Office of Naval Research, NIWC Pacific host 26th international RoboSub Competition

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SAN DIEGO – The Office of Naval Research (ONR) and Naval Information Warfare Center (NIWC) Pacific hosted RoboNation's 26th international RoboSub Competition at NIWC Pacific Transducer Evaluation Center (TRANSDEC) July 31 – Aug. 6.

Student participants from across the globe built robotic submarines designed to overcome simplified versions of challenges relevant to the autonomous underwater vehicle (AUV) field.

"The Navy employs unmanned systems in every domain – in the air, on the sea, and under the sea," said Vice Chief of Naval Operations Adm. Lisa Franchetti, who attended Aug. 2. "The innovation and creativity we see through programs like RoboSub push the imagination of what is possible in unmanned platforms. These competitors represent the leaders of the future who will bring solutions to some of our most difficult challenges in the fleet and industry."

This year 35 teams represented five countries: the U.S., Canada, Bangladesh, India, and Singapore. Teams are affiliated with high schools, university undergraduate and graduate programs, and non-profit organizations.

Though teams compete for various amounts of prize money, cross-team cooperation is common at RoboSub, in what RoboNation Program Manager Julianna Smith called a spirit of "cooperatition," a combination of cooperation and competition.

In the spirit of cooperatition, Team Inspiration, a local team affiliated with non-profit organization Advancing Science, Technology, and Art, hosted a visiting team who arrived to the competition early for dinner at a teammate's home in the San Diego suburbs.

"It's rewarding to work with the other teams," one Team Inspiration member said. "We get to learn from them and then pass that knowledge down to younger teams, not just here at RoboSub but at all the robotics events we do. We help mentor kids interested in robotics both locally and globally and check in with them on Zoom and Discord often."

The Ohio State University team helped several teams with mechanical fixes throughout the competition. "Of course we want to win, but not because one of the competitors had an issue we could have helped them fix," one student team leader said.

Students from local team "SDSU Mechatronics," affiliated with San Diego State University, drove back and forth from their facility to retrieve spare parts for other teams. "When I first joined RoboSub, I worried that it would be overly competitive, but the atmosphere is completely different," an

SDSU Mechatronics team member said. “One of the best parts of RoboNation events is that all the schools help each other out – and as a local team, we want to be a part of that.”

Teams submitted pre-event technical design documentation before arriving at the TRANSDEC. During the competition, volunteer judges evaluated the teams’ performances in underwater autonomy challenge tasks, team presentations, and system assessments. Judges inspected vehicles for design, craftsmanship, technical innovation, and visual impact.

“From my perspective as both the Chief of Naval Research [CNR] and the Naval Science, Technology, Engineering, and Math [STEM] Executive, RoboSub is truly a valuable and important event for fostering greater naval innovation,” said CNR Rear Adm. Kurt Rothenhaus, who also visited the competition Aug. 2. “Not only do we get to meet the next generation of talented scientists and engineers, but we also introduce them to some of the most pressing challenges faced by our Sailors and Marines. This is especially prevalent as autonomous systems and capabilities play an increasingly important role in current and future battlescapes.”

In one of the six challenges, autonomous underwater vehicles navigated through one of two gates; in another, the vehicles dropped path markers into bins and earned bonus points for dropping markers in bins coinciding with the gate passed through earlier.

“Teams have been in the pool at TRANSDEC nearly non-stop,” said Travis Moscicki, NIWC Pacific lead for RoboSub, on the third day of the competition. “Hands down, the number one indicator of performance is time spent in water. This highlights the exact reason we hold the event – there is no substitution for experience.”

Moscicki, who holds a doctorate in ocean engineering,

participated in RoboNation robotics competitions as a student before his employment at NIWC Pacific. Now he's getting to watch how teams evolve year after year. "One team pointed out that at last year's event they encountered many gremlins (engineer speak for an issue!), but they weren't sure how to solve them," he said. "This year, they are still encountering gremlins, but are finding they have solutions. Progression is what RoboSub is all about."

This year, the National University of Singapore team took first place for the second year in a row, Brac University from Bangladesh took second place, and the University of Alberta from Canada took third place in the autonomy task challenges. Teams also won awards for design documentation, mentorship, ingenuity, data sharing, and "cooperatition."

NIWC Pacific hosted RoboSub from 2002 to 2019. This year marked the competition's return to the TRANSDEC pool, which contains six million gallons of water and is 300 feet by 200 feet in size. Its design eliminates all extraneous man-made or natural biologic noises and permits precise control of surface and underwater conditions.

NIWC Pacific and ONR research, develop, and deliver integrated capabilities to the fleet. Both regularly contribute to STEM outreach programs which help develop talent and partnerships for the future.

"The Navy is built on the keel of STEM education, leveraging scientific understanding, critical thinking and problem-solving skills to take us where we need to go," Franchetti said. "Our Sailors and civilians are out there every day developing, operating and maintaining the most complex ecosystems of warfighting functions; integrating propulsion, power, weapons, combat and information systems we need remain the greatest Navy in the world."