Unmanned Survey Vessel for Shallow Water

Problem

Accurate, reasonable cost surveys of areas that a regular hydrographic survey boat cannot access are needed to assess those areas.

Approach

This research is developing an unmanned survey vessel for use in shallow water and areas normally inaccessible to survey boats. The boat has a catamaran type hull made of roto-molded polyethylene with a foam filled core. It is 10-ft-long, 48-in-wide and drafts 6-8 in of water. A 36-lb-thrust trolling motor is located near amidships in each pontoon for propulsion and steering. A third trolling motor is located at the stern to provide additional propulsion when needed. The boat is driven with a radio control system that directs power independently to each of the three motors. The system allows the boat to turn around in its own length. At this time two deep-cycle batteries provide power to the motors. Two additional batteries provide power for the data acquisition systems. For surveying, the boat is currently equipped with an Odom MB1 Multibeam Echo Sounder which provides a swath width of up to 120 deg. The unit's transducer is mounted below the waterline between the pontoons where it is protected from damage. The Odom is integrated with a sound velocity probe, a TSS motion sensor, and a dual frequency GPS system that provides position, heading, and raw GPS data logging capability. The multibeam unit will work in water less than a meter deep or as deep as 120 m. The transducer mounting bracket is also configured to allow a RDI Workhorse ADCP unit to collect velocity data from the vessel. An i7 CPU on the boat controls the multibeam unit (Odom software) and also logs data from the various sensors using Hypack software. The CPU receives real time video input from a webcam. All settings on this CPU are viewable and remotely controlled by radio link from the ground station. The system has been tested upstream and downstream of Bankhead Lock and Dam on the Black Warrior River. For comparison, data were collected the same week using a survey boat with an interferometric swath system. Additional testing of the survey system will be conducted to help determine operation limits such as operational time and the limits of the radio systems.

Products

This work will result in an unmanned survey vessel capable of collecting multibeam, velocity, GPS, and video data. Having the capability to safely survey all areas around navigation infrastructure will provide worker safety and the data needed to determine scour, obstructions and other conditions that may require engineering actions.

Benefits

Having the ability to determine the extent of scour downstream of dams has the potential to prevent dam failures. Having a reliable survey tool for presently inaccessible areas of waterways will provide more accurate data upon which maintenance decisions can be made.

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