F/A-18E/F Super Hornet

The F/A-18E/F Super Hornet program experienced development challenges in the latest software update, System Configuration Set (SCS) H16, which delayed the operational test for Block II aircraft by nine months to June 2021. Operational testing of the latest Super Hornet configuration, Block III, is scheduled to begin in 2QFY22. The Navy expects to complete Block II and Block III SCS H16 FOT&E in 2022 to support a fleet release expected in 2QFY22.

System Description

The F/A-18E/F Super Hornet, the U.S. Navy's principal power projection aircraft, is a strike fighter and attack aircraft. It performs a variety of roles that include air superiority, fighter escort, suppression of enemy air defenses, reconnaissance, forward air control, close and deep air support, day and night strike missions, and aerial refueling. The F/A-18E is a single-seat version of the aircraft and the F/A-18F is a two-seat version. The F/A-18E/F Super Hornet replaces the F-14 and F/A-18A-D, and complements the F-35C, as a strike-fighter tactical aircraft employed by Navy carrier strike groups. The SCS is the higher-order aircraft language software that the Navy historically updates on a two-year cycle to further enhance F/A-18E/F capabilities.

Program

The F/A-18E/F Super Hornet is an Acquisition Category IC program. In 2021, DOT&E approved the Test and Evaluation Master Plan for the latest software update, SCS H16, covering both Block II and Block III aircraft. DOT&E approved the first phase of the Block II SCS H16 Test Plan in May 2021. DOT&E also approved a phased entry into Block II SCS H16 FOT&E, requiring the Navy to seek DOT&E approval for subsequent phases as software deficiencies resulting from developmental challenges are resolved. Operational testing of Block II SCS H16 aircraft began in June 2021, with fleet release expected in 3QFY22.

The Navy is also leveraging production of the Kuwaiti Super Hornet to purchase Block III aircraft that include upgraded hardware, advanced cockpit displays, and improved networking capability. Boeing delivered the first two Block III Super Hornets to the Navy in 2021. The Navy also plans to retrofit existing Block II aircraft with the Block III upgrades. Block III operational testing is scheduled to begin by 3QFY22.

Major Contractors

- The Boeing Company, Integrated Defense Systems – St. Louis, Missouri.

- Raytheon Company – Forest, Mississippi.
- General Electric Aviation – Evendale, Ohio.
- Northrop Grumman Corporation – Bethpage, New York.
- Lockheed Martin – Orlando, Florida.

Test Adequacy

The Navy started the Block II SCS H16 operational testing in June 2021. In accordance with the DOT&E-approved test plan, the Navy will collect data against continuous response variables instead of relying on binary response data to provide a more robust evaluation of Super Hornet performance in all environments, while facilitating an assessment of the capability improvements' effect on performance compared to previous SCS releases.

DOT&E approved the SCS H16 operational cybersecurity test plan in May 2021, noting that future iterations of cybersecurity test plans for the air system (both air vehicle and logisitics support) must be more comprehensive.

The Navy has not yet completed the long-standing requirement to conduct end-to-end multiple simultaneous AIM-120 missile engagements to demonstrate that the active electronically-scanned array (AESA) radar can support this required capability. This is planned for in the DOT&E-approved Block II SCS H16 test plan.

A long-standing limitation to F/A-18E/F operational testing has been the lack of a real-time, high-fidelity kill-removal system. The DOD continues to incorporate Open Air Battle Shaping into multiple CONUS ranges and fighter aircraft, to include those utilized by naval aviation OT&E. Efforts are underway to continue integration and updates to Open Air Battle Shaping in H18 and all future F/A-18E/F software releases, which will address this limitation. Utilization of Open Air Battle Shaping will enhance the realism of current and future high-fidelity AESA threat radar emulators while providing critical data from open-air, mission-level testing for use in verification, validation, and accreditation of modeling and simulation solutions.

The Navy simultaneously executed developmental test events involving F/A-18E/F SCS H16, IRST Block II, and E-2Ds with Delta System Software Configuration 4 software during the August 2021 Gray Flag detachment. Although no operational testing data were gleaned, this system of systems approach is likely to maximize the effectiveness and efficiency of future test events.

Performance

Effectiveness

Past effectiveness evaluations concluded that the Super Hornet is operationally effective in most environments. The SCS H16 operational test will evaluate new and enhanced F/A-18E/F capabilities. The limited SCS H16 testing conducted thus far does not appear to change the SCS H14 effectiveness evaluation. Final assessment of Block II SCS H16 operational effectiveness will be published in the Block II SCS H16 FOT&E report in 2022, after the completion of operational testing.

Suitability

Past evaluations concluded that the Super Hornet is operationally suitable, even though the F/A-18E/F's AESA radar has not met reliability requirements. While radar reliability has gradually improved across FOT&E periods, it still fails to meet the reliability requirement established in the Operational Requirements Document. Final assessment of Block II SCS H16 operational suitability will be published in the Block II SCS H16 FOT&E report in 2022, after the completion of operational testing.

Survivability

The Navy is leveraging completed developmental cybersecurity testing to inform the evaluation of Block II SCS H16 survivability in a cyber-contested environment. Additional SCS H16 cybersecurity testing was delayed due to hardware delivery and resource constraints. The Navy has not yet adequately addressed previous cybersecurity deficiencies or developed a comprehensive roadmap to inform future cybersecurity testing.

Recommendations

The Navy should:

1. Continue to improve the reliability of the AESA radar.
2. Allocate adequate resources for planning and conducting comprehensive F/A-18E/F cybersecurity operational testing and address previously identified cybersecurity deficiencies.
3. Incorporate Open Air Battle Shaping and high-fidelity AESA threat radar emulators into future test events, to include for SCS H18 FOT&E.
4. Plan and resource end-to-end testing employing multiple AIM-120 missiles.
5. Continue to utilize more robust data collection and analysis methods during operational test events, to include aircraft instrumentation and the use of continuous variables, in order to more adequately assess F/A-18 capability in the rapidly evolving threat environment.