

Integrated Defensive Electronic Countermeasures (IDECM)

Executive Summary

- The Navy ended Integrated Defensive Electronic Countermeasures (IDECM) Block IV (IB-4) hardware testing on November 17, 2015. The Navy did not conduct FOT&E in accordance with the original DOT&E-approved test plan due to missed test points; however, the FOT&E that the Navy did accomplish is adequate for an operational assessment (OA) for the subsequent Software Improvement (SWIP) testing. The Navy, in collaboration with DOT&E, began conversion of the FOT&E to an OA in August 2015 since the Navy's intent is to field IB-4 hardware with mature SWIP software as the Navy's final configuration to counter modern threats.
- Preliminary analysis indicates that IB-4 hardware with precursor SWIP software is as effective on the F-18 E/F platform as the currently fielded IB-3 system.
- On May 26, 2015, the Assistant Secretary of the Navy for Research, Development, and Acquisition issued an Acquisition Decision Memorandum approving the FY15 buy for IB-4 hardware. In addition, the Deputy Assistant Secretary of the Navy for Air Programs issued a Program Deviation Report to the Assistant Secretary of the Navy for Research, Development, and Acquisition authorizing the Navy to equip three F-18 E/F squadrons with IB-4 hardware with precursor SWIP software as an early fielding step towards achieving Initial Operational Capability for the F-18 E/F fleet, and use data from the early fielded systems to enhance the reliability growth plan.
- DOT&E will submit a classified IB-4 OA report in early 2016 assessing preliminary system operational effectiveness and suitability.

System

- The IDECM system is a radio frequency, self-protection electronic countermeasure suite on F/A-18 aircraft. The system is comprised of onboard and off-board components. The onboard components receive and process radar signals and can employ onboard and/or off-board jamming components in response to identified threats.
- There are four IDECM variants: Block I (IB-1), Block II (IB-2), Block III (IB-3), and Block IV (IB-4). All four variants include an onboard radio frequency receiver and jammer.
 - IB-1 (fielded FY02) combined the legacy onboard receiver/jammer (ALQ-165) with the legacy (ALE-50) off-board towed decoy.
 - IB-2 (fielded FY04) combined an improved onboard receiver/jammer (ALQ-214) with the legacy (ALE-50) off-board towed decoy.



- IB-3 (fielded FY11) combined the improved onboard receiver/jammer (ALQ-214) with a new (ALE-55) off-board fiber-optic towed decoy that is more integrated with the ALQ-214.
- IB-4 with Software Improvement Program (SWIP) (currently in test) replaces the onboard receiver/jammer (ALQ-214(V)3) with a lightweight, repackaged onboard jammer (ALQ-214(V)4 and ALQ-214(V)5). IB-4 also replaces the ALQ-126B to provide advanced, carrier-capable jamming to the F/A-18C/D for the first time. IB-4 (without SWIP) fielded to three squadrons in FY15.
- The additional program to provide IB-4 the capability to either deny-delay targeting of the F/A-18 by enemy radars, known as the SWIP, is in early development with developmental test flights planned to begin in November 2015. The intent of SWIP is to allow IB-4 hardware to counter modern threats.
- The F/A-18E/F installation includes off-board towed decoys. The F/A-18C/D installation includes only the onboard receiver/jammer components and not the towed decoy.

Mission

- Combatant Commanders will use IDECM to improve the survivability of Navy F/A-18 strike aircraft against radio frequency-guided threats while flying air-to-air and air-to-ground missions.
- The Navy intends to use IB-3's and IB-4's complex jamming capabilities to increase survivability against modern radar-guided threats.

Major Contractors

- ALE-55: BAE Systems – Nashua, New Hampshire
- ALQ-214: Harris – Clifton, New Jersey
- ALE-50: Raytheon Electronic Warfare Systems – Goleta, California

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Activity

IB-4

- The Navy decided in April 2012 to transition production of the IB-3 systems to IB-4 systems (production lot buy 9). The IB-4 system has been in full-rate production as of production lot buy 11 and the Navy no longer procures IB-3 systems.
- The IB-4 FOT&E experienced delays for several reasons. Problems with the Environmental Control System cooling and cabin pressure on test F/A-18 C/D aircraft with IB-4 hardware installed, as well as additional test aircraft unscheduled and phase maintenance, resulted in test aircraft being unavailable. Lack of test aircraft led to missed range periods at Nevada Test and Training (NTTR) and Electronic Combat Range (ECR). Another problem was unavailability of the China Lake ECR test range due to both scheduled and unscheduled maintenance of range threats.
- Due to the delays to IB-4 testing and the Navy's decision to no longer procure IB-3 systems, new F/A-18E/F aircraft would not include installed jammers. This resulted in the Navy's decision to field IB-4 with precursor SWIP software to three squadrons before the completion of FOT&E.
- On May 26, 2015, the Assistant Secretary of the Navy for Research, Development, and Acquisition issued an Acquisition Decision Memorandum approving the FY15 buy for IB-4 hardware. In addition, the Deputy Assistant Secretary of the Navy for Air Programs issued a Program Deviation Report to the Assistant Secretary of the Navy for Research, Development, and Acquisition authorizing the Navy to equip three F-18 E/F squadrons with IB-4 hardware with precursor SWIP software as an early fielding step towards achieving Initial Operational Capability for the F-18 E/F fleet, and use data from the fielded systems to support the reliability growth program.
- In late June 2015, DOT&E recommended the Navy convert the planned IB-4 FOT&E to an OA to facilitate SWIP development and support the SWIP FOT&E. DOT&E and the Navy pursued this approach since the final IDECM system expected to be fielded throughout the fleet is the IB-4 hardware with the SWIP software and the September 30, 2015 expiration of FY14 research and development funding for IB-4 testing. The Navy began FOT&E conversion to an OA in August 2015 and will continue IB-4 testing under SWIP operational testing.
- On November 17, 2015, the Navy declared end of test with the following completed on IB-4 hardware:
 - 89 of 160 planned test conditions at the ECR at China Lake, California, with 18 of 80 on the C/D and 71 of 80 on the E/F.
 - Sufficient test at NTTR to assess preliminary IDECM performance.
 - All planned laboratory testing, including a dense emitter scenario and closed-loop hardware-in-the-loop testing.
 - A limited maintenance demonstration.

