The R/V Ka’imikai-o-Kanaloa has been operating successfully as a mothership for the submersible Pisces V for two years without any operational days lost at sea. These two seasons have validated the concept of a 70-meter length all-ocean, all-weather vessel built to operate in tropical or temperate latitudes. The 70-meter length design is a compromise between efficient low-cost operation capability and sufficient length and hull displacement to accommodate submersible operations in up to state 4 seas. Careful design criteria allowed specialized chemical laboratories, a moon pool with acoustic sensor equipment, an air-castle containing a rosette-CTD array lowered over the side with a horizontal boon and other innovations to be accommodated in the vessel design. A low superstructure profile for the vessel and SCR diesel-electric propulsion has allowed versatile maneuverability and speed control over a wide range of sea and wind conditions. The ship was designed around an integrated shipboard research system capable of operating in waters of up to 2,000 meters. The system includes a remotely operated ocean bottom survey camera system, an RCV-150 ROV, the Pisces V submersible, and a hull-mounted multibeam mapping system aboard the 225-foot R/V Ka’imikai-o-Kanaloa. The over-the-side systems are operated from the stern of Ka’imikai. The Pisces V submersible is deployed and recovered with a tealarm mounted on an articulated A-frame. The integrated shipboard system was designed for a multi-purpose use of the R/V Ka’imikai-o-Kanaloa by the Hawaii Undersea Research Laboratory for Pisces V day-time operations or night-time operations with the RCV-150 using an optical cable. In order to obtain a reliable bathymetric database for potential dive sites, a SeaBeam multibeam, narrow-beam mapping system was installed on the vessel. The installation consists of a hybrid system with classic shipboard electronics and ceramic SeaBeam 210 underhull arrays. The first test results with the ship’s bow thruster tunnel closed showed that the SeaBeam 210 system performed continuously with a normal central beam-crossing error of less than 10 meters.