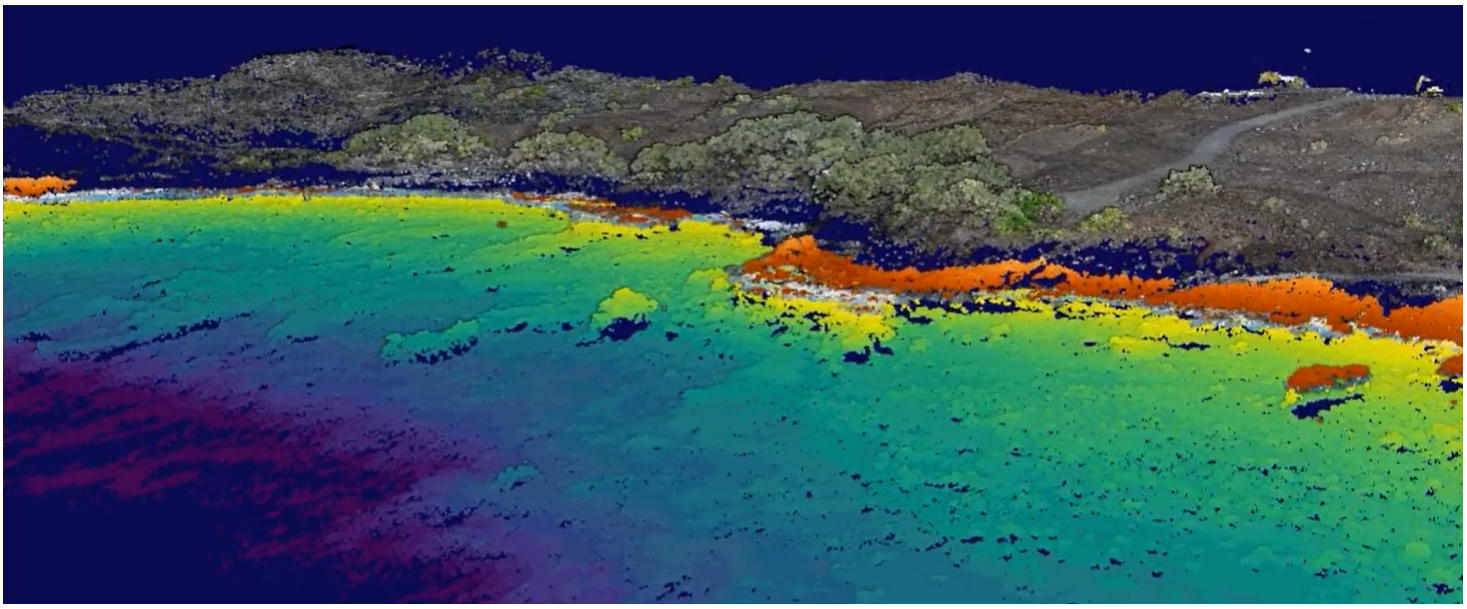
CASE STUDY

CHARTING COASTAL DEPTHS

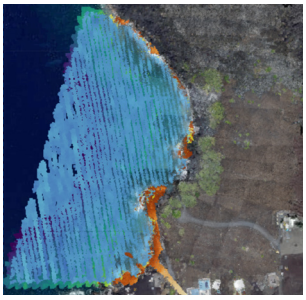
ORION SPACE SOLUTIONS
an Arcfield company

Near-shore precision mapping using bathymetric LiDAR



THE EDGE

EDGE 2-in-1 bathymetric lidar system produces high resolution point clouds, boasting over 150 pts/m² on a single pass. Above is a point cloud from a survey of a coral reef for reef health studies. Below is that data set overlayed on satellite imagery, including water surface in light blue and a colorized topo point cloud.



Monitoring of near-shore change detection is critical for safety of life, commerce, and maintenance of infrastructure, especially after major storms such as Hurricane Michael (Cat 5, Oct 2018). As seen in these pictures of the Panama City Inlet in Florida, displacement and submergence of jetty riprap and severe dune erosion resulted in severe boating hazards and dangerous conditions. The resulting bathymetric change diverts and focuses wave energy in complex ways that can further impact beach and dune erosion as well as boating channel navigation.

The shallowness of the near-shore environment exacerbates these issues and creates difficult conditions for measuring and detecting change, especially when traditional measurement techniques (sonar) require submergence in water. Risk to equipment and personnel are also a factor due to changing bottom topography, unknown obstructions, and dangerous shore conditions.

