

## 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 (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 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 FY13, the Center completed over 50 T&E activities. The Center's support of these activities resulted in analysis

and reporting 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 49 percent of the Center's efforts were spent on ASE testing, with the majority of these efforts in support of rotary-wing aircraft. About 11 percent of the Center's efforts were spent on PGW, foreign system, and other types of field testing not related to ASE. Approximately 6 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.

Thirty-two 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 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, the Center is expanding in the electronic warfare realm with a new internally funded Portable Range Threat Simulator capability. The Center dedicates about 2 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

#### RESEARCH AND DEVELOPMENT ACTIVITY

##### **Army: Distributed Aperture Directed Infrared Countermeasures System (DADS)**

- **Sponsor:** Information Intelligence Warfare Directorate (I2WD), Communications-Electronics Research, Development, and Engineering Center, U.S. Army Research, Development and Engineering Command
- **Activity:** The Center provided Joint Mobile IRCM Test System (JMITS) infrared (IR) simulations, high-temperature thermal sources, and a select assortment of post-launch configured Man Portable Air Defense System (MANPADS) IR seekers. The DADS was stationary with respect to the JMITS and seekers during the data collection events.
- **Benefit:** The results and measurements obtained from these tests will directly benefit and enhance the DADS tracker development and I2WD's related modeling and simulation efforts.

#### ROTARY-WING TEST EVENTS

##### **Navy: Future Naval Capabilities of Advanced IR Countermeasure Techniques Technology Demonstration Phase II**

- **Sponsors:** Navy Program Executive Officer, Advanced Tactical Aircraft Protection Systems Program Office, and Naval Research Laboratory
- **Activity:** The Center provided JMITS two-color IR simulations and reactive captive IR seekers to verify the performance of advanced IRCM techniques. The Center provided all data collected to the sponsors for their assessments.
- **Benefit:** The data collected from this effort allowed the sponsors to assess the performance of the advanced IRCM techniques against reactive IR static threat seekers and to modify these advanced IRCM techniques for improved performance.

## **Navy: Department of the Navy (DoN) Large Aircraft Infrared Countermeasures (LAIRCM) Super Back End Processor (SBEP) Regression Flight Test**

- **Sponsor:** Navy Program Executive Officer, Advanced Tactical Aircraft Protection Systems Program Office
- **Activity:** The Center provided JMITS two-color IR simulations to support a proof of Engineering Change Proposal upgrade to the DoN LAIRCM. The Center provided all data collected to the sponsors for their assessments.
- **Benefit:** The testing provided a cost-effective test venue for collecting critical data needed to assess the performance of the DoN LAIRCM SBEP prior to installation on fleet aircraft.

## **Navy: CH-53E DoN LAIRCM Advanced Threat Warner (ATW) Risk Reduction Flight Test**

- **Sponsor:** Navy Program Executive Officer, Advanced Tactical Aircraft Protection Systems Program Office
- **Activity:** The Center provided JMITS two-color IR missile simulations and threat-representative laser beamrider, designator, and rangefinder to collect system response data for assessing the ATW sensors and processor.
- **Benefit:** The testing provided a cost-effective test venue for collecting critical data needed to assess performance of the DoN LAIRCM ATW sensors and processor.

## **Navy: CH-53E DoN LAIRCM ATW Sensor Upgrade, Missile Warning and Laser Warning Flight Test**

- **Sponsor:** Navy Program Executive Officer, Advanced Tactical Aircraft Protection Systems Program Office
- **Activity:** The Center provided JMITS two-color IR missile simulations and threat-representative laser beamrider, designator, and rangefinder to collect system response data for assessing the ATW missile and laser warning systems.
- **Benefit:** The testing provided the Navy with a cost-effective test venue for collecting critical data needed to assess performance of the DoN LAIRCM ATW sensors and software.

## **Navy: Naval Research Laboratory Laser Beam Rider Detection Experiment**

- **Sponsor:** Naval Research Laboratory
- **Activity:** The Center provided test assets and crew to support a joint U.S./Canada laser warning experiment.
- **Benefit:** The sponsor used the data from this test effort to improve laser warning algorithms.

