

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) T&E activities of U.S. and foreign weapon systems, subsystems, sensors, and related components. The Center accomplishes this work in support of the DOT&E, Deputy Assistant Secretary of Defense (DASD) for Developmental Test and Evaluation (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 CM.
- 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 FY12, the Center tested, analyzed, and reported on more than 40 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.

Approximately 53 percent of the Center's efforts were spent on ASE and HFI systems, and 7 percent of the Center's efforts were focused on overseas contingency operations support (with emphasis on CM-based, pre-deployment training for rotary-wing units). About 19 percent of the Center's efforts were spent on PGW, foreign system, and other types of field testing not related to ASE, and 15 percent were applied to internal improvement and modernization efforts to enhance test capabilities and efforts to develop test methodologies for use across the Services.

The Center continued to develop multiple test tools for evaluating ASE infrared countermeasure (IRCM) systems and hostile fire signature (HSIG) database models used to support development of HFI systems. In addition to leading test tool development efforts, the Center also developed an ASE T&E methodology guidebook to provide DoD with guidance for planning, executing, and reporting on ASE test events. The Center dedicates about 6 percent of its efforts to providing subject matter expertise to numerous working groups and task forces.

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

ASE AND HSI ACTIVITIES

ROTARY-WING TEST EVENTS

Army: Reduced Optical Signature Emissions Solution VII

- **Sponsor:** Department of the Army Technology Applications Program Office, Systems Integration and Maintenance Office, Aircraft Survivability Equipment Cell
- **Activity:** The Center provided test assets and crew to perform effectiveness testing of flares and flare sequences against reactive captive infrared (IR) missiles. These tests evaluated new CM sequences, variations of current CM sequences using improved flares, or different flares within the sequences. The Army used these data to finalize flare sequences on 160th Special Operations Aviation Regiment rotary-wing aircraft.
- **Benefit:** The outcome of this combined effort resulted in verification of the effectiveness of flare sequences used on aircraft deployed in-theater and under development.

Army: MH-60M Initial Operational Capabilities Testing and Training

- **Sponsor:** Department of the Army Technology Applications Program Office, Systems Integration and Maintenance Office, Aircraft Survivability Equipment Cell
- **Activity:** The Center provided Joint Mobile IRCM Test System (JMITS) simulations, reactive captive IR seekers, and test personnel to conduct integrated testing and aircrew training of the aircraft Common Missile Warning Sensor and IR flare dispensers. The performance of the aircraft's IR flare sequence against reactive captive IR missiles was evaluated along with aircrew training in an electronic warfare (EW) threat environment consisting of the JMITS simulations and radio frequency threats. The Army used these data to finalize flare sequences on 160th Special Operations Aviation Regiment MH-60M rotary-wing aircraft and develop tactics, techniques, and procedures for the aircrews.

- **Benefit:** The outcome of this combined effort resulted in verification of the effectiveness of flare sequences used on MH-60M aircraft and aircrew training in a simulated EW threat environment.

Army: Hostile Fire Indicating System (HFIS) – Army Flight Test 2

- **Sponsor:** U.S. Special Operations Command (USSOCOM), Technology Applications Program Office
- **Activity:** The Center provided a laser system for laser simulations to support a flight data collection event with USSOCOM MH-47 and MH-60 aircraft equipped with the HFIS system at Redstone Arsenal, Alabama.
- **Benefit:** The sponsor used this event to collect background and live fire data from the AN/AAR-57 Common Missile Warning System, AN/AVR-2B Laser Detecting Set, and Helicopter Alert Threat Termination-Acoustics systems installed on representative aircraft.

Navy: Technology Demonstration of the Department of the Navy (DoN) Large Aircraft Infrared Countermeasures (LAIRCM) Interface to the AN/ALE-47 for Smart Dispense and Advanced IR Countermeasure Techniques

- **Sponsor:** Navy Program Executive Officer, Advanced Tactical Aircraft Protection Systems Program Office (PMA 272), and Naval Research Laboratory
- **Activity:** The Center provided JMITS IR stimulations to verify the performance of advanced IRCM techniques and a new interface between the DoN LAIRCM and ALE-47. The Center provided all data collected to the sponsors for their assessments.
- **Benefit:** The data collected from this effort allowed the sponsors to perform early assessments of the new interface between the DoN LAIRCM and ALE-47 for smart dispense techniques. In addition, it allowed the sponsors to assess the performance of the advanced IRCM techniques against reactive IR static threat seekers and modify these advanced IRCM techniques for improved performance.

