

Large Aircraft Infrared Countermeasures (LAIRCM)

The Air Force intends for the Large Aircraft Infrared Countermeasures (LAIRCM) system to enhance individual aircraft survival. 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. The Air Force intends for LAIRCM to autonomously detect and declare infrared threat missiles then track and jam the missiles to create a miss, resulting in aircrew and aircraft protection.

The system currently consists of five basic elements: a Control Indicator Unit (CIU), an ultraviolet Missile Warning Subsystem (UV MWS), a Fine Track Sensor (FTS) subsystem, a Countermeasures Processor (CP), and a laser jam source subsystem. The CP is the master system controller and the interface among the subsystems. The Air Force may install up to three laser jammers on each aircraft type. In 2003, the Air Force tasked the LAIRCM program to support two Quick Reaction Capability requirements to get IRCM equipment into the field as quickly as possible. The first capability installed and tested a one-jammer turret configuration (vice three on the full-up system) on the C-17. The second requirement installed a system on the MH-53M Pave Low IV helicopter gunship. LAIRCM will undergo developmental test/operational test (DT/OT) and IOT&E 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, the 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, FTS, CP, and UV MWS) will come directly from the 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 its Internal Research and Development Program and has undergone considerable laboratory and field testing. The United Kingdom (UK) has installed the system on nine different aircraft types and there are plans for integration on eight additional aircraft types. SOCOM procured DIRCM systems under the UK contract. DOT&E approved the IOT&E Plan in October 2003.

TEST & EVALUATION ACTIVITY

All the subsystems, with the exception of the laser jammer, are non-developmental items and SOCOM had previously tested them as part of the special operations C-130 Directed Infrared Countermeasures (DIRCM) program. In 2002, the Air Force tested the multi-band laser as part of the LAIRCM system at the hardware-in-the-loop facility known as the Air Force Electronic Warfare Evaluation Simulator, and at the Aerial Cable Range during the operational assessment (OA) that supported the Milestone C low-rate initial production decision in August 2002. In FY02 and FY03, the SOCOM aircraft underwent Operational User Evaluation Tests on four different types of C-130s to ensure effective operation prior to deployment.



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AIR FORCE PROGRAMS

In FY03, the primary T&E activities were two quick-look tests performed to support the Quick Reaction Capability (QRC) requirements on the C-17 and the MH-53 helicopter. Both aircraft needed IRCM protection for their operations in South West Asia. The C-17 installation, known as LAIRCM Lite, consisted of six missile-warning sensors (MWSs) and one laser jammer (vice the three planned for the standard C-17 configuration). The Air Force conducted effectiveness flights at Edwards Air Force Base, California. These tests consisted of irradiating the aircraft with ground-based missile plume stimulators to determine if the system produced the correct jamming energy from the aircraft to a sensor on the ground. The Air Force evaluated false alarm susceptibility and the robustness of the LAIRCM Lite system on the aircraft. The Air Force tested the MH-53 system, known as the MH-53 DIRCM system, in a similar manner at Eglin Air Force Base.

The Air Force Operational Test and Evaluation Center (AFOTEC) plans to conduct DT/OT and IOT&E for the C-17 and C-130 in FY04. The DT/OT tests will include open-air range tests, a sled test to ensure that the laser jamming can irradiate jamming energy on a missile seeker that is moving at realistic missile speeds, and several flights to test suitability in operational environments such as unprepared runways and tactical descents. AFOTEC has accredited models and simulations based on the FY02 OA and the QRC quick-look tests. Together with the open-air test data, these models will be used to evaluate the FY04 DT/OT and IOT&E results.

TEST & EVALUATION ASSESSMENT

LAIRCM, using the majority of the components of the already fielded DIRCM system, has met with success in its OA and DT/OT tests to date. 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 hardware-in-the-loop tests, 150 hours of system operating time, and during the LAIRCM Lite and MH-53 DIRCM tests.

Prior to the QRC flight tests discussed above, one of the main concerns was whether the laser jammer could withstand the vibration and temperature environment in the C-17's tail section. Considerable engineering analysis and preliminary flight tests with representative mock-up models of the equipment were conducted to measure the vibration and temperature levels at that location. Incorporating a rigid truss assembly in the tail cone reduced the vibration levels. This appears to have been successful since there were no laser jammer failures during these flights. There were no failures in the MH-53 vibration environment.

Although the LAIRCM Lite and the MH-53 tests were successful, they were limited in scope. The MH-53 tests conducted at Eglin used two of the same laser jammers and four of the MWSs that are used in the C-17 system. Although both were abbreviated tests, the C-17 LAIRCM Lite and the MH-53 DIRCM systems performed adequately enough to be deployed as QRC systems. To support full-rate production of the multi-jammer system, a more detailed test and analysis of the system performance is required and scenarios that are more realistic should be performed. In order to test the interactions of the three-jammer configuration, scenarios that include more than one missile simulator/stimulator together with false alarm sources should be included. In addition, operational flight profiles should be flown that test the suitability of the system when aircraft lands on unprepared runways and conducts tactical descents. These types of tests are planned for the C-17 LAIRCM DT/OT in December 2003 and the IOT&E in January/February 2004. A similar DT/OT and IOT&E are planned for the C-130 in February- May 2004. Use of the modeling and simulation described earlier will support the overall system evaluation.