

# Rapid Deployment Multibeam/Forward-Looking Sonar System

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## Introduction

A new survey system was recently delivered to the U.S. Army Corps of Engineers, Mobile District, that includes a state-of-the-art survey vessel and electronics suite which combines forward-looking and vertical-looking multibeam sonars. This requirement was predicated by the need for a survey system that could be deployed rapidly to the site of a marine accident, accurately locate and identify submerged obstacles, perform a detailed survey of the obstruction and its surroundings, mark and buoy the hazard, and generate charts/maps to define deviation routes and facilitate immediate and complete removal of the hazard.

## Background

The Mobile Corps is responsible for maintaining all of the navigable waterways within the District. According to Terrell Smith, head of the Irvington area office, the Corps has been working closely with the Coast Guard to investigate Maritime accidents that occur in the shipping channels in and around Mobile Bay. These incidents are primarily caused by hurricanes, navigation/steering malfunctions, and human error. To avoid compounding the loss or damage to equipment, cargo, or human life, the Corps of Engineers must quickly dispatch a survey vessel to the site, locate the sunken object, and perform the necessary surveys required to protect shipping and recreational boating.

## Mission

In addition to critical post-hurricane reconnaissance missions, the Corps must coordinate efforts with the Coast Guard in order to keep the waterways clear by searching for lost ships, barges, beacons, recreational vessels and other wrecks. When a hazard is reported, the object and the surrounding area must be surveyed quickly to determine if it is safe to reroute traffic around the hazard or, in extreme situations, if it is necessary to close the waterway until the obstruction is removed.

The new vessel, M/V Irvington, was designed and outfitted with the latest in high-resolution sonar technology to accomplish this mission. According to Mr. Smith, in earlier years, sonar profiling had been used (as a quick look around), however with increasingly stringent survey requirements, a much higher resolution system was sorely needed to ensure that the channels are clear of obstructions and safe for traffic. Earlier attempts to use off-the-shelf recreational sonars for obstacle avoidance proved ineffective. On several occasions, the survey vessel suffered extensive damage due to collision with the submerged object.



**Figure 1**  
**M/V Irvington**

## The Survey Vessel

The M/V Irvington is a 54' aluminum catamaran with a 20' beam. It provides a very stable platform for the onboard electronic systems and can transit to an accident site at 35 knots. Both primary sonars are deployed on rams through moon pool doors located just forward and just aft of the cabin.

The vertical-looking multibeam sonar head is fixed to the end of an electrically operated, telescoping ram as shown in Figure 2. In its deployed position, the amidships ram extends the sonar head to a point below the surface that allows the 120 degree across track beam to clear the hulls. Also located on the amidships ram is a dual frequency single-beam echo sounder for detecting and measuring the thickness any loose, unconsolidated sediments.



**Figure 2**  
**Amidships Ram**

## Sonar Systems

During the design phase, Mr. Smith and his team concluded that the combination of vertical and forward-looking sonar sensors would be mounted between the hulls of the catamaran for optimum coverage and protection. The RESON SeaBat model 8125 multibeam echo sounder was selected as the primary mapping sonar based on reports from other Corps Districts such as St. Louis and Detroit that are using the same equipment. The SeaBat 8125 is a focused, vertical-looking multibeam that provides the extremely sharp and detailed bathymetry data necessary for this application. Each beam is 0.5 x 1.0 degrees and the entire swath provides 3.5 times the water depth coverage across the bottom. With an update rate of 30/sec, the SeaBat 8125 offered the best solution for high speed, high-resolution data collection.

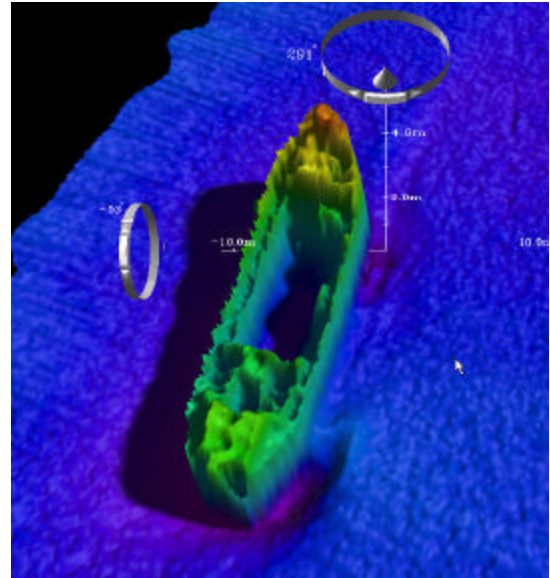
Mr. Smith adds, "The 8125 will also be used to identify shoals along the toes of the channels. Due to increasing requirement cost to perform Hopper Dredging within our jurisdiction, we have looked for a better system to accurately identify and quantify



**Figure 3**  
**Bridge of the M/V Irvington**

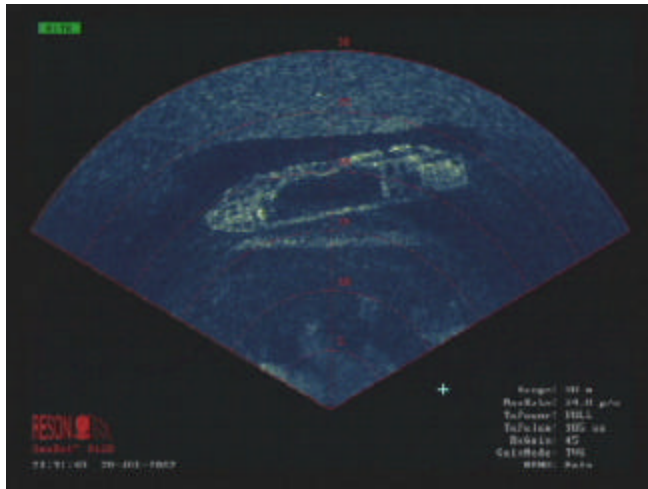
sediments in these areas. Extensive comparisons between the 200 kHz single beam from Odom and the 455 kHz multibeam from Reson will be performed to determine if there is any significant difference in the final dredge quantity calculations. We are confident that the 8125's narrow beam pattern and full bottom coverage will improve positional accuracies of depths acquired on the toes, thereby improving the accuracy of our computations."

The real-time forward-looking sonar, also from RESON, is the Seabat 8128. It is almost identical in size and functionality to the 8125 but incorporates elongated forward-looking beams of 0.5 x 20 degrees. As with the 8125, the 8128 has a range of 0.5 to 120 meters, covers a 120 degree sector, and updates at 30 Hz. The forward-looking imagery is very clear with near video quality for accurate object identification and video recording, even in zero visibility.



**Figure 4**  
**Vertical-Looking Sonar**

The software selected for calibration, data collection, editing, and post-processing was RESON's 6042v7 multibeam package installed on a PC platform similar to installations in the Galveston and Tulsa Corps Districts. Survey operators from Mobile received initial cross-training on the 6042 software at the Corps facility in Tulsa.



**Figure 5**  
**Forward-Looking Sonar**

### Sea Trial Results

Sea trials performed to date have been very successful with only a few minor problems that were quickly resolved. Final tests and 6042v7 training are scheduled to be completed by mid-March of 2003. Examples of data and images from the system will be presented and the vessel displayed at the HYDRO 2003 conference.