

NAVY SBIR TRANSITION PROGRAM

SPOTLIGHT

Company: Dynamic Dimension Technologies
 Website: www.dynamicdimensiontechnologies.com

POC: Karl Leodler
 Phone: 703-963-2204

Address: 694 Charingworth Ct.
 Westminster, Maryland 21158

DDT's simulation technology to support Marine Corps ACV driver training system

By Amie Alscheff

“This past year has been a roller coaster!” says Karl Leodler, president and CEO of Dynamic Dimension Technologies (DDT). In May 2023, DDT was part of the industry team selected by the Marine Corps to design the prototype for the Amphibious Combat Vehicle (ACV) Driver Training System. Working with the prime contractor, Logistic Services International, Inc. (LSI), and vehicle manufacturer BAE Systems, DDT completed an aggressive six-month period of performance to design, develop and deliver three ruggedized deployable virtual trainers with integrated hardware controls. The first prototype trainer was delivered to the Marine Corps in October.

Founded in 2015, DDT has extensive experience in computational sciences and developing physics-based modeling and simulation solutions for autonomous vehicle testing. A Navy SBIR project focused on surf zone simulation for autonomous amphibious vehicles afforded DDT the opportunity to advance their studies into the complex physics of surf zones, interaction of wind, water, currents, waves and seafloor shape, and the development of their novel full three-dimensional breaking wave simulations.

“This led to DDT's involvement in the ACV driver training system,” says Leodler, “where the Marine Corps was very interested in accurate simulation of the type of breaking waves, such as plunging, spilling and surging, and the vehicle response as it drives through these waves, bouncing on the seafloor as the waves lift and drop it, or flip it. Our simulation included different surf conditions ranging from three to six-foot waves and littoral currents from one to three knots, conditions to



Image courtesy of LSI

LSI's trainer for ACV drivers, using DDT's technology

push the limits of the drivers and ACV. When we delivered the training systems in October, we included over 500 pages of analysis comparing our simulations with the Marine Corps testing data to demonstrate the accuracy of our models.

“The Marine Corps has an amphibious vehicle test branch at Camp Pendleton where they've been testing amphibious vehicles for many years. The current vehicle being built by BAE Systems is called the Amphibious Combat Vehicle. They've been testing that on land and flat water for a while, but in the summer of 2022, two ACVs turned over in the surf zone. Fortunately, all the crew and testers got out of the vehicles safely without injuries. That's when they found my SBIR and called me. We discussed our surf zone models and vehicle modeling capabilities and what information they could collect in testing that could help validate and improve our surf zone models. A few months later a third vehicle

SPOTLIGHT

DDT's simulation technology to support Marine Corps ACV driver training system....Continued

turned over in the surf and it became an urgent requirement for them to have better vehicle surf zone modeling and simulation capability for driver training.”

The roller coaster ride began at the 2022 I/ITSEC conference, where the Marine Corps gave an industry presentation describing their needs and desired technologies. “I had already been talking with LSI prior to that, but I received calls after that industry briefing from several different companies wanting to pursue this opportunity.” When the Marine Corps issued their solicitation for the driver training system prototype, DDT teamed with LSI and BAE Systems to submit their winning proposal.

The SBIR technology that caught LSI's attention is VxSIM, an interactive physics-based simulation environment with digital twin

technologies that provides appropriate sensor feedback and vehicle motions to simulate the experience of a vehicle maneuvering through complex environments such as surf zones, off-road and urban regions. DDT designed VxSIM to aid in experimentation and evaluation of new technologies, supporting the development of new autonomous and robotic systems. In the ACV Driver Training System, the technology's innovative simulation capabilities are used instead to support a realistic driver training experience. “The Marine Corps had a much more urgent need,” says Leodler, “so we've pivoted from training computer (autonomous) drivers to a human training system version of our work.”

Having BAE Systems on the ACV Driver Training System team provided additional insights on how the ACV operates, which helped DDT develop

accurate models. “For example, the transmission system for the vehicle is pretty complex. There's not a lot of documentation available on how the vehicle shifts from gear to gear in automatic mode so we worked with the subject matter experts on the vehicle within BAE to help verify that our representations are close to how they feel when they're actually driving the vehicle.”

While the ACV is a Marine Corps platform, the driver training system prototype contract was awarded through the Army's C5 consortium. C5 was established by the Army to accelerate the development and deployment of new C4ISR and

cyber-technology capabilities through the use of Other Transaction Authority (OTA) awards. In 2018, the Marine Corps signed a five-year no-ceiling agreement with C5 for the use of OTA. With the contract awarded to the LSI/DDT



DDT's simulation of an amphibious vehicle on the ocean shore

team in 2023, says Leodler, “We just made it in on time.”

As the contract is structured, DDT is a subcontractor to LSI. “I don't have the bandwidth to be a prime at this stage,” says Leodler, “so I'm happy that it went through the OTA and LSI was prime on it.” Leodler ensured that DDT's SBIR data rights for the technology were preserved as the technology moved beyond the SBIR program. “I pointed them to the FAR requirements and DFAR for the SBIR data rights, just as it's been preached at Navy STP for years. They said, ‘OK, no problem.’ I've got all my SBIR data rights included in the contract.”

DDT began work on VxSIM in 2018 with a Phase I SBIR award from the Office of Naval Research (ONR). An initial Phase II was

awarded in late 2019; however, Leodler recalls, the COVID-19 pandemic blocked access to crucial resources during much of the period of performance.

“We were working with a couple of universities, Naval Surface Warfare Center-Carderock Division and ONR. When everyone got sent home, the universities pretty much shut down their labs that were doing some of the testing. We struggled for a year because we couldn't get everything that we needed. At the end of the first Phase II, we were able to accomplish quite a bit, but we still lacked a lot of test data to validate the models, and the universities were just starting to allow people to go back into the labs.”

Fortunately, DDT's technical point of contact

at ONR was able to arrange a sequential Phase II award in 2022, which allowed DDT to work with ONR and the University of Iowa's wave basin facility research team to complete testing and demonstration.

In winning a sequential Phase II award, DDT also had the opportunity to participate in the Navy SBIR Transition Program (Navy STP) more than once. With the resumption of in-person industry events after the pandemic, this included attending Sea-Air-Space in Washington. “Last year at Sea-Air-Space they announced the semifinalists for the ACV Driver Training System prototype award by calling them and asking for follow-up discussions. That's where we learned, as LSI was hanging out with me at the Navy STP table, that we were being down selected for discussions.”

DDT has been supported further by ONR, as the company was nominated and selected in 2022 to be one of the small businesses featured at the first SBIR/STTR Innovation Center in the exhibition hall at the Navy Gold Coast Small Business Procurement Event held in San Diego. DDT was one of 20 small businesses selected to showcase technologies developed through the Navy's SBIR/STTR programs.

As 2023 drew to a close, DDT was invited to join the Maryland Department of Commerce delegation to the Indo Pacific International

Maritime Exposition in Sydney, Australia. Preparing for the November event, Leodler realized he already had Navy Public Affairs Office (PAO)-approved marketing materials available, which he had developed for Navy STP and the

Gold Coast event. “I came across the trifold brochure again that I created as part of the Navy STP. It was perfect and already approved and in the right format. I printed up a bunch at the printing shop right across the street from me.”

Located in Westminster, Maryland, DDT conducts research in the field of digitally connected, interactive synthetic environments and digital twins to develop innovative solutions for government and industry customers. For further information, see:

www.dynamicdimensionstechnologies.com.



The DDT team with the ACV at Marine Corps Base Quantico

