SH-60R MULTI-MISSION HELICOPTER UPGRADE

Navy ACAT IC Program		**Prime Contractor**
Total Number of Systems:	243	Lockheed Martin
Total Program Cost (TY$):	$5823.9M	
Average Unit Cost (TY$):	$23.967M	
Full-rate production:	2QFY04	

SYSTEM DESCRIPTION & CONTRIBUTION TO JOINT VISION 2020

The SH-60R Multi-Mission Helicopter Upgrade (formerly called LAMPS MK III Block II Upgrade) consists of a Service Life Extension Program (SLEP), avionics improvements, and new or improved mission sensors. The SLEP entails the remanufacture of SH-60B, SH-60F, and some HH-60H airframes currently in the fleet for a resultant life extension of 10,000 hours and a maximum gross take-off weight increase from 21,884 pounds to 23,500 pounds. The program develops the AN/AQS-22 Airborne Low Frequency Sonar (ALFS) and increases sonobuoy acoustic signal processing capability by initial EMD use of the UYS-2A Enhanced Modular Signal Processor and final EMD incorporation of a commercial-off-the-shelf acoustic processor. The acoustic suite is designed to improve USW mission effectiveness against the quiet submarine threat in both deep and shallow water environments. The aircraft will employ a Multi-Mode Radar (MMR) that includes Inverse Synthetic Aperture Radar (ISAR) imaging and periscope detection modes. Other improvements include the ALQ-210 electronic support measures (ESM), a fully Integrated Self-Defense (ISD) system, a Forward Looking Infrared (FLIR) sensor with laser designator, and armament capability to launch Hellfire missiles. The SH-60R and CH-60S will incorporate the "Common Cockpit" which consists of multi-functional displays, keysets, and a

complex client-server based tactical data processing system. The upgrade represents a significant avionics modification to the SH-60 series aircraft by enhancing USW, ASUW, surveillance and ID, and power projection, thereby supporting the ***Joint Vision 2020*** operational requirement of ***full-dimensional protection***.

BACKGROUND INFORMATION

The SH-60R Multi-Mission Helicopter Upgrade entered EMD in FY93 and combined the mission functions of the predecessor SH-60B and SH-60F baseline aircraft. A series of cost, budget, and technical issues have prompted program restructures. In May 1999, ASN(RDA) approved exit criteria for the first three SH-60R LRIP lots in FY00, FY01, and FY02. He also designated two of the LRIP Lot 1 aircraft to be used as additional test aircraft and approved exit criteria for full-rate production. The two prototype SH-60R test aircraft were delivered 157 days late to the Navy because of wiring bundle design problems and Common Cockpit software immaturity. The scheduled delivery dates for the first four production representative test aircraft also incurred a 45-day delay due to interface configuration design problems. The Acquisition Program Baseline (APB) was revised in FY00 to accommodate the late aircraft deliveries. The restructured program re-defined the third LRIP lot exit criteria and added exit criteria for a fourth LRIP lot in FY03. The program and APB were restructured to also reflect transfer of test responsibility for a portion of the Common Cockpit hardware and software common to both the SH-60R and CH-60S and to the CH-60S program.

The current program consists of four phases. *Phase one* installed the ALFS, UYS-2A acoustic processor, displays, and control keysets in a SH-60B test aircraft, and focused both DT and OT on mechanical dipping performance of the system. Limited acoustic performance was tested due to the immaturity of the acoustic system's development software. ALFS DT completed in late June 1999 and OT completed in December 1999. ALFS was assessed as potentially operationally effective and potentially operationally suitable. Subsequent phases of test in prototype SH-60R aircraft selectively employed a mixed DT/OT crew to conduct operational scenario-based data collection suitable for both DT and OA purposes. This DT/DT assist testing occurs during the last 30 percent of the DT period and also provides aircraft familiarization for the VX-1 personnel to conduct later dedicated OT flight tests. *Phase two* of the program consists of the DT/DT Assist and OT testing focused on the Common Cockpit and MMR systems installed in two prototype SH-60R aircraft. The DT/DT Assist commenced in May and is projected to be completed in January 2001. Independent OT has slipped from November 2000 to 3QFY01 and may be designated as a DT Assist. *Phase three* consists of a DT/DT Assist and OT focused on the ESM, ALFS, and MMR systems in the two prototype aircraft. The DT/DT Assist testing will start in January and complete in late September 2001. Independent OT will start in October and continue through December 2001. *Phase four* will consist of the DT/DT Assist and OT periods of testing on four production representative aircraft, with the full suite of SH-60R avionics and sensors installed. The DT/DT Assist testing will span the full CY02. Independent OT will start in late March and continue into September 2003. Milestone III is currently scheduled for January 2004.

