

DEPARTMENT OF THE NAVY
SBIR/STTR TRANSITION PROGRAM
SPOTLIGHT

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Hydronalix Technology Tested in the Baltic Sea

By Jennifer Reisch

BALTOPS 2021, held in June, marked the 50th anniversary of this multi-national exercise conducted annually in the Baltic Sea. BALTOPS is a joint maritime-focused exercise that brings together NATO Allies and partners in order to increase interoperability and enhance flexibility among the participants. Navy SBIR technologies were tested during the exercises, including five brought by small business and Navy STP participant Hydronalix.

The rapid statement of need developed by the U.S. Marine Corps (USMC) 1st Explosive Ordnance Disposal (EOD) team established the foundation for the initiatives brought to the BALTOPS event. Training focus areas included air defense, anti-submarine warfare, maritime interdiction, and mine countermeasures operations. "It's unusual to see a single small business that has such a diverse portfolio that they are working on simultaneously," said Tony Brescia, a program manager at Naval Air Warfare Center Aircraft Division, Patuxent River, Md., and the technical point of contact (TPOC) for Hydronalix's technology.

These initiatives developed capability to fulfill written requirements by USMC EOD Littoral Explosive Ordnance Neutralization (LEON) units. "This year we've been working with the LEON Marines," said Tony Mulligan, CEO of Hydronalix. "It started with a driving requirement they had for a small USV that was similar to what we were already developing so we started tweaking our path to more closely match what they wanted. They were very encouraged by our first set of demos and they



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came to visit us in our facilities. We showed them other SBIR technologies that we had and it turned out they had requirements for those as well. In the process the Navy SEC team and our TPOC, Tony Brescia, were extremely helpful for us."

"The Marine Corps has been making a pivot toward the Pacific, specifically peer competition and we have aligned ourselves with the SBIR process to develop low TRL technologies toward the end state of what we want so our systems command could eventually purchase



NIX, an autopilot-controlled USV, can haul gear and run resupply missions.

it and we could develop it further with RDT&E money,” said MSgt Matt Jackson, capability concept development team staff noncommissioned officer in charge, who led the LEON exercises in BALTOPS.

“The first exercise we really worked on with the LEON group started in December 2020 so roughly six months of development and integration and incorporation was done to make BALTOPS exercise goals. It was very fast and agile to add and incorporate new technologies into their existing platform in that time frame,” said Brescia.

During the first few months of 2021, the Marines continued to test the equipment, asking for improvements and changes. As things progressed, Hydronalix integrated the Marine Corps handheld radio systems into its boats and drone operations. “The Marines could then use the MPU5 radio with their software that they’re already trained on to do

the mission planning for our technologies,” Mulligan explained.

As testing happened for Hydronalix’s technologies, the Department of Navy Small Business Innovation Research (SBIR) Experimentation Cell (DoN-SEC) team mentored Hydronalix and facilitated the process, including drawing up a data collection and compilation plan with NAWCAD, to help ensure a successful exercise. DoN-SEC connects SBIR innovators with the DoN experimentation community to facilitate delivering innovative solutions for the warfighter.

“The way that Hydronalix and their TPOC Tony Brescia work with us is the right way to do things in our opinion. The support we’ve gotten from the SBIR office at ONR has been absolutely critical for our capability and concept development and what the future vision is for the Marine Corps EOD community in the littoral regions. We’ve gone to Hydronalix multiple times, we’ve talked directly with engineers, and they’ve seen our mission profiles. Sitting there at Hydronalix in Tucson, Arizona, we’ve talked about and developed everything from handles to latches. We’ve discussed where stuff could be located to see potential problems. An engineer who’s never been on a fully loaded rubber raft on the water in the dark with guns might not think of a design feature being unusable when it’s buried under a bunch of gear or thrown out of a helicopter,” said Jackson.

“We have a requirement for an unmanned surface vessel with the capability to have acoustic satellite RF communications; it’s essentially a communications node and that communications node needs to talk to our UUVs, our ROVs, our divers, and basically it’s the transition from acoustic communications in the water up through satellite to the common operating picture. We’ve been developing this through the NAVAIR SBIR. It’s been very promising. They’ve been developing

their SBIR technology at a rapid pace to fit our requirement.”

Brescia said that he and Hydronalix team members listened to what the Marines were saying and then connected the dots, bringing companies and technology together to do it. “The Marines have taken a detailed look at various technologies and then reached out to me and other folks to articulate their needs and look at how we can adapt what’s already being done to meet those needs. In this case the Marines had a need a little different from what the Navy was doing for EOD units so we took the basic platform and put different types of sensors on it,” he said.

“So we’re already starting with something that’s been tested out and is adaptable and modular enough that you can add and change things around without too much trouble, maximizing the utility of the device versus making a single standalone system that can only do one thing. And one of the things that we’ve done from an SBIR/STTR perspective is to look at how technologies can be used by other services and commercial industry and use that to our advantage.”

Immediately after the technology qualified for BALTOPS, Hydronalix staff helped the Marines clean and check the equipment and then pack it into shipping boxes for military transport to Rota, Spain, followed by a convoy from Rota up to Putlos, Germany, on the Baltic Sea.

The Hydronalix platforms tested at BALTOPS “are true SBIR core technologies. A lot of times SBIR is a part of a system, but these entire capabilities were developed on the SBIR programs. In our case everything was the exact intent of the SBIRs,” Mulligan said.