Navy: Distributed Aperture IR Countermeasures (DAIRCM) MH-60R Test

- **Sponsor:** Naval Research Laboratory
- **Activity:** The Center provided JMITS IR simulations to verify the performance of the DAIRCM jammer against static seekers. The Center provided all JMITS and static seeker data to the sponsor for assessment.
- **Benefit:** The sponsor used the data from this test effort to adjust their jam code, which resulted in better performance against the static seekers.

Navy/Marine Corps: AH-1Z and MV-22 Aircraft Self-Protection Optimization Flight Tests

- **Sponsor:** Naval Surface Warfare Center – Crane Division, with funding from the Aircraft Self-Protection Optimization program
- **Activity:** The Center provided test assets and crew to perform effectiveness testing of flares and flare sequences against reactive captive IR missiles. These tests evaluated new CM

sequences, variations of current CM sequences using improved flares, or different flares within the sequences.

- **Benefit:** The sponsors are using the test results on flare sequence effectiveness to enhance the protection of these aircraft against IR Man-Portable Air Defense Systems (MANPADS).

OSD: Rotorcraft Aircraft Survivability Equipment (RASE) Experiment 2012

- **Sponsor:** Assistant Secretary of Defense for Research and Engineering
- **Activity:** The Center served as Experiment Director and radiometric data collector during the RASE 2012 Tower event at the Weapons Survivability Laboratory Remote Test Site, China Lake, California. Fourteen different systems mounted on an SH-60 helicopter installed on a hover stand participated in the experiment.
- **Benefit:** The RASE Experiment is a venue focused on ASE that enhances decision makers' understanding of ASE performance and advances the ASE state-of-the-art testing. The RASE Experiment is expected to improve realism and standardization in the testing of ASE, improve the extent of testing prior to fielding, and provide an opportunity for multiple developers to save costs overall.

FIXED-WING TEST EVENTS

Air Force: LAIRCM Operational Flight Program (OFP)-14X Software Update

- **Sponsor:** 46th Test Wing, Eglin AFB
- **Activity:** The Center provided JMITS missile simulators and crews to perform ultraviolet and two-color IR simulations to collect system response data for assessing the OFP-14X software update. The Air Force conducted the tests at Eglin AFB using a Beechcraft King Air aircraft fitted with a LAIRCM test bed capable of supporting ultraviolet and IR missile warning systems and the Viper™ laser.
- **Benefit:** The testing provided the Air Force with a cost-effective test venue for collecting critical data needed to assess performance of the LAIRCM flight test software prior to installation on the host aircraft.

ROTARY- AND FIXED-WING TEST EVENTS

Air Force, Navy: Advanced Strategic and Tactical IR Expendables

- **Sponsors:** Naval Surface Warfare Center – Crane Division, Air Force Special Operations Command, 46th Test Wing, and Air Mobility Command
- **Activity:** The Center provided test assets and crew to collect test data on eight different aircraft against reactive captive IR missiles. These tests evaluated new flare CM sequences, variations of current flare CM sequences using improved flares, or different flares within the sequences.
- **Benefit:** Sponsors are using these test results on flare sequence effectiveness to enhance the protection of various aircraft against IR MANPADS.

Army: Seeker Bowl VII

- **Sponsors:** U.S. Army Research Development and Engineering Command, Engineer Research and Development Center, and Aviation Applied Technology
- **Activity:** The Center provided test assets and crew to collect test data on flare protection effectiveness for four fixed-wing and two rotary-wing aircraft against reactive captive IR missiles. The test evaluated the effectiveness of new flare CM sequences or variations of current flare CM sequences.
- **Benefit:** Sponsors are using these test results on flare sequence effectiveness to enhance the protection of various aircraft against IR MANPADS.

HOSTILE FIRE INDICATOR (HFI) DATA COLLECTION EVENTS

Army: Hostile Fire Detection System Signature Ammo Study (SAS)

- **Sponsor:** Program Manager – Aircraft Survivability Equipment (PM-ASE)
- **Activity:** The Center provided radiometric equipment and test crews to collect and reduce signature data on small arms (muzzle, hardbody, and tracer) and rockets (eject, boost, and tracer characteristics) on two separate test events, SAS-W and SAS-3.
- **Benefit:** The results from measured data will determine the variability within ammunition types and country of origin. The Center will use the measured data to develop the

DOT&E Threat Resource Activity-sponsored HSIG model, which will integrate into T&E Modeling and Simulation facilities and support Hostile Fire Detection System foreign ammunition purchases for test events.

Navy: Trial Oxidizer 1

- **Sponsor:** Naval Research Laboratory
- **Activity:** The Center provided radiometric equipment and test crews to collect and reduce signature data on small arms and anti-aircraft artillery muzzle flash.
- **Benefit:** This was the first international signature collection trial in cooperation with NATO. The Center will share the collected radiometric data on small arms and anti-aircraft artillery among all participants.