The Hellfire missile Integration Program Upgrade to the SH-60B and HH-60H aircraft was designated for LFT&E in March 1995. Extensive ballistic testing had been conducted on the H-60 series of helicopters during development and later under the Joint Live Fire Program. A waiver from full-up, system level testing was granted in July 1996. The LFT&E Alternative Plan for the SH-60B and HH-60H included an evaluation of the vulnerability of these H-60 variants based on those past tests. The results of the vulnerability evaluation for the SH-60B and HH-60H, including the effect that the addition of the Hellfire Missile had on vulnerability, were reported in a separate Live Fire report to Congress and

summarized in a separate entry in this report. The SH-60R variant was specifically identified as a "covered" upgrade in January 1998. The Navy determined that the waiver granted to the SH-60B and HH-60H aircraft did not apply to the SH-60R, and that a separate waiver must be requested. Because the SH-60R program is currently in EMD, the Acquisition Executive is precluded from granting a waiver without first obtaining legislative relief from the requirement that waivers be granted prior to a program entering EMD.

TEST & EVALUATION ACTIVITY

Operational Testing of the AN/AQS-22 Airborne Low Frequency Sonar System installed in a SH-60B was conducted over a 59-day period from October-December 1999.

Initial DT of the SH-60R began mid-May 2000 and will extend into January 2001. This phase one testing is focused on the Common Cockpit and MMR systems. Electromagnetic interference, compatibility, vulnerability design discrepancies, detected early in DT, have been corrected. Common Cockpit software faults continue and are being corrected through revised software programs. The two prototype aircraft had accumulated over 120 hours of flight test by September 28, 2000.

The Navy and DOT&E determined that important data voids exist that preclude an adequate evaluation of SH-60R vulnerability for LFT&E. DOT&E recognized that the data voids were common to other H-60 aircraft variants such as the Navy's CH-60S and the Army's UH-60L Upgrade, and proposed that the Army and Navy coordinate their efforts to fill these voids so that the total LFT&E data requirement could be met with minimum cost. The Navy and Army are preparing a plan whereby each Service will address some of the data voids and, taken together, all of the data voids will be addressed. DOT&E is reviewing an Alternative Plan that identifies test assets and resources specific to the SH-60R.

TEST & EVALUATION ASSESSMENT

The AN/AQS-22 ALFS system was assessed to be both potentially operationally effective and potentially suitable. The system was accredited with: (1) increased detection ranges and area coverage rates compared to the predecessor AN/AQS-13F dipping sonar; (2) the ability to concurrently process both sonobuoys and active sonar; (3) deeper dip capability due to a longer usable transducer cable; (4) automatic dip depth control features; and (5) a locking device to secure the transducer during tactical maneuvers of the aircraft. The system also exhibited an excessive Built-In-Test (BIT) false alarm rate, an inadequate BIT error reporting format, a below threshold Mean Time Between Mission Critical Failure rate, numerous human factors engineering problems, and insufficient factory training to address the complexity of the system.

SH-60R programmatic and schedule changes have made it difficult to finalize a revision to the January 1994 TEMP. The August 1992 ORD is also in need of revision. The Program Manager has been forthright in reporting technical and schedule issues, thereby enabling the Systems Test IPT to facilitate test plan adjustments. Combined CT and DT, as well as combined DT and OT, have been planned wherever feasible. A revision to the March 2, 1992 ORD has been prepared and is in the initial stages of staffing in OPNAV. A revision to the January 6, 1994 TEMP is being developed to reflect the ORD revision and program restructuring.

The Audio Management Computer, the MMR, and the Airborne Operational Program software continue to demonstrate low levels of maturity. The generation rate of Program Trouble Reports has exceeded predictions and the number of flight test hours for each test point has not met expectations.

RECOMMENDATIONS, CONCLUSIONS AND LESSONS LEARNED

Development and test of the Common Cockpit system has been a greater technical challenge than originally anticipated. The first DT and OA periods were to focus testing on the Common Cockpit system and on two operator modes of the MMR. Because of the larger than expected generation rate of Program Trouble Reports and flight test hours for each test point, the first OA period has slipped from November 2000 to 3QFY01 and may be designated a DT assist. The DT/OA periods of the SH-60R program are date-based, not event-based. Each period tests available operator modes of the MMR, additional partially developed mission systems as they become available, and additional Common Cockpit interface modules. The date-based portion of the schedule does not sufficiently define functional packages to bound DT and OA efforts. The value of early OTA involvement is maximized when the system(s) to be tested are more clearly defined by an event-based schedule.