

## **Shipboard Ballast Water Treatment Facility Training Ship *Golden Bear*—Vallejo, California**

A ship's untreated ballast water can have serious environmental consequences. When a ship is empty of cargo, it must fill with ballast water to maintain its stability, trim, and structural integrity. When the ship loads cargo in a distant port, it discharges its ballast water along with any aquatic life it contains. This aquatic life may out-compete native species and multiply into pest proportions. Problems directly resulting from invasive species include the collapse of entire commercial fisheries, the displacement of native seabed communities, and the red tide contamination absorbed by filter-feeding shellfish, among many others affecting the environment and human health. The *Training Ship Golden Bear* will help to combat these problems by serving as a shipboard ballast water treatment testing facility, with its operational goal set for late 2009. Owned by the US Maritime Administration (MARAD) and run by the California Maritime Academy (CMA), the facility will be used as a research, development, testing, and evaluation (RDTE) facility, providing impartial science to serve the needs of the maritime and environmental regulatory world. This program will:

- ◆ Provide access to an operational ship with purpose-built laboratories to researchers working on ballast water treatment solutions.
- ◆ Reduce the high costs associated with current shipboard testing.
- ◆ Increase the standardization and quality control of shipboard experiments.
- ◆ Educate merchant marine cadets and general student populations on ballast water issues.

*Golden Bear* will function as a “plug and play” platform for research teams, regardless of how they approach the treatment challenge. Researchers will be able to install their system in a standard 20-foot shipping container, using connection specifications provided by the facility to access ballast water tanks, electricity, and ancillaries. This will enable them to set up their platform at their home location, and then easily transport it to Vallejo for loading aboard the facility without having to install their treatment system below deck.

### **Outreach**

*Golden Bear* will provide valuable service as both a test platform and educational outreach facility. The *Golden Bear* RDTE team, including University of Washington (UW) scientists and CMA faculty and engineers, will publish and effectively disseminate key findings and results. Visiting teams will be encouraged to collaborate and disseminate their findings as well. Faculty and staff from UW will work with CMA faculty and administrators to develop educational opportunities on ballast water and aquatic nuisance species (ANS) issues. This will result in a course syllabus and framework for future educational activities.

### **Partnership**

This project was made possible by a National Oceanographic and Atmospheric Administration (NOAA) National Sea Grant, with additional funding from the U.S. Maritime Administration, and the California State Lands Commission (CSLC). The American Bureau of Shipping (ABS) is providing classification society oversight and plan acceptance services. Partners for this project include

- ◆ California Maritime Academy
- ◆ California State Lands Commission
- ◆ United States Maritime Administration
- ◆ University of Washington, School of Aquatic and Fishery Sciences
- ◆ American Bureau of Shipping
- ◆ The Glostén Associates, Inc.
- ◆ ITT Inc., with Beckwith & Kuffel of Seattle.

### **Contacting *Golden Bear***

To learn more about *Golden Bear*, contact J. Kim McNutt, Dean of Sponsored Projects and Extended Learning for CMA, at (707) 654-1217 or [kmcnutt@csum.edu](mailto:kmcnutt@csum.edu).

## Technical Overview

### Testing

Systems must be tested and independently certified to verify they meet standards applicable to the regulatory jurisdictions where they will be operated. Currently, separate standards have been promulgated by the International Maritime Organization (IMO) and various US States, including California, with additional federal standards expected by the United States. *Golden Bear* is designed to simplify this process.

Container-mounted treatment systems are supported by new below deck structure, and fasteners to secure up to two containers. A support services station is positioned nearby with compressed air, fresh water, electrical power receptacles, ballast water supply and sampling lines, and instrumentation.

Researchers will have access to two existing ship ballast tanks (one treatment and/or one control), each with a capacity of 432 cubic meters and with large hatches for plankton net sampling. The pumping system can vary the flow capacity of the system and permits treatment on uptake and/or discharge, with variable and control tanks filled simultaneously. An onboard marine biology laboratory is outfitted with equipment to analyze samples.

Certification testing will be provided by the University of Washington to give teams the independent third-party certification needed for Type Approval of ballast treatment systems. The facility will be available for visiting teams to conduct research and development. Ship crews are familiar with various testing operations, and technicians will be available full time to maximize efficiency of operations. The vessel schedule will be fixed to permit efficient planning efforts, minimizing costly waiting times inherent with working commercial ships.

### Facility

This 30-ton capacity stern crane will enable containerized treatment systems to be easily moved to and from the ship.



**Mounting:** The facility will accept one or two standard 20-foot containers (ISO R-668, ISO R-1161), with the second secured on top of the first and supplied with an inclined ladder. Both must not exceed 25 short tons.

**Ballast:** Two 8-inch, 150-pound ANSI flanges will be provided for ballast water supply and return connections. The ship's ballast can be provided to the treatment system in any range between 660 to 1,980 gallon per minute (150 to 450 cubic meters per hour) at up to 64 feet of water (2 bar) of pressure during either uptake or discharge.

**Electrical:** Three electrical supply terminals are available, and use a Russellstoll connection system, all at 60 hertz: 100 amps at 450 volts, 50 amps at 450 volts, 30 amps at 120 volts.

**Service:** Connections include 1-inch female national pipe thread for 80 psi compressed air and 50 psi fresh water. Water and air consumption allowances are limited.

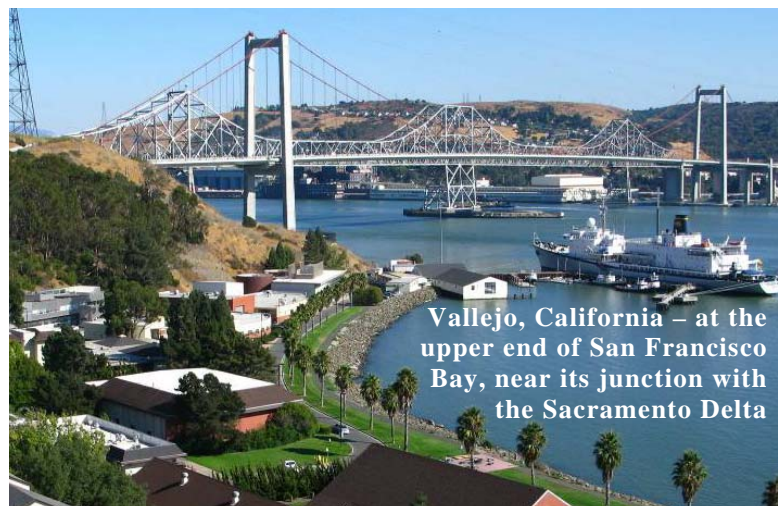
### Location

California Maritime Academy is home port for the 500-foot *Training Ship Golden Bear*, which is berthed at the campus eight months each year. The facility is next to a major interstate, with ample lodging for research teams.

With both fresh and brackish waters (depending on tide), the facility will offer two of the three salinity requirements of the IMO Guidelines. The bay provides a rich 'soup' of marine organisms, many non-indigenous, which will decrease the need for surrogate organisms.



*Golden Bear* is a dynamic facility capable of handling a wide variety of system concepts and designs. In addition, it will reduce the lengthy time requirements and economic costs of current shipboard testing.



Vallejo, California – at the upper end of San Francisco Bay, near its junction with the Sacramento Delta