MERICA System

Enhancing the mobility and lethality of the MLR

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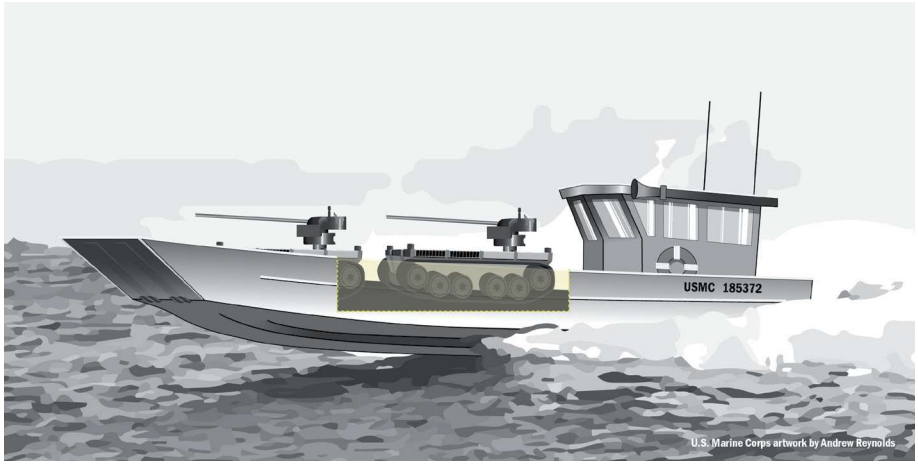

Figure 1. Artistic rendering of a Small High-Speed Amphibious Role-Variant Craft (SHARC) carrying two Expeditionary Modular Autonomous Vehicles (EMAV). *(Image by Andrew Reynolds.)*

Marine Littoral Regiment (MLR) execution of *Expeditionary Advanced Base Operations* (EABO) will require dispersed fires and forward arming and refueling point (FARP) EABs using limited manpower and resources. These types of locations are mutually exclusive capabilities, yet both require assured mobility within the enemy's weapon engagement zone (WEZ) for force protection and logistical sustainment. This will be a difficult task until the Marine Corps establishes the necessary equipment required to enable a MLR's execution of EABO. In order to enable the MLR to maneuver and persist in a contested maritime environment, the Marine Corps must develop an autonomous family of systems (FoS) built on common platforms that host interoperable modular mission packages (MMPs).

Gen David H. Berger, in *Force Design 2030*, details the creation of the MLR while also highlighting that he is

> not confident that we have identified the additional structure required to provide the tactical maneuver and logistical sustainment needed to execute [Distributed Maritime Operations], [Littoral Operations in a Contested Environment] and EABO in contested littoral environments against our pacing threat.[1]

The structure—which includes personnel and equipment—needed to support operations in a littoral environment is more expensive to train, develop, operate, and sustain than what has been needed in any previous operating environments.

To meet these challenges, Marine and civilian Acquisition Professionals in Program Manager Engineer Systems (PM ES), Portfolio Manager Logistics Combat Element Systems at Marine Corps Systems Command (MCSC) developed the Maritime Robotic Integrated Combat Autonomous (MERICA) System concept, in conjunction with Naval Surface Warfare Center Panama City Division. The concept is an autonomous FoS designed around two core platforms that leverage other science and technology (S&T) initiatives. Our vision is that the two core platforms will host MMPs that support nearly all naval warfighting functions. Working in tandem, these two platforms will be able to execute unmanned strike and FARP EABs while reducing the structure required to operate and sustain them.

A SHARC will operate within the littoral waters ...

The first of these two platforms is the Small High-Speed Amphibious Role-Variant Craft (SHARC), which is a "21st Century Higgins Boat." Figure 1 is an artistic rendering of a SHARC carrying two expeditionary modular autonomous vehicles (EMAV). PM ES proposed this concept through a Fiscal Year 2020 (FY20) Marine Corps Small Business Innovative Research (SBIR) Topic and is currently in Phase I conceptual development with four different vendors. A SHARC will operate within the littoral waters, both inland and within the first and second island chain by filling two distinct roles. The first role will be to serve as a transport for smaller equipment and vehicles with a 14,000-pound cargo capacity. The second role will be to host the employment of autonomous

MMPs directly from the deck of the boat (see Figure 2).

