

# The National Robotics Training Center

A Division of Florence-Darlington Technical College

## Robotics Production Technology Online Program

- ✓ All online courses
- ✓ Eight-week terms, five times per year
- ✓ TA and VA Benefits
- ✓ A member of the Servicemembers Opportunities College (SOC)
- ✓ Credit for military transcripts



### Associate in Arts Degree

#### Concentration in Robotics Production Technology

- ✓ Earn an AA degree with a concentration in Robotics Technology
- ✓ Learn through hands-on robotics labs
- ✓ Enhance the technical aspects of your career
- ✓ Career preparation for robotics, intelligent systems, and general manufacturing
- ✓ Prepare for national certification



## Leadership and Management Online Program



- ✓ All online courses
- ✓ Eight-week terms, five times per year
- ✓ TA and VA Benefits
- ✓ A member of the Servicemembers Opportunities College (SOC)
- ✓ Credit for military transcripts

### Associate in Arts Degree

#### Concentration in Leadership and Management

- ✓ Jump-start your career
- ✓ Enhance your military career
- ✓ Grow your NCO leadership skills
- ✓ Accelerate career advancement
- ✓ Become a more effective manager and leader
- ✓ Better prepare yourself for the challenges of today's leaders

### Contact FDTC's Admissions Office

at [Admissions@fdtc.edu](mailto:Admissions@fdtc.edu) or call 843-661-8289  
or apply online at [www.fdtc.edu](http://www.fdtc.edu)

For more information contact Dorothy Czarnocki,  
customer service specialist at:

[Dorothy.Czarnocki@nrtcenter.com](mailto:Dorothy.Czarnocki@nrtcenter.com) or call her at 843-413-2756.

The National Robotics Training Center • P. O. Box 100549 • Florence, SC 29502

[www.NRTCcenter.com](http://www.NRTCcenter.com)

## YourNavy

# Brain study examines submariners in training

## What puts teams on same wavelength? DARPA wants to know

By Sam Fellman  
[stellman@militarytimes.com](mailto:stellman@militarytimes.com)

It looks like a run-of-the-mill training session, with submariners gathering to practice navigation before screens and mock equipment, until a researcher puts on the electroencephalogram sensors on their heads.

The lieutenants are test subjects in an ongoing Defense Advanced Research Project Agency study measuring how teams work, neurologically. The submariners in the study wear headsets that resemble skull-caps with electrodes — devices that measure the electrical activity of their brains during the simulated transit.

The idea is to use the EEG headsets to track how mentally engaged the team is in the scenario by measuring each individual's level of brain activity. Researchers can then use the data to track the navigation team's engagement levels moment by moment.

In addition to training submariners more effectively, the research could lead to insights about why teams fall into disorder and how to identify these signs early. Reports of collisions routinely point to distracted and unengaged watchstanders as factors that led to impending disaster.

The researchers have measured students going through the Submarine Officer Advanced Course in Groton, Conn., who are prospective department heads and compared them with the performance of navigation teams from submarines. Four sub teams and five Submarine Officer Advanced Course teams have been studied so far, the latter over three periods during their 22-week course.

Over two years, the research team has found a correlation between proficient piloting and a high level of engagement in the scenario.

The researchers, who hope to continue the study this fall with additional funding, presented some of their findings at the Human Factors and Ergonomics Society annual meeting in September. The research has been funded largely by \$1.4 million in DARPA contracts.

In the Submarine Learning Center simulator, a typical transit begins at Race Rock outside of New London, Conn., for an inbound run up to the Interstate 95 bridge near Naval Submarine Base New London. As in real life, the inbound track is packed with ships and traffic and sometimes a dusting of morning fog. The instructor can drop in rough weather, unpredictable traffic, even equipment malfunctions to up the ante.

"We can throw little things at them to try to force the cognitive workload on them, and then we're measuring that to see how they're going to react," said Tom Wohlge-muth, the center's technology officer.

The best benchmarks to measure team performance in the simulator are the rounds. Every three minutes, the piloting team performs a navigation fix. Over this period, the navigator makes a series of announcements; the final is "mark a round." Once he says this, the radar operator and periscope operator call out the bearing to navigation reference points. This should happen like clock-work — and it does for the navigation teams from the submarine.

The difference between the two teams is that the junior officer team is much more likely to defer a problem — say, putting off what to do about a vessel that seems to be crossing ahead, said Dr. Ron Stevens, a lead researcher on the study and chief executive officer of study subcontractor Learning Chameleon. Once the contact is suddenly getting too close, the team gets loud as everyone tries to make belated reports and suggestions.

In contrast, the submarine navigation teams, who are trained specifically for their positions and accustomed to working together, have more of a quality that Stevens calls "cognitive flexibility" — the ability to reorganize a team to confront a challenge.

### Staying 'in the groove'

For both teams, focus levels fluctuate during the course of scenarios. Perhaps the quartermaster of the watch is very engaged in something while everyone else's attention drifts — a situation that, if it persists for a minute or two, could put the sub in danger. The sub team is better able to break out of this discord than the junior officer team, Stevens said.

"We're maybe getting at what 'in the groove' looks like, at a cognitive level," Stevens said. "Everybody can see when a team's out of groove or out of sync, but they don't know how they got there. And if they're out of sync, they don't know how they're going to get back in sync."

It takes Stevens' three-man research team weeks to arrange and analyze the six streams of brain-wave data from the study participants. But as the technology advances and his team discovers quicker functions to calculate engagement levels, Stevens hopes to get that down to minutes, maybe even seconds — in time for an instructor to use it.

"I think we're just at the tip of the iceberg, here," Stevens said. "Somewhere down the line, I could see metrics being made for trust" or leadership, he said. "You could actually envision a time where there's this whole library of different cognitive states that would be modeled in real time." □