

## AIM-9X SIDEWINDER AIR-TO-AIR MISSILE



### Navy ACAT ID Program

Total Number of Systems:	10,097
Total Program Cost (TY\$):	\$2.8B
Average Unit Cost (BY97\$):	\$178K
Full-rate production:	1QFY04

### Prime Contractor

Raytheon Systems Company

### SYSTEM DESCRIPTION & CONTRIBUTION TO JOINT VISION 2010

The multi-Service AIM-9X Sidewinder Air-to-Air missile program is a follow-on modification to the existing AIM-9M short range missile, for both the U.S. Air Force and Navy/Marine Corps fighters. AIM-9X is designed to be a highly maneuverable, launch and leave missile, capable of engaging multiple targets using passive infrared guidance to provide full day/night capability with improved resistance to countermeasures, expanded target acquisition, and high off-boresight improvements relative to the AIM-9M. AIM-9X is designed to work with any on-board aircraft cueing source, including the Joint Helmet-Mounted Cueing System (JHMCS), which is being developed in a parallel program to provide high off-boresight capability.

The AIM-9X missile retains the warhead, fuze, and rocket motor of the existing Sidewinder missile family. A new imaging infrared focal plane array seeker, thrust-vector tail-control actuation system, and state-of-the-art signal processor/auto pilot should provide the missile with performance improvements over AIM-9M.

AIM-9X will be employed in both offensive and defensive counter air operations. It will contribute to the *Joint Vision 2010* objectives of *precision engagement* in the offensive counter air role and to *full-dimensional protection* in the defensive counter air role. The F-15C/D and F/A-18C/D will be the initial fighter platforms for AIM-9X integration and testing; the missile will be integrated with the F-16, F/A-18E/F, F-15E, and F-22 later.

## **BACKGROUND INFORMATION**

AIM-9X development was initiated in response to the development and fielding of new foreign missiles clearly exceeding AIM-9M capabilities. An 18-month AIM-9X competitive DEM/VAL program began in 1994 with the Hughes Missile Systems Company and the Raytheon Company. At the conclusion of this Dem/Val program, Hughes was selected as the AIM-9X prime contractor in December 1996. An evaluation of the British ASRAAM missile, conducted in parallel with the AIM-9X Dem/Val phase, including a 6-month Foreign Comparison Test, showed that it did not meet all of the U.S. performance requirements.

The AIM-9X program is a joint Navy/Air Force program, with the Navy designated as the Executive Service. It is also an acquisition reform program in which the contractor bears total system responsibility for a weapon system meeting Operational Requirements Document requirements. The contractor, now Raytheon Systems Company through a merger with the Hughes Missile Systems Company, is developing AIM-9X through an Integrated Product Team (IPT) management approach that includes Navy, Air Force, and OSD membership. The EMD phase began in January 1997, and is currently planned for completion in approximately six years with Milestone III scheduled for November 2003.

## **TEST & EVALUATION ACTIVITY**

AIM-9X test and evaluation activity has proceeded from laboratory and captive carry development and demonstration tasks to missile test launches from F-15s and F/A-18s. Eight separation and control test vehicle launches were conducted to demonstrate safe separation and missile aerodynamic performance. The first three launches were successful. The fourth launch was not, due to a structural failure of the external harness cover resulting in separation of the electrical wiring to the control actuation system. Subsequent launches have been successful and have demonstrated the fix for the harness cover and the wiring multiple times over. The first Engineering Development Missile, equipped with a seeker and tracker, successfully intercepted and destroyed a QF-4 drone from an aft quarter, off-boresight launch position. A second guided AIM-9X killed a QF-4 drone in a head-on, lookdown, shoot-down attack. The program launched a third guided shot in a 2-circle engagement again against a QF-4. This shot missed off the tail by a classified miss distance (outside the lethal range). Prior to that shot, simulation predictions indicated risk in achieving a hit. The program took the shot to enhance modeling of the target—its plume—and continues to progress on tracker algorithm development. The shot yielded excellent seeker data at appropriate closing rates to be used for further improvements.

