

ROV Competitions for Students: Developing the Next Generation of Ocean Explorers, Scientists, Technologists, and Engineers

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Abstract: Our nation's interest in and reliance on the ocean environment – from exploration to energy, food, telecommunications, and transportation – is only increasing. Yet despite this fact, educational programs that focus on the engineering and technology that supports ocean activities are sorely lacking, especially at the middle and high school level where students are just beginning to think about their career paths. With many electronics, machining, and other “shop” programs being phased out at schools and colleges because of funding cuts and a shortage of technical expertise to support them, the situation does not seem to be improving. This lack of technical education programs, in turn, leads to a shortage of qualified individuals to support ocean activities, including the development, maintenance, and operation of technologies that are needed to further exploration, research, and industry.

The national student ROV competition program developed by the MATE Center and the Marine Technology Society's (MTS) ROV Committee is helping to remedy this situation and improve technology education by addressing the lack of 1) relevant technical skills and information in mainstream educational programs; 2) technical expertise and funds to support such programs; and 3) skilled individuals who can fill work force needs. The program also promotes the understanding and

development of the skills and abilities needed to support ocean activities, and helps bridge the gap between the educational system and the ocean workplace.

Since 2001, MATE and the ROV Committee, working in collaboration with organizations such as NOAA's Office of Ocean Exploration, has coordinated and helped to facilitate both regional and national ROV competitions that provide students with a learning environment that is based on real workplace situations. These competitions involve budgeting, setting deadlines, documenting procedures and results, and producing deliverables on time – just like the real working world. Building an ROV to successfully complete a competition mission not only involves a practical, working knowledge of math, subsea physics, electronics, hydraulics, and engineering; it also requires project management, written and verbal communication, teamwork, critical thinking, and continual problem solving. The competitions also promote creativity and innovation, both of which could someday lead to the development of technologies that advance ocean exploration, research, and industry.

In partnership with NOAA's Office of Ocean Exploration (OE), MATE and the ROV Committee held our first annual national student ROV

competition in May 2002 at NASA's Kennedy Space Center and Brevard Community College-Cocoa campus in Florida. Twenty-two high school, home school, community college, and university teams from across the U.S. and Canada participated in the event, which was held as the primary educational component of the NOAA/NASA Link Project Symposium. The Symposium brought together scientists, technologists, and engineers to share technologies and encourage future ocean-space collaborations, providing an exciting opportunity for the students and instructors to interact with these individuals and showcase their skills and abilities.

Having the ocean community involved is indeed the key to the program's success. Contributions of funds, building supplies, access to facilities, time, and, most importantly, technical expertise from marine industries, employers, research institutions, professional societies, government agencies, and working professionals make it possible for us to create a truly unique learning environment. For example, the DeepArch (Deepwater Archaeology) Group at the Massachusetts Institute of Technology (MIT) is sponsoring the 2003 event, "Lost on the *Titanic*: Rusticles or Bust," on the MIT campus. In addition to providing facilities and technical and logistical support, DeepArch is also helping to organize seminars and technical workshops that complement the competition's shipwreck theme.

The New England, Texas, and Southern California regional competitions that the Center supports and helps to organize are serving as feeders into the 2003 national event. In collaboration with MTS and the ROV Committee, the MATE Center is working to establish additional regional competitions in strategic locations across the country. The goal is to engage

MTS sections, as well as other professional societies and marine-related organizations like NOAA OE, in helping to support – financially, technically, and logistically – the student teams participating in the regional event that takes place in their area. The Center hopes to have several more regionals under way in 2004.

The idea is that the competition program will continue to grow and reach more and more students and in turn, more and more students will be excited to apply their math, science, engineering, and teamwork skills to creatively solving problems – and developing technologies – in the ocean arena. For the ocean community, the program will continue to serve as a venue through which they can support technical education and, in turn, reap the rewards by way of students who are well prepared to meet their work force needs.

In addition, together with its California Center for Ocean Science Education Excellence (CA COSEE) partners (the Marine Activities, Resources, and Education at the Lawrence Hall of Science at the University of California at Berkeley, Scripps Institution of Oceanography, and California Sea Grant), the Center is working to expand the ROV program's impact to include middle school students and instructors. One of CA COSEE's initiatives includes aligning MATE's ROV-related curricula and instructional materials with national science and technology standards and incorporating this material into CA COSEE partners' existing and activities. In this way, MATE and its CA COSEE partners will reach even more students with the excitement and importance of ocean science and technology, allowing them to see how what they are learning in the classroom can be applied in the real working world.