Flying metal detectors? Navy tests new unmanned mine-detection system

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Cory Stephanson, president and CEO of Broadband Discovery Systems, Inc., launches a small quadrotor platform as Dr. Rosemarie Oelrich, scientist, Naval Surface Warfare Center Carderock, uses a handheld Android device to monitor data during the Ship-to-Shore Maneuver Exploration and Experimentation (S2ME2) Advanced Naval Technology Exercise (ANTX) 2017 at Marine Corps Base Camp Pendleton, Calif. Credit: U.S. Navy photo by John F. Williams/Released

During a recent technology demonstration at Marine Corps Base Camp Pendleton, Dr. Rosemarie Oelrich and Dr. Cory Stephanson unveiled a new way to detect buried and submerged mines.

Oelrich, a scientist at Naval Surface Warfare Center (NSWC) Carderock's Combatant Craft Division, and Stephanson, president and chief executive officer of Broadband Discovery Systems (BDS), stared at an Android tablet showing search data from an unmanned aerial drone they had just flown. The device's screen glowed as a green fluorescent map appeared, splashed with red clusters of varying sizes and shapes.

"See that large cluster?" asked Stephanson. "That's the dummy mine we buried. The smaller blotches near it are construction rebar we found nearby. The drone detected and localized these items quickly and accurately, which would be extremely valuable in a real combat scenario."

Oelrich and Stephanson were testing the new Mine Warfare Rapid Assessment Capability (MIW RAC) system. Sponsored by the Office of Naval Research's (ONR) TechSolutions program, MIW RAC consists of a one-pound quadcopter outfitted with an ultra-sensitive magnetometer sensor system to detect mines and provide real-time search data to a handheld Android device.

"This technology will help Sailors and Marines who are approaching a beachfront to rapidly clear, or at least determine the location of, mines or other hazards that are in their way," said ONR Command Master Chief Matt Matteson. "It could potentially save a lot of lives."

MIW RAC is a portable, remote-controlled system that can detect buried or underwater mines during amphibious beach landings. It's designed to help explosive ordnance disposal teams quickly find mines and dangerous metal obstacles within coastal surf zones and very-shallow-

water zones. MIW RAC would provide a new, real-time aerial complement to existing underwater mine-detection capabilities.

"Everyone wants to know where they are going and what they are about to get into," said Oelrich, who is overseeing the development of MIW RAC. "It helps to have a rapid capability to just fly something in the air and survey an area before you put troops on the ground or bring a vessel ashore."

While the quadcopter and tablet device are available commercially, the heart of MIW RAC is its proprietary magnetometer sensor suite—which has an extensive detection range and uses complex algorithms to differentiate between various types of objects.

MIW RAC originated in 2015, when the Navy Expeditionary Combat Command (NECC) sent a request to ONR's TechSolutions program for a portable system that could detect potential hazards in surf zones, be easy for warfighters to use and fit diverse platforms. TechSolutions is ONR's rapid-response science and technology program that develops prototype technologies to address problems voiced by Sailors and Marines, usually within 12-18 months.

With TechSolutions guidance, NECC partnered with NSWC Carderock, Combat Direction Systems Activity Dam Neck and two commercial companies—BDS and Physical Sciences, Inc.—to develop the components of MIW RAC.

"We took our inspiration from a stationary scanning system developed by BDS," said Oelrich. "It was sensitive enough to not only detect weapons, but identify the hidden location of the object on a person and the angle in which it was oriented—a knife in a front pocket or gun turned sideways, for example.

"We flipped that concept on its head," she continued. "Instead of a stationary system detecting moving objects, we have a moving system detecting relatively stationary objects."

Later this year, TechSolutions will deliver prototype MIW RACs to NECC's Explosive Ordnance Disposal Group for further testing and evaluation. Oelrich and her team hope to see the system issued throughout the fleet next year.

Provided by Office of Naval Research