MMPs employed from the deck of the SHARC will be self-contained modules that tie into the SHARCs power and craft data. Another capability will be employment of MMPs from the deck of an unmanned ground vehicle (UGV). Proposed MMPs may include firing the Ground Based Anti-Ship Missile (GBASM) and High Mobility Artillery Rocket System from the deck of their hosted UGV while aboard the SHARC.

The SHARC is being designed around a specific UGV, the EMAV, which is the second core platform of the MERICA System. The EMAV is a UGV developed by the Marine Corps Warfighting Laboratory (MCWL), designed to host both commercial and government-owned MMPs (see Figure 3). It will provide the ability to rapidly change payloads for a variety of missions, creating an MV-22 transportable, tactically relevant human-machine teaming option. The EMAV is a modular hybrid-electric multifunction, fully autonomous robotic platform with exportable power interfaces and government-owned payload interfaces. MCWL has developed MMPs that will enable employment from the deck of the SHARC (see Figure 4 on next page).

In addition to the SHARC and EMAV, the MERICA System will employ other new S&T initiatives, such as the Crawling Amphibious Breacher (CRAB), that enables the MLR to support distributed operations in a contested environment. The CRAB is also a PM ES SBIR Topic that will be accepting proposals at the end of FY20. The CRAB would employ from the SHARC outside the very shallow water zone, and then drop to the sea floor while moving toward the beach to neutralize both bottom-laid sea mines and buried land mines by targeting their fuze types.

The CRAB, EMAV, SHARC, small naval craft, and ground vehicles operating within the littorals would use a Single Amphibious Integrated Precision Augmented-Reality Navigation (SAIPAN) System. The SAIPAN System is another PM ES FY20 SBIR Topic that the PM has accepted industry proposals for Phase I. SAIPAN is intended to replace the Augmented Reality Visualization of the Common Operating Picture system as one of components of the U.S. Navy's Assault Breaching System—the joint program of record for breaching obstacles in the surf zone and beach zone. SAIPAN would provide drivers and operators with a monitor that overlays three-dimensional virtually marked lanes and other data pulled from the integration of information and sensors. This precision navigation system would enable craft and vehicles to maneuver in much tighter lanes in an explosive hazard threat environment. It would also enable Marine Corps Combat Engineer and Navy mine countermeasure (MCM) units to clear narrower lanes within the littoral land and sea areas and upload the route information, in realtime, into the SAIPAN System, which would generate the common operational picture with virtual lane markings.

Deployed units of the MLR would use the technologies of the MERICA System to conduct theater security cooperation operations and other bilateral exercises during contact layer activities. This will enable the SHARC and EMAV to be geographically pre-

PROPOSED SHARC MODULAR MISSION PACKAGE

Engineering & Logistics	Fires/RECON/ Infantry	Navy
Mine Countermeasures	Long Range Precision Fire	Mine Countermeasures
EOD Operations	UAS Employment	Mine Warfare
Fuel Transport & Distribution	Riverine Operations	EOD Operations
Water Purification	Coastal Patrols	UUV Employment
Engineer Reconnaissance	Direct Fire Support	Sea Control
Vehicle Delivery	Bathymetry Collection	Diving Operations
Palletized Supply Delivery	UUV Employment	Transport

Figure 2. Proposed SHARC MMP.

Figure 3. The EMAV is an unmanned ground vehicle developed by the MCWL, designed to host both commercial and government-owned MMPs. *(U.S. Marine Corps photo.)*

staged inside an enemy's WEZ while the environment is permissive. While conducting contact layer operations, the MLR would employ MERICA System's non-lethal MMPs to establish FARPs, conduct bathymetry or hydrographical surveys, distribute all supplies, and conduct facility repair or preparations, among other missions (see Figure 5). EMAVs loaded onto SHARCs could be launched with various MMPs from amphibious ships or from advance naval bases to support dispersed littoral combat team locations. Autonomous navigation via the SAIPAN system will reduce manning requirements necessary to logistically support distributed operations.

