Tactical Aircraft Protection Systems Program Office
- **Activity:** The Center provided MSALTS and JMITS two-color, IR missile simulations and jam beam radiometers to support a proof of Engineering Change Proposal upgrade to the DoN LAIRCM system.
- **Benefit:** The testing provided a cost-effective test venue for collecting critical data needed to evaluate and update DoN LAIRCM Super Backend Processor algorithms.

Reduced Optical Signature Emissions Solution IR Countermeasure Test VIII

- **Sponsors:** U.S. Army TAPO and 160th Special Operations Aviation Regiment Systems Integration and Maintenance Office
- **Activity:** The Center provided subject matter expertise during the IRCM effectiveness test for the MH-60M and MH-47 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 an independent assessment of test results to TAPO leadership.
- **Benefit:** The data collected from this effort allowed TAPO to use the test results to enhance the protection of the MH-60M and MH-47 aircraft against IR Man Portable Air Defense Systems (MANPADS).

NATO: Trial PULSATILLA 2014

- **Sponsor:** Joint Countermeasures T&E Working Group (JCMT&E WG)
- **Activity:** The Center served as trial manager and radiometric data collector during Trial PULSATILLA 2014 at the Military Training Area in Hradišče, Czech Republic. There were 23 organizations representing 10 NATO countries that provided sensors and ASE systems to the trial.
- **Benefit:** Trial PULSATILLA 2014 provided an opportunity for NATO Sub-Group 2 member nations to expand and develop alliances, Quick Reaction Assessment (QRA) capabilities, and measure weapon and ammunition signatures, all of which will be used to create a NATO database. Data will also be collected from threat warning sensors for use in refining algorithms.

NATO: Trial MACE XVI

- **Sponsor:** 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 an opportunity for NATO Sub-Group 2 member nations to understand the potential vulnerabilities within modern, multi-function radars and integrated air defense systems. An outcome of MACE XVI will be to develop radio-frequency countermeasures advice for inclusion in a NATO handbook.

FIXED-WING TEST EVENTS

Air Force: LAIRCM AC-130U Flight Test

- **Sponsor:** 46th Test Wing Test Squadron Defensive Systems and Mobility Directorate, Air Force Life Cycle Management Center
- **Activity:** The Center provided JMITS missile simulators and personnel to perform two-color, IR simulations to collect system response data for assessing the LAIRCM system as installed on the AC-130U. The test was conducted at Eglin Air Force Base (AFB), Florida.
- **Benefit:** The testing provided the Air Force with a cost-effective test venue for collecting critical data needed to assess performance of the LAIRCM system as installed on a new platform, the AC-130U.

Air Force: LAIRCM MC-130H Flight Test

- **Sponsors:** 46th Test Wing Test Squadron Defensive Systems and Mobility Directorate, Air Force Life Cycle Management Center
- **Activity:** The Center provided JMITS missile simulators and personnel to perform two-color, IR simulations to collect system response data for assessing the LAIRCM system as installed on the MC-130H. The tests were conducted at Eglin AFB, Florida.
- **Benefit:** The testing provided the Air Force with critical data needed to assess performance of the LAIRCM system as installed on the MC-130H.

Air Force: LAIRCM System Processor Replacement Flight Test

- **Sponsors:** 46th Test Wing Test Squadron Defensive Systems and Mobility Directorate, Air Force Life Cycle Management Center

- **Activity:** The Center provided JMITS missile simulators and personnel to perform two-color, IR simulations to collect system response data for assessing the upgraded system software with the new system processor. The tests were conducted at Eglin AFB, Florida.
- **Benefit:** The testing provided the Air Force with critical data needed to assess performance of the upgraded LAIRCM system.

Air Force: QF-16 Live Fire

- **Sponsors:** Air Force Operational Test and Evaluation Command, Detachment 2
- **Activity:** The Center provided two remote-launch systems and operators to launch surface-to-air missiles at a QF-16 to demonstrate the installed Vector Scoring System capabilities.
- **Benefit:** The results of this live fire test will help support a Full-Rate Production decision.

Air Force: F-35 IR Countermeasure Test

- **Sponsors:** Joint Strike Fighter Program Office
- **Activity:** The Center provided personnel to support the Missile and Space Intelligence Center with the operation of reactive- and preemptive-configured IR seekers.
- **Benefit:** The data collected from this effort allowed the sponsors to assess the performance of various IRCM flare sequences.

Navy: C-40 Guardian Pod Flight Testing

- **Sponsor:** Navy Program Executive Officer, Advanced Tactical Aircraft Protection Systems Program Office
- **Activity:** The Center provided JMITS two-color, IR missile simulations during flight testing of the C-40 ASE. The Center provided all data collected to the sponsors for their assessments.
- **Benefit:** The testing provided the critical data needed to support a fleet introduction decision for the Guardian Pod as installed on the U.S. Navy C-40A aircraft.

