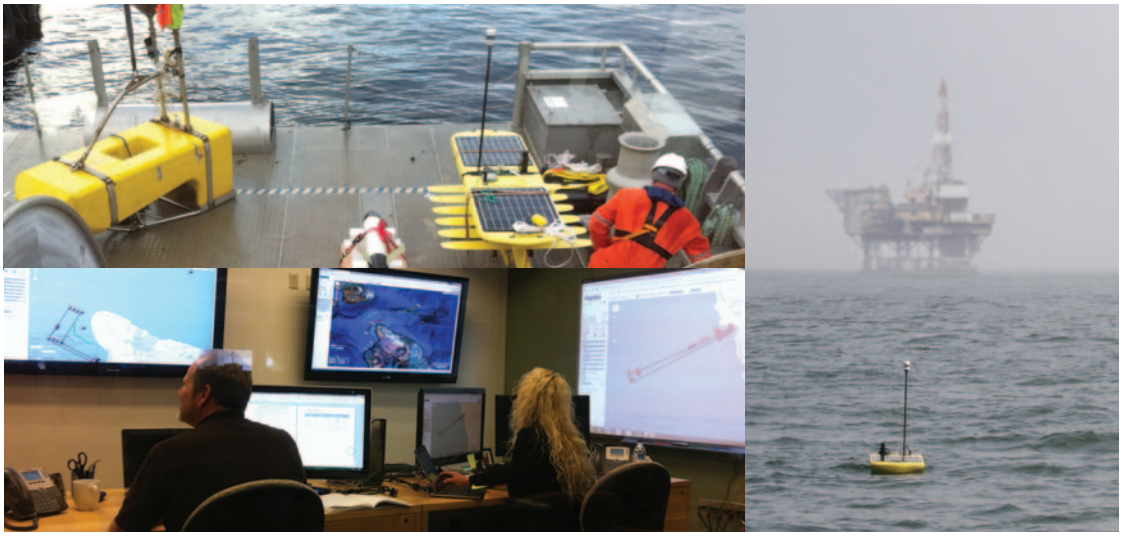
liquid robotics
OIL+GAS

+ ABOUT US

Liquid Robotics Oil & Gas, a joint venture with Schlumberger, is an innovative new company supplying leading-edge environmental and offshore measurement and communication services to oil & gas companies worldwide.

Combining Schlumberger's comprehensive global oilfield service & product offerings with Liquid Robotics' groundbreaking autonomous marine vehicle technology, we deliver real-time solutions to help the oil & gas industry address its exploration and environmental monitoring challenges.



As oil and gas companies face increasing operational demands and technical complexities, access to new sources of offshore environmental data willl bring increasing value.

Traditional offshore environmental data acquisition methods (e.g., support ships, satellites, and ROVs) for monitoring and surveying provide valuable insights, but they are limited in range and mission duration and are expensive to procure and maintain. Implementing innovative remote monitoring and survey technologies at lower acquisition costs and with greater operational efficiencies provides a significant business advantage.

Liquid Robotics Oil & Gas brings this advantage through the delivery of real-time, continuous services for applications including seep detection, METOC, biological monitoring, and subsea data communications.

Using a state-of-the-art marine platform that is environmentally safe (no fuel or emissions, and acoustically silent), yet rugged enough to withstand harsh offshore conditions for months or up to a year at a time, Liquid Robotics Oil & Gas can deliver game-changing information and analysis services to customers worldwide on demand.

+ APPLICATIONS

Communications

Wave Gliders provide an ideal, low-cost and persistent platform to communicate with subsea equipment via acoustic modem. For a variety of subsea sensors and equipment, this can provide operational control, assessment of the equipment, or the communication of real-time alarms. Depending on the application, data thus extracted can be recorded or transferred onwards via satellite. Application development is in progress to provide broadband communications for offshore facilities to augment or replace wired systems.

Magnetometry

Wave Gliders fitted with marine magnetometers / gradiometers, base station magnetometers, and other seismic receivers will provide a range of geophysical measurements needed during exploration, field characterization, directional drilling and persistent production monitoring.

