

F/A-18 E/F UPGRADES



ACTIVE ELECTRONICALLY SCANNED ARRAY - AESA

Navy ACAT IC Program

Total Number of Systems: 258 (192 potential retrofit)
Total Program Cost (TY\$): \$385M RDT&E
\$1.13B (APN-1)

Prime Contractor

Raytheon

ADVANCED TARGETING FORWARD LOOKING INFRARED - ATFLIR

Navy ACAT IC Program

Total Number of Systems: 547
Total Program Cost (TY\$): \$1.1B
Average Unit Cost (TY\$): \$1.9M

Prime Contractor

Boeing
Raytheon (Major Subcontractor)

SYSTEM DESCRIPTION & CONTRIBUTION TO JOINT VISION 2020

The FA-18E/F F Super Hornet, is an advanced derivative of the FA-18 C/D now in operational service with the Navy, Marine Corps, and several foreign countries. Designed to overcome existing deficiencies in FA-18 C/D range, endurance and carrier bring-back payload and weapons payload capability/flexibility, the new design features a larger airframe with more fuel capacity and two additional store stations. It also has a reduced radar signature, increased survivability engines, extensive use of

composites, and improvements to some avionics and displays. The projected firepower from Super Hornets operating from aircraft carriers is a key contributor to the *Joint Vision 2020* concepts of *dominant maneuver* and *precision engagement*.

Individual Upgrade Descriptions

Active Electronically Scanned Array (AESA)

AESA represents the last of three preplanned upgrades to the FA-18 radar and is being developed to dramatically increase FA-18E/F warfighting capability. It should provide significant lethality and survivability enhancements, greatly improved detection, EP performance, and enhanced signature characteristics for the aircraft. It will correct current APG-73 hardware and software deficiencies, lack of growth capability and allow near-simultaneous operations of different modes of the radar while increasing overall reliability and flexibility. AESA will enable new workload strategies within the cockpit in the FA-18F, substantially increasing multi-mission effectiveness by allowing each crewman to independently perform different mission functions near simultaneously.

Government and Industry have been working since 1992 on AESA requirements and technical definition. DARPA, JSF, ONR, and USAF programs significantly reduced technical and affordability risks for this type of system. Provisions for growth to support AESA are already embedded in the FA-18E/F. Boeing has total system performance responsibility for integrating the AESA radar system into the aircraft and competitively selected Raytheon as the AESA supplier. The process fully utilizes Boeing Integration expertise and supports Acquisition Reform initiatives.

- Jul 98: Decision to formally compete radar subcontract through Boeing.
- Dec 98: PBD 752 adds \$660M in FY00-05 to partially fund AESA program.
- Apr 99: AESA fully funded in FYDP with PBD752 and PR01 submit.
- Jul 99: USD (A&T), OSD(C) Decision to Proceed with New Start Notification to Congress.
- Jan 01: Expected Milestone II decision

Because of the importance of AESA as a roadmap system for the FA-18E/F aircraft, DOT&E has placed it on oversight. AESA is a multi-phase program. In Phase I (Pre-E&MD Activities and Prototype Development) Boeing conducted a competitive source selection for radar system subcontract under advanced agreement. Agreement for prototype development (FY99-FY01) included commercial development and amortization provisions. In Phase II, EMD program/contract will support a Milestone II decision in FY01. Phase III: E&MD (January 2001-July 2006). Phase IV comprises LRIPs I, II, & III comprising 42 units (FY03-08, FY04-12, FY05-22). Phase V is Full-rate production (FY06). The program is currently fully funded and on track.

Advanced Targeting Forward Looking Infrared (ATFLIR)

ATFLIR represents a the latest, third 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 AN/AAS-38B FLIR pod currently deployed in FA-18C/D squadrons has known deficiencies in magnification and resolution resulting in insufficient performance for target location and precise aimpoint selection outside threat envelopes, particularly from higher altitudes. ATFLIR will

incorporate sensor technologies intended to maximize air-to-ground targeting performance. Testing began in FY99 and will IOC in FY03. This next generation technology will operate at shorter wavelengths than previous systems, have 3 nominal fields of view to include a very narrow 0.7 degrees, incorporate a larger detector array and allow operations up to 50,000 feet pressure altitude.

First flight of the EMD pod and start of the DT-IIB Test Phase occurred in November 1999. OT-IIA was June/July 2000, and involved 20 C/D flights. OT-IIA revealed five major anomalies requiring corrective action:

1. ATFLIR overheat on deck, requiring the pilot to wait until airborne to turn the pod on and initiate Built in Test that should be done prior to flight to ensure reliability.
2. Stuck Field of View (FOV) when attempting actuation commands.
3. Uncommanded pod shutdowns during high "G" initiated flight conditions.
4. Multiple break-locks during auto-track deliveries.
5. Laser failures airborne requiring power recycling to reset the pod.

In September 00 the program objectives were re-addressed. To move the program from a high-risk program in schedule, cost and performance, to medium risk status required a schedule re-alignment and design modification of the Electro-Optical Sensor Unit (EOSU). Early involvement in the developmental/operational testing of ATFLIR has properly identified areas of concern in meeting Key Performance Parameters and ensuring second FA-18E/F deployment availability.

Most anomalies identified in OTIIA have been mitigated or largely reduced through mission computer software changes and interface improvements. Uncommanded Pod shut downs are not fully understood at this time. Recognition range performance KPP compliance will determine program progress. Upgraded EOSU underwent Developmental Testing during Oct/Nov00 timeframe with an LRIP-I Decision expected in Dec00.

OT-IIB (OPEVAL) is currently scheduled for 1Q03.

TEST & EVALUATION ASSESSMENT

AESA is on track to increase performance and capabilities to the Super Hornet. 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 the potentially attainable performance of AESA will meet or exceed requirements. There is reason to have high confidence in the simulated results since the contractor has previously demonstrated the accuracy of this simulation in a similar antenna program. DOT&E will continue to monitor this effort until hardware becomes available for OT assessment. Early OT involvement is essential to ensure full integration with contributing new systems such as the Advanced Mission Computer & Displays, Fiber Channel Network Switch, Software Configuration Set High Order Languages, Advanced Crew Station and the advances in the aircraft avionics cooling system are compatible.

ATFLIR is presently high risk in performance, schedule and cost, requiring a restructuring of this program. Design tests underway at China Lake will determine if target recognition range Key

Performance Parameters are attainable. Restructuring of the Test and Evaluation Master Plan has slid the program one year to the right. Many uncertainties remain in this challenged program.

The effectiveness and survivability of the FA-18E/F depends heavily on the health of these programs. Although they are separate systems with individual TEMPs, their integration is paramount to insure carrier aviation remains relevant and the Vision 2020 precept of *precision engagement* is met.