NATO: NATO Threat Data Collection Quick Reaction Assessment (QRA) (Trial PROTEUS)

- **Sponsor:** NATO Air Capability Group 3, Sub-Group 2
- **Activity:** The Center provided trial management, radiometric instruments, and crew during the collection of hostile fire threat signatures at the Poček range near Postojna, Slovenia.
- **Benefit:** This activity provided a venue for seven nations to collaborate and test HFI systems for rapid fielding and to collect threat signature data for use in developing hostile fire models.

CM-BASED PRE-DEPLOYMENT TRAINING FOR SERVICE MEMBER EXERCISES

Surface Attack Training – Nellis AFB, Nevada

Angel Thunder – Barry Goldwater, Arizona

Texas Air National Guard Pre-Deployment Training – San Antonio, Texas

Mobility Air Force Exercise – Nellis AFB, Nevada

Mission Employment Exercise – Nellis AFB, Nevada

Apache Block III Technics, Tactics, and Procedures (TTP) Development Support – Fort Irwin, California

Neptune Falcon – Nellis AFB, Nevada

58th Special Operations Wing Training Support – Albuquerque, New Mexico

4th Battalion 501st Aviation Regiment Training Support – Fort Bliss and Houston, Texas

28th Test and Evaluation Squadron Maritime TTP Development – San Diego, California

Joint Readiness Training Center Training Support – 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 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:** Provides realism to the training threat environment for the 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 TTPs to enhance survivability.

PGW CM ACTIVITIES

Navy: Joint Stand-Off Weapon (JSOW) System

- **Sponsors:** U.S. Navy, Program Manager, Precision Strike Weapons (PMA 201)
- **Activity:** The Center provided camouflage, concealment, and deception countermeasures for two JSOW missile live-fire drops against stationary land targets. The missile drops consisted of camouflage nets or IR smoke pots supplemented with camouflage nets.
- **Benefit:** Conducted regression testing to determine if the JSOW C-1 mission capability regarding stationary land targets has been retained in an IRCM environment given the recent addition of a moving maritime target capability. The IRCM land target test results will provide data characterizing imaging IR seeker performance, which will be presented at the JSOW C-1 Operational Test Readiness Review in 1QFY13.

National Ground Intelligence Center: Foreign Electro-Optical System (FEOS)

- **Sponsor:** National Ground Intelligence Center
- **Activity:** The Center provided a Paveway III semi-active laser guidance section and personnel to collect and reduce data showing the countermeasure effects caused by the FEOS in a field environment.
- **Benefit:** Collected field test data on the FEOS will help aide the exploitation efforts and evaluate the effects on U.S. domestic guided weapon systems when subjected to this foreign electro-optical countermeasure system.

SURVIVABILITY INITIATIVES

HSIG Model

The Center is leading development of an HSIG model to support HFI T&E and modeling efforts. The HSIG model project is sponsored by the Threat Resource Activity and will develop a physics-based, electro-optical model that produces signatures for the 12.7 mm Armor Piercing Incendiary Tracer round and a rocket-propelled grenade (RPG 7). The Center completed development of the first small arms tracer round and RPG models. Model validation and integration to Navy and Army facilities will take place in FY13.

Aircraft Survivability Equipment (ASE)/Hostile Fire Indicator (HFI) Symposium

The Center held the fourth ASE/HFI symposium and workshop that included current Australian, Canadian, New Zealand, United Kingdom, and U.S. threat detection systems briefings; “break-out” coordination sessions; and continued development of a five-nation methodology for ASE/HFI performance testing. This Center-led initiative provides a venue for cross-Service and international discussion on the common problem of Service member protection from threat missile and ballistic hostile fire in theater. The Center has partnered with the U.S. Naval Postgraduate School to develop an academic certificate of training to participants of future international, classified ASE/HFI T&E Training Symposiums sponsored by the Joint Countermeasures T&E Working Group (JCMT&E WG).

