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Submarine Races Sail into Carderock Once Again

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From Naval Surface Warfare Center, Carderock Division Public Affairs

WEST BETHESDA, Md. (NNS) -- In most competitions, teams have an opportunity to train for the final event. For the International Human-Powered Submarine Races (ISR), that doesn't happen until the actual races at Naval Surface Warfare Center, Carderock Division in West Bethesda, Maryland.

"Where else are you going to find a 100-meter underwater race course in a world-class facility to test the speed of your submarine with the support of the Navy Experimental Dive Unit (NEDU)?" asked Charles Behrle, president of the Foundation for Underwater Research and Education (FURE), which sponsored the 15th ISR June 24-28. "At best, they can test their submarine in a swimming pool for buoyancy and maybe a little movement."

Carderock hosted the event in its 3,200-foot David Taylor Model Basin where 19 academic teams brought 21 submarines to race. This biennial science, technology, engineering and math (STEM) event provides an avenue for high school and college teams to tackle the difficult challenges of submarine design, construction and operation. The students have to design, build and race a one- or two-person, human-powered submersible on an underwater course.

"We hosted over 20 teams from across the nation, but also from the Netherlands, Canada and Great Britain," said Capt. Cedric McNeal, Carderock's commanding officer. "Those teams are not only showing off their innovation and their technological capabilities toward supporting racing, but also building platforms that will contribute to what we see as planting seeds for the next generation of the workforce."

One of the students from Texas A&M even scored a job interview while he was at Carderock for ISR. Whether he gets the job remains to be seen, but in the meantime, he and his teammates were working hard to get their two-person submarine 12th Manatee down the course.

"Our biggest goal is finishing a race and progressing to see how fast we can get it from there," said Peter Blank, a returning participant to the competition. Unfortunately, it was not to be this year.

Most of the submarines have bicycle-styled gearing for propulsion and a student who is SCUBA certified inside the submarine, which is full of water. They dive the submarine and pedal their way down the course. The submarine stays underwater for the 100-meter course as they race for speed, which is captured in the middle 10 meters.

"Being human powered makes it an equalizer, as well as an increased complexity of requiring a human-machine interface," Behrle said, who is also a former commander of Carderock. "We want to ensure that we are challenging their minds, regardless of the amount of resources they may have."

Besides the strength of the person propelling the submarine forward, the key to success is the design of the boat. Being mostly engineering students, this challenge was primarily hindered by budgets. For some teams, like L'École de Technologie Supérieure from Montreal, Quebec, the budget was well-resourced. They even brought their own machine shop to make repairs throughout the week on their submarine Omer 11.

For others, especially the high school teams, the students relied on their ingenuity. Dover Area High School of Dover, Pennsylvania, entered ISR for the first time. They've been in several other engineering-centered contests, like Punkin' Chunkin' and Battle of the Rockets, but this offered a bigger challenge. Their submarine, the Cormorant, is made up of four layers of fiberglass and riveted together with aluminum bands. The drive train was created almost completely of repurposed bicycle parts: the gears, gearshift, the pedals and the rear-sprocket.

"We tried to keep it as simple as possible," said Jakub Becker, a recently graduated team member and a pilot for the submarine. "Our biggest success has been that we haven't had any big mechanical issues, our failure to race has mostly been pilot error, myself."

Behrle explained that even when a submarine doesn't make it down the course, it's not really a failure.

"The students learn from every run, and this event gives them the opportunity to really flex their brains to find ways to make course corrections as necessary," Behrle said.

When teams do have mechanical problems, they have not only been coordinating with opposing teams to make repairs, but they've also enlisted the help of one of Carderock's own, Patrick McGrail, a mechanical technician in the Towing Basin Operations Branch. Using mill and lathe machines, McGrail helped the University of Michigan with a broken crankshaft and recycled the leftover material to make a separate part for the University of Waterloo. While he said it is not necessarily part of his assigned duties, he wants to see the teams succeed.

"You want to help wherever you can," McGrail said. "It's in the spirit of things."

A couple local schools, such as Kids into Discovering Science (KIDS) and Frederick County Career and Technology, received special attention from Maryland's top official. Lt. Gov. Boyd Rutherford said a visit allowing

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Submarine Races (ISR) in its 3,200-foot David Taylor Model Basin in West Bethesda, Md., June 24-28. The biennial science, technology, engineering and math (STEM) event provides an avenue for high school and college teams to tackle the difficult challenges of submarine design, construction and operation.

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technology, received special attention from Maryland's top office. Lt. Gov. Boyd Rutherford paid a visit, allowing them to tell him about their experience at ISR and show off their submarines.

"I had a wonderful time at the International Submarine Races this morning," Rutherford posted on Facebook page after his visit. "This biennial design competition provides young men and women with the opportunity to design, build and race human-powered underwater vehicles, and requires an impressive amount of STEM knowledge and skill. Congratulations to all the young men and women who participated in today's event."

KIDS is an educational organization from Accokeek, Maryland, that focuses on K-12 students, some of whom were at ISR either directly participating or cheering for the team. Liam Vincent first got involved with the team 10 years ago when he saw the group testing a submarine in a local swimming pool. He is going to be a junior in high school in the fall and is a project manager for the KIDS team.

"It's my job to make sure that everybody is involved, that everyone has a role and that we're targeting their interests," he said.

For Carderock, one of the goals is to recruit students for STEM jobs. The STEM and Outreach Program Director for Carderock, Charlotte George, asked other employees to sit at a recruiting table at the event. George herself was a contestant when she attended Florida Atlantic University.

"ISR was a life-changing experience for me that exposed me to other Department of Defense opportunities," George said. "This event gives us a large pool of potential employees, and we hope to snag some of them. It's our 'gateway' event."

Ashlee Floyd, a non-destructive testing engineer in Carderock's Welding, Processing and Non-destructive Evaluation Branch, spends a good amount of time recruiting for Carderock and worked at ISR talking to students.

"If you don't recruit, how can you get the best talent?" Floyd asked.

With so many student divers at Carderock for ISR, safety is a big deal. Carderock's two dive officers were in the David Taylor Model Basin the whole week supporting the efforts of NEDU and the Naval Academy Dive Locker, as well as civilian volunteer divers.

"One of the primary missions we have here is ensuring the contestants are safe in the water, as well as retrieving contestants, whether it's along the water column or at the end near the finish line," said Marc Nelson, one of Carderock's command dive officers. "All the students have been doing a great job, they've been really comfortable in the water, and that's definitely a confidence booster for all of us."

In the end, the team from Quebec with their submarine, Omer 11, was the big winner, taking the highest speed for a one-person, propeller submarine away from the Netherlands' Wasub IV on the last day of competition. The two teams had been tied at 6.4 knots going into Friday, but Omer 11 sped into the lead at 6.85 knots compared to Wasub IV's 6.54 knots.

Omer 11 also took the Innovation Award, the Best Spirit of the Races Award and the Overall Performance Award. The full list of winners will be posted on the ISR website at www.internationalsubmarineraces.org.

Editor's Note: Kelley Stirling, Edwin Hernandez, Brooke Marquardt, Benjamin McKnight III and Lydia Weyrich contributed to this story. To see all the stories from ISR, visit the Carderock web site at <https://www.navsea.navy.mil/Home/Warfare-Centers/NSWC-Carderock/>.

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