

The goal of the UEC project is to build a small family of devices that serve as a standardized and modular way of placing self-contained secondary experiments on research submarines, submersibles, buoy systems, ROVs and AUVs. Placing these additional projects on the platform is a way of accomplishing more experiments per deployment with minimal interruption of the platform's routine.

The United States Navy's deep diving research submarine NR-1 is serving as the platform for the project. We are currently looking for other platforms (Navy and civilian) that could host UECs on board.

The project also provides MIT midshipmen and students with ocean-related design and engineering experience in working with the fleet and the Woods Hole Oceanographic Institute. Eventually we hope to expand the project to so that it can serve as an educational resource for elementary and high school science curriculums.

The idea for the UEC Project was inspired by NASA's Small Shuttle Payloads Project (SSPP). In this program NASA provides a family of containers in which organizations and institutions can place their experiments. These containers cover a range of sophistication levels, and are placed in the otherwise unused space of the Shuttle's cargo hold. The UEC is the underwater version of the SSPP. It was envisioned to require no (or very little) supervision from the ship's crew. In essence the experiment would just be tagging along for the ride. The Electric Boat Corporation's NR-1 Planning Office suggested that additional stand-alone experiments could be placed in NR-1's NAVNET launch tubes.

Two types of UECs have been built to date:

UEC-1 is a free flooding unit. This unit is just a canister that is open to the water and has mounting hard points on the inside. This is good for cheaply testing materials and small components under real operating conditions for long periods of time. It went to sea aboard NR-1 from September to November of 1998. It carried three experiments. A strain gage coating experiment, an electronics encapsulation test, and a test block of syntactic foam made by us.



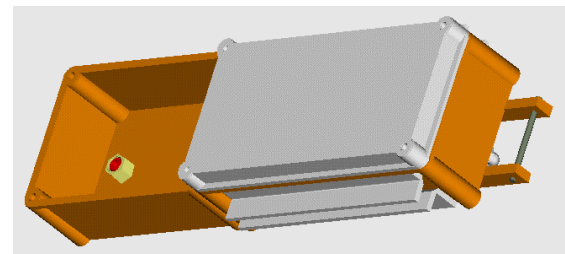
*Figure 1: UEC-1 first went to sea on Submarine NR-1 from September to November 1998.*

The second generation UEC devices (UEC-2X) has an oil-compensated electronics bay and a microprocessor for data-collection and experiment control. We are currently experimenting with different microprocessors, power supply options, and hardware layouts to find the best design. UEC-2B went to sea aboard NR-1 for the last week of April 1999.

During the upcoming summer we plan on continuing the improvement of the UEC-2 series, and start designing and building the third generation UEC.

The third generation UEC will be a water sample collection unit. This unit will be designed to take between 20 and 40 water samples at preset intervals (sampling one every 12 hours for about 3 weeks). The time stamps on the water samples can later be correlated with the platform's navigational plot to determine the sample's location. We are also looking into how the UEC-3X could take samples on command from the platform. This would allow NR-1 to take a water sample WITHOUT breaking SUBSAFE.

Once the UEC-3 series is working, we will start developing a series of experiments, projects, and support material to teach aspects of science to elementary and high school students.



*Figure 2: The Pro/Engineer model of UEC-2B with the lower access panel removed.*