Infrared Search and Track (IRST)

Executive Summary
- The first flight of the Engineering Development Model (EDM) Infrared Search and Track (IRST) system pod on the F/A-18E/F took place on February 12, 2014.
- The Commander, Operational Test and Evaluation Force (COTF) conducted an operational assessment (OA) to inform a December 2, 2014, Milestone C decision.
- DOT&E reported on the OA results in a classified report to the Milestone Decision Authority, the Principal Military Deputy to the Assistant Secretary of the Navy for Research, Development and Acquisition (ASN(RDA)) in December 2014. DOT&E found that the system was progressing towards meeting reliability requirements. The system did not demonstrate tracking performance needed for weapons employment.
- The Milestone C decision will consider approval of 14 Block I low-rate initial production units and a plan to transition to Acquisition Category (ACAT) I status.

System
- The IRST system consists of a passive long-wave infrared receiver (IRR), a processor, inertial measurement, and environmental control unit.
- The Navy designed the IRST to be flown on the F/A-18E/F and it will be built into a modified centerline fuel tank.
- The Navy is developing and fielding the system in two blocks: Block I will reach Initial Operational Capability (IOC) in FY18 and use components from the F-15K/SG IRR that derive from the F-14 IRST system. Block II will begin after the Block I Full-Rate Production Decision Review and will include an improved IRR and updated processors.
- The Navy intends to produce a total of 170 IRST systems. There will be 60 Block I sensors, which will eventually be updated to the Block II configuration; the Navy will build an additional 110 Block II sensors.

Mission
Commanders will use IRST in a radar-denied environment to locate and destroy enemy forces. The IRST system is intended to allow the F/A-18E/F to operate and survive against existing and emerging air threats by enhancing situational awareness and providing the ability to acquire and engage targets beyond visual range.

Major Contractors
- The Boeing Company – St Louis, Missouri
- Lockheed Martin – Orlando, Florida

Activity
- COTF conducted an OA in two phases in accordance with DOT&E-approved test plans.
- Phase I of the OA consisted of contractor flight testing on a flying test bed between July and October 2013 and events flown by operational test pilots October 29 – 31, 2013, in Boeing's manned simulator facilities.
- The first flight of the EDM IRST pod on the F/A-18E/F took place on February 12, 2014.
- Phase II of the OA included a maintenance demonstration on April 2, 2014, and six flights on IRST-equipped F/A-18E/F developmental test aircraft between May 14 and July 16, 2014. The OA served both developmental and operational test objectives.
- DOT&E approved the Milestone C Test and Evaluation Master Plan (TEMP) in October 2014.
- In December 2014, DOT&E reported on the OA results in a classified report to the Milestone Decision Authority, the Principal Military Deputy to the ASN(RDA).

Assessment
- IRST, as tested in the OA, demonstrated unsatisfactory tracking performance. The individual problems seen vary in the degree to which they can be addressed through incremental improvements and are reflective of immature system design. Present track quality represents a significant risk that the

system to be tested in IOT&E may not be effective. No decision has been made whether entry into IOT&E will be delayed in order to fix these problems. Further details can be found in DOT&E's classified report to the Navy acquisition executive.

- Prior to the OA, the F/A-18E/F mission computer's multi-sensor integration (MSI) software had difficulty integrating IRST data with data from other sensors (e.g., radar). This is to be expected given the poor quality of information provided by IRST; however, how MSI will perform with better information from IRST is unknown. As a result, COTF did not test MSI during the OA. Historically, integration of information from disparate sensors has been difficult; thus, IRST MSI will require careful developmental testing and analysis to ensure the successful integration of IRST track data.

- The Key Performance Parameter (KPP) for detection and tracking does not adequately represent the operational environment where the Navy will employ IRST. Presently, the KPP can only be met in an environment that does not reflect realistic fighter employment and tactics.

- Although data are limited, reliability and maintainability as demonstrated during the OA flights and prior developmental testing are consistent with a system with a rigorous reliability growth program.

- No hardware failures were experienced during flight test on F/A-18E/F prior to or during the OA. While software reliability requires significant improvement prior to IOT&E, fixes have been identified for the problems seen and the Program Office has a process in place to track and correct errors as they are encountered. Most software reliability problems were related to Built-in Test (BIT), which exhibited a high frequency of false alarms. The most serious issue was tracker process failures not detected by BIT. The program has identified a fix for this problem and is currently in flight test for evaluation.

- A maintenance demonstration indicates removal and replacement times should be adequate to meet requirements. The demonstration identified improvements to technical documentation and system design that should be incorporated.

- Line-of-sight estimation algorithms (known as servo-transfer alignment) are not working and have required an alternate approach for boresighting the system. A mechanical boresight procedure was used for the OA and might serve as a permanent solution if the servo-transfer alignment algorithm cannot be improved. An assessment is being made to determine what the logistical impact would be. The assessment will examine how long the manual boresight is expected to hold and whether new support equipment will be required to re-boresight the system aboard ship.

Recommendations
- Status of Previous Recommendations. This is the first annual report for this program.
- FY14 Recommendations. The Navy should:
  1. Explicitly state detection and tracking requirements for the range of operational conditions in which the Navy expects to employ the system.
  2. Improve detection and tracking performance prior to entry into IOT&E.