DEPARTMENT OF THE NAVY
SBIR/STTR
TRANSITIONS

SPOTLIGHT

With SBIR, One Good Thing Leads to Another

EMILY leads the way for getting relief supplies to storm-damaged Bahamas

By Edward Lundquist

This SBIR/STTR story begins in 2001, when Tony Mulligan's company Advanced Ceramics Research (ACR) received a Navy Small Business Technology Transfer (STTR) investment to develop a system to detect marine mammals so Navy ships could avoid them. In 2003, this evolved into another SBIR effort, the Silver Fox unmanned air vehicle (UAV), which the Marine Corps and Navy subsequently used for surveillance in Iraq and Afghanistan. Mulligan sold ACR in 2009, but later used his original unmanned aerial systems knowledge to start his new company, Hydronalix.

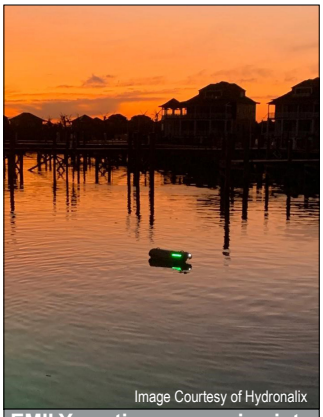
In 2010, Mulligan and his business partner Robert Lautrup had a eureka moment and invented the EMILY (Emergency Integrated Lifesaving Lanyard) concept. Additional SBIR investments to Hydronalix led to the development and refinement of the EMILY system, which is actively used as a lifesaving device around the world. Thanks to SBIR, the EMILY technology continues to evolve. Most recently, a version of EMILY mapped a safe route for ships to dock in the Bahamas with hurricane relief supplies after the devastation of Hurricane Dorian.

Sonar EMILY mapping Marsh Harbor, Bahamas

"Sonar EMILY can be used to create sonar maps of the sea floor or look for missing bodies or objects," said Mulligan. "This technology was used in the Bahamas to ensure a safe channel to enable ships to navigate into ports to deliver desperately needed relief supplies."

Hurricane Dorian severely damaged Great Abaco Island, and closed Marsh Harbor. "Our job was to make sure the shipping channel was open so the rescue and supply ships could come in and reopen the airport. This allowed

Operator running EMILY Sonar Control Station



EMILY continues mapping into the night

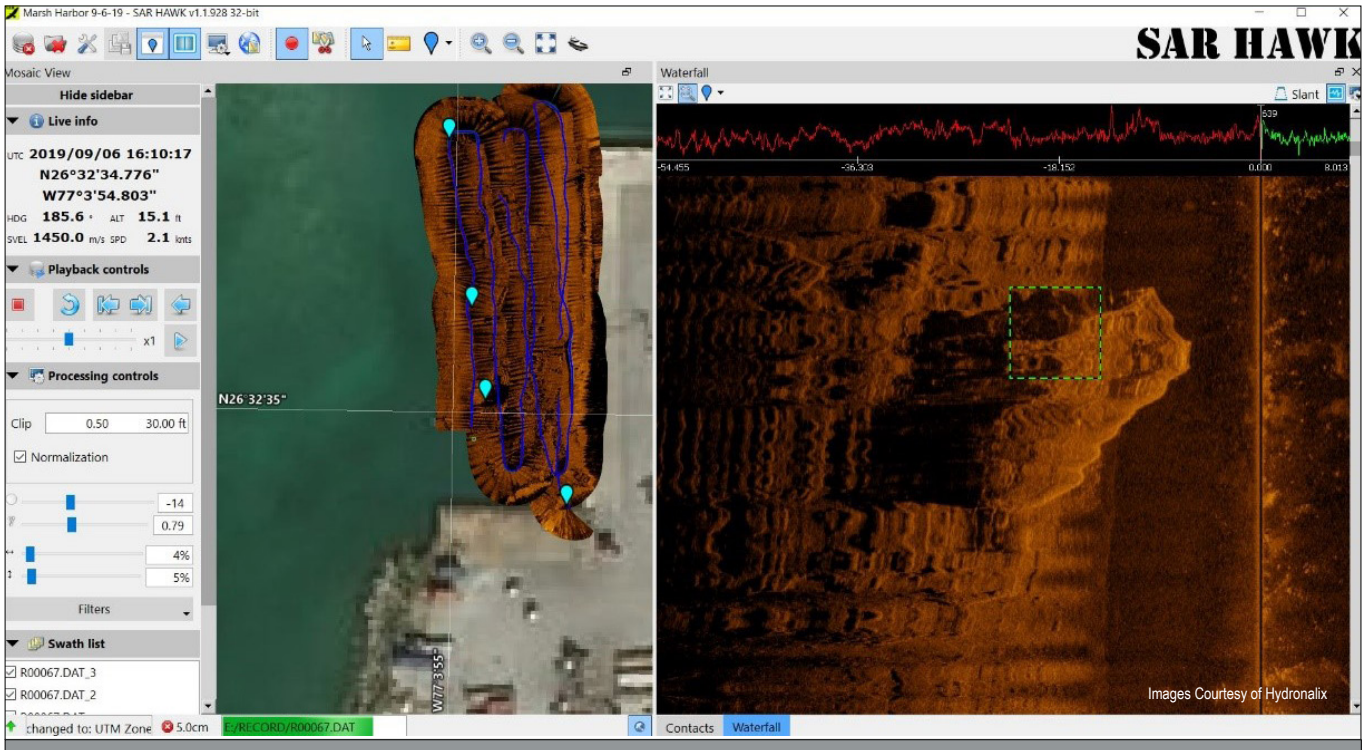
the doctors, medical staff and administrators to arrive, bringing medicines, equipment and supplies, reopening the hospital and begin to treat patients," Mulligan said. "All the ships that followed used the clear-passage map generated by the Sonar EMILY USV."

