Challenges ahead in search-and-rescue for missing submersible: Retired Coast Guard commander, officer weigh in

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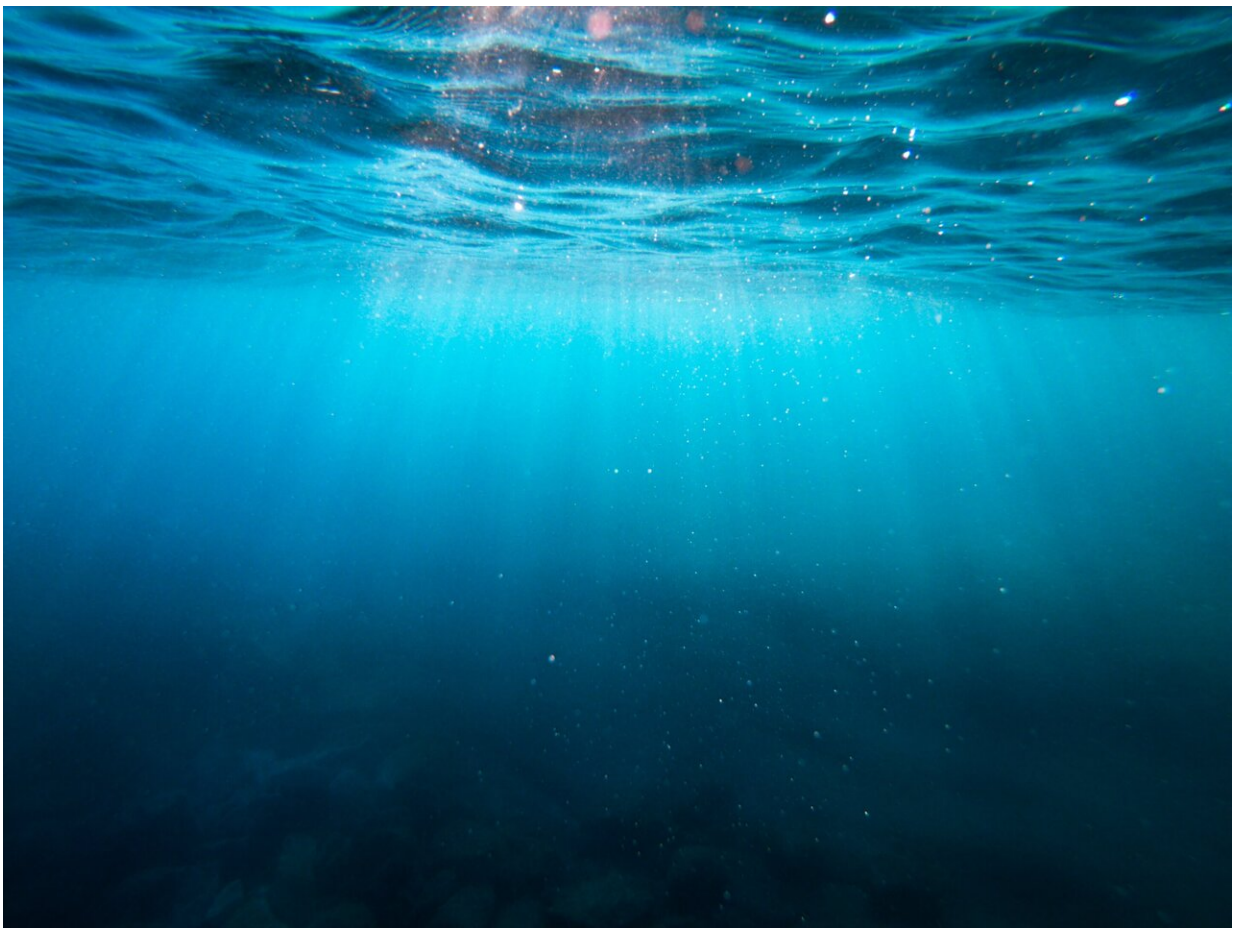

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As the hunt continues for a missing submersible with five people on board in the North Atlantic, experts from Northeastern University described a challenging search-and-rescue operation that would likely bring heartbreak.

"It's not going to have a happy ending. That's almost pretty clear at this stage," Steve Flynn, retired Coast Guard commander and director of Northeastern's Global Resilience Institute, said Wednesday afternoon. "As you get down to this last 40 hours plus or minus, the fact that we haven't located it—just the mechanics are really, really challenging. So it's hard to see how this turns out well for the folks on the submersible."

Meanwhile, Peter Boynton, affiliated faculty with the Global Resilience Institute, retired CEO of the Kostas Research Institute at Northeastern University and a retired Coast Guard officer, describes many challenges with the search-and-rescue operation.

"As I reflect on this, there are half a dozen challenges, and all half dozen are big challenges," Boynton said. "It's that dicey."

The "Titan" submerged Sunday morning, and its support vessel lost contact with it about an hour and 45 minutes later, according to the Coast Guard. Five people are aboard the craft, which was launched to survey the wreckage of the ocean liner Titanic.

