

F/A-18 E/F SUPER HORNET



The F/A-18E/F Super Hornet (E/F) is a multi-mission, day/night strike fighter aircraft that provides strike capability to Joint Task Force and Carrier Battle Group Commanders. The E/F features improvements in range, endurance, carrier bring-back, weapon payload, and survivability. It also provides in-flight tanking for other tactical aircraft, and additional room for growth and upgrades.

Three major upgrades to the E/F are planned: an Active Electronically Scanned Array (AESA) radar, an Advanced Targeting Forward Looking Infrared (ATFLIR) sensor, and an Advanced Crew Station (ACS) in the two seat F/A-18F aircraft. AESA, the APG-79 radar, significantly increases E/F capabilities. It is designed to improve aircraft lethality, survivability, and enhance signature characteristics. It corrects current APG-73 radar deficiencies, including a lack of capability for growth, while allowing near-simultaneous operation of different radar modes. In conjunction with the ACS, AESA permits new workload strategies within the two-seat “F” cockpit by allowing each crewman to perform different mission functions independently. For example, the pilot might concentrate on air-to-air while the Weapon Systems Officer concentrates on air-to-ground.

ATFLIR represents the latest generation of technology in infrared targeting capabilities, including navigation FLIR, laser spot tracker, air-to-air laser ranging, electronic zoom, geographic-point targeting, and Electro-optics. The existing FLIR pod has documented deficiencies in high altitude magnification and resolution that degrade and, in some instances, preclude target location and precise aimpoint selection. ATFLIR incorporates sensor technologies designed to correct these deficiencies. This next-generation technology is designed to provide three fields of view, incorporate a larger detector array, and allow flight operations up to 50,000 feet altitude.

ACS introduced design and structural changes to the F/A-18F aft cockpit when the Navy decided to retire the two-seat F-14 and replace it with the F/A-18F. The two-seat F/A-18F was initially designed and produced as a trainer for single-seat F/A-18E pilots. Aft cockpit displays and controls replicated those of the front cockpit so that an instructor pilot had the same information as the front-seat student pilot. The most significant ACS change decouples rear seat displays and functions from the front seat so that the Weapons System Officer (WSO) can perform functions independent of the front seat pilot. A redesign of the main instrument panel increases multi-function display area. A Digital Video Map Computer provides a high-resolution map on the 8 x 10 display to increase WSO situation awareness. Secondary Hardware-Software Integration, the situational awareness (SA) format, and secondary sequence lines allow independent control in each cockpit. The pilot and WSO can independently view

maps giving each the display they need to perform separate but complementary functions, particularly in a combat environment.

BACKGROUND INFORMATION

AIRCRAFT

OPEVAL on the E/F was conducted from May to November 1999. In April 2000, DOT&E's B-LRIP report to Congress found that the E/F was operationally effective and operationally suitable. Several OT issues relating to missing or deficient systems required further attention:

- Not all stores combinations intended for use by the E/F were cleared for carriage and release during OPEVAL. While the configurations available were extensive for this phase of testing, there were numerous restrictions involving weapon type, weapon quantity, release interval, multiple release and mixed loads that were not available during OPEVAL.
- Due to an increased noise and vibration environment discovered under the wing of the E/F during developmental testing, a variety of stores and air-to-air missiles in particular required additional and more frequent inspections to help ensure acceptable reliability.
- The full potential of the E/F will be realized only after the incorporation of several new subsystems on the Navy's roadmap for the aircraft, especially the Joint Mounted Helmet Cueing System (JHMCS), the AIM-9X missile, and ATFLIR.

AIRCRAFT UPGRADES

AESA Milestone II was conducted in February 2001. The IOC of AESA is scheduled for late 2006. Because of the potential significance of AESA, DOT&E placed it on oversight for both OT&E and LFT&E. AESA requires several significant structural changes to the aircraft's forward fuselage and cooling system. An umbrella LFT&E program that evaluates the modified aircraft structure with all changes incorporated is under consideration.

ATFLIR. First flight of the ATFLIR pod and start of the DT-IIB Test Phase occurred in November 1999. OT-IIA, an operational assessment, was conducted in June/July 2000 and documented several major deficiencies that required corrective actions. In September 2000, schedule and design changes to the Electro-Optical Sensor Unit were implemented to reduce program risk from high to medium in schedule, cost and performance. OT-IIB, an Operational Assessment period, is planned for 2002 using refurbished Engineering Development Model ATFLIR pods in preparation for a planned Early Operational Capability with the first deployment of the F/A-18E aboard the USS Abraham Lincoln (CVN-72) in 2002. OPEVAL of the ATFLIR is scheduled in FY03, using units that incorporate changes anticipated to make them fully compliant with requirements.

