The 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) T&E activities of U.S. and foreign weapons systems, subsystems, sensors, and related components. The Center accomplishes this work in support of DOT&E, the 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

In FY16 the Center completed 32 T&E activities. These activities included operational/developmental tests for rotary- and fixed-wing ASE, PGWs, threat data collection, experimentation tests, and pre-deployment/exercise support using CM/CCM. The Center conducted analysis of more than 30 DOD systems or subsystems – with special emphasis on rotary-wing survivability – and reported the results.

The Center provided T&E support throughout the year as follows:

- ASE testing, primarily in support of Joint Urgent Operational Needs Statement (JUONS) and Urgent Universal Needs Statement (UUNS) (approximately 40 percent)
- PGW, foreign system, and other types of field testing not related to ASE (approximately 22 percent)
- Realistic Man Portable Air Defense System (MANPADS) threat environment for Service member aircrew training (approximately 8 percent)
- Internal programs to improve test capabilities and develop test methodologies for new types of T&E activities (approximately 26 percent)
  - The Center continued to improve, develop, and validate multiple test tools for evaluating ASE infrared countermeasure (IRCM) systems.
  - In addition, the Center is improving its electronic warfare capability by developing and validating the Portable Range Threat Simulator (PRTS), which will provide a more comprehensive, integrated ASE T&E environment.
- Subject matter expertise to numerous working groups (WGs) and task forces (approximately 4 percent)

The Center's FY16 activities are summarized in the following subsections.

JUONS SUPPORT

Army: Advanced Threat Warning (ATW) Flare Interference Tower Test

- Sponsors: Technology Applications Program Officer (TAPO) and the 160th Special Operations Aviation Regiment (SOAR) Systems Integration Management Office (SIMO)
- Activity: The Center provided one Multi-Spectral Sea and Land Target Simulator (MSALTS) to perform two color, infrared (IR) missile simulations and jam beam data collection. The Center also provided missile warning sensor (MWS) subject matter expertise. This test focused on the ATW Directed Infrared Countermeasure (DIRCM) capabilities to maintain track of a MANPADS in the presence of flares.
- Benefit: The Center's participation in this test was in direct support of ongoing TAPO JUONS efforts. The data the Center collected during this test helped TAPO evaluate the ATW DIRCM's tracking capabilities in the presence of flares.

Army: Project Management Office Aircraft Survivability Equipment (PMO ASE) Formal JUONS Demonstration Pallet Test

- Sponsor: PMO ASE
- Activity: The Center provided one MSALTS to perform simultaneous ultraviolet (UV) and IR missile simulations and jam beam data collection. The Center also provided MWS subject matter expertise. This test evaluated the ATW system. The ATW system was on a pallet installed on the UH-60M. UV simulations were used to assess Common Missile Warning System (CMWS) responses; IR simulations were used to assess ATW responses; and jam beam radiometers were used to assess ATW jam return.
- Benefit: The Center's participation in this test was in direct support of ongoing PMO ASE JUONS efforts. The data the

Center collected during this test helped PMO ASE assess the performance of the integrated ATW/CMWS.

Army: TAPO JUONS Demonstration Test
- Sponsors: TAPO and the 160th SOAR SIMO
- Activity: The Center provided two MSALTS to perform two-color IR missile simulations. The Center also provided MWS subject matter expertise. This test evaluated the ATW system. The ATW system was on a pallet installed on the UH-60A. This test familiarized TAPO with IR MWS testing. The Center provided an independent assessment of ATW detection and angle-of-arrival (AOA) capabilities. After the test, the Center provided an independent assessment analysis report.
- Benefit: The Center's involvement in the program was in direct support of ongoing TAPO JUONS efforts. The Center's independent assessment and the data it collected during this effort helped TAPO determine the ATW system's detection and threat AOA capabilities, which in turn will help them plan future JUONS test activities.