MetOcean

We provide time-series and real-time data on meteorology, oceanography, weather observation, wave height, surface currents and loop current mapping – over your area of operation, specific locations and required time duration, for:

- Succesful planning and installation of offshore facilities
- Safe drilling and intervention operations
- Mission planning for close-pass seismic operations near obstructions

Response

When a spill happens, rapid detection and assessment of its location, extent, severity and composition is critical to the management of an effective response. Baseline field seep detection and the mapping of natural seeps is important in offshore exploration and in the assessment of post-spill remediation.
Wave Glider technology allows us to offer subscription services for rapid spill assessment and for low-cost, life of field environmental monitoring.

Surveillance

Combining METOC sensors and communications links on a single Wave Glider to extend the measurement envelope of at-sea installations. Over time, these capabilities will be expanded with additional sensors and security features.

+ NETWORK

The Wave Glider connects to shore via satellite and internet for remote piloting and delivery of data services.

The Wave Glider monitors weather, water, and ocean conditions around offshore installations while providing security alerts.

The Wave Glider can be linked to ship-board operators for piloting, coordinated operation, or to provide a communications gateway to undersea assets.

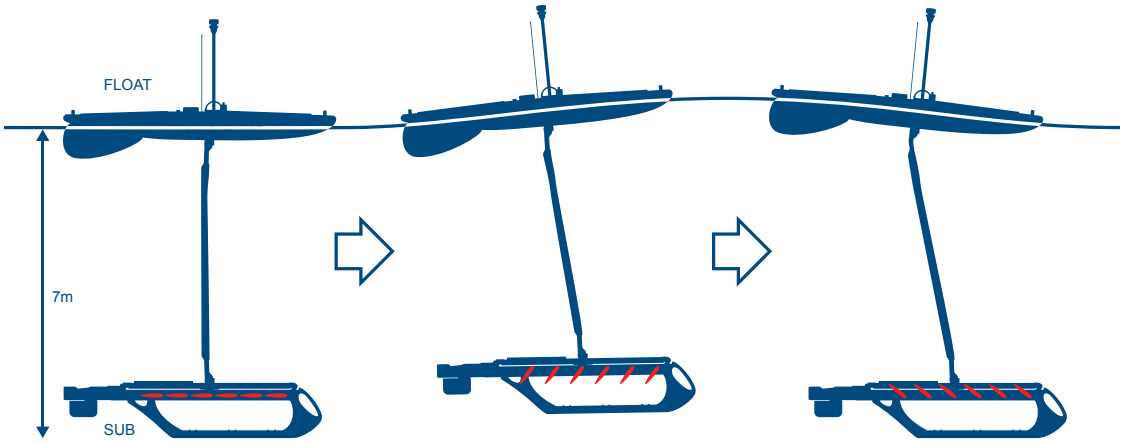
The Wave Glider provides real-time and recorded geo-stamped data on marine mammal activity.

The Wave Glider provides a subsea communications link to help monitor and extract data from Autonomous Underwater Vehicles (AUVs).

The Wave Glider communicates acoustically with subsea and wellhead equipment to extract data on condition and operation or to issue commands.

+ TECHNOLOGY

Wave motion is greatest at the water's surface, decreasing rapidly with increasing depth. The Wave Glider's unique two-part architecture exploits this difference in motion to provide forward thrust.