If the environment becomes non-permissive, forcing the transition into the blunt layer, the MERICA System is already located within the WEZ where the MLR could replace the non-lethal MMPs of the EMAV and SHARC with lethal packages (see Figure 6 on next page). The SHARC would support the Navy and Marine Corps MCM units as they clear and sweep sea routes. As these units approach the shore, engineers would use the autonomous SHARC and EMAV to conduct amphibious breaching. Once ashore, the MLR would establish strike EABs.

Strike EABs would be populated with EMAVs that provide autonomous force protection by employing smart minefields covered by remotely operated weapons systems and tethered intelligence, surveillance, reconnaissance drones. This force protection would protect long-range precision fires of GBASM and other future expeditionary ship interdiction system MMPs of the EMAV. These autonomous EMAVs could remain in hide position until they receive firing missions. Once the weapons are launched, the EMAVs would displace to a new hide or move to a mobile cache to reload.

In addition to establishing FARPs and EABs, the MERICA System could support sea control and sea denial operations. While the SHARC could conduct MCM missions in support of the long-range unmanned surface vessel, it could also support offensive sea mining and the employment of unmanned underwater vehicle barriers. Future GBASMs and other expeditionary ship interdiction systems, remote direct fire weapons systems could be employed from the SHARC and used in coastline defense operations by Marine Corps infantry and Navy units alike. Development and integration of the MMPs, platforms, and systems required to execute these autonomous FARP EABs, strike EABs, sea control, or sea denial operations will require an agile MCSC acquisition strategy.

This agile acquisition strategy will require focus on three core strategies. First, MCSC's teaming with Combat Development & Integration (CD&I) to develop requirement documents specific enough to provide concise direction but broad enough to provide flexibility to the acquisition workforce in their engineering and procurement activities. This partnership needs to start early and often to provide the necessary analytical rigor to appropriately inform the requirements process. Second, development of an Interface Control Document (ICD) that defines the interface between each platform with the MMPs.

PROPOSED EMAV MODULAR MISSION PACKAGE

Combat Engineering Force Protection	General Engineering & Logistics	Fires/RECON/ Infantry	Forward Arming & Refueling Point
Offensive Mining (SAVO)	CASEVAC Platform*	GBASM/NMESIS	Airfield Damage Repair
Mine Countermeasures	Material Handling	HIMARS	FOD mitigation
Explosive Breaching	Limited Earth Moving	Remote Weapon System*	Palletized Loading
Mechanical Proofing	Fuel Transport & Distribution	UAS Employment	Arming
Lane Marking	Water Purification & Distribution	Organic IDF*	Refueling
Obstacle Emplacement	Power Generation & Distribution	Anti-Armor	Crash Fire Rescue
G-BOSS Employment	Energy Storage & Foraging	ISR Employment	Aircraft Tug
Counter UAS	Engineer Reconnaissance	Sensor Employment	
	Shelter Emplacement	Laser Designation/ RSTA*	
	Unmanned Resupply*		
	Mobile Supply Cache		

*Annotates MCWL Completed EMAV Mission Package

Figure 4. Proposed EMAV MMP.

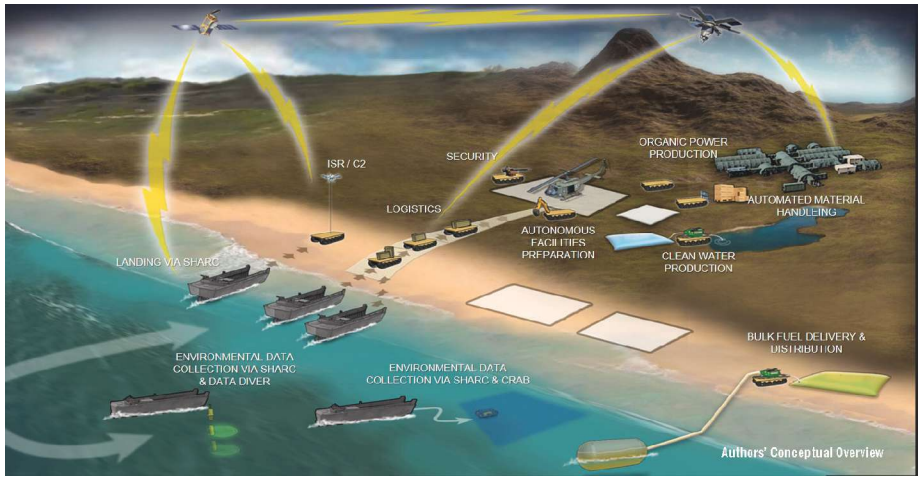

Figure 5. Conceptual depiction of MERICA System conducting operations in the contact layer. (U.S. Marine Corps graphic.)