Army: PMO ASE JUONS Hostile Fire Indication Tower Test
- Sponsor: PMO ASE
- Activity: The Center provided one MSALTS – to perform simultaneous UV and IR missile simulations – and jam beam radiometers. This test assessed the capability of the ATW/CMWS-integrated system to track and place laser energy on the true target (MSALTS) with competing sources in the ATW DIRCM tracker field of view. The Center provided near real-time data reduction and analysis of simulations quality and jam onset times to assist the sponsor in test decisions.
- Benefit: The data the Center collected during this test helped PMO ASE assess the integrated ATW/CMWS's performance capabilities in the presence of competing sources.

Army: PMO ASE Formal JUONS IT3 Phase 2 Test
- Sponsor: PMO ASE
- Activity: The Center provided one MSALTS and one Joint Mobile Infrared Countermeasure Test System (JMITS) to perform simultaneous UV and IR missile simulations along with jam beam radiometers. The Center provided simulators for single and dual threat engagements against the integrated ATW/CMWS system as installed on the AH-64E.
- Benefit: The data the Center collected during this test helped PMO ASE assess the integrated ATW/CMWS system declaration, as well as threat AOA performance and DIRCM slew and pointing accuracy.

Army: PMO ASE Formal JUONS IT3 Clutter Flight Testing
- Sponsor: PMO ASE
- Activity: The Center provided one MSALTS – to perform simultaneous UV and IR missile simulations – and jam beam radiometers. The test evaluated the integrated ATW/CMWS system as installed on the AH-64E. The AH-64E flew in the Houston area with MSALTS placed in an urban/industrial environment. The objective was to determine the integrated ATW/CMWS's capabilities to detect and declare the MSALTS simulations in the presence of clutter.
- Benefit: The data the Center collected during this test helped PMO ASE assess the AH-64E integrated system's capability to declare, track, and respond when presented with simulated missiles in a clutter environment.

Army: Army Special Operation Aviation JUONS Phase 1a and 1b Flight Test
- Sponsors: TAPO and the 160th SOAR SIMO
- Activity: The Center provided one JMITS to perform two-color IR missile simulations. The test evaluated the ATW, which was on the MH-60M upturned exhaust system (UES) for Phase 1a testing and on the MH-47F for Phase 1b testing. The test assessed the ATW system's declaration and threat AOA performance, as well as DIRCM slew and pointing accuracy.
- Benefit: The Center's participation in this test was in direct support of ongoing TAPO JUONS efforts. The data the Center collected during this test allowed TAPO to investigate the use of smart dispensing for IRCM flare sequences (i.e., dispense the best pattern based on threat AOA).

Air Force: Air Force Special Operations Command JUONS CV-22 ATW Sensor Flight Test
- Sponsor: 413th Flight Test Squadron Special Systems, Air Force Life Cycle Management Center
- Activity: The Center provided two MSALTS missile simulators to perform two-color IR simulations, as well as a laser van to conduct laser illuminations. The Center also provided test support to include consultation regarding test preparation, planning and execution, as well as data reduction, analysis and reporting for the missile simulations and laser illuminations. The test evaluated the Large Aircraft Infrared Countermeasure (LAIRCM) ATW system as integrated on the CV-22 platform.
- Benefit: The data the Center collected during this test helped the Air Force assess the performance of the ATW system as integrated on the CV-22 platform.

UUNS SUPPORT

Navy: Department of the Navy (DON) LAIRCM ATW MV-22 UUNS IT2A and B Flight Testing
- Sponsors: Program Executive Officer, Advanced Tactical Aircraft Protection Systems (PMA-272) and Commander, Operational Test and Evaluation Force (COTF)
- Activity: The Center provided two MSALTS to perform two-color IR missile simulations, threat-representative lasers, PRTS, and consultation regarding test preparation, planning and execution for the missile simulator and laser test events. This test was an end-to-end, open-air test and evaluation of the

UUNS for integration of the DON LAIRCM ATW system onto the MV-22. After the test, the Center provided an independent assessment analysis report.
- Benefit: The Center's independent assessment and the data it collected during this effort helped PMA-272 evaluate the integration of the DON LAIRCM ATW system onto the MV-22 and test the new ATW software upgrades.

