

Riding waves of the future

By [Kirk Moore](#) • STAFF WRITER • May 28, 2008

Fifty miles southeast of Atlantic City, a missile-shaped robot probe was poised for launch as Rutgers University technician Dave Aragon typed its mission instructions on a laptop computer, setting up a series of 100-foot deep dives to begin its trans-Atlantic voyage.

"That will get us into an eddy that will shoot us right into the Gulf Stream," Aragon said, as lines of text scrolled down the laptop screen, monitoring computer chatter that Slocum Electric Glider RU-17 sent by Iridium satellite phone to its handlers in New Brunswick.

Nearly 20 years after marine scientist Henry Stommel envisioned a fleet of unmanned underwater vehicles cruising the world's oceans, his idea is a growing reality. The start last weekend of the RU-17 glider's 2,400-mile mission to Spain is by far the longest underwater glider flight to date.

It's part of a broader effort that can over time supply several hundred gliders to the Navy and oceanographic institutions, and train a new generation of scientists and technicians to operate the technology to monitor the changing oceans.

"New Jersey's an excellent test bed. We want to go to the poles, to those pulse points of global change, where the signals are large," said professor Scott Glenn, an oceanographer of the Rutgers Institute of Marine and Coastal Science. "On our coast, we'll see the effects of that change on industrial coastlines. The same thing's happening in Europe. We're surrogates for the same thing there, and in China and India."



Rutgers University marine technicians David Aragon (left) and Bob Hess launch the underwater glider RU-17 into the sea 50 miles off the coast of Atlantic City. (STAFF PHOTO: KIRK MOORE)



Oceanographer Scott Glenn in the Coastal Ocean Observing Laboratory at the Institute of Marine and Coastal Sciences at Rutgers University. Students in the New Brunswick lab are plotting a course for a robot probe to ride the Gulf Stream eastward across the Atlantic Ocean to Europe. (STAFF PHOTO: KIRK MOORE)

"For us, this is another in a series of many tests," said Glenn, whose team flew a glider off Antarctica last year on a mission sponsored by the National Science Foundation.

The last long-distance voyage, from New Jersey to Nova Scotia, ended about 40 miles short of Halifax when a pump on glider RU-15 failed.

It hit bottom in almost 600 feet of water, and jettisoned a 100-gram weight to trigger an emergency surfacing, Aragon recalled: "It shot to the surface, called (on the Iridium phone), and said, 'Pick me up.' " Colleagues from Dalhousie University in Halifax rescued RU-15.

International cooperation is key to the success of the Gulf Stream mission, too. If it goes according to plan, RU-17 — recently christened the Scarlet

Knight by university President Richard L. McCormick — will ride the warm-water current across the North Atlantic in about 200 days and be picked up off Vigo, Spain, by scientists from the Harbors and Coasts Research Center, Spain's ocean environmental agency.

At the Rutgers Coastal Ocean Observation Laboratory in New Brunswick, Glenn's students are tracking the glider and updating its onboard computer with the best predictions for optimal course corrections along the Gulf Stream.

"Picture a roundabout," marine technician Bob Hess said of the Gulf Stream. "It goes north up along our coast, across the ocean, and south to the coast of Spain."

Like a kayaker heading down a twisting river, RU-17 can steer into the fastest parts of the current. To pick the best spots, its handlers use satellite imagery that shows the warmest surface waters in the stream, and altimeter data that measure the height of the ocean.

"There's topography to the ocean," Glenn said, and the differential in speed and volume of flow between the Gulf Stream and cooler waters can make a difference of as much as a meter in height.

"We need to stay close on the north wall of the Gulf Stream," Aragon said. "If you get on the south side, you can get caught in an eddy that shoots you out."

That would be like taking the wrong exit ramp off a highway, maybe with no way to get back on. It lends an air of adventure to the 7-foot-long robot's voyage and the students helping it — and that itself is a major goal, Glenn said.

The Atlantic mission was born two years ago at a UNESCO conference in Lithuania on the Baltic Sea, when Richard Spinrad, now the assistant administrator for ocean and atmospheric research at the National Oceanic and Atmospheric Administration, "sat us down and said he had something we had to do for the good of the country," Glenn recalled.

The oceanographers were taken aback, until Spinrad explained he was concerned about the state of American science and math education.

He had an idea to get more students excited about it, and told Glenn: "I want you to take one of your gliders and modify it, and fly it across the Atlantic."

This spring semester's Atlantic Crossing class at Rutgers numbered eight undergraduate students.

"Some of them are freshmen," Glenn said. "Classes end here in May, so they go back to their high schools and talk about what they're doing at Rutgers."

Student Evan Randall-Goodman, who's pursuing a double major in Spanish and oceanography, has a summer internship in Spain and will work with the Harbor and Coasts center, learning their computer systems and coastal wave-heights radar to guide RU-17 into its recovery area.

"So the students (in New Jersey) who are flying the glider over there will be able to talk to him," Glenn said.

RU-17 is the first "stretch glider" in the Slocum family, named after Joshua Slocum, the American sailor who in the 1890s became the first solo mariner to circle the globe. It's got a larger bay for scientific instruments and more powerful lithium batteries for trans-Atlantic endurance. Other upgrades are being developed by Rutgers and its partners.

The National Science Foundation "wants to make the glider smarter," Glenn said, and engineers are developing a new computer so the probe can autonomously seek out and track certain phenomena like thermoclines, temperature boundaries in the ocean, much like swordfish and tuna hunting for meals along the edges of warm water.

"Right now it has to call home, and we do the calculations," Glenn said.

But the oceanographers aren't the only ones interested in RU-17 — the U.S. Navy wants its gliders toughened up.

"The Navy wants like 150 of them. They have to be hardened," Glenn said. "You'll have sailors banging them around and dropping them. They can't be scientific instruments any more. They need to be plug-and-play."

With millions of dollars being invested by partners, Rutgers is using the glider work to leverage something else: a new generation of trained graduates.

A private donor contributed \$200,000 to create the Atlantic Crossing class, and glider technology is creating a potential career path for marine and environmental technology students who come to Rutgers, Glenn said.

"With the Navy buying 150 gliders," he said, "they need people."

Navy glider operations are based at the service's coastal Mississippi oceanographic research program at Stennis Space Center, and the work is much like the ocean laboratory control center at Rutgers, Glenn said.

"They all have to work as a team to get this thing to go," he said.