ACS. The first flight of an ACS aircraft is scheduled for FY03, with installation beginning in Lot 26 aircraft to be delivered in CY04 and fleet deployment in Lot 27 aircraft in late CY05.

TEST & EVALUATION ACTIVITY

FOT&E (1) -- FIRST PERIOD OF AIRCRAFT FOLLOW-ON OPERATIONAL TEST AND EVALUATION

DOT&E approved the TEMP and Test Plan. Aircraft FOT&E (1) began in September 2001 and is scheduled to finish in April 2002. The aircraft's tactical software was upgraded to Software Configuration Set 18E (SCS-18E). This software upgrade plus the addition of new systems and new munitions requires more sorties to support FOT&E (1) than were flown during OPEVAL.

The objectives of FOT&E (1) are to:

- Determine the operational effectiveness and operational suitability of the E/F aircraft with SCS 18E installed.
- Evaluate items that were waived from OPEVAL that are now ready for test.
- Evaluate corrections to deficiencies identified in OPEVAL.
- Complete evaluation of Critical Operational Issues (COIs) that were only partially resolved during OPEVAL.
- Investigate potential new tactics for use with the E/F.

During OPEVAL, the Navy approved 50 waivers to the testing of required capabilities. For FOT&E (1), 30 of those waivers were declared ready to test with no additional waivers. FOT&E (1) also initiated OT of two new systems in addition to SCS 18E: a Positive Identification System (PIDS) and JHMCS. In December 2001, OT of the E/F as a carrier-based tanker was conducted. Two munitions began OT: Joint Direct Attack Munition and the Joint Stand Off Weapon with operational assessments of the ATFLIR and MIDS.

AIRCRAFT UPGRADES

AESA developmental testing focused on a number of prototype modules or components to reduce specific design risks identified by the several Integrated Product Teams that are responsible for specific AESA components during FY01. This testing supported the conduct of a series of design reviews for each of the major subsystems, culminating in the successful conduct of a Critical Design Review in October 2001 for the integrated AESA design.

TEST & EVALUATION ASSESSMENT

AIRCRAFT

The E/F B-LRIP Report noted that one of the principal reasons underlying the upgrade to the E/F is the capacity for growth to accept further improvements and to correct deficiencies in key subsystems of the F/A-18C/D. DOT&E also reported that the E/F must incorporate several key improvements to realize its full potential and operational capabilities. FOT&E (1)'s wide array of potential improvements indicates that the necessary growth process is underway. DOT&E is monitoring FOT&E (1) and will provide an evaluation of the test results in next year's Annual Report.

AIRCRAFT UPGRADES

AESA is on track to increase performance of the E/F. DT activity to date includes laboratory bench testing of prototype array modules and an assessment of the anticipated array performance using modeling and simulation of a completed array using the bench testing results. Simulation results indicate that AESA will meet requirements. The accuracy of this simulation in a similar antenna program has been demonstrated. DOT&E will monitor this effort as hardware becomes available for OT assessment. Early OT involvement supports full integration and compatibility of five new systems or modifications: the Advanced Mission Computer & Displays, Fiber Channel Network Switch, Software Configuration Set High Order Languages, Advanced Crew Station and the structural modifications to the aircraft's avionics cooling system. The LFT&E evaluation of the Common Block 2 E/F AESA aircraft effort will be an incremental LFT&E update based on the E/F EMD aircraft program.

ATFLIR OT-IIA identified ten major deficiencies affecting the sensor performance, E/F compatibility, and interoperability with other E/F systems. Four have been fixed as verified by DT flight test; three have been significantly improved as verified by DT flight test. Of the remaining three deficiencies, a change has been incorporated to correct observed jumps in the Line of Sight, but remains to be verified in DT/OT and the root cause of the two remaining deficiencies under investigation. Concurrent with FOT&E (1) of the E/F, OT-IIA of the ATFLIR in 2002 will provide an operational assessment of the Engineering Development Model pods refurbished to incorporate these corrections. Although these refurbished pods will have some carriage limits not representative of the production pods, e.g., limited to 5 Gs, this testing will provide an early look at how the design changes have improved the operational effectiveness and operational suitability of this system.