Navy: DON LAIRCM ATW MV-22 Quick Reaction Assessment Flight Testing
- Sponsors: PMA-272 and COTF
- Activity: The Center provided two MSALTS (to perform two-color missile simulations), threat-representative lasers, and consultation regarding test preparation, planning and execution for the missile simulator and laser test events. This test was an operational test and evaluation of the UUNS for integration of the DON LAIRCM ATW system onto the MV-22.
- Benefit: The Center's participation in this test was in support of MV-22 ATW quick reaction operational testing. The data the Center collected during this test helped PMA-272 evaluate the integration of the DON LAIRCM ATW system onto the MV-22.

ASE ACTIVITIES

Army: Seeker Performance in a Cluttered Environment Test
- Sponsors: Army Research Laboratory (ARL) and Utility Helicopters Project Office (UHPO)
- Activity: The Center provided the Seeker/Radiometric Test System (SRTS) with eight preemptive-configured IR surface-to-air missile (SAM) seekers, IR radiometric imagers, and SAM subject matter expertise during acquisition testing. This test evaluated the ability of MANPADS to acquire Army rotary wing aircraft flying against a cluttered terrain background. The radiometric and imagery data collected were used to quantify the background. After the test, the Center provided an independent assessment of the SAMs for incorporation into a briefing for ARL and UHPO.
- Benefit: The Center's involvement in this activity was in support of ARL's modeling and simulation efforts. The Center's independent assessment and the data it collected during this effort will help validate modeling and simulation of rotatory wing aircraft flying in a cluttered background environment against MANPADS.

Army: Reduced Optical Signature Emissions Solution IRCM IX Test
- Sponsors: TAPO and the 160th SOAR SIMO
- Activity: The Center provided the SRTS with eight post-reactive-configured IR seekers and subject matter expertise 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, different flares, and/or flare timing within the sequences. The Center provided near real-time data reduction and analysis of flare sequences as well as on-site recommendations on flare sequence timing and/or pattern adjustments. As a result, the sponsor was able to make decisions on flare sequence performance during the course of the test. After the test, the Center provided an independent assessment analysis report and a briefing of test results to TAPO leadership.
- Benefit: The Center's involvement in this activity helped TAPO determine a final IRCM flare solution. The Center's independent assessment and the data it collected during this effort allowed TAPO to procure the new flares needed to enhance the protection of the MH-60M and MH-47G aircraft against MANPADS.

Army: Seeker Bowl XI IRCM Test
- Sponsor: Armament Research, Development and Engineering Center (ARDEC), Pyrotechnics Division, Countermeasure Flare Branch
- Activity: The Center provided the SRTS with eight post-reactive-configured IR seekers and subject matter expertise during the IRCM effectiveness test for the AH-64E ASPI, UH-60M UES, UH-60L UES, UH-60L HIRSS, and CH-47F IRSS aircraft. These tests evaluated the fielded flare IRCM sequences and variations of the sequence with timing and/or pattern adjustments. The Center provided near real-time data reduction and analysis of flare sequences as well as on-site recommendations on flare sequence timing and/or pattern adjustments. As a result, the sponsor was able to make decisions on flare sequence performance during the course of the test. After the test, the Center provided an independent assessment analysis report.
- Benefit: The Center's involvement in this activity helped ARDEC determine a final IRCM flare solution and prepare its post-test briefing for its higher headquarters. The Center's independent assessment and the data it collected during this effort allowed ARDEC to change the fielded flare sequence for all but the CH-47F IR Suppression System, thus providing better protection for those aircraft against MANPADS. ARDEC also briefed the test results to PMO ASE and platform program managers.

Air Force: U-28 ATW Sensor Flight Test
- Sponsor: 46th Test Wing Test Squadron, Defensive Systems and Mobility Directorate, Air Force Life Cycle Management Center
- Activity: The Center provided one JMITS missile plume simulator and personnel to perform two-color IR simulations in support of flight testing. The Center also provided test support to include consultation regarding test preparation, planning, and execution, as well as data reduction, analysis, and reporting for missile plume simulations. After the test, the Center provided an independent assessment analysis report.