A bottom survey normally requires a sonar-equipped mapping ship with sophisticated equipment, which could take several days to arrive, even in a large port with significant resources. The Sonar EMILY, however, can be quickly packed up and delivered and put right to work.

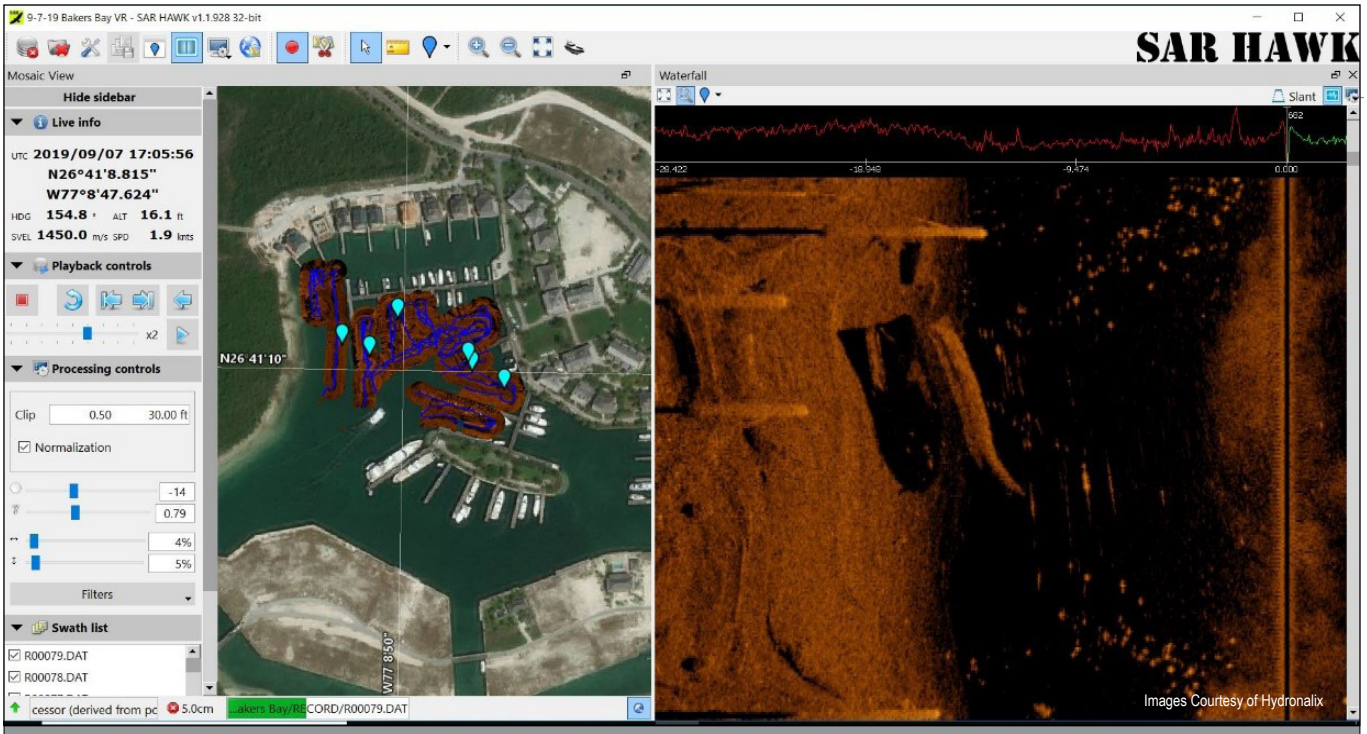
"We cut several days off that timeline," Mulligan said. "In just a few hours we essentially opened the island up for disaster response and relief, which would have been delayed for multiple days if they had to wait for larger ships. After the success in Marsh Harbor, the team moved to Baker's Bay on Great Guana Cay."

