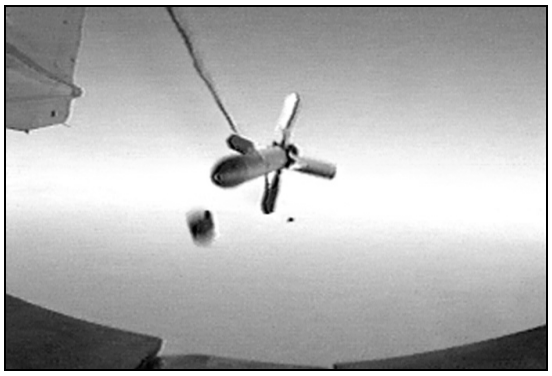
INTEGRATED DEFENSIVE ELECTRONIC COUNTERMEASURES (IDECM) AN/ALQ-214



The Integrated Defensive Electronic Countermeasures (IDECM) is intended to provide self-protection and increased survivability for tactical aircraft against radio frequency (RF) and Infrared (IR) surface-to-air and air-to-air threats. The major hardware component to be developed by the IDECM program is the IDECM radio frequency countermeasures (RFCM) system and the ALE-55 Fiber Optic Towed Decoy (FOTD), which is trailed behind the aircraft to optimize RFCM techniques against threat missiles and tracking/targeting systems. The RFCM consists of an on-board receiver/processor/techniques generator that stimulates the FOTD via fiber optic cable or on-board transmitters for transmission of the countermeasure technique. The FOTD is intended to be deployed from the T-3F launch controller, also used with the ALE-50 Advanced Airborne Expendable Decoy (AAED).

In addition to RFCM and FOTD, the IDECM lead aircraft (F/A-18E/F) will integrate the radar warning receiver, a missile warning system, the ALE-47 chaff/flare dispenser, and an off-board decoy launch controller/dispenser. In FY99, the Navy decided to add an on-board jamming capability to provide a full self-protection capability throughout the entire operational flight envelope of tactical strike aircraft. Even if operational maneuvers or engagements deplete the limited number of FOTDs carried, the platform will still have a capable self-protection suite. Upon completion of its own OPEVAL, the Advanced Strategic Tactical Expendable is one of several expendables that may be dispensed by the ALE-47.

IDECM Block I is an interim system consisting of the ALQ-165 Advanced Self-Protection Jammer (ASPJ) and the ALE-50 AAED. The Navy plans to use the IDECM Block I configuration for the first three F/A-18 E/F operational deployments only.

IDECM Block II, a second interim configuration, will replace the ASPJ with the ALQ-214 (V)2, providing on board jamming capability. This configuration is planned for the fourth and fifth F/A-18 E/F deployments.

IDECM Block III will be the final configuration and will consist of the ALQ-214 (V)2 RFCM and ALE-55 FOTD.

BACKGROUND INFORMATION

IDECM was intended for the first F/A-18E/F operational deployments in 2002. USAF requirements for a common FOTD and techniques generator were included in the IDECM RFCM engineering and manufacturing (EMD) contract. USAF has selected components of IDECM RFCM for the B-1B Defensive System Upgrade Program, and is planning integration into the F-15 ALQ-135 Tactical Electronic Warfare System architecture. In 1998, IDECM was re-baselined to fund an 87 percent development cost overrun and extend the development six months. In April 1999, technical difficulties and cost overruns resulted in a second restructuring by the Program Executive Officer (PEO(T)). The resultant strategy is a three-phased, sequential approach intended to meet early operational deployment requirements and reduce the development risk of the final IDECM suite.

On a parallel schedule, the Navy conducted the F/A-18E/F OPEVAL from 3QFY99-1QFY00. Since this OPEVAL was conducted before any of the IDECM blocks were available, aircraft were equipped with the ALE-50 Launch Controller/Dispenser portion of IDECM Block I, including AAED. This (effectively Block 0) configuration fulfilled the initial self-defense requirement in support of the overall F/A-18E/F survivability requirement.

IDECM Block I DT, Sep 99 through Feb 00, tested ASPJ installation, effectiveness and suitability on the F-18 E/F to include compatibility with other self-protection systems (ALE-50, ALE-47, and ALR-67 (V)3). The successful initial DT of IDECM Block I led to a combined DT/OT test conducted in March to April 2000, and an independent OT, conducted May to August 2000. The operational effectiveness criteria was a measurable reduction in lethality for the Block I equipped F/A-18 E/F as compared to an ALQ-126B equipped F/A-18 C/D. DT and OT included hardware-in-the-loop simulations and flights involving actual threat systems. Block 1 was found to be effective and suitable. Of particular note was that there were no ASPJ failures in 152 hours of flight testing and the BIT false alarm rate was zero.

IDECM Block II completed a limited DT Assist by operational test personnel in 4QFY00. The results indicated positive progress towards a Block II fielding in the fourth F/A-18E/F deployment in August 2003. Technical delays and budgetary shortfalls have delayed the test and procurement of the Block III configuration, originally scheduled to occur concurrently with the Block II configuration.

Block III completed a limited (no on board transmitters) Operational Assessment (OA) in March 2000, in which it was assessed to be potentially operationally effective and suitable. The IDECM Block III RFCM OA was conducted in two phases. A hardware-in-the-loop (HITL) test versus a realistic threat system was conducted in November 1999. The aircraft, missile flight path, and environmental effects were modeled using an uninstalled RFCM and FOTD to counter a missile in a radar anechoic chamber. The second OA phase was flight testing at NAWC-WD China Lake's Electronic Combat Range, carried out February-March 2000. This test phase provided an early look at the potential operational effectiveness and suitability of IDECM. By design, the test was limited to a non-production representative installation on a test bed aircraft using a reel-out, reel-in external pod to conserve decoys.