- Benefit: The Center's independent assessment and the data it collected during this effort helped the Air Force assess the performance of the ATW system installed on the U-28 platform.

Navy: KC-130J DON LAIRCM Integration Test
- Sponsor: PMA-272
- Activity: The Center provided two MSALTS and subject matter expertise during the planning and execution of integration testing of the DON LAIRCM ATW onto the KC-130J.
- Benefit: The Center's participation in this test helped support integration of the ATW system onto the KC-130J and testing of new ATW software upgrades. The data the Center collected during this test helped the Navy assess the performance of the ATW system as installed on the KC-130J.

FOREIGN EVENTS

Foreign: Static Burn Test/NATO Trial KANERVA
- Sponsors: The Joint Countermeasures Test and Evaluation (JCMT&E) WG and the Naval Research Laboratory (NRL)
- Activity: The Center, along with the Arnold Engineering Development Complex and the NRL, collected radiometric signature data on static rocket motor burns at Niinisalo, Pohjankangas, Finland. Participation was under the provisions of existing NATO agreements and data analysis was coordinated within the provisions of the four-nation Multinational Test and Evaluation Program's Air Electronic Warfare Cooperative Test and Evaluation Project Arrangement. Data was collected on five types of threat rocket motors. Model updates resulting from this effort will be used to improve JMITS/MSALTS simulations.
- Benefit: The data the Center collected during this test supports refinements to MWS threat algorithms.

RESEARCH AND DEVELOPMENT ACTIVITY

USD(AT&L)/Air Force: Space-based Hypertemporal Imaging Research and Development
- Sponsors: USD(AT&L) Coalition Warfare Program and Air Force Research Laboratory, Advanced Missile Warning Technologies
- Activity: The Center deployed and operated the Towed Airborne Plume Simulator (TAPS) to Woomera, Australia. This risk reduction activity supported research and development associated with space-based sensor detection of IR sources through varying cloud layers.
- Benefit: The Center's TAPS provided the sponsors with the ability to present a controlled IR source (i.e., location and signature) within a space-based sensor's field-of-view at desired weather conditions. The Center provided self-assessment quick-look reports within 24 hours of each mission, summarizing the simulator's performance for each event.

PGW CM ACTIVITIES

Navy: JSOW C-1 OT-IIIB Land IRCM Live Fire Flight Test
- Sponsor: COTF
- Activity: The Center supported a live-fire test of the JSOW C-1 missile against a stationary target. The Center provided a CM environment consisting of camouflage nets and IR smoke to obscure and modify the signature of the stationary target while the JSOW C-1 attempted to acquire, track, and hit the target. After the test, the Center provided an independent assessment analysis report.
- Benefit: The Center's independent assessment and the data it collected during this test helped COTF determine if the JSOW C-1 missile had retained its stationary land target mission capability in a CM environment given the recent addition of a moving maritime target mission capability.

Army: Joint Air-to-Ground Missile (JAGM) System
- Sponsor: Joint Attack Munition Systems Project Office
- Activity: The Center, in conjunction with the Edgewood Chemical and Biological Center, Smoke and Target Defeat Branch, provided various battlefield atmospheric obscurants for test and evaluation of the JAGM in tower and captive flight environments.
- Benefit: These tests were conducted to characterize the performance of the JAGM guidance section and collect scene data for the guidance section sensors in the presence of CMs for the verification of Integrated Flight Simulation results.