Of particular interest and focus to the USMC was the AMY unmanned surface vehicle (USV). AMY can carry a variety of payloads and utilized a commercial-off-the-shelf (COTS) sonar unit produced by Hummingbird during the event. Other Hydronalix initiatives used in



Courtesy of Hydronalix

The ADAPT disposable drone can deliver a payload to an exact location up to a mile and a half away.

BALTOPS were SONAR EMILY, demonstrating bathymetry mapping; NIX, another autopilot controlled USV that was used for hauling gear; ADAPT, a disposable low-cost drone used to deliver small payloads to remote locations; and the SBIR-supported high precision autopilot system used on the AMY and NIX boats, developed by the small business AREA-I.

“Some of the experiments and demonstrations they were doing for fleet consisted of resupply capabilities so they used the NIX and the AMY platforms to test the concept of being able to run supplies from the ocean to the beach. And they used the ADAPT disposable drone to demonstrate that without training or a pilot Marines could fly the drone from a small manned boat offshore to a very exact spot on the beach,” Mulligan said.

“The ADAPT drone can deliver a five-pound payload about a mile and a half away. The drone can fly from a rubber raft to an exact spot on the beach by operating off the Marines’ mission planning app. The drone

has no radio, no ground station, no pilot. The traditional ground station hardware is now simply any device capable of running the control software apps, such as a laptop, phone or tablet. There's no extra gear, so that's why we call it convenient—it's a convenient disposable drone. It only takes a couple of minutes to learn how to run the app and there are no pilot training skills or anything like that. It just goes and does it."

"Running BALTOPS, we took a family of unmanned systems and connected them to a single C2 platform. It was run through Stennis Space Center and their IS2 to ops software. It takes any information from a system and converts it into a common language. It feeds essentially

anything we want from whatever sensor we want it to be fed from. It's really deciphered a lot of the problems because individual technologies, for example, are proprietary; they have their own software. This is a bridge that can get by that. We want everything open architecture of course. We want everything to be agnostic to everything. We're not there yet but that is now within the requirements, especially with unmanned systems," Jackson explained.

"And BALTOPS was extremely successful," Jackson added. "It was the first time it was really done at scale with some program of record systems, some developing SBIRs, and some ONR technology in its portfolio and we made it all talk and it painted a picture. It's

much aligned with Mosaic Warfare, taking a bunch of different sensors that are relatively low-cost versus having an exquisite machine that does everything in one package and is not attritable. We want to be able to take different sensors or platforms that are attritable and paint an overall picture. If you lose one you don't go into the blind.

"Our end vision for the USV is to have onboard satellite communication so I can

take information, whether it be from another team out on the water or divers from under the water or our unmanned system, and pump it up and out SATCOM in order to have real time data imagery video anywhere in the world. Hydronalix took a step toward that in the RF world. Data was pushed all the



way to Stennis Space Center and then their server was sending it to the overall common operating picture of the joint partners so the Norwegians, the Germans, everybody had the ability to see everybody. Ultimately what it did was decrease the detect to engage sequence by magnitudes.

"Once we get satellite communication we believe that we demonstrated that we can get a UUV to transmit sonar images from underwater to a gateway buoy out through a radio and then to IS2 to ops and then federated to everybody. The AMY boat could essentially become a mobile gateway buoy and be able to loiter in an area with underwater sensors and pass that information up and out without a man being there," Jackson explained.

When Hydronalix staff arrived in Putlos for the exercises, they taught more of the Marines how to operate the equipment. "Since it was new equipment at the end of the day we would help the Marines inspect and service the equipment. We would make sure that if anything was going wrong we fixed it so the next day it was operational for them. Everything went well. We were prepared for some long nights but pretty much the day wrapped up in an hour or so and folks went back to the hotel," Mulligan said.

"Things went so well we were able to send two staff members to do Phase III commercial sales in multiple locations in Europe because they were already there and cleared on COVID-19. Two of our staff were able to do an event in London for the commercial versions of what we are doing for the Marines. We were able to train and do a SONAR EMILY demonstration for leadership in London, including the fire brigade in the Thames River right in front of Parliament and Big Ben. They also went to Denmark on another Phase III commercial project to train our distributor and then we sent them on to Amsterdam for more commercial sales! After BALTOPS we sent another two engineers to a big program for the Greek Red Cross. They use the systems for rescuing refugees or drowning people off the coast.

"The Marines did a really good job. It was a lot of hard work to make it look easy. They learned fast and they knew their stuff."

Hydronalix's success in BALTOPS demonstrates that the "SBIR/STTR program in general is a really good development tool

set that is used by the acquisition community to bring external ideas into the organization to solve problems. I think it should be used to an even greater extent than it currently is to address problems, not just in the Navy but that any of the services have," Brescia said.

In addition to helping the USMC meet its mission, Hydronalix's SBIR-developed platforms are helping first responders across the nation. "The regular EMILY boat for rescue, SONAR EMILY which has the side scan sonar on it, and a Swiftwater platform were made available to first responders through the OSD's Domestic Preparedness Support Initiative, which transitions DoD technology to first responders. Assets are given to a first responder unit and become a user feedback loop. First responders, including U.S. Border Patrol, LA County lifeguards, and Search and Rescue Units in Austin and Houston, Texas, Fairfax and Norfolk, Va., New York, Denver, Kauai, Hawaii, and at the University of Mississippi will provide information back from a technical point of view. So that's all incorporated into providing a better capability for the commercial side of their business as well as feeding into the military side of the house by having another pool of evaluators and users to make the systems better," Brescia said.

Hydronalix is a small high technology company specializing in extreme performance small unmanned vehicles. Founded in 2009, the company has shipped nearly 800 systems worldwide. For more information, visit the company website at <https://www.hydronalix.com/>.

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