This ICD will act as a common starting point in the development of specific MMPs across the Naval force and will allow for the autonomy and modularity to be built into the architecture in the early stages. Since there will be various forms of MMPs that supports the full spectrum of military operations, MCSCs acquisition efforts will have to be dispersed amongst numerous program offices within the Naval Services. This will require MCSC to create an integrated product team to unify efforts and allow the necessary information sharing to support the ICDs outputs. Third, create close partnership with industry and the Navy program offices to share engineering development costs and innovative technology. This coalition will spread load cost of the development and sustainment of MMPs across all program offices within the Navy and Marine Corps.

Industry will play a prodigious part in the development of the MERICA System. The partnership that MCSC will develop with industry is key to the success of the identification and technological possibilities for the MERICA System. Flexibility must be provided to the acquisition workforce to tailor its approach when engaging with industry. Requests for information should be developed and posted early in the process. Numerous industry days will need to be conducted, not only to ensure technology is available to develop and support the MERICA System, but also to inform, and if needed, refine the requirements. These engagements with industry will assist in the development, refinement, and procurement of the individual platforms within the MERICA System as well as being able to identify and address potential sustainment problems in the early stages of development. Further, engaging with industry will increase competition and potentially lead to a reduced total lifecycle cost of the MERICA System. Reducing lifecycle costs, teaming with industry and Combat Development & Integration, and developing an ICD will lead to a better fielded and sustained MERICA System.

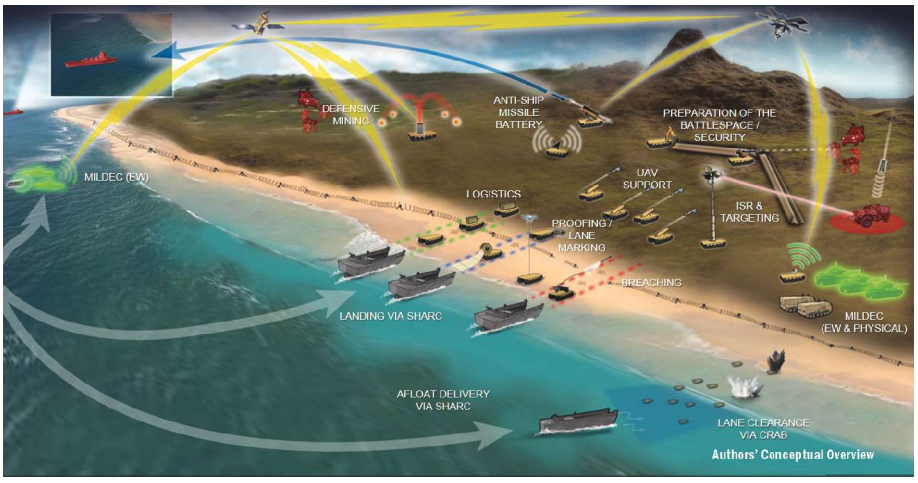

Figure 6. Conceptual depiction of MERICA System conducting operations in the blunt layer. (U.S. Marine Corps graphic.)

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Assuring the mobility and enhancing the lethality of the MLR are the focus of the MERICA System. If the MLR must maneuver and persist in a contested environment, then the Marine Corps must develop a FoS built on common platforms with shared MMPs. Technologies developed by MCWL, MCSC, and others will provide the family of autonomous systems that will reduce structure and sustainment costs required to execute FARP and strike EABs. As the Marine Corps gains a clearer vision of the structure requirements to conduct tactical maneuver and logistical sustainment for EABO, the MERICA System be considered as an integral part of any solution.

Note

1. Gen David H. Berger, *Force Design 2030*, (Washington, DC: March 2020).