## **OSD: Rotorcraft Aircraft Survivability Equipment (RASE) Experiment 2013**

- **Sponsor:** Assistant Secretary of Defense for Research and Engineering
- **Activity:** The Center served as experiment director and radiometric data collector during the RASE 2013 Tower event at the Weapons Survivability Laboratory Remote Test Site, China Lake, California. Twenty-three 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 EC-130J Operational 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 crews to perform two-color IR simulations to collect system response data for assessing the LAIRCM system as installed on the EC-130J. The test was conducted at Eglin 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 the new platform, the EC-130J.

### **Air Force: LAIRCM KC-135 Operational Flight Test**

- **Sponsors:** 46th Test Wing Test Squadron Defensive Systems and Arizona National Guard, Air National Guard Air Force Reserve Test Center
- **Activity:** The Center provided JMITS missile simulators and crews to perform two-color IR simulations to collect system response data for assessing the LAIRCM system as installed on the KC-135 pod. The tests were conducted at Eglin 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 pod-based LAIRCM system as installed on the KC-135.

### **Air Force: LAIRCM AC-130U Operational 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 crews to perform two-color IR simulations to collect system response data for assessing the LAIRCM system as installed on the AC-130U. The tests were conducted at Eglin 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 the new platform, the AC-130U.

### **Air Force: Advanced Strategic and Tactical IR Expendables Fall 2012 Test**

- **Sponsors:** Air National Guard Air Force Reserve Command Test Center and Air Mobility Command
- **Activity:** The Center provided test assets and crew to collect test data on five different aircraft against post-launch configured IR missile seekers and three different aircraft against pre-launch configured IR missile seekers. 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 effectiveness results from flare sequence testing to enhance the protection of various aircraft such as the C-17, C-130H, F-15C, F-16, and A-10 against IR MANPADS.

## **Air Force: Advanced Strategic and Tactical IR Expendables Spring 2013 Test**

- **Sponsors:** Air Force Special Operations Command and Air Mobility Command
- **Activity:** The Center provided test assets and crew to collect test data on four 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 effectiveness results from flare sequence testing to enhance the protection of various aircraft against IR MANPADS.

## **Air Force: F-35 Electro-Optical Distributed Aperture System (EO DAS)**

- **Sponsor:** F-35 Lightning II Joint Program Office
- **Activity:** The Center provided the Towed Airborne Plume Simulator (TAPS) and JMITS missile simulators and crews to perform IR simulations, allowing the F-35 Team to collect data on the EO DAS. The Air Force conducted the tests at Naval Air Station Pensacola and Eglin AFB, Florida, using the Cooperative Avionics Test Bed aircraft fitted with the F-35 EO DAS.

- **Benefit:** The testing provided the Air Force with an opportunity to evaluate the potential of TAPS and JMITS to support future open-air testing of F-35 capabilities.

## **Starbuck III Tests**

- **Sponsor:** Other Government Agency
- **Activity:** The Center provided test assets and crew to provide immediate feedback on the effectiveness 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:** These test results were used to verify the effectiveness of flare sequences used on aircraft deployed in theater and under development.

## **ROTARY- AND FIXED-WING TEST EVENTS**

### **Army: Seeker Bowl VIII**

- **Sponsors:** U.S. Army Research Development and Engineering Command, Engineer Research and Development Center, and Aviation Applied Technology Directorate
- **Activity:** The Center provided test assets and crew to collect test data on flare protection effectiveness for one 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 flare sequence effectiveness test results to enhance the protection of various aircraft against IR MANPADS.

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## **PGW CM ACTIVITIES**

### **National Ground Intelligence Center: Smoke Week 2012**

- **Sponsor:** National Ground Intelligence Center
- **Activity:** The Center coordinated, directed, and conducted this event. The Center also provided vehicle-launched smoke grenades and several contaminated battlefield obscurant environments.
- **Benefit:** This event provided a venue for PGW system developers, including Hellfire and a variety of Navy combat optics, to evaluate their EO and IR systems in the presence of various obscurant environments. It also provided an opportunity to improve obscurant characterization methodology and collect characterization data on several new obscurant environments.

### **Air Force: RQ-4B Block 40 Global Hawk Operational Utility Evaluation**

- **Sponsor:** Air Force Operational Test and Evaluation Center
- **Activity:** The Center provided camouflage, concealment, and deception elements consisting of inflatable surface-to-air missile decoys, inflatable armored vehicle decoys, and one radar scattering camouflage net deployed in scenarios in which the RQ-4B Block 40 Global Hawk attempted to detect, locate, and identify those elements.
- **Benefit:** This test was a pre-deployment event held prior to the fielding of the RQ-4 Block 40 Multi-Platform Radar Technology Insertion Program in theater in summer 2013.

