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One innovative application of PC/104 technology can be found as deep as 3000 meters beneath the sea where archaeological explorations are unfolding with the help of Little Hercules, a Remotely Operated Vehicle (ROV) developed by Woods Hole Marine Systems, Inc. (WHMSI). WHMSI is an oceanographic engineering service company that specializes in the development of unmanned, tele-operated underwater vehicles and associated equipment and software.

Little Hercules is a mid-sized, fully maneuverable imaging ROV that is equipped with a broadcast quality underwater video camera, dynamic thrusters, and sophisticated lights. A Micro/sys SBC0386EX PC/104 computer controls Little Hercules. This single board computer (SBC) is located in a one-atmosphere housing onboard the ROV. One of the serial ports on the SBC is used to communicate through a fiber-optic cable system with a Windows-based PC that is onboard the ship. The PC/104 bus has a quad serial card and an IndustryPack carrier board with isolated D/A. This D/A controls the four 1-HP thrusters that maneuver the vehicle. The quad serial ports connect to a magnetic compass, a Paro-scientific

precision-depth sensor that measures pressure, a Benthos altimeter that gives distance off the bottom (acoustically), and the tilt actuator that aims the high quality primary video camera. A/D channels read a heading rate sensor. This is helpful for controlling heading. Digital bits control relays that turn the underwater lights off and on.

One of WHMSI's major clients for the last few years has been Dr. Robert Ballard's Institute for Exploration. They have used Little Hercules on marine archaeological expeditions around the world. It was used in the Pearl Harbor expedition of November 2000, and the Black Sea expedition during September 2000, in which the discovery of an ancient shoreline confirmed theories that the Black Sea underwent catastrophic flooding some 7500 years ago. ROVs like Little Hercules are a vital tool in the search for human and natural history in deep, underwater environments.

During 2001, Woods Hole Marine Systems, Inc. also designed and integrated the same Micro/sys PC/104 control package into a system called Orpheus, a shallow water ROV that is used to provide interactive video experiences from NOAA's National Marine Sanctuaries. Orpheus is used in 50 feet of water in the Monterey Bay National Marine Sanctuary in California. Its cable comes ashore, then the video and control signals are transmitted cross-country between Monterey and Mystic Aquarium in Connecticut, allowing visitors to the aquarium to view images and even control the vehicle in far-away Monterey.

Little Hercules and Orpheus are examples of how the creation of two innovative ROVs was facilitated by the use of PC/104 technology such as that which is found on the Micro/sys SBC0386EX. By allowing a standardized interface with both custom and off-the-shelf I/O, the design cycle of complex systems is reduced.