Seaglider: Autonomous Undersea Vehicle

Basic and Applied Research Push Vehicle's Capabilities

Narrator: Seaglider – a revolutionary autonomous underwater vehicle, jointly developed at the University of Washington School of Oceanography and the UW's Applied Physics Laboratory.

Neil Bogue: Seaglider has been used all around the world. There have been almost two hundred of them built.

Narrator: A Seaglider has no propeller. No engine.

Fritz Stahr: The vehicle itself is driven entirely by change in density between it and the water around it. We use the pitch angle to make it fly through the water this way or fly through the water that way.

Narrator: APL scientists continue to expand Seaglider's capabilities.

Bogue: What we've been working on with Seaglider over the past three or four years is adding passive acoustic detection capability. It's a very quiet, steady platform from which to listen.

What we've done has been to add a passive autonomous acoustic monitoring capability, which consists of hydrophones — underwater microphones — and an internal, custom, designed-and-built-here-at-APL recording and detection electronics board, which goes inside the pressure hull of the glider.

And we've been focused on detecting a class of marine mammals called beaked whales. They dive deep and feed on squid at about a thousand meters depth. We're going down to the same depth data where the animals are actually foraging for food and we are listening for their echo location or foraging clicks they make.

Here at APL, we have groups running missions that are approaching ten months in length. We're continually pushing to get one year missions and we're about to do that.

Craig Lee: To get to a year, we've been doing a lot of things to the glider and to the software to increase efficiency. One of those is going from a system that uses high-voltage and low-voltage battery packs to a single voltage battery pack. The glider previously had a single computer that ran everything. So the more it's awake, the more energy it consumes, the shorter the mission. So by introducing an independent processor that does nothing but sample the sensors — pay attention to the science, if you will — you can sample at a very high rate, whereas previously that hasn't been possible.

Another really exciting development is the integration of micro-structure sensors onto the glider. They respond to very high-frequency fluctuations in temperature and those allow the gliders to measure mixing in the ocean. Gliders turn out to be a very good platform for doing that.

Another developing glider capability is the ability to actually work under ice cover — to extend the missions in fully ice-covered waters. In ice-covered waters, it can't access the surface any more. The ice cover prevents it from talking to the satellites. So no more GPS. How does it navigate? It navigates by acoustics — by essentially a set of beacons that we put down in the water that broadcast a chirp, if you will.

Narrator: Seaglider offers depth, versatility, and persistence at an operating cost far less than an ocean research vessel.

Bogue: I always tell people they should like them because they're really cool. But they do like them because they're really cheap.

Narrator: In May 2013, the University of Washington licensed the manufacture of Seagliders to Kongsberg Underwater Technology.

Rich Patterson: We've got great expectations for environmental monitoring in general and the commercial side of things and specifically the oil and gas industry. The vehicles we make now — their endurance in the field is measured in hours or maybe, at most, days. The ability to have a system that could last months in the water is very important to us.

Bogue: It's a big ocean and there are relatively few gliders out there. So there's still a big undersampling problem in the ocean and if we can continue to push these out to users, there is a lot of future and the future is really expanding the capabilities of the gliders.

This is APL **The Applied Physics Laboratory at the University of Washington in Seattle.**