

### Substructure's Survey Vessel *Orion*

Substructure's engineers and technicians designed and built *Orion* specifically to conduct near shore multibeam surveys capable of satisfying the International Hydrographic Organization's (IHO) Special Order standards, while also enabling safe and effective diving operations. Throughout the design/build process numerous, and often time-consuming, steps (e.g., reducing hull twist, minimizing engine and electrical noise, precise sensor placement and alignment, optimizing transducer location to minimize surface noise, etc.) were taken to enhance the boat's overall ability to acquire exceptionally high quality data. *Orion* is trailerable for easy transport and also has rated lift points to enable deployment with any conventional crane.



*Orion* parked adjacent to the RTK DGPS base station prior to launching at a remote survey site on Lake Superior.



*Orion* maneuvering around a structural support during a multibeam survey of a bridge on the Kennebec River in Maine. Inset photo shows the Reson 8125 multibeam sonar array just prior to installation of the sonar plug into the moon pool.

### Orion Hydrographic Survey Package

- Designed and built around a system of Substructure-owned components for conducting surveys to International Hydrographic Organization's Special Order Standards.
- R2Sonic 2024 and Reson 8125 Multibeam Echosounders, Applanix POSMV 320 Vessel Position and Orientation Unit, Odom Digibar Speed of Sound Profiler, Seabird SBE 37SI CTD, Knudsen 3212 Chirp Sub-Bottom Profiler, and Hypack / Hysweep, QPS Qinsy, and Caris HIPS/SIPS Data Acquisition and Processing Software Packages.
- Real-time Kinematic (RTK) differential GPS (DGPS) base station and multiple data link options for high-accuracy horizontal and vertical control.
- A-frame and davit attachments, large working deck, and open transom to support a variety of survey, sampling, and instrument deployment and recovery operations.

### Orion Commercial Diving Package

- Compressor, volume tank, filtration, hydraulics, generator, and redundant HP cylinders are all below a flush deck.
- Gas distribution, monitoring, communications, video and diver tracking incorporated into one panel located inside the pilothouse.
- Clear deck leads to the open transom and large swim platform with retractable ladder for easy deployment and recovery.
- Jet drive system permits safe and effective live boating applications for underwater inspections, pipeline tracking, etc.
- ORE Trackpoint 3 system to track a diver, towed sensor, or vehicle's underwater position from the surface.
- USACE accepted Health and Safety Manual for its contract diving operations to USACE 385 1-1.
- Substructure's diving program strictly adheres to all industry standards including: OSHA 29 CFR 1910 Subpart T, USCG/ DoT 46 CFR 197 Subpart B and ADC Consensus Standards.



*Orion* on its trailer illustrating installation of the faired pole for underway ADCP operations. Inset photo shows the pole mount as it was configured for shallow-water side-scan sonar survey operations.