

## **LCS Heavy Lift Tender Conversion**

**LT Jeff White, USN; LT Matt Williams, USN; LT Ryan Zachar, USN**

This study evaluated the design of the first ship of the Mobile Landing Platform-class, the USNS *Montford Point* (MLP-1), for conversion to service the anticipated large fleet of Littoral Combat Ships (LCS) in forward deployed locations. The new LCS Heavy Lift Tender (AL-1) was a modified repeat of the MLP-1 design. The AL-1 provides a floating dry dock capable of lifting the Freedom or Independence-class LCS as well as a barge to serve as an Intermediate Maintenance Facility (IMF) for up to four ships at a time. The study included three major components; determining the size and weight of the maintenance barge, a heavy lift analysis of the AL-1 with the LCS and barge on deck, and an analysis of the strength, seakeeping, and cost of the AL-1.

The MLP-1 is a maritime pre-positioning ship designed to provide logistics movement from sea to shore. It uses a semi-submersible mission deck to support three Landing Craft Air Cushion (LCAC) vessel lanes. In order to accommodate the new mission of heavy lift and repair, the ship needed to ballast down to a lower draft and have a longer mission deck. To meet these requirements an 18 meter section was added to the mid body. The new section contained six large ballast tanks which, along with approximately 10,000 MT of fixed ballast, allows the AL-1 to submerge to over 8.5 meters of water over deck. This is enough draft to dock both classes of LCS and provides a margin for some damaged conditions.

The engineering analysis for the concept evaluation was conducted using Program of Ship Salvage Engineering (POSSE) 5. The AL-1 was evaluated against the strength and stability criteria for the MLP-1. A docking evolution with a fully loaded LCS-1 and maintenance barge was simulated using the heavy lift feature of POSSE 5 in order to validate the AL-1 design. A Freedom-class LCS with a draft of 4.3 meters and docking blocks set up in accordance NAVSEA drawings was run through the simulation to determine points of least stability. Also, the AL-1 was run through a linear sea keeping program to estimate the limiting sea state in the heavy lift condition. A maximum number of deck wetness events was used to determine the limiting case.

The AL-1 provides the ability to dry dock a LCS in a U.S. Navy facility anywhere in the world – something the Navy presently cannot do. This provides the ultimate flexibility to repair these ships in forward locations, without making a return transit to the United States. Additionally, the AL-1 provides the ability to conduct intermediate level maintenance in forward locations without any additional shore based infrastructure, also a capability gap for the U.S. Navy. Using the 2N Auxiliary Cost Model, the total cost increase for the AL-1 over the MLP-1 is approximately \$70 million in FY2011 dollars. The AL-1, built as a modified repeat with relatively simple design changes, would only cost 14 % more than building another MLP-1. A detailed design and cost analysis for the barge is an area for future study.

	<b>MLP-1</b>	<b>AL-1</b>
LOA [m]	239	257
LBP [m]	233	251
Beam [m]	50	50
Mission deck length [m]	154	172
Depth to mission deck [m]	15.5	15.5
Max. draft [m]	21	24.1
Max. water over deck [m]	5.5	8.6
Navigational draft displacement, SW [MT]	96,706	117,676

