

ROV Competitions for Students: Improving Marine Technology Education & Helping to Meet Work Force Needs

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Abstract – What started as a back-of-the-envelope type of idea to engage students in marine technology and connect them to marine industries has turned into a program that involves more than 300 students, working in teams, to design and build ROVs for missions based on real-world problems, with more than 50 organizations and 45+ technical professionals contributing to make the program a success. When the MATE Center and the Marine Technology Society's (MTS) ROV Committee came together to establish the framework for a student ROV competition program, we had no idea that it would grow into something that involved so many students, educators, employers, and working professionals – but we're glad that it did!

The need for qualified individuals to support marine industry, research, and exploration has never been greater, yet educational programs that focus on the engineering and technology that supports marine 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, this situation does not seem to be improving. This lack of technology education programs, in turn, leads to a shortage of qualified individuals to support marine industries.

The MATE Center/MTS ROV Committee's national student ROV competition program is helping to remedy this situation and improve marine technology education by addressing the lack of 1) relevant technical skills and information in mainstream educational programs; 2) technical expertise, equipment, 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 marine activities, and helps to bridge the gap between the educational system and the marine 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.

Industry involvement is the key to the ROV 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, organizations such as Oceaneering International, Penn State University's Applied Research Laboratory, and Perry Slingsby Systems, donated funds, facilities, and technical expertise in support of the twenty-two teams that competed in the 2002 national competition, while individuals from Oceaneering, Monterey Bay Aquarium Research Institute, and Stolt Offshore were on hand to serve as competition judges, technical advisors, and team assistants. These same organizations – and more – are supporting the 2003 national event, which is taking place June 19-21 at the Massachusetts Institute of Technology in Cambridge, Massachusetts.

The New England, Texas, and Southern California regional competitions that the MATE Center supports and helps to organize are serving as feeders into the 2003 national event. In collaboration with MTS and the ROV Committee, the

Center is working to establish additional regional competitions in strategic locations across the country. The goal is to engage MTS sections in helping to support – financially, technically, and logistically – the student teams participating in the regional event that take place in their area. The Center hopes to have several more regionals under way in 2004.

The idea is that the competition program to 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 in the marine arena. For marine industries, the program will continue to serve as a venue through which they can support marine technology 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.