TRAINING SUPPORT FOR SERVICE MEMBER EXERCISES

Red Flag 16-1 (January 25 – February 12, 2016) Nellis AFB, Nevada

Red Flag 16-2 (February 29 – March 11, 2016) Nellis AFB, Nevada

Emerald Warrior (May 2 – 13, 2016) Hurlburt Field, Florida
Advanced Integration/Joint Forcible Entry (June 7 – 21, 2016) Nellis AFB, Nevada
Red Flag 16-3 (July 11 – 29, 2016) Nellis AFB, Nevada
Red Flag 16-4 (August 15 – 25, 2016) Nellis AFB, Nevada

- Sponsors: Various
- Activity: The Center provided personnel and equipment to simulate a threat environment, as well as subject matter expertise, to observe aircraft ASE systems and crew reactions to this environment. Specifically, the Center simulated MANPADS threat engagements for participating aircraft. Additionally, the Center provided MANPADS capabilities and limitations briefings to pilots and crews and conducted familiarization training at the end of the briefings.
- Benefits: The Center's participation in these exercises provided realism to the training threat environment and enhanced the Service member pilots' and crews' understanding and use of CM equipment, especially ASE. The data the Center collected and provided to the trainers helped the units develop/refine their tactics, techniques, and procedures to enhance survivability.

T&E TOOLS

The Center continues to develop tools for T&E of ASE. The Joint Standard Instrumentation Suite (JSIS) and the MSALTS Ultraviolet Emitter Enhancement (MUVEE) projects were funded by USD(AT&L), the Test Resource Management Center; and the Central T&E Investment Program.

JSIS

JSIS is a transportable, fully-integrated instrumentation suite that will be used to collect signature; Time, Space, Position Information; 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 Navy (PMA-272), Army (PMO ASE), and Air Force (LAIRCM System Program Office) have endorsed JSIS, and it will be an integral part of each program office's ASE development. The Center deployed and operated JSIS during a risk reduction activity at Redstone Arsenal, Alabama, in February 2016. The Center exercised the system in an operationally realistic environment and verified the performance of key system capabilities. Some anomalies were identified that could not be detected in a laboratory environment. Post-event analysis discovered the root cause of these anomalies and the engineering changes needed to resolve them prior to acceptance testing. Early detection and resolution of any anomalies mitigates the risk of such anomalies arising when JSIS is used to collect data during actual acquisition program events.

The JSIS Initial Operational Capability is expected to be completed in FY17. As part of the JSIS project, the Center managed a contract to develop a Doppler Scoring Radar to support missile and hostile fire signature data collections and model developments. It is a 10.08 – 10.56 GHz tunable continuous wave and frequency modulated continuous wave radar, providing three degrees of freedom information (X, Y, Z) in time and range rate information on acquired and tracked targets. The Doppler Scoring Radar radar is capable of acquiring 128 targets and tracking 3 targets. The radar supported JSIS Risk Reduction tests. Its TrackVue software – which supports radar configurations, calibration, operational functionality, and data analysis – was updated to version 1.5.1. Sixteen high-power amplifiers within the radar and one spare were repaired to reduce noise floor fluctuations.

JSIS initial operational capabilities were driven by near-term needs for operational testing with the Navy's Advanced Threat Warner. While it represents a significant step forward in fielding data collection capabilities, significant gaps and shortfalls remain to include expanded missile attitude data collection and additional signature instrumentation to support emerging ASE programs with associated modeling and simulation needs. The Center has been actively formulating a technical approach, cost estimate, and acquisition strategy to produce JSIS Phase II with the intent of securing sponsorship beginning in FY17.

MUVEE

The MUVEE is an engineering improvement to MSALTS that incorporates the Army's T-MALUS emitter and software. The MUVEE will improve UV performance to enhance support of Army operational testing of Common Infrared Countermeasure (CIRCM) integrated with CMWS. Acceptance testing of the MUVEE was completed on May 20, 2016. The system was deployed to Redstone Test Center during the week of May 23 to collect signature data in support of system validation, as well as conduct some field regression testing. Corrective actions for deficient items and documentation updates were completed the first week of June 2016, followed by delivery of the system to the Center.

