Large Aircraft Infrared Countermeasures (LAIRCM)

The Large Aircraft Infrared Countermeasures (LAIRCM) system enhances individual aircraft survival through improved aircrew situational awareness of the electromagnetic threat environment. The fundamental requirement for the LAIRCM system is to provide protection against man-portable, shoulder-fired and vehicle launched infrared guided missiles. The system will be installed on the C-17, C-130, and KC-135 aircraft. LAIRCM is designed to autonomously detect and declare Infrared (IR) threat missiles then track and jam the missiles to create a miss, resulting in aircrew and aircraft protection.

The system consists of five basic elements: a Control Indicator Unit (CIU), a Missile Warning Subsystem (MWS) which may include either or both ultraviolet (UV) and IR sensors, a Pointer/Tracker Transmitter (P/T) subsystem, a Countermeasures Processor (CP), and a laser jam source subsystem. The CP is the master system controller and the interface among the subsystems. Up to three laser jammers will be installed on each aircraft type. All the subsystems, with the exception of the laser jammer, are non-developmental items (NDI) that have been previously tested as part of the special operations C-130 Directed IR Countermeasures (DIRCM) program. In 2002, the multi-band laser was tested as part of the LAIRCM system at the hardware-in-the-loop (HITL) facility known as the Air Force Electronic Warfare Evaluation Simulator (AFEWES), and at the Aerial Cable Car Facility (ACF) during the operational assessment (OA) that supported the Milestone C, Low-Rate Initial Production (LRIP) decision in August 2002. LAIRCM will undergo initial operational test and evaluation on the C-17 during FY04 to support the full-rate production decision.

In response to the urgent requirement stated in the LAIRCM Operational Requirements Document, Aeronautical Systems Center developed an evolutionary strategy to yield a near-term solution for the protection of large transport type aircraft. The use of proven subsystem solutions, integrated into a LAIRCM system, is the first step in the LAIRCM Evolutionary Acquisition strategy to address the overall requirement. This first step, designated Phase 1, is to identify a near-term LAIRCM solution. The LAIRCM System Program Office, in association with Air Force Research Laboratory, conducted comprehensive market research to evaluate options available from industry as well as from Government programs. Based on the market research, only four subsystems demonstrated the maturity and performance to provide a near-term solution. All or part of the selected subsystems will comprise the LAIRCM system. Four of the subsystems (CIU, P/T, CP, UV MWS) will come directly from the United States Special Operations Command's (SOCOM) DIRCM program, presently in production. The final subsystem will be a Multi-Band Laser Subsystem, which has been developed by Northrop Grumman as part of their Internal Research and Development Program and has undergone considerable laboratory and field testing. The UK has installed the system on nine different aircraft types and there are plans for integration on eight additional aircraft types. The DIRCM systems for the United States Air Force SOCOM aircraft were bought under the UK contract. The SOCOM aircraft are currently undergoing a User Qualification Evaluation Test on three different types of C-130s to ensure effective operation prior to deployment.

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TEST & EVALUATION ACTIVITY

The primary thrust of LAIRCM test and evaluation during FY02 was to conduct an OA on the uninstalled system to support the Milestone C LRIP decision. The assessment included extensive utilization of the Development Verification Test (DVT) model to predict the performance of the AAR-54 missile warning subsystem during the HITL tests. These tests addressed jammer effectiveness against actual missile seekers and were used to predict performance in the live missile shots against the entire LAIRCM system at the Aerial Cable Car Facility at the White Sands Missile Range. In

addition, the results from the previous operational utility evaluations of four different C-130 DIRCM installations were used as part of the assessment. The DVT model underwent a limited validation to ensure that the predictions of missile declaration were reasonable and could be used in the HITL tests to provide accurate declaration times to the laser tracker. The results of live missile fire tests provided the actual declaration times and correlated well with the model predictions. Over 4,000 jammer effectiveness runs were conducted at the HITL facility and they demonstrated very successful jammer performance against the threats required in the operational requirements document.

Twenty-six live missiles were fired at the LAIRCM system at the ACF. For two of the events, dual missile shots were fired. The system successfully countered all the missile types that were launched, including those fired during the dual-shot events. Two problems with the missile warning sub system were encountered during the ACF tests. Both were software related and satisfactory fixes have been incorporated.

TEST & EVALUATION ASSESSMENT

LAIRCM, using the majority of the components of the already fielded DIRCM system, contributed to the success of the LAIRCM Operational Assessment. The previously accomplished C-130 tests, the several successful live fire tests against the DIRCM system, and the extensive qualification and environmental tests that were performed on the DIRCM system all substantially mitigated the usual risks associated with complex systems in development. The DIRCM program had to solve several problems during its infancy, which resulted in a more mature system for LAIRCM. The only developmental component within LAIRCM is the multi-band laser, which to date has performed almost flawlessly during the 4,000 runs in HITL tests and 150 hours of system operating time.

There are two major risk areas remaining that must be evaluated during the remainder of the test program. First and foremost is the performance of the system as actually installed on the C-17 aircraft. Although the system has demonstrated good functional performance during the early operational assessment phase, it has not been subjected to the temperature and vibration environment on a real C-17. Again some of this risk is tempered by the fact that the DIRCM system has been successfully integrated on several US and UK aircraft, but the C-17 environment will be especially stressful. C-17 integration and flight tests will be the primary test activity leading up to Initial Operational Test & Evaluation (IOT&E), scheduled for early FY04.

The second risk is with the multi-band laser. Although it did perform successfully in the OA, it has not yet completed its environmental qualification tests. These tests are currently being performed and the results should be available prior to IOT&E.

The DVT model will continue to be used as an evaluation tool and will require a more substantive validation prior to accreditation for IOT&E. The Program Manager has agreed with a DOT&E plan for further validation through correlation of the model with multi-sensor test results planned in FY03.