PGW CM ACTIVITIES

Army: Dazzler

- **Sponsor:** U.S. Army Research, Development and Engineering Command, Armament Research, Development and Engineering Center
- **Activity:** The Center coordinated, directed, conducted, and collected data for this event. The test was performed to characterize and evaluate the effectiveness of new pyrotechnic CM.
- **Benefit:** The data collected will be used to evaluate the effectiveness of the CM as intended and to adjust the CM formulation if required.

Air Force: Small Diameter Bomb (SDB) II Obscurants Test

- **Sponsor:** SDB II Program Office
- **Activity:** The Center, in conjunction with the sponsors, the 46th Test Wing and 782nd Test Squadron, Eglin AFB, Florida, coordinated, directed, and conducted the captive-carry test of this air-to-ground missile system. The Center provided some obscurants and deployed all obscurants.
- **Benefit:** The field test provided an opportunity for the SDB II Program Office to determine seeker performance against static- and moving-ground mobile targets in obscurant environments.

National Ground Intelligence Center: Grackle Oyster

- **Sponsor:** National Ground Intelligence Center and SDB Program Office
- **Activity:** The Center, in conjunction with the sponsors, the 46th Test Wing, and 782nd Test Squadron, Eglin AFB, Florida,

coordinated, directed, and conducted the field exploitation of this foreign battlefield obscurant.

- **Benefit:** This event provided field characterization data for use in the modeling and simulation of the performance of weapon system sensors.

CM-BASED PRE-DEPLOYMENT TRAINING FOR SERVICE MEMBER EXERCISES

Surface Attack Training – Nellis AFB, Nevada

160th Special Operations Aviation Regiment Radio

Frequency Training – Hill AFB, Utah

Joint Forcible Entry – Nellis AFB, Nevada

Advanced Integration Exercise – Nellis AFB, Nevada

Joint Readiness Training Center Training

Support – Fort Polk, Louisiana

Emerald Warrior – Hurlburt Field, Florida

10th Aviation Brigade, 6th Squadron, 6 Cavalry

Training – Fort Polk, Louisiana

509th Weapons Squadron KC-135

Support – Roswell, New Mexico

- **Sponsors:** Various
- **Purpose:** The Center’s equipment and personnel provided a simulated threat/CM environment and subject matter

expertise to observe aircraft sensor/ASE systems and crew reactions to this environment. Specifically, the Center emphasized simulated MANPADS and radio-frequency threat engagements for participating aircraft. Additionally, the Center provided MANPADS capabilities and limitations briefings to pilots and crews and conducted “hands-on” training at the end of the briefings.

- **Benefit:** 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 collected data to the trainers for assisting units in the development/refinement of techniques, tactics, and procedures to enhance survivability.

SURVIVABILITY INITIATIVES

Hostile Fire Signature (HSIG) Model

The Center led development of the HSIG model to support HFI T&E and modeling efforts. The HSIG Model project, sponsored by the Threat Systems WG with oversight by the Test and Evaluation Threat Resource Activity, has developed a 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 hardbody. Final model validation report was completed in FY14. Additional support is being sought to incorporate RPG back blast and small-arm muzzle flash features to the models.

Enhanced Missile Signature (EMSIG) Model

The Center was instrumental in identifying the need to fund the development and integration of six additional missile signature models along with the Army’s Re-programming Analysis Team and Services’ Program Offices at the Common IRCM missile summit. These additional models will provide all of the Services’ ASE and countermeasure programs with a more comprehensive threat signature database.

Joint Countermeasures T&E Working Group (JCMT&E WG)

The JCMT&E WG is co-chartered by DOT&E and DASD(DT&E) to improve the integration of:

- Aircraft self-protection and countermeasure developments
- Live-fire threat weapon open-air T&E
- Developmental and OT&E
- Development of standardized test methodologies

- Common instrumentation and standards
- Overseas threat and air electronic warfare systems performance and effectiveness data

The JCMT&E WG includes DOT&E, DASD(DT&E), all four of the U.S. Services, Australia, Canada, Great Britain, New Zealand, and NATO Air Force Armaments Group Sub-Group 2 as members of a coalition warfare sub-WG. The group 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 included the following.