TEST VANS

- The Center procured a new van to replace a legacy, off-road test van which is no longer field-worthy. The van will be used for video and radiometric data collection at remote test sites.
- The Center is modifying one of its existing vans for use as the JSIS control van. This van will allow rapid and efficient deployment of JSIS to test sites.
- The Center is developing a new van to serve as the Center's Remote Launcher System control and instrumentation van. This van will be capable of controlling up to two launch trailers simultaneously.

THREAT SIGNATURE GENERATION

In support of Army's PMO ASE, the Center is generating up to 60,000 threat signatures for the CIRCM program. Initial planning meetings and coordination with the threat integration laboratories have occurred. The Center briefed its threat signature generation

process to the program, Army Test & Evaluation Command, and Army Validation WG. The Center submitted the standard operating procedure to the PMO ASE for review and signature. The signatures will be used in labs and open-air testing for evaluating CIRCM performance.

PRTS AND HIGH-POWERED PRTS (HPRTS)

The Center is internally funding the procurement of two RF threat emitters: PRTS and HPRTS. This was prompted by the Center's FY13 electronic warfare internal study and the increasing demand for test tools that support multi-spectral, integrated ASE threat environments. The low-powered PRTS system completed validation data collection in FY16, and an HPRTS capability is scheduled for delivery in FY17. These systems are designed to replicate short-range acquisition and targeting radar systems. Both systems will be validated to support operational testing of the APR-39D(V)2 Radar Warning Receiver/Electronic Warfare Management System.

JCMT&E WG

DOT&E and DASD(DT&E) co-chartered the JCMT&E WG to measure, test, and assess the following:

- Aircraft self-protection, CMs, 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 collection in coalition warfare environments

DOT&E, DASD(DT&E), all four of the U.S. Services, Australia, Canada, New Zealand, the UK, and the 22-nation NATO Air Force Armaments Group Sub-Group 2 participate in the JCMT&E WG. The WG is tasked with actively seeking mutually beneficial T&E opportunities to measure performance and suitability data, which are necessary to provide relevant operational information to deploying joint/coalition Service members and to U.S. acquisition decision makers. Specific efforts include:

- The JCMT&E WG has initiated discussions with European Command's Office of Defense Cooperation to conduct testing and data collection in its area of responsibility under operationally relevant environments important to the Combatant Command, Warfare Centers, and Programs of Record.
- The JCMT&E WG is cooperating with NATO partners and Partnership for Peace nations to provide opportunities to obtain and expand operationally relevant information in order to field new capabilities rapidly and reduce cost. The JCMT&E WG is building on the Center's proven record of conducting successful ASE data collection by coordinating live firings of radio frequency/electro-optical/IR SAMs, Hostile Fire Indication, and anti-tank guided missile firings by active duty air-defense units and test organizations in Finland, Sweden, the UK and Bulgaria. These efforts will provide measured operational performance of actual, modern, multifunction radars and integrated air defense systems that pose threats to U.S. and allied forces.
- The JCMT&E WG is the U.S. Steering Committee Chairman for bilateral and multinational Test and Evaluation Program Cooperative T&E Project Arrangements with Australia, Canada, and the UK. The JCMT&E WG is currently developing similar agreements with Germany, Finland, Denmark and Sweden. These efforts have already expanded the availability of air-electronic warfare system performance and suitability data to improve aircraft survivability. They have also identified opportunities to use other member nations' T&E capabilities to support U.S. program efforts.

The JCMT&E WG worked with the United States, Australia, Canada, and the UK to conduct modeling and simulation in Canada to support a combined MANPAD/radio frequency threat test of ASE installed in helicopters and fixed-wing aircraft at the Woomera Test Range, South Australia. That September 2016 threat test, trial DESERTRIDER 16, was designed to assess a preliminary open-air test methodology appropriate for testing integrated ASE. Combining the four nations' captive seekers, actual and simulated emitters for fixed- and rotary-wing aircraft equipped with flares and decoys provided each nation with valid, measured data not available singularly. Follow-on testing is being planned for laser warning/countermeasures systems in the UK, cold weather environment data collection in Canada, and ASE performance and tactics verification in the United States.