Orion Space Solutions, an Arcfield Company has demonstrated the ability to perform surveys of coastal areas with a high degree of accuracy, discerning navigation channels, identifying submerged objects of interest (rocks, sand bars, infrastructure, etc.), and providing accurate measurements of depth. Our personnel were able to scout the location, develop flight plans, perform UAV flights that simultaneously collected topographic and bathymetric data, and evaluate the resulting data in near real-time. Obtaining results while still deployed enables full data

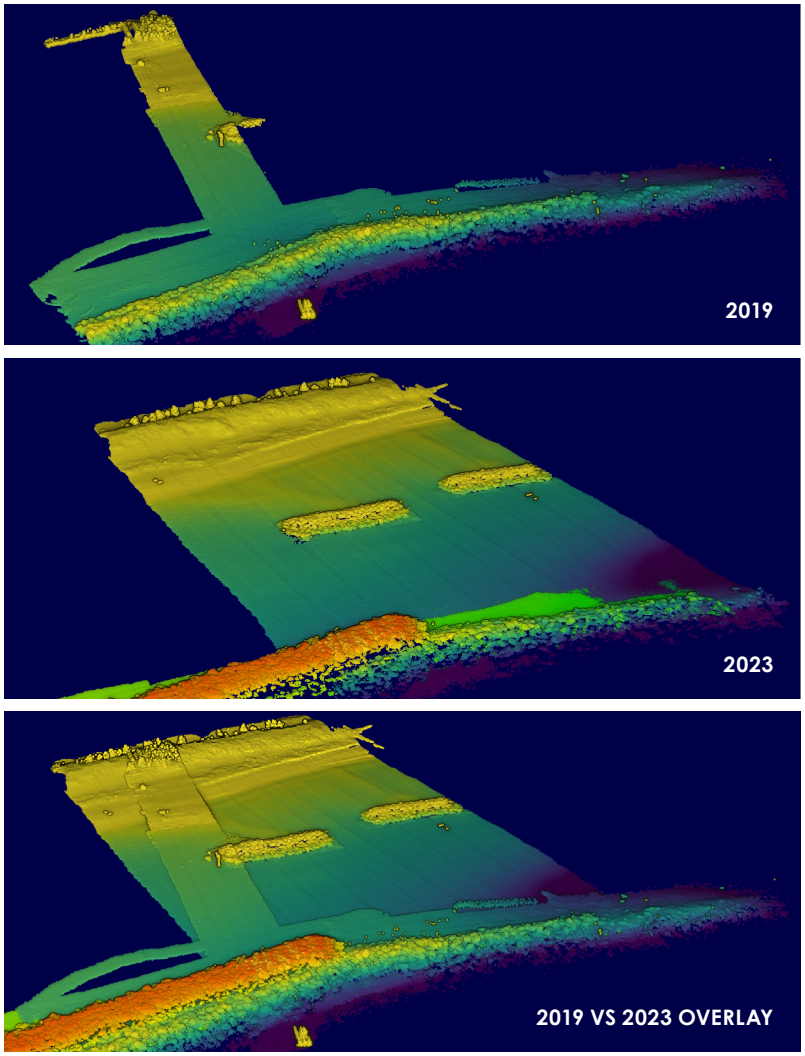
acquisition of the area of interest and represents a huge improvement over traditional bathymetric lidar with improved data acquisition for these challenging shallow waters.

Our topographic and bathymetric LiDAR has been used successfully in coastal areas to accurately measure shallow water depths, identify the extent, shape, and depth of coral formations, sand bars, and jetties. The ability to identify submerged rocks near the water surface of the Panama City Beach, Florida jetty damaged in Hurricane Michael is a prime example of the hazards to shipping channel navigation and danger to people and boats.

Using EDGE LiDAR to "paint the scene" underwater, high density point clouds of up to 300pts/m^2 were acquired of the damaged jetties so that the U.S. Army Corps of Engineers could determine if the rip rap was recoverable to repair the jetty. This level of detail also enables object identification by shape for suspended subsurface hazards, and assessment of infrastructure for structural integrity and potential damage.

CHANGE DETECTION

The data output of the system allows for change detection analysis of bathymetric data, offering unparalleled precision in monitoring underwater environments. By comparing multiple bathymetric scans acquired at different intervals, the system can accurately identify alterations in underwater topography, such as shifts in sediment deposition, changes in seabed morphology, variations in aquatic habitats, or changing shorelines. EDGE provides invaluable insights for a wide range of applications in oceanography, hydrology, and environmental monitoring, empowering decision-makers with actionable data for informed decision-making and effective resource management.



PANAMA CITY BEACH, FL - CHANGE DETECTION

Above are two data sets of the same area; the top was collected in 2019, and the middle was collected in 2023. The bottom image shows the two data sets overlayed on each other to show the dramatic changes of the bottom surface before and after a new jetty was installed. The images below highlight some of those changes. The image on the left shows where the new jetty was installed on top of the old. The orange/red points represent topography (above water), and the yellow-green-purple points represent bathymetry of the submerged /damaged jetty. The image on the right shows that after the jetty was installed, there was a 20-meter shift in the shoreline, highlighting the change detection capability.