Boynton is familiar with the protocol for a search-and-rescue, having captained three ships while in the Coast Guard and being involved in "scores" of search-and-rescue operations. He is also a licensed master mariner.

And while he is not involved with this particular search-and-rescue operation, he is paying close attention to the news. He is worried about several factors: time, distance, the ability to locate, the depth of the

ocean, the ability to recover, and—the wild card—the weather.

As for time, the submersible has four days of oxygen—something that Boynton called "very limiting."

Geoffrey Trussell, director and Doherty Professor of Marine and Environmental Sciences at Northeastern's Coastal Sustainability Institute and Marine Science Center in Nahant, elaborated on the air-supply issue—noting it was not just about the availability of oxygen, but also the ability to remove carbon dioxide from the air.

"When I went 2.5 miles down in the ALVIN Deep submergence vehicle, we were always attentive to CO_2 scrubbing and O_2 supply," Trussell said. "Sadly I think the oxygen supply and carbon dioxide levels will be the most pressing issue."

Regarding distance, the site of the Titanic is about 370 nautical miles from Newfoundland and 900 nautical miles from Boston, Boynton said. This means that a large ship is necessary for a rescue rather than a helicopter, and getting such a ship to the site would take either roughly 24 hours from Newfoundland or roughly 60 hours from New England.

That may be unlikely.

But that's if they can even find the submersible, which Boynton notes is roughly the size of a minivan. The best chance of that is if the submersible manages to surface and it is located by an airplane before the oxygen runs out. The door is bolted from the outside, Boynton noted.

"Listening to the reports, if accurate, it sounds like their ability to surface in an emergency is—there is a method, but it sounds pretty rudimentary," Boynton said, describing a process of releasing iron pipes as ballast.

If the submersible remains submerged, then it is in water that is 2.5 miles deep. Airplanes can drop sonobuoys—small buoys that detect sound or emit sonar to locate objects developed for anti-submarine warfare—to help their search. But the submersible appears to not be emitting any signal, Boynton said.

Moreover, the submersible is presumably in an area surrounding a shipwreck with an immense debris field.

"How do you distinguish between a sub and all the debris that is around," Boynton said.

On Wednesday morning, the Coast Guard said "underwater noises" were being investigated. In a press conference Wednesday afternoon, the Coast Guard described them as "banging noises," and said they were being analyzed by experts on underwater sounds.

"We're doing the best you can possibly do with the best people on the case," Coast Guard Capt. Jamie Frederick told reporters, noting that the search was now focused on the areas where the sounds were detected. But he described the search area as "larger than the state of Connecticut."

Purnima Ratilal, a professor in the electrical and computer engineering department in the College of Engineering, said that searchers can triangulate where a sound is coming from by using underwater microphones. In fact, her lab has set up an array of 160 such hydrophones to locate sounds in all directions. Then by recording and analyzing the sound, experts can determine what it is that is likely making the noise.

"Just like when you hear a recording, you know what part is singing, and you know what part is just music—just like that, you can record the

sounds underwater and play back and try and make some sense of the sound," Ratilal said, noting that algorithms can be written to differentiate sounds as man-made or from a marine organism.

"And people who listen to underwater sounds on a daily basis would probably be able to pick out unusual sounds," Ratilal said.

But what do you do if you find it underwater? Boynton said it would then require a remote-operated vehicle to recover, probably using a tow rope … which would then have to be both long, strong and flexible enough to tow a submersible to the surface amid the strong currents of the North Atlantic.

But even then, it is not a done deal.

"Effecting a rescue at sea can be one of the most dangerous moments in time," Boynton said, noting the proximity of vessels and the risk of a fatal or damaging collision. "When at sea and in distress, survival depends not just on training and effectiveness of people doing the rescue and abilities of ships and planes, but it also depends on the vessel and people in distress. Do they have the right equipment to help the rescuers, and is that equipment redundant, resilient? The equipment and training of a vessel and the people in it when a vessel is in distress is key."

Add to this the fog, wind and waves of the North Atlantic, and "there are just a lot of challenges with this," Boynton said.

Flynn, who also is a professor of political science and affiliated with the Civil and Environmental Engineering Department, said that the incident showcases the "gray area" that exists in international waters as well as with envelope-pushing technology.

"I think people think there are a set of very stiff safety requirements that

are supervised and closely monitored and that there are sanctions if you don't follow them," Flynn said. "A submersible being dropped in the international sea, it is literally in a no-man's-land in the regulatory area."

"Because its subsurface, and it is not qualified as a vessel as a submersible, it creates challenges for regulatory agencies to adapt to new technology," Flynn continued.

He also found it ironic that the submersible was visiting the wreckage of the Titanic—a disaster that ushered in new shipping and safety regulations.

"As we continue to innovate and push envelopes, it's always going to outpace some of the risk associated with this and how we manage it," Flynn said. "This is reminding us, bringing us full circle to the Titanic exposing some of those risks 100 years ago. We continue to struggle with this."

Provided by Northeastern University

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