The JCMT&E WG, in the capacity of the Chairman of the eight-year bilateral ASE Cooperative Test and Evaluation Project Arrangement Steering Committee, worked with Great Britain to ensure smooth and highly-effective testing of ASE. The United States and Great Britain have developed and successfully implemented three WGs in order to more effectively manage the growing level of efforts. The two nations’ defense organizations, ASE Program Offices, developmental testing, operational testing, and LFT&E agencies have been able to collaborate on common test equipment methodologies and measure threat missiles, guns, and rockets’ effects on ASE using actual threat gunners, weapons, and environmental data that will continue to improve Service member survivability.

The JCMT&E WG, in the capacity of the Chairman of the 10-year bilateral ASE Cooperative Test and Evaluation Project Arrangement Steering Committee, worked with Australia to ensure smooth and highly-effective testing on both sides of the Pacific. The United States and Australia developed and successfully implemented three WGs to more effectively manage the growing level of efforts. As a result, the Center participated in the planning of the Australian Trial OXIDIZER II and other data collection opportunities using the Marine Rotational Force in Darwin, Northern Territory. These data will be used to improve U.S. threat detection algorithms while reducing both nations' test costs.

The JCMT&E WG was the U.S. Technical Advisor to the official negotiations of the Multinational Test and Evaluation Program memorandum of understanding with Australia, Canada, Great Britain, New Zealand, and the United States. In support of high-level NATO multinational approaches initiatives and DOT&E initiatives to NATO, the Center developed, organized, and conducted a highly-successful, 10-nation NATO QRA in the Czech Republic. The calibrated data and expert analysis measured has been hailed as the model for NATO to expand use for future QRAs. Due to the Center's efforts, the NATO National Armaments Directors Representative designated the Defensive Aids Suite effort a Smart Defence Tier 1 project.

The JCMT&E WG worked with the Office of the Deputy Assistant Secretary of the Army for Defense Exports and Cooperation; the Navy International Program Office; the Deputy Under Secretary of the Air Force, International Affairs; and the Services' program managers to spear-head the development of the four-nation Aircraft Electronic Warfare Cooperative Test and Evaluation Project Arrangement that will be negotiated in November 2014. This effort will coalesce many of the redundant testing conducted by Australia, Canada, Great Britain, and the United States while significantly expanding performance and suitability data at reduced cost for all four nations.

The JCMT&E WG worked with NATO Air Force Armaments Group Sub-Group 2 to develop, plan, and conduct a major threat data collection effort in the Czech Republic. Joined by 10 nations and over 80 technicians, the Center managed the firing of operationally significant types and measured the performance of surface-to-air missiles, anti-tank weapons, rockets, and Soldier-fired weapons in Trial PULSATILLA. This trial provided the United States and our allies with substantive data for use by threat-warning systems' developers and improvements in tactics, techniques, and procedures by our Service members.

THREAT SIMULATOR TEST AND EVALUATION TOOLS

The Center has continued to develop tools for T&E of IRCM systems funded by the USD(AT&L), Test Resource Management Center, and Central Test and Evaluation Investment Program. Currently, the Center is leading the development of 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-one 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, and integration, and executed government acceptance testing of the first MSALTS system in April 2014. Acceptance testing of subsequent units completed in October 2014.
- The JSIS is a transportable, fully-integrated instrumentation suite that will be utilized for collecting signature, Time-Space-Position Information, acoustic, and related metadata of threat missile and hostile fire munitions. The transportability of JSIS will allow it to be used both in the United States and abroad with the intent of reducing costs and expanding the types of threats available in the United States. JSIS data collected during these live fire events will be used to support ASE systems development, modeling and simulation activities, T&E ground truth data, and anomaly investigation. All data collected from JSIS will be calibrated,

measured, and stored according to the standards defined by the Joint Tactical Missile Signatures Handbook and will be available to the ASE community. 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 in each Program Office's ASE development. In July 2013, the JSIS was selected as a "Resource Enhancement Project New Start" project and received FY14 funding from the Test Resource Management Center and Central Test and Evaluation Investment Program. In FY14, the Center, partnered with the Arnold Engineering Development Center, actively created program plans, refined requirements from the ASE T&E community, created and refined a concept of operation, and began identifying specific instrumentation that meets JSIS requirements. A successful Critical Design Review was conducted in May 2014.

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 radio-frequency threat emitters. A low-powered Portable Range Threat Simulator system will be delivered in early FY15 and a high-powered Portable Range Threat Simulator capability is scheduled to be delivered in FY16. These systems are being designed to replicate short-range acquisition and targeting radar systems.

THREAT LIVE WEAPON FIRE TEST AND EVALUATION TOOLS

The Center has continued to develop tools for the T&E community for threat, live-fire IRCM testing. In FY14 a new remote-missile launcher was developed by Missile and Space Intelligence Center 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 is expected to be operationally verified during live fire acceptance testing in early FY15.