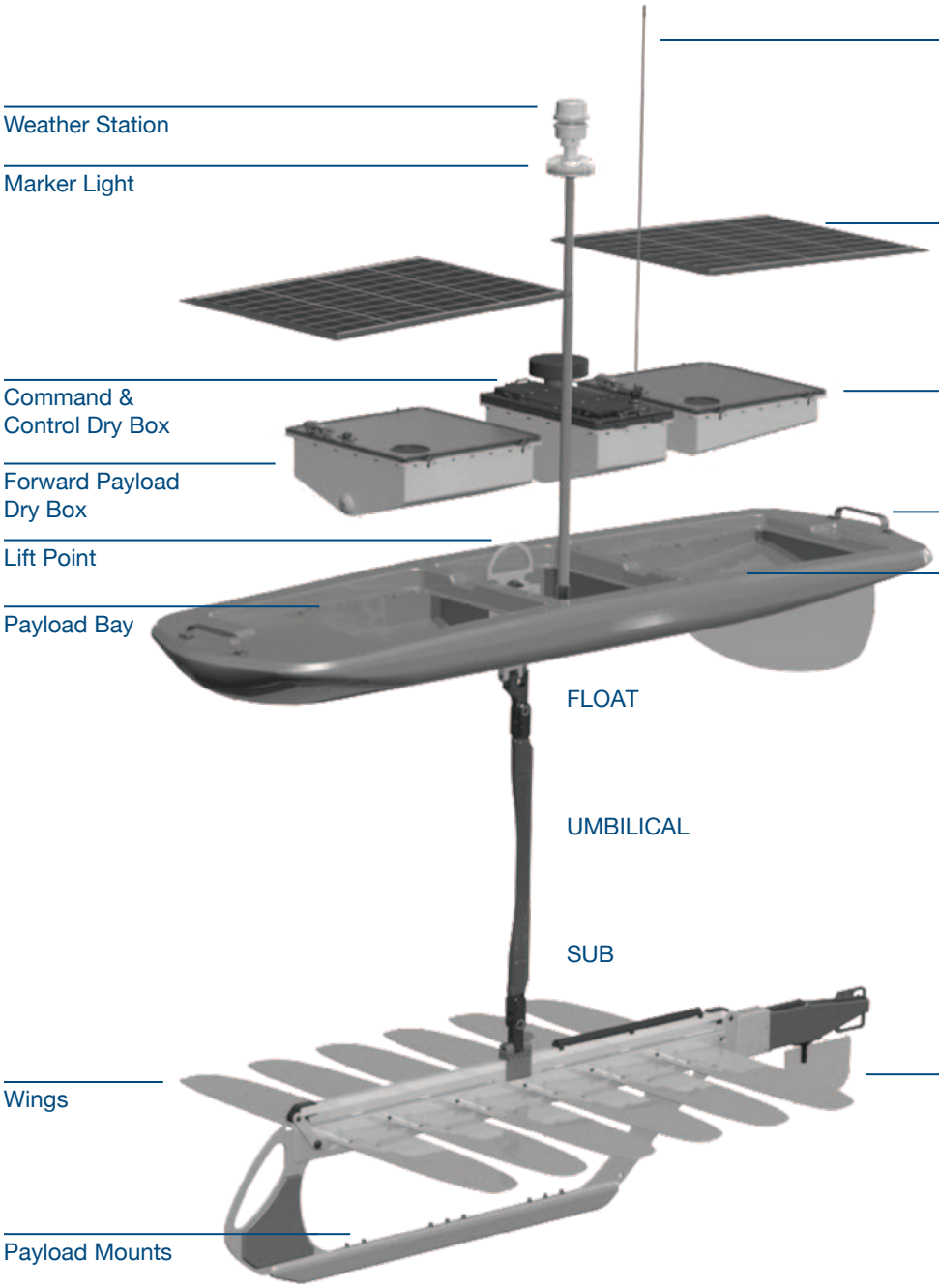


A rising wave lifts the Float, causing the tethered Sub to rise. The articulated wings on the Sub are pressed down and the upward motion of the Sub becomes an up-and-forward motion, in turn pulling the Float forward and off the wave. This causes the Sub to drop, the wings pivot up, and the Sub moves down-and-forward. This process is repeated again and again as long as there is wave motion on the surface, even the smallest amount.

A versatile platform, the Wave Glider is equipped with GPS and sophisticated computers for navigation and payload control, with satellite communication systems, and with state of the art ocean sensors to monitor and measure the environment around it. The power needed to operate the sensors and computers is provided by solar panels.

The Wave Glider is designed to exist harmoniously in the environments in which it operates.

+ ARCHITECTURE



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+ SPECIFICATIONS

GENERAL

Vehicle Configuration	Sub and Float joined by 6m (20ft) tether
Dimensions	Float: 208cm x 60cm (82in x 24in) Sub: 40cm x 191cm (16in x 75in) Wings: 107cm wide (42in)
Weight & Buoyancy	Mass: 90kg (200lb) Displacement: 150kg (330lb)
Endurance	Up to 1 year (variable)
Water Speed	0.4 kts to 2.0 kts (variable)
Depth Rating	Continuous wash and salt spray Brief submergence to 2m (6.5ft)
Observability	Silent propulsion system Minimal visual & radar signature Optionally increased by visibility mast, marker light and radar target enhancer
Transportation & Shipping	Two-person portable Air freight compatible

SAFETY

Emergency Location	Shore-activated marker light RF beacon Redundant Iridium tracker
Health Sensors	Pressure, temperature & leak sensors in dry boxes
Battery Compliance	Individual batteries are isolated from each other Automatic charge/discharge cut-off (for temperature and/or voltage)
Marine Mammals	Passive pressure-actuated