

## UW, local company building innovative deep-sea manned submarine

October 8 2013

---

For the past 70 years, the University of Washington's Applied Physics Laboratory has conducted ocean research and engineering. Now they are teaming up with a local submersible company to build an innovative five-person submarine that would travel to almost 2 miles below the ocean's surface.

When completed in 2016, it will be the first deep-sea manned [submarine](#) project for the UW.

"What a terrific asset for the UW to have access to one of the few available manned submarines in the U.S.," said principal investigator Robert Miyamoto, who directs the lab's industry and defense programs. "If someday students routinely had the opportunity to go on a manned sub I think the research in deep-ocean science would explode."

The submarine, named Cyclops, has a carbon-fiber hull that can take passengers to 3,000 meters (9,842 feet) – deeper than all but a handful of existing subs.

"Most people don't appreciate there are not very many private or commercial subs," said Stockton Rush, CEO of OceanGate Inc., an Everett, Wash., company that charters submarines. He says there are about 600 military subs worldwide, but only about 100 certified civilian subs, and most of those are on private yachts or in storage.

For the past year and a half, members of Miyamoto's team have leased a

campus lab with OceanGate. The group has gone through more than 20 prototype designs before settling on the recently unveiled plan.

The carbon-fiber hull is shaped like a bullet that can plunge down to depth in less than 60 minutes. Once the vessel reaches depth, it rotates to its cruising orientation. The passenger seats pivot in order to stay upright.

The Boeing Company worked with OceanGate and the UW on initial design analysis of the 7-inch-thick pressure vessel. The design uses a strategy where each strip of carbon fiber and resin is precisely placed to ensure that there will be no gaps or weak points. The battery will be a lithium-polymer design that will also make the sub lighter and able to dive longer and faster than traditional subs.

The front viewing area, for which the vehicle is named, is designed as a 5-foot-wide dome of 4-inch-thick glass. Passengers will sit inside the dome to have a 180-degree view.

The collaboration was worked out through the UW Center for Commercialization. For OceanGate, the UW offers ocean engineers who are used to working on challenging problems, and access to wider campus expertise. For the UW, it's a chance to test new sensor, manipulator arms and [control systems](#), and give researchers and students a front-row seat to explore the deep sea.

Miyamoto and Rush say they plan to integrate modern control systems into the vehicle, replacing the many dials and levers used on today's submersibles with joysticks and more automated control systems that allow it to operate with a single pilot.

"It's like going from Model T to the Tesla," Rush said.

APL researchers hope to test and integrate their underwater sensors. Since high-bandwidth communication is not possible through water, the unmanned vehicles they typically use either must be tethered to the ship or record data that they download at the surface.

"With a manned submarine you can actually have the researcher watch as the sensor is taking data and make changes," Miyamoto said. "It speeds up the testing cycle and provides better information on how the tool is operating."

The UW portion of the project is funded by a \$5 million industry grant from OceanGate. The UW team now comprises about six people; Miyamoto anticipates that will grow to about 10 when the project is at its height. The submarine is scheduled to be commercially available from the company in 2016.

Passenger safety and cost are the two most common criticisms of manned submersibles. But Rush argues that in the past 35 years there have been no serious injuries in nonmilitary submarines. And the team aims to build a smaller, lighter vehicle with a launch system that doesn't require a specialized vessel to keep total operating costs lower than today's manned submersibles.

Rush, an amateur diver who moved to Seattle in 1990, says he became involved with submarines as a way to explore the Pacific Northwest marine environment without having to deal with the cold water and cumbersome dry suits.

When he discovered that subs-for-hire were in short supply, he bought an unfinished sub and finished it for his own use. In 2009, he founded a company that now charters two submarines for exploration, research, commercial use and deep-water filming. Researchers pay two-thirds as much as commercial clients.

With Cyclops, OceanGate seeks to develop a versatile, economical submarine that can go more than six times as deep. The company will target the oil and gas industry, deep-sea mining, pharmaceutical exploration, academic research and even tourism.

"To make a submersible economically viable you need to be able to serve multiple users so you have the volume to keep costs low," Rush said. "The key today for big projects is you've got to have multiple revenue streams."

Miyamoto and Rush met through BlueView Technologies, a Bellevue, Wash.-based spinout from the Applied Physics Laboratory that develops underwater sonar. Rush now holds an affiliate position at the UW Applied Physics Laboratory.

Despite the recent emphasis on autonomous vehicles, including many projects at the UW, the pair believes there is a role for human presence in deep-sea exploration.

"I grew up in a Jacques Cousteau world, with a lot of emphasis on oceanography, and it just feels like it's waned since then," Miyamoto said. "Pragmatically, it's nice to advance the state of the science, but I would do it just for the exploratory aspect."

Provided by University of Washington

Citation: UW, local company building innovative deep-sea manned submarine (2013, October 8) retrieved 18 April 2024 from

<https://phys.org/news/2013-10-uw-local-company-deep-sea-submarine.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.