

Topic: N152-101

Great Lakes Sound & Vibration, Inc.

Amphibious Combat Vehicle Ramp Interface Modular Buoyant Kit (MBK) for Joint High Speed Vessel (JHSV) Stern Ramp

The Expeditionary Fast Transport (EPF) ramp was originally designed only for ship-to-ship and ship-to-pier cargo transfer operations; consequently, Great Lakes Sound & Vibration (GLSV), a full-service engineering and manufacturing company developed a Modular Buoyant Kit (MBK) for the stern cargo ramp; facilitating Splash-Off Launch and Retrieval (L&R) of Amphibious Combat Vehicles (ACVs) and Assault Amphibious Vehicles (AAVs). The modular design does not require a brand-new ramp design, only some modifications, and allows rapid change-over between cargo transfer and amphibian L&R operating modes. GLSV is teamed with Lake Shore Systems, the original equipment manufacturer for the EPF cargo ramp, which will facilitate integration. Extensive modeling and simulation to simulate the system dynamics, including ship motion and ramp motion due to wave interaction has been performed.

Technology Category Alignment:

Ground and Sea Platforms

Mobility

Modularity

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SYSCOM: NAVSEA

Contract: N00178-17-C-0008

Department of the Navy SBIR/STTR Transition Program

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WHO

SYSCOM: NAVSEA

Sponsoring Program: PMS 385, Program Office for Strategic and Theater Sealift

Transition Target: Modular Buoyant Kit (MBK) for the expeditionary fast transport ship (T-EPF) stern ramp

TPOC:
(240)393-2354

Other transition opportunities: A functional MBK also enables Launch and Recovery (L&R) of small boats and unmanned platforms down the EPF stern ramp. There is also potential for use of a comparable system on the Littoral Combat Ship (LCS) for L&R of unmanned underwater and surface vehicles.

Notes: The design of the MBK goes well beyond adding static buoyancy to the end of the ramp to float it while the amphibious vehicle is launched and recovered by incorporating a thorough understanding of the ramp structural design and known limitations in specific loading cases. This allows the MBK active motion compensation to protect the ramp in calm and heavy seas while amphibious splash on / splash off is executed at operational tempo.



<http://www.navy.mil/management/photodb/photos/180611-N-PF515-007.JPG>

WHAT

Operational Need and Improvement: The United States Marine Corps has advised the Navy that it needs to develop a light weight kit that can be readily attached to the Expeditionary Fast Transport's (EPFs) stern cargo ramp so that when the ramp is lowered directly into the water it would allow assault amphibious vehicles (AAVs) and amphibious combat vehicles (ACVs) to be launched and retrieved from the EPF near the shore (splash-off).

Specifications Required: The MBK will facilitate launch and retrieval of the USMC ACVs and AAVs through full Sea State 3 (SS3) with significant wave heights up to 1.25 meters without damaging the ramp; accommodate the weight of the future Advanced Combat Vehicle (ACV) that is projected to weigh approximately 30 short tons and will be splash-launched directly into the sea via the stern cargo ramp and then driven back up the ramp from the sea; portable enough to store in a Twenty-foot Equivalent Unit (TEU) meeting TEU tare weight restrictions of 47.6k lbs; be easily transferred from the vehicle bay to the stern "porch" with standard shipboard cargo movement forklift or similar gear; be prepared for use by shipboard personnel while the EPF is underway at speeds of up to 20 knots; automatically position itself beneath the ramp prior to the ramp being lowered into the water; and dynamically compensate for motion in SS3 while in use to ensure safe L&R.

Technology Developed: The GLSV team has developed an innovative, reliable, modular buoyant kit (MBK) that will allow the EPF stern ramp to allow splash-off launch and recovery of amphibious vehicles during Sea State 3 conditions. The MBK will be deployable off the end of the stern cargo ramp, and will be augmented by a dynamic compensation system to mitigate damaging ramp motions due to wave action and vehicle movement on the ramp. The MBK system will also serve the dual purpose of facilitating L&R of small manned and unmanned boats.

Warfighter Value: The MBK will enable the Marine Corps to launch a dozen or more AAVs/ACVs within three miles from shore as these Amphibious vehicles do not carry sufficient fuel to enable them to carry out their assigned mission ashore if they are launched from deep draft Amphibious Landing Ships positioned at a long standoff distance.

WHEN

Contract Number: N00178-17-C-0008 **Ending on:** September 14, 2020

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Modeling and simulation verification of system dynamic performance	Med	Verify structural stability of system during L&R operations in Sea State 3 conditions.	2	September 2018
Scale model prototype - validation of dynamic compensation system in controlled wave tank	Med	Validation of control system performance.	4	September 2019
Demonstration of full-scale MBK prototype (if Option 2 is exercised)	Med	Demonstration of amphib L&R from the EPF in lower sea state conditions (pier-side or protected harbor)	6	September 2020
Navy tests of full-scale MBK prototype in operational environment (if Phase 2.5 is awarded)	Med	Successful demonstration of amphib L&R in up to Sea State 3 conditions	7	September 2021

HOW

Projected Business Model: GLSV Inc. is a small business established in 1996 to offer engineering services with a focus on noise and vibration. GLSV has since expanded our capabilities to offer complete turnkey solutions as a full-service engineering and manufacturing company with a strong background in defense, marine, automotive, off-highway, and recreational markets.

Our experience includes structural design and analysis of a launch handling and recovery crane, stern door and ramp design and analysis, and design and analysis of shipboard components to meet MIL-S-901D shock requirements. GLSV performs preliminary concept design, prototype development, detailed design and analysis, integration, validation testing, and manufacturing services.

GLSV is partnered on this project with the current ramp supplier for the EPF, Lake Shore Systems where Lake Shore Systems would manufacture the full scale MBK system, while GLSV would provide the control system software. The MBK system could be sold either directly to the Navy or to Austal (prime contractor for the EPF).

Company Objectives: GLSV would like to meet key customers in the Navy and Marine Corps, as well as key stakeholders who can assist us with qualification and integration issues. GLSV would also like to meet Navy representatives from the LCS program office to discuss potential applications of a ramp/MBK system for launching small boats and UUVs.

Potential Commercial Applications: Potential commercial applications include using the dynamic compensation to assist with other ramp systems for ship-to-ship and ship-to-pier cargo transfer, and launch and recovery of small boats and UUVs from commercial ships and vessels.

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