



## MATE

MARINE  
ADVANCED  
TECHNOLOGY  
EDUCATION  
CENTER

www.marinetech.org

## IN THE spotlight:

### NASA's Neutral Buoyancy Lab

Participants in the 2005 national ROV competition will be in good company—they'll see their share of NASA astronauts and divers. That's because the competition will be held at NASA's Neutral Buoyancy Lab (NBL) at the Sonny Carter Training Facility. The training facility allows the simulation of zero gravity conditions experienced by astronauts during space walks.

Located in Houston at the Johnson Space Center, the NBL provides astronauts with pre-flight training for extravehicular activities in a 20,000-plus square foot pool that's 40 feet deep and contains 6.2 million gallons of water and life-size mockups of the International Space Station and the space shuttle. Because it familiarizes astronauts with how the body and other objects move under the weightless conditions experienced in space, the NBL is a critical part of astronaut training.

#### What is Neutral Buoyancy?

Neutral buoyancy is the state of an object that has the same tendency to float as it does sink. People and objects can be made neutrally buoyant with a combination of weights and flotation devices. "It's similar to the buoyancy compensator, or BC, worn by SCUBA divers," says Lisa Spence, NBL Flight Lead. "The BC compensates your buoyancy so that you don't sink to the bottom or pop up to the surface too fast. You can control your buoyancy based on your depth."

"The crew members are pressurized in their space suits, so technically, they're already in a BC," Spence continues. "But depending on the task they'll be completing and what body orientation they're



Astronauts and their support divers practice for space missions at NASA's NBL.

personnel. Every astronaut is attended by at least four divers, who are responsible for tasks such as managing the astronaut's tools, tending to his or her umbilical line, and filming the astronaut using an underwater float camera. The live video is simultaneously viewed in a control room by instructors who analyze the crew

member's performance and at a console where medical officers look for signs of distress or fatigue.

#### NBL and the MATE Center

According to Spence, it was the Columbia tragedy that sparked the NBL's interest in the MATE Center. In the weeks following the accident, most training had been cancelled as the agency evaluated its next steps. The NBL staff mourned their colleagues and looked for ways to keep busy.

The slow period gave Spence the opportunity to follow up on an inquiry letter requesting the use of the NBL for the Texas regional ROV competition. "It turned out to be a lot of fun and not really a lot of time and resources," she says. "Afterwards, many of my co-workers asked me to do it next year."

"Working with the high school kids was a lot of fun," adds Spence. "They were really motivated and well-behaved and it was truly refreshing."

After hosting the Texas regional competitions in 2003 and 2004, the NBL is "reading, willing, and able" to host the 2005 regional and national competitions. Students from across the country will have the opportunity to learn about underwater physics principles that are also useful when training for space exploration—like neutral buoyancy. "All systems are go!" says Spence.

going to be in—standing, on their side, or even inverted—we compensate their buoyancy by strategically placing lead weights or pieces of foam in their suits."

#### A Day in the Life of the NBL

Activities simulated in a typical NBL training session include ongoing space station construction, as well as repair or replacement of items on the space station or shuttle that have failed, or by design have a limited life. For example, the astronauts currently in training at the NBL will be the first shuttle crew in space since the Columbia accident grounded flights in February 2003. Before shuttle flights begin next summer, the crew will be trained to complete a spacewalk task that was partly developed in response to the Columbia accident.

Spence says that the NBL has developed a spacewalk exercise that allows crew members to practice repair techniques for damaged shuttle tiles. Although tile damage was ultimately not the cause of the Columbia accident, the ability to repair damaged tiles in space is a highly desirable goal. "We've developed a training exercise that simulates checking for tile damage while the shuttle is docked at the space station," she says. "The crews practice looking for, finding, and repairing damaged tiles."

Astronauts training at the NBL are supported by a complete staff of instructors, divers, and medical

## Contents

- Page 2:** *From Our Director*  
MATE Interns—Where are They Now?
- Page 3:** *Marine Technology in the News:*  
U.S. Commission on Ocean Policy
- Page 4:** *2005 ROV Competition*  
2005 Summer Institutes
- Page 5:** *Partner Profile:*  
Saddleback College  
*Knowledge and Skills Guidelines*  
for ROV Technicians
- Page 6:** *Employer Profile:*  
Monterey Abalone Company
- Page 7:** *NVC Profile:*  
Drew Michel  
*Upcoming Events*
- Page 8:** *Career Profile:*  
Ginny Broadhurst,  
Marine Program Coordinator

**MPC**

Monterey Peninsula College



This project is supported by the  
National Science Foundation  
DUE/ATE 0085345