

High-Resolution Multibeam Sonar Survey and Interactive 3-D Exploration of the D-Day Wrecks off Normandy

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Historically, archaeological investigations use sidescan sonar and marine magnetometers as initial search tools. Targets are then examined through direct observation by divers, video, or photographs. Magnetometers can demonstrate the presence, absence, and relative susceptibility of ferrous objects but provide little indication of the nature of the target. Sidescan sonar can present a clear image of the overall nature of a target and its surrounding environment, but the sidescan image is often distorted and contains little information about the true 3-D shape of the object. Optical techniques allow precise identification of objects but suffer from very limited range, even in the best of situations. Modern high-resolution multibeam sonar offers an opportunity to cover a relatively large area from a safe distance above the target, while resolving the true three-dimensional (3-D) shape of the object with centimeter-level resolution. The combination of 3-D mapping and interactive 3-D visualization techniques provides a powerful new means to explore underwater artifacts. A clear demonstration of the applicability of high-resolution multibeam sonar to wreck and artifact investigations occurred when the Naval Historical Center (NHC), the Center for Coastal and Ocean Mapping (CCOM) at the University of New Hampshire, and Reson Inc., collaborated to explore the state of preservation and impact on the surrounding environment of a series of wrecks located off the coast of Normandy, France, adjacent to the American landing sectors. The survey augmented previously collected magnetometer and high-resolution sidescan sonar data using a Reson 8125 high-resolution focused multibeam sonar with 240, 0.5° (at nadir) beams distributed over a 120° swath. The team investigated 21 areas in water depths ranging from about three to 30 meters (m); some areas contained individual targets such as landing craft, barges, a destroyer, troop carrier, etc., while others contained multiple smaller targets such as tanks and trucks. Of particular interest were the well-preserved caissons and blockships of the artificial Mulberry Harbor deployed off Omaha Beach. The near-field beam-forming capability of the Reson 8125 combined with 3-D visualization techniques provided an unprecedented level of detail including the ability to recognize individual components of the wrecks (ramps, gun turrets, hatches, etc.), the state of preservation of the wrecks, and the impact of the wrecks on the surrounding seafloor. Visualization of these data on the GeoWall allows us to share the exploration of these important historical artifacts with both experts and the general public.

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