COASTAL MINE HUNTER (MHC 51)

Navy ACAT IC Program

Total Number of Systems:	12
Total Program Cost (TY$):	$1730M
Average Unit Cost (TY$):	$143M
Full-rate production:	2QFY90

Prime Contractor

Intermarine USA & Avondale Shipyard

SYSTEM DESCRIPTION & CONTRIBUTION TO JOINT VISION 2020

The 12-ship Coastal Mine Hunter (MHC 51) program and an earlier program to construct 14 Mine Countermeasures Ships were initiated to replace minesweepers constructed in the 1950s. The mission of the MHC 51 is to detect, localize, identify, and neutralize current and future threat mines in littoral areas, harbors, and coastal waters worldwide. The MHC 51 is a vital part of ***dominant maneuver*** in maritime scenarios, contributing to both strategic and tactical mobility of naval and land forces. The MHC 51 also contributes to ***full-dimensional protection*** since naval mines inflict personnel and material casualties as well as deny freedom of action.

The design of the MHC 51 is based on the Italian LERICI class of mine hunters. Constructed of Glass-Reinforced Plastic (GRP), the ship is 188 feet long, has a beam of 36 feet, and displaces about 895 tons. Non-magnetic diesel engines drive cycloidal propellers. In another departure from conventional design, major machinery platforms are suspended from the main deck to provide acoustic isolation and shock dampening.

The combat system includes the AN/SYQ-13 Navigation, Command, and Control System; the AN/SLQ-48 Mine Neutralization System; the AN/SQQ-32 Minehunting Sonar; and .50 caliber machine guns.

BACKGROUND INFORMATION

The USS OSPREY (MHC 51) Shock Trial, consisting of five underwater explosions of progressively increasing intensities, was conducted at the Aberdeen Test Center in August-September 1995. This was the first U.S. Navy shock trial conducted on a ship with GRP hull and structure. The MHC 51 is also the largest composite monocoque hull ever built. Hence, there were many unknowns prior to the testing as to what its shock tolerance would be. Of note, the cradle arrangement used to suspend the propulsion diesel engines and electrical generators was successful in preventing damage to the cradle structure. The cradle arrangement was designed to address noise and vibration as well as shock. The Navy's Shock Trial final report was received by DOT&E in October 1998 and is addressed in the MHC 51 B-LRIP report.

The TEMP approved by DOT&E in 1995 called for a series of three operational tests. Two of the tests were to be conducted in 2QFY96 to evaluate minehunting effectiveness (OT-IIIA) and minesweeping effectiveness against moored mines (OT-IIIB). The second and third tests to evaluate the MHC 51's minesweeping effectiveness (OT-IIIB/OT-IIIC) were not conducted because the Navy cancelled plans to field modular minesweeping systems for the MHC 51. Shock trial preparations and post-shock repairs delayed the start of OT-IIIA to 2QFY97. OT-IIIA was completed aboard USS OSPREY and USS BLACK HAWK (MHC 58) in 1997.

FOT&E (OT-IIIB) was conducted aboard USS RAVEN (MHC 61) from March 1-16, 1999 to re-examine aspects of MHC 51 performance found deficient in OT-IIIA. Test operations included minehunting and mine neutralization in the shallow coastal waters near Panama City, FL, and in deeper water in the Gulf of Mexico. There were also several periods of testing conducted on the Coastal Systems Station instrumented range designed to measure the ship's magnetic and acoustic signatures and evaluate its susceptibility to bottom influence mines.

TEST & EVALUATION ACTIVITY

DOT&E completed an independent evaluation of OT-IIIB results and finalized the B-LRIP report, which was submitted to Congress in December 2000.

TEST & EVALUATION ASSESSMENT

Operational test of the MHC 51 class was conducted in accordance with test plans approved by DOT&E and, although not without limitations, was adequate to support an evaluation of operational effectiveness and operational suitability. Although most of the mine targets were uninstrumented mine shapes, they were sufficiently threat representative to support an evaluation of the ship's ability to detect, locate, identify, and neutralize mines under favorable environmental conditions. Lack of environmental variety precluded an assessment of minehunting effectiveness in areas with adverse conditions, such as a rocky bottom.

Targets capable of emulating the sensors and logic of threat mines and collecting data on ship-mine interactions were used to support evaluation of the ship's susceptibility to mines. These included Versatile Exercise Mine Simulators programmed to emulate specific threat mines in OT-IIIA and OT-IIIB. The test concept called for use of the Navy's Total Mine Simulation System (TMSS) to extend the limited live test results to other types of mines. However, TMSS failed to meet accreditation standards because of documentation deficiencies and discrepancies between M&S results and test observations. In particular, some of the mine fires predicted by TMSS did not occur during testing on the instrumented range. DOT&E believes, however, that the Navy's TMSS-based analysis of MHC 51 class mine susceptibility is sufficiently credible to be considered along with the results of operational testing and data from MHC 51 shock trials in order to evaluate MHC 51 class survivability.

As noted in previous annual reports, the ships tested during OT-IIIA were not operationally suitable because of unsatisfactory reliability and maintainability performance of the AN/SQQ-32 sonar and AN/SLQ-48 Mine Neutralization System and logistics support deficiencies. These factors, coupled with sub-par maintenance self-sufficiency caused by training and documentation deficiencies, resulted in below-threshold operational availability. Significant improvement was noted during OT-IIIB. The test ship and its combat systems demonstrated above-threshold performance in all aspects of suitability, and all maintenance was accomplished by the crew. This improvement was due, in part, to the Navy's efforts to enhance the reliability of the AN/SQQ-32 sonar. The shipboard availability of spares was below Navy supply system goals but did not adversely impact test operations.

CONCLUSIONS, RECOMMENDATIONS AND LESSONS LEARNED

The MHC 51 class is operationally effective. Overall survivability is considered to be satisfactory because of the ship's low *susceptibility* to mines when operated in accordance with the Navy's current tactical guidance. However, *vulnerability* is unsatisfactory due to failure to meet the design keel shock factor during the MHC 51 Shock Trial.

The shock deficiencies are related to the GRP design and fabrication methods used for construction of the MHC 51 class. No remedies have been identified. Before embarking on any new acquisition program to construct GRP ships intended to go in harm's way, it would be prudent to conduct a robust RDT&E program to optimize material selection, structural design and fabrication methods and demonstrate improved shock hardness.

Efforts to refine and validate TMSS models should be continued to increase confidence in the resulting susceptibility analyses and fleet tactics. Susceptibility to mines in shallow water might be further reduced by incorporation of recent advances in degaussing system technology, such as closed-loop degaussing and continuation of ongoing initiatives to reduce radiated noise.

The operational suitability of the MHC 51 class is improving and is now considered satisfactory. Additional funding may be required to bring the shipboard availability of repair parts to desired levels.