TEST & EVALUATION ACTIVITY

Test and evaluation activity of Block II/III during FY01 was beset by technical difficulties with the FOTD and launcher assembly, the receiver signal tracking capability, and system integration. Developmental testing revealed unexpected FOTD flight envelope and IDECM component interoperability issues. System development was at a much slower pace than expected, and led to

multiple delays in the DT/OT and OPEVAL. Fast deploy (a rapid release and reel out to a specific distance behind the aircraft) testing was carried out on F/A-18 E/F, B-1B, and F-15E aircraft. Multiple iterations of the canister and towline were evaluated. To resolve safety of flight issues caused by FOTD fins striking the underside of the aircraft, a fin delay mechanism was developed and tested. Developmental flight testing continued throughout the end of the fiscal year. Software and software integration appear to be on track, although integration with the RWR has proved difficult. However, due to the by-design deployment of the FOTD in the area of the engine plume, the F/A-18 E/F continues to be the most difficult platform for IDECM.

Several efforts were made to improve decoy deployment and retention on the F-18E/F. Materials research studies, to improve the thermal and mechanical limits on new fiber optic and towline strength member materials, were continued. A final signal and strength member configuration for the tow-line was selected. In addition, two efforts to improve the current version of the reel-out, reel-in pod for test use were completed. These improvements are needed to improve the rate of decoy re-use and expand the flight envelope over which the decoy can be tested.

The ALQ-214 (V)2 and FOTD were tested at two HITL facilities Radio Frequency Simulator System (RFSS) and the Air Force Electronic Warfare Evaluation Simulator (AFEWES) against the missile seekers of four threats. Preliminary results from the tests indicate excellent performance of the FOTD versus these four systems. The performance was in line with expectations, indicating the system is functioning against each of these threats as intended.

Technical and budgetary shortfalls led to a restructuring of the program at the end of the FY01. Test aircraft availability, continued difficulties with fast deployment of the FOTD decoys, and unplanned iterations of the software to correct integration and effectiveness problems, revealed during lab and flight testing, all led to these shortfalls. The Block II configuration alone will be tested during the DT/OT 1QFY02 and the subsequent OPEVAL. A few flights with the revised towline configuration will be flown 1QFY02, but the majority of Block III testing will be done in FY03 and FY04.

TEST & EVALUATION ASSESSMENT

The approved TEMP is dated April 1999. It was approved by DOT&E with the condition that it was valid only through the IDECM RFCM OA and that the TEMP will be updated prior to the next OT test event. Annex A to the TEMP covering all Block I test efforts was approved in March 2000. The TEMP IPT has updated the capstone and Block II TEMP annexes to include the first two phases of IDECM development, testing, and introduction to the Fleet. This version of the TEMP, complete through the testing of IDECM Block II, was signed by ASN(RD&A) 1QFY02. With revisions caused by the separation of the Block II and Block III test phases, it will be submitted to USD/AT&L and DOT&E shortly. The development and testing of Block III will be covered in a subsequent Annex to the TEMP.

The new three-phase development strategy and test planning have successfully mitigated some of the risk incurred over the last three years of IDECM evolution. As mentioned earlier, Block I is presently on track to support the first three F-18E/F deployments. The IDECM Block I test effectively re-baselined survivability of the F/A-18E/F. The Block I system, by virtue of being an interim solution, has limited logistic supportability for the fleet. The Navy has not sought to change or extend the ASPJ logistics support structure. Follow-on IDECM blocks must produce an effective and suitable replacement to the Block I suite before its available logistics support expires. Block II DT results look promising; however, operational tests of Block II have yet to be conducted.

Block III, particularly the FOTD, towline, and deployment design, is still high risk. In the lab environment, the Block III RFCM and FOTD have proved to be a highly effective system. Results in the HITL tests versus realistic threat systems were very positive, and also very close to predicted results. Once the flight envelope in which the system could successfully deploy and maintain fiber optic continuity was determined, the IDECM OA flight test was successful. The results of the test proved – in the very limited maneuver, altitude, and airspeed regime explored – that the RFCM and FOTD could be effective against several distinctly different types of SAMs. However, the hardware and software installations were non-production representative and, therefore, little could be determined in the OA about suitability. DT flight test results with regard to suitability are very promising; however, a number of repeated system BIT failure indications were removed from scoring because corrective actions are underway.

Several test range limitations have hampered all blocks of IDECM testing. Some threat simulators intended for use during the RFCM OA were not operational. One new test asset, the "Missile on a Mountain," used for testing a particular class of missiles, did not produce consistent miss distance data. Daily alignment variations of several of the threat simulators made analysis and interpretation of the results difficult. Furthermore, only a small number of threat assets available have accredited fly-out models that work in real-time profiles. The situation has improved slightly for the DT/OT and OPEVAL, but needs further improvement. The Navy needs to invest in these test assets, to include valid fly-out models and accreditation of as many threats in the IDECM threat matrix as possible, in order to produce operationally relevant and credible T&E results for Block II and Block III variants.

The Navy needs to continue developmental efforts to produce a reliable IDECM system, solve decoy launch/flight envelope issues, and gain further insight on towline characteristics and failure conditions. Despite the hopes for a successful Block III program, a rigorous and comprehensive operational test of the Block II configuration will be required before fielding the system for interim use. It is especially important to do this, in case the Block III (ALE-55 FOTD) is not acquired.