

## Integrated Defensive Electronic Countermeasures (IDECM)

### Executive Summary

- The Navy completed an Integrated Defensive Electronic Countermeasure (IDECM) Software Improvement Program (SWIP) operational assessment (OA) on September 30, 2015. Developmental testing of the SWIP program is ongoing, and integrated test missions flew in July and August 2016, at the Joint Pacific Alaska Range Complex (JPARC) at Eielson AFB near Fairbanks, Alaska.
- The Navy's F/A-18 wingman radio frequency compatibility group that contains members from multiple Navy Program Offices continues to investigate and resolve deficiencies associated with the aircraft radar, which may be caused by other systems such as IDECM. The Navy has asked for significant funding to resolve the incompatibilities.
- DOT&E produced a classified report on the IDECM SWIP OA and the integrated testing at JPARC. The IDECM Block 4 hardware is effective and suitable on the F/A-18E/F, and not effective and not suitable on the F/A-18C/D because the system is unsafe due to environmental control system issues leading to cabin pressurization problems.
- The IDECM Block 4 with SWIP demonstrated inconsistent performance during integrated testing at the JPARC. However, the system demonstrated improved stability over previous developmental test flights.

### System

- The IDECM system is a radio frequency, self-protection electronic countermeasure suite on F/A-18 aircraft. The system is comprised of on- and off-board components. The onboard components receive and process radar signals and can employ on- 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 the 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 SWIP (currently in developmental 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.
- IB-4 hardware will run enhanced onboard software known as SWIP. SWIP will give IDECM enhanced capabilities against modern threats, denying or delaying a weapons-quality track on the F/A-18.
- 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-4's complex jamming capabilities to increase survivability against modern radar guided threats.
- IDECM SWIP provides a new deny/delay capability to enhance survivability against modern radio frequency threats.

### Major Contractors

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

## Activity

### IB-4

- The Navy completed an OA for IDECM Block 4 hardware on September 30, 2015. Testing was adequate to assess effectiveness on the F/A-18E/F. However, due to a major safety issue on the F/A-18C/D, the Navy deferred testing on F/A-18C/D until the middle of FY-17.
  - All planned laboratory testing, including a dense emitter scenario and closed-loop hardware-in-the-loop testing was completed.
  - Follow-on testing is scheduled for 2017 to complete all remaining flight test points for both platforms.

### IB-4 with SWIP

- The Navy completed integrated testing at a hardware-in-the-loop facility for the SWIP software.
  - Integrated testing at the JPARC tested the SWIP system against a modern threat in a more realistic threat environment than was previously possible. Further, while working in concert with the EA-18G and the ALQ-99 jamming pod, the Navy tested SWIP interoperability and effectiveness in the presence of support jamming.
  - Due to the integrated nature of the test, multiple configurations and software versions were tested at the JPARC.
- The Navy conducted all testing in accordance with a DOT&E-approved test plan.

## Assessment

### IB-4

- IDECM Block 4 is effective and suitable on the F/A-18E/F and unsafe and not suitable on the F/A-18C/D, leading to a not effective evaluation. Testing was adequate to support DOT&E evaluation of the system.
  - IDECM Block 4 demonstrated the same capabilities as the legacy IDECM Block 3 system.
  - Environmental Control System (ECS) problems on multiple F/A-18C/D aircraft prevented completion of IDECM Block 4 testing. Since the root cause of the ECS issues has not been determined, IDECM Block 4 is unsafe on the F/A-18C/D. The Navy wrote technical orders to diagnose ECS problems on the F/A-18C/D, but each aircraft must be investigated individually to solve the problems. IDECM is therefore not suitable on the F/A-18C/D fleet writ large.

### IB-4 with SWIP

- IDECM Block 4 with SWIP demonstrated little deny-delay capability at the JPARC against a modern threat. The

IDECM program should optimize countermeasure techniques employed using SWIP and their effectiveness for the threats of interest.

- IDECM Block 4 with SWIP did not demonstrate consistent effectiveness against modern surface-to-air missile systems. Integrated test led to the discovery of stability problems with the SWIP software, some of which have potential fixes in the latest software, but system effectiveness is often unpredictable. On at least one occasion, the SWIP system produced no radio frequency output but all system indications showed that IDECM was working perfectly.

## Recommendations

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

### IDECM System

1. The Navy should develop hardware and/or software changes to provide pilots with correct indications of whether a decoy was completely severed. This recommendation does not apply to the F/A-18 C/D installation since that installation does not include a towed decoy.
2. The Navy should continue to improve maintenance data collection processes and reporting methods during developmental and integrated test for IDECM to support an adequate suitability assessment.
3. The Navy should ensure that the ALR-67(V)3 Radar Warning Receiver interface with IDECM is updated to allow for proper situational awareness when SWIP is in use.
4. The Navy should ensure that the SWIP software is consistent and produces effective output prior to fielding.

### 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 ensure aircraft survivability.
  6. The Services should improve the fidelity of missile endgame analysis, to including warhead fuzing.
- FY16 Recommendations. The Navy should:
    1. Fully resolve F/A-18C/D ECS issues before resuming any test flights on the F/A-18C/D.
    2. Determine for each threat whether the current SWIP techniques or the original IDECM Block 3 or 4 baseline techniques provide the greatest survivability gains and field the most effective technique.