The Sonar EMILY USV can operate for three hours on its battery pack. It has a single beam, multi-beam, side scan, and downward imaging sonar imagery, and can provide a live-feed to the operator to display what the sensors are seeing on the bottom of the waterway.

The initial Navy STTR marine mammal detection and mitigation solution featured low-cost sensors and automatic detection and decision aids. The SBIR Silver Fox technology



Quay wall for ship docking mapped by EMILY in Marsh Harbor, Abaco Island, Bahamas.



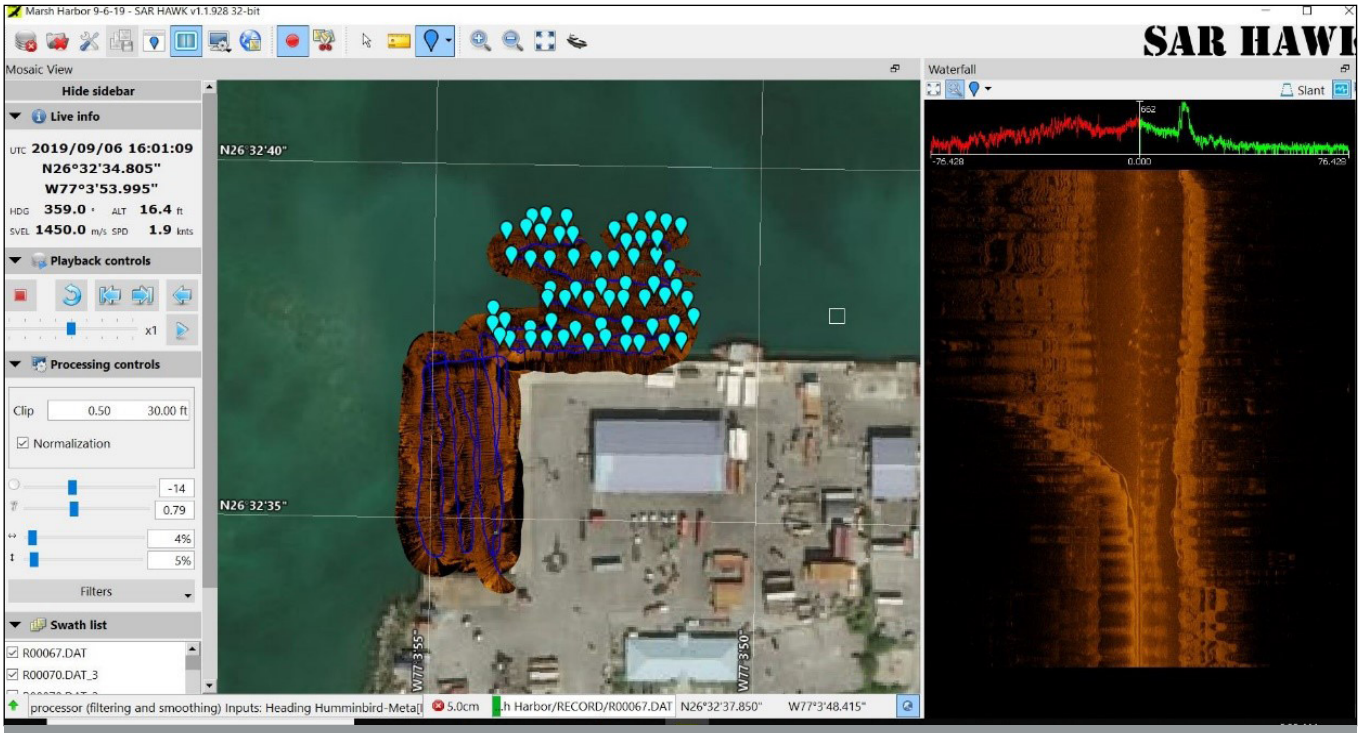
Bakers Bay, Great Guana Cay, Bahamas, EMILY SONAR Data processed with SARHAWK Software.