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 developments
- Live weapon-fire T&E
- Operational T&E
- Development of standardized test methodologies
- Common instrumentation and standards

This group includes DOT&E, DASD(DT&E), all four of the U.S. Services, Australia, Canada, New Zealand, the United Kingdom, 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 developed, coordinated, and implemented an eight-year bilateral ASE Cooperative Test and Evaluation Project Arrangement (CTE PA) and its supporting Project Management Plan (PMP) with the United Kingdom. Nations’ defense organizations, ASE Program Offices, DT, OT, and LFT&E agencies will now be able to collaborate on common test equipment and procedures, measure operationally relevant ASE data, and improve Service member survivability.
- The JCMT&E WG completed official negotiations and concluded agreement of a bilateral ASE CTE PA and PMP with Australia to expand U.S. T&E capabilities and cooperation. This coordination resulted in the Center’s participation in an Australian hostile fire data collection trial that expanded the U.S. threat database and will improve U.S. HFI threat detection algorithms.
- In support of High-Level NATO Multinational Approaches Initiatives, and DOT&E initiatives to NATO, the Center developed, organized, and conducted a highly successful, seven-nation NATO QRA in Slovenia. U.S. Ambassador Joseph Mussomelli praised the Center for coordination with the Embassy and Slovene Forces, and for its planning and execution of this first U.S.-led NATO QRA in Slovenia.
- The Center coordinated the first Technical Meeting of the Multinational Test and Evaluation Program memorandum of understanding in Ottawa, Canada, to initiate negotiations

of this 10-year agreement between Australia, Canada, New Zealand, the United Kingdom, and the United States.

- In support of NATO sub-group 2 and the Australia, New Zealand, and U.S. agreements, the JCMT&E WG's efforts led to the approval by the Chief of the New Zealand Defence Force to conduct Trial PĀKAI KŌPERE II by SG2 in New Zealand in 2QFY14. The sub-group will ask the Center to provide a Multi-Spectral Sea and Land Test Simulator, IR MANPADS Seeker Test Van, and test personnel to support this effort.

Aircraft Survivability Equipment (ASE) Test and Evaluation (T&E) Methodology Guidebook

The Center created an ASE T&E Methodology Guidebook to provide the DoD with guidance for planning, executing, and reporting on ASE systems' test events. The ASE systems addressed in this guidebook include IRCM, ultraviolet, IR passive missile warning systems, HFI, and Laser Warning Receiver systems.

Program managers and T&E leads should use the guidebook to better understand the process their teams follow, ensure that testing is being conducted using good test objectives, and ensure

that the data gathered to evaluate those objectives are valid. Such a guide is especially critical for program managers and test managers/leads new to ASE testing. This guidebook provides suggested processes and procedures for collecting test data, as well as suggested data formats and data products for presenting test data to aid the T&E community in achieving consistency and setting expectations.

Both DOT&E and DASD(DT&E) endorsed the ASE T&E Methodology. As the ASE T&E community converges on common test methodologies and approaches, programs can achieve efficiencies and savings by utilizing common test and range infrastructure, common models and simulation tools, and the ability to share threat weapon data.

Helicopter Survivability Task Force

The Center is participating with the Assistant Secretary of Defense for Research and Engineering to increase aircraft survivability by coordinating Research and Development activities and JCMT&E WG initiatives using tailored projects for DoD programs of record and out-of-cycle emergent Service member projects.

THREAT SIMULATOR TEST AND EVALUATION TOOLS

The Center, in conjunction with the Test Resource Management Center, is nearing completion of the IRCM Test Resource Requirements Study (ITRRS) "refresh." The end product from this effort will be an updated roadmap of prioritized projects necessary to perform T&E of advanced IRCM and HFI systems. The Center completed the original ITRRS roadmap in 2007, which led to several projects being funded by the Central Test and Evaluation Investment Program to fill the identified IRCM T&E gaps. Each product will have a functional description of the project; the priority is based upon Program of Record test schedules, requirements, and Service input.

The Center has continued to develop tools for T&E of IRCM systems funded by the USD(AT&L) Test Resource Management Center, Central Test and Evaluation Investment Program. Currently, the Center is leading the development of the Multi-Spectral Sea and Land Test Simulator (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 Joint and Allied Threat Awareness System.

The Center initiated development of the first two systems in September 2011. The Center completed fabrication, assembly, and checkout of most hardware items in FY12; four of eight software builds completed in FY12. Developers plan to execute Government acceptance testing of these MSALTS systems in September 2013.

- The Center has completed a preliminary concept and development plan for the JSIS. The Center intends JSIS to be a comprehensive, turnkey instrumentation package that can be used during hostile fire testing and MANPADS firing events in and outside the U.S. to support model development and validation. The JSIS will provide calibrated signature measurements for T&E (thus enhancing test adequacy) and post-test anomaly resolution. The Center will archive all the data that it collects using JSIS and make them available to the Services for current and future IRCM programs. The Center is actively pursuing JSIS sponsorship via the Central Test and Evaluation Investment Program. In the spring of 2012, the Helicopter Survivability Task Force initiative provided funding to develop equipment that will measure hostile fire munitions' time-space-position information, and ultraviolet signatures. The Services will field this equipment in FY13, fulfilling an immediate JSIS development need.