Modeling and simulation (M&S) tools are key contributors to the development and evaluation of AIM-9X. Due to this missile's expanded capabilities and cost constraints on the number of test launches, a family of simulations will be used to assess missile performance across a wide spectrum of engagements (encompassing various threats, backgrounds, and countermeasures). These simulations will

approximate the missile's performance in target detection and acquisition, fly out to the target, and end game warhead fuzing and lethality. The live missile launches will be primarily used to validate these simulations. Since the same simulations will be used for the OT&E and DT&E phase, DOT&E and the OTAs have been involved in the AIM-9X program's intensive M&S planning from the program start. From an independent Draper Lab assessment of the M&S strategy, through the decision to contract with the Joint Accreditation Support Activity to assist in validation of the simulations, DOT&E has actively monitored M&S planning and operations. This active involvement will continue throughout this challenging and important contractor/government task EMD period.

The Live Fire Test and Evaluation program consisted of warhead characterization tests to determine if the added wiring harness and cover affected warhead performance. These tests will be conducted by Raytheon. The LFT&E program was expanded when a primary threat target became available for testing. Static arena testing of the AIM-9X warhead against this target was conducted in September-October 1999 at Dahlgren, VA. This testing demonstrated the lethality of the AIM-9X warhead against its primary target for several expected end game geometries. Test results will also support validation of the Joint Service Endgame Model, which will be used to determine AIM-9X probability of kill.

The Joint Helmet Mounted Cueing System (JHMCS) is now under OSD oversight. Its mutual dependence on AIM-9X for testing and tactical operations has led to informal cooperation in the test area. JHMCS development is ahead of the new AIM-9X schedule, with OT&E for the F-15 and F/A-18 in the February-June 2000 period, and Milestone III scheduled for September 2000. This schedule should provide a developed JHMCS capability to adequately test its interface with AIM-9X during OT&E.

## **TEST & EVALUATION ASSESSMENT**

The AIM-9X development program has slipped during this fiscal year. In July 1999, the schedule slip was estimated to be about eight months behind in the separation and control-testing phase due to control actuation system problems. At the same time, the guided testing phase was estimated to be about four months behind the original schedule. Program management elected to restructure the EMD program at that time to recover some but not all of the lost schedule time. The restructured schedule impact on OT&E resulted in shifting the final OT period from December 2000-October 2001 to November 2001-November 2002. Milestone III has also shifted from May 2002 to March 2003, with an additional LRIP buy inserted in FY02. Subsequently, Congress zeroed planned FY00 procurement, forcing the three planned LRIPs and Milestone III to occur in November of FY01, FY02, FY03, and FY04 respectively. A fortuitous result of this schedule change is that more mature production representative missiles will be available for OT&E launches.

Development of the simulation suite is progressing satisfactorily. Contractor and government stakeholders are cooperating in solving the simulation and interface problems as they occur. Simulation strategy and planning will be further documented in the TEMP revision now in the approval cycle. This TEMP update will also restructure the test program to reflect the program schedule change, as well as support the FY00 119-missile LRIP budget request.

Currently, the simulations indicate that the missile has difficulty against targets employing countermeasures and may fail to meet the required kill probability against targets employing countermeasures. The contractor is aggressively working this issue and, several possible solutions, including a substantially new tracker, will be explored in the coming months. It is presently difficult to

quantify the risk associated with this issue because it is not clear whether the problem is with the simulations or the missile design. We will be considerably closer to resolving this issue after the first five live shots in 1Q FY00 since at least three of these shots will include countermeasures.

### **CONCLUSIONS, RECOMMENDATIONS, LESSONS LEARNED**

The AIM-9X program demonstrates the benefits of a cooperative IPT approach by involving the prime contractor, program management, Air Force and Navy test organizations, AFOTEC/OPTEVOR, and OSD in developing a practical and credible simulation strategy supporting missile development and operational test and evaluation.

The AIM-9X program has invested heavily in modeling and simulation to support development and testing, including simulation of potential threats, backgrounds, and countermeasures. This simulation suite is being relied upon to guide development of the new missile seeker and tracker, especially in providing acceptable capability against countermeasures. These simulation initiatives have allowed the number of guided test missiles to be significantly reduced to 31 for OT&E and DT Assist plus 18 guided test launches for development testing (from 69 operational test shots and 103 development test launches during EMD for the AMRAAM program). Accordingly, if the test results with these few missiles do not meet operational requirements or do not agree with simulation results, additional test missile firings will be required.