transitioned into an unmanned aircraft with video communications, navigation, propulsion, battery management, sensor classification and threat warning systems, eventually for use in combat. This technology also evolved into EMILY, providing rapid-response water rescue. Mulligan stated that EMILY has been used in Mongolia and Kazakhstan during floods, Indonesia for tsunami response, and in Greece to rescue migrants.

While EMILY is just one of the products derived for this partnership with the Navy, it has captured the attention of the world with hundreds of the lifesaving devices in service around the globe. The robotic system can reach people in distress faster than a rescue swimmer or someone on a surfboard. The brightly colored buoys weigh just 25 pounds and can travel at speeds up to 22 miles per hour. The buoys can be optioned with a two-way radio, camera, and lights for night missions. It can be thrown in the water, tossed off a boat or bridge, or dropped out of a helicopter. The device can also be tethered so a swimmer in distress can grab it and be pulled to safety.

"EMILY is made of Kevlar and aircraft-grade composites and is virtually indestructible," said Mulligan.

The unmanned surface vessel (USV) is now being outfitted with different sensors that can conduct a variety of missions. SBIR encourages small businesses to "complete; derive; and extend," and the EMILY technology has done just that. Hydronalix keeps finding new uses for the EMILY platforms. In addition to the rescue EMILY, there is the Sonar Search and Rescue EMILY, Police EMILY, a Man Over Board EMILY (MOBE), and SPEEDoo Water Sampling EMILY. With support from the DoN SBIR program, EMILY is being upsized to a 65" and 75" Autonomous Mobile Buoy Intelligence, Surveillance, and Reconnaissance (ISR) platform with tracking cameras, radar, weather station, and sonar imaging.



Marsh Harbor Quay wall for ship docking mapped for hazards by Sonar EMILY

Mulligan said the lifesaving technology is being used in many other ways as well. "We have a water sampling system that is designed to test sewage or industrial waste for hazardous substances or to monitor natural events such as a red tide bloom."

The Michigan Department of Transportation (MDOT) has a fleet of Sonar EMILYs and has successfully trained about 100 people to use this technology. MDOT said that the system's sonar and cameras are being used to obtain images of substructure units below water, view the underside of bridges and performance characteristics, and to monitor the bridge for scouring. The EMILY systems can operate in turbulent waters with high currents near substructure units or debris.

It has interesting commercial markets beyond the military or government-sponsored rescue or environmental and infrastructure monitoring roles. A police version being used in Thailand with sirens, lights, and a small but extremely efficient speaker.

"It's being used for public events on the water such as triathlons. They can drive the boat 600 meters away, and still talk to people several hundred meters beyond that," Mulligan said.

Whether monitoring bridges under water, leading ships safely into port, reaching swimmers in distress, rescuing flood victims, sampling water for hazardous substances, or keeping triathletes in communication with event officials, EMILY has the potential to save untold numbers of lives. In fact, it already has. SBIR grants are meant to support research on projects that will be commercially viable. EMILY, in use by military and government organizations in multiple countries around the world, is paying dividends on the Navy's original investment.