## CM-BASED PRE-DEPLOYMENT TRAINING FOR SERVICE MEMBER EXERCISES

**Surface Attack Training** – Nellis AFB, Nevada

**160th Special Operations Aviation Regiment Radio Frequency Training** – White Sands Missile Range, New Mexico

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

**Joint Forcible Entry** – Nellis AFB, Nevada

**Mission Employment Exercise** – Nellis AFB, Nevada

**Destruction of Enemy Air Defense United States Air Force Warfare Center Training** – Nellis AFB, Nevada

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

**Joint Readiness Training Center Training Support** – Fort Polk, Louisiana

**Emerald Warrior** – Hurlburt Field, Florida

**10th Aviation Brigade, 6th Squadron, 6 Cavalry Training** – Fort Drum, New York

**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 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

### 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 Test and Evaluation Threat Resource Activity, has developed a physics-based EO model that produces signatures for the 12.7 mm Armor Piercing Incendiary Tracer round and a rocket-propelled grenade (RPG 7) tracer and hardbody. Model validation and integration to Navy and Army facilities were completed in FY13.

### 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
- Developmental and 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, 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. The

two nations have developed and successfully implemented three Working Groups in order to more effectively manage the growing level of efforts. The two nations’ defense organizations, ASE Program Offices, development testing, operational testing, and LFT&E agencies have been able to collaborate on common test equipment and procedures and measure operationally relevant ASE and environmental data that will continue to improve Service member survivability.

- The JCMT&E WG worked with the Deputy Under Secretary of the Air Force, International Affairs, Armaments Cooperation Division to synchronize the U.S. Air Force Information Exchange Annexes with the United Kingdom to effectively strengthen the cooperation between the two nations. Due to the Center’s efforts, DOT&E Air Warfare was identified as one of two essential U.S. National Technical Establishments in the Information Exchange Annexes, ensuring that the Center remains in a leadership role.
- 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 two nations developed and successfully implemented three Working Groups to more effectively manage the growing level of efforts. As a result, the Center participated in the planning of the Australian hostile fire data collection Trial OXIDIZER II and other data collection opportunities that expanded the U.S. threat database and improved 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, seven-nation NATO Quick Reaction Assessment (QRA) in Slovenia. The calibrated data and expert analysis in the Center's Trial Report was hailed as the model for NATO to 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 2 project.

## **Helicopter Survivability Task Force**

The Center is participating with the Assistant Secretary of Defense for Research and Engineering in an effort 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.

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## **THREAT SIMULATOR TEST AND EVALUATION TOOLS**

The Center, in conjunction with the Test Resource Management Center (TRMC), completed the IRCM Test Resource Requirements Study (ITRRS) "refresh." The end product from this effort is an updated roadmap of prioritized projects necessary to perform T&E of advanced IRCM and HFI systems. The TRMC completed the original ITRRS roadmap in 2007, which led to the Central Test and Evaluation Investment Program's (CTEIP) funding of several projects to fill the identified IRCM T&E gaps. Each product has a functional description of the project; the priority is based on 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), TRMC, and CTEIP. 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 FY11 and the third system in FY12. The developer completed fabrication, assembly, and integration of the first system in FY13, along with two demonstration events to show system maturity and

alleviate risk to the program. The developer plans to execute government acceptance testing of the first MSALTS system in October 2013.

- 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. 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 (Program Manager Air – 272), Army (Program Management Office – 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 will receive FY14 funding from the TRMC and CTEIP. In FY13, 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.

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## **LIVE FIRE TEST AND EVALUATION TOOLS**

The Center has continued to develop tools for the T&E community for live fire IRCM testing. Included in these developments are two new dual MANPADS missile launchers developed by Missile and Space Intelligence Center for the Center. These systems have been delivered and their operation verified during live fire acceptance tests. These launcher systems feature:

- Compatibility with a large variety of MANPADS missile types
- Single, dual, and salvo launch capability (up to four missiles of the same or different types)
- Precision launch synchronization and timing capable of simultaneous or programmable launch delays
- High-mobility, self-contained operation

