Coming ashore: unmanned systems lead the way in amphibious operations

Marines coming ashore rely on unmanned systems to provide situational awareness that lets them know if surf zones and beaches are free of obstacles, mines, and potential adversaries. *Michael Fabey* , *Geoff Fein* , and *Pat Host* examine the use and development of unmanned systems in amphibious operations

A number of emerging naval concepts note the importance of unmanned systems in today's operational environment – one where the basic assumption that the maritime force will have, or will be able to easily achieve, sea control no longer applies.

These naval concepts – Fleet Design, the Marine Corps Operating Concept, Distributed Maritime Operations, Littoral Operations in a Contested Environment, and Expeditionary Advanced Base Operations – also drive greater collaboration when exploring the integration of emerging unmanned systems and innovative capabilities to enhance naval operations. Areas of exploration in amphibious environments include systems that could be employed for pushing logistics to forward operating points, unmanned aerial vehicles (UAVs) in support of expeditionary forces, unmanned underwater vessels (UUVs), and potentially unmanned surface vehicles (USVs) that support the entire mine countermeasures (MCM) kill chain.

To succeed in this anticipated new environment, commands such as the Navy Expeditionary Combat Forces (NECF) seek to encourage, prioritise, and integrate innovation, experimentation, and lessons learned across all levels. "This is how we close and mitigate gaps," Commander Cate Cook, NECF spokesperson, told *Jane's* .

"NECFs are a critical enabler in amphibious operations providing MCM, security, transportation, military construction, intelligence, and re-supply capabilities. Unmanned systems are at the forefront of those contributions, as NECFs exercise and employ currently fielded systems and experiment along with system commands [SYSCOMs] and the Office of Naval Research [ONR] to develop future systems," Cdr Cook said.

The unmanned systems currently integrated into NECF amphibious warfare operations provide a number of capabilities.

In MCM operations, expeditionary mine countermeasures (ExMCM) companies assigned to explosive ordnance disposal (EOD) units use the Kongsberg/Hydroid REMUS 100 (Mk 18 Mod 1) and REMUS 600 (Mk 18 Mod 2) UUVs to conduct exploration and reconnaissance in support of amphibious landings, MCM operations, and hydrographic mapping in sea lane approaches and shallow water zones, Cdr Cook said.

The REMUS 100 has a diameter of 19 cm, is 170 cm long, weighs 32 kg, has a maximum depth of 100 m, and can operate for up to 12 hours depending on the configuration.

The REMUS 600 is 32.4 cm in diameter, 2.7 m long, weighs 220 kg (although the weight varies depending on module configurations), and can operate at depths down to 600 m for 24 hours in a standard configuration.

An RQ-21A Blackjack STUAS is recovered via Insitu's SkyHook capture system. (US Navy) 1480562

As a Program of Record, the Mk 18 family of systems includes an evolving training plan. This includes a baseline UUV operator and maintainer course taught by the Mine Warfare Training Center in San Diego, California.

Future planned courses include: advanced operator and maintainer (currently under development with the anticipated pilot programme due to begin in the fourth quarter of fiscal year 2018 [FY 2018]); advanced sensors (anticipated to begin in FY 2019); advanced post-mission analysis (to begin in FY 2019); and a scenario-based tactical employment course.

Moreover, the Navy Expeditionary Combat Command (NECC) has developed an Optimized Fleet Readiness Plan for ExMCM companies, which includes standards for training and readiness to operate, deploy, and analyse data from UUVs currently assigned to the EOD Force.

"With additional resources, assessment, manpower, and training, it is possible to add other unmanned systems to include USVs and UAVs to the ExMCM company because it is a modular construct that enables various equipment to be plugged into a relatively small footprint consisting of EOD specialties, unmanned systems operators, data analysts, and a command-and-control [C2] cell capable of acting as the local MCM commander in support of the composite warfare commander," Cdr Cook said.

NECC is also working with ONR and US Naval Sea Systems Command (NAVSEA) to test and evaluate emerging unmanned technologies.

"NECC is interested in pursuing smaller unmanned systems that meet numerous operational requirements to recon, detect, classify, communicate, manipulate, and place payloads and tools in support of amphibious operations and fleet manoeuvre," Cdr Cook said.

In general, NECC is interested in technology and industry improvements in the following areas: decreased mission time and risk to force and mission; improved sensors; increased probability of detection, classification, and identification; reduced probability of false alarms; increased area clearance rates; increased stand-off between operations and high-value units such as amphibious ready groups (ARG); and increasing modularity for payloads and mobility while decreasing the size and footprint of support equipment.

In addition, NECC is interested in developing automated target recognition (ATR) and potentially artificial intelligence (AI) for its fielded Mk 18 family of systems for MCM. It is also experimenting with technology candidates for Rapid Airfield Damage Repair, Cdr Cook added.

NAVSEA and the US Navy's (USN's) Space and Naval Warfare Systems Command (SPAWAR) are leading SYSCOMs in developing unmanned capabilities for NECF and are currently exploring trade-offs between size, weight, payload, power/endurance, ruggedisation, sensors, communication ability, and cost, Cdr Cook said.

The navy is also exploring autonomous or unmanned systems for Port Damage Repair (PDR).

The Port Improvement via Exigent Repairs (PIER) Joint Capability Technology Demonstration (JCTD), for example, is a four-year project culminating in FY 2019 designed to demonstrate and assess a suite of capabilities that will enable personnel to rapidly repair a damaged pier to support strategic sealift operations.

"To expedite the 'reconnaissance' portion of the mission, unmanned technology candidates are being experimented with that utilise photogrammetry, Light Detection and Ranging [LIDAR], and multibeam sonar to assess damage and assist engineers and sailors on the ground to determine the best method to repair the pier," Cdr Cook said. "NECC is involved in this JCTD to improve its PDR capability and help assess unmanned technology candidates."

NECC is also exploring how to increase the lethality and improve the ability of the riverine force to identify hostile intent via unmanned aerial missile systems. "Such systems show potential providing an organic, lightweight precision-strike capability to engage enemy combatants without exposing the CRF sailors to direct enemy fire," Cdr Cook noted.

"These systems can be guided to a specific location or can be diverted with 'wave-off' capabilities to minimise collateral damage. NECC is interested in future technologies that provide a low-cost, small footprint 'swarm' of drones that could simultaneously engage and deconflict multiple targets," she explained. "NECC, in conjunction with NAVAIR [US Naval Air Systems Command] and PMS 325G [support ships, boats, and craft] recently conducted a proof-of-concept engagement using such a system from a Mk VI patrol boat to help further define future requirements."

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