Containerized Autonomous Marine Environmental Laboratory - Enhancing Coastal Resiliency with New Technologies

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- Enhancing Coastal Resiliency with New Technologies and Community Design
- Maritime and Port Logistics, Resilience and Security in an Era of Ever-Bigger Ships, Deeper Ports, Increased Commerce, and Stronger Storms
- Ocean Vehicles and Floating Structures




ASV Global and partners have recently developed a containerized autonomous marine environmental laboratory (CAMEL) to assess hazard risk and community vulnerability following extreme coastal events such as hurricanes, tsunamis, and cyclones and for use in research in the topical areas of fundamental fluid mechanics and turbulence, sea-level rise, coastal sustainability, and resilience.

Housed in a pair of 20ft containers, the lab provides a complete autonomous survey and data collection solution that can be easily transported and utilized in areas difficult to access and map across the world following storm events. This presentation will discuss the challenges involved in marine science data collection for difficult to survey areas such as inshore and coastal waters, particularly for developing nations. We will also discuss new algorithms and data processing methods under development that can stream-line processing on the vessel in real-time and in post-processing ashore.

The system can be used in coastal resilience projects around the U.S. and particularly in developing countries to provide complete autonomous survey and data collection solutions without need for expensive ship-based techniques. These unmanned vehicles can provide after-storm surveys of ports, harbors and shipping channels with sonars reducing risk to navigation and environmental sensors preserving human and ecosystem health. The necessary data will enable planners, government officials, and communities to develop risk reduction, restoration, and resilience strategies and Small Island

Developing States (SIDS) develop and sustain marine economies by ensuring the marine resources that belong to them are better understood and managed.

CAMEL includes an ASV C-Worker 4 autonomous surface vessel (ASV) equipped with a range of hydrographic, geophysical and oceanographic sensors. A built in Mission Control facility will enable users to operate the ASV and its sensors over a radio communications link as well as review and process collected data.

The diesel-powered C-Worker 4 will be capable of being launched from a beach trailer to collect coastal data. The C-Worker 4 is a reliable jet powered autonomous surface vehicle controlled through ASView® a world leading, robust, and reliable autonomous vehicle control system. The vehicle combines a robust maneuverable platform with the flexibility to complete a range of missions in support of research programs. Its waterjet propulsion makes it an ideal solution for shallow water surveys and can operate continuously for periods of up to 48 hours.

The most critical application for a vehicle of this type would be coastal mapping followed by oceanography. For survey operations, the C-Worker 4 has the ability to be trailer launched which will enable it to be used from a variety of coastal locations and also has the ability to be ship launched. During survey operations, the data collected can be reviewed over a remote desktop link to an on-board acquisition system to provide quality control. ASView® provides the facility to upload line plans from the acquisition system to reduce the planning overhead on operations.

The C-Worker 4 sea chest and standard 19" rack for data acquisition and processing systems allows easy configuration and significant flexibility to include a wide range of sensors on deployments without the need for additional integration costs. The standard sensor payload would include a multibeam and sidescan bathymetry system, current meters, profiling CTD/SVP, underway water quality sensors, and a met station.

Researchers from the Center for Coastal and Ocean Mapping Joint Hydrographic Center in New Hampshire have been developing and testing various modes of operation, vehicle behaviors, control algorithms and tight sensor integration. BEN the Bathymetric Explorer and Navigator the Center's C-Worker 4 is equipped with a multibeam sonar and high-resolution mapping system to collect sonar bathymetry and sub-bottom profiling data to characterize the seafloor in these unmapped areas and recently mapped around the NOAA Channel Islands National Marine Sanctuary. BEN provides a research platform with enough endurance to undertake production survey operations and meets the goal of simplifying the painstaking effort of producing the highest quality hydrographic data for nautical charting.

Currently coastal resiliency projects encompass 17 coastal states, the Caribbean, Mexico and Central America. The Gulf of Mexico's marine and estuarine ecosystems are the foundation of life in the Gulf and form the backbone of the region's economy. But the Gulf has seen about half of its coastal habitats vanish during the past century. As a result of these losses, species have declined and the resilience of the coast in the face of natural and man-made disturbances has been compromised. The oil spill, and Hurricane Katrina before that, showed starkly how people and the economy are vulnerable when natural habitats are deeply compromised by long term degradation and impacts.