- Failure scoring boards for the OA flights in support of assessing system reliability have not convened, but are scheduled for November 2015.
- DOT&E will submit a classified OA report detailing the results of IB-4 testing in early 2016.

SWIP

- The Navy completed the first major test event for the SWIP program in July 2015 at a systems integration lab at Edwards AFB, California, against a surrogate threat system.
- The Navy conducted an IDECM SWIP Flight Readiness Review on November 4, 2015. The Navy anticipates beginning IB-4 hardware regression flight testing with SWIP software in 2QFY16 at NTTR and ECR.

Assessment

IB-4

- DOT&E discovered suitability problems with IB-4 on the F/A-18C/D platform during integrated testing and confirmed them during FOT&E.
 - Cabin pressure problems and avionics cooling air degrades were observed at about 20,000 feet in altitude, which delayed FOT&E.
 - Cooling problems were observed with the Environmental Control System. The Navy made repairs to the aircraft under test; however, until they have also completed these repairs to the Environmental Control System on legacy IB-4 aircraft, DOT&E assesses it is likely not suitable as integrated on the F/A-18C/D platform.
- The Navy corrected the deficiency caused by interaction between the ALR-67(V)2 and (V)3 radar-warning receivers and IB-4 system, which caused false threat symbols to be displayed. However, the Navy deferred correcting the deficiency in which the APG-79 radar is falsely identified to the ALQ-214(V)4 by the ALR-67(V)2 and (V)3 radar-warning receivers to a wingman compatibility working group composed of multiple Program Offices.
- IB-4 testing revealed an effectiveness problem against an operational threat for the F/A-18C/D, which would decrease overall survivability for the aircraft if not corrected. Previous testing using developmental test aircraft and a previous software version, and not flying operational maneuvers, did not reveal an effectiveness problem. Further details on this problem are classified.
- The planned IB-4 FOT&E was not completed in accordance with its DOT&E-approved test plan due to missed test points. However, testing to date is adequate since the IB-4 FOT&E conversion to an OA supports the SWIP program.

SWIP

- While the OA supports the SWIP program, the missed IB-4 test points must be collected during SWIP integrated regression testing to ensure adequate data for analysis to determine performance.

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- Preliminary analysis indicates the IB-4 hardware with precursor SWIP software, which the Navy chose for their three early fielding F-18 E/F squadrons, is as effective as the currently fielded IB-3 system on the E/F platform.

Recommendations

- Status of Previous Recommendations. The Navy addressed some previous recommendations; however, the following remain outstanding:

IDECM System

1. The Navy should reorganize complex IDECM software to minimize potential problems that could occur during the IDECM SWIP.
2. The Navy should develop hardware and/or software changes to provide pilots with correct indications of whether a decoy was completely severed.
3. The Navy should investigate the effects of IDECM on threat missile fuses.
4. The Navy should use the high-fidelity, accredited F/A-18 radar cross section (RCS) data when accomplishing analysis and hardware-in-the-loop testing, and ensure that the RCS models account for the entire F/A-18 airframe configuration.

Electronic Warfare Warfighting Improvements

5. In coordination with the Defense Intelligence Agency, the Navy should update the warhead probability of kill data

- in requirements documents to confirm IDECM effects are sufficient to enhance aircraft survivability.
- FY15 Recommendations. The Navy should:
 1. Improve data collection processes to allow for an adequate collection of suitability data during the SWIP/IB-4 operational test period.
 2. Use the results from IB-4 testing accomplished to date to prioritize system shortfall resolution for the SWIP FOT&E.
 3. The Navy should ensure that all resources needed for the SWIP FOT&E will be available by the start of testing in 1QFY17.
 4. The Navy should ensure that the ALR-67(V)3 radar-warning receiver interface with IDECM is updated so that aircrew have accurate situational awareness of the effectiveness of SWIP deny-delay countermeasures.
 5. In addition to the previous recommendation that the Navy should investigate the effects of IDECM on threat missile fuses, the Navy should include warhead fusing in this investigation.
 6. During SWIP integrated regression testing, the Navy should collect the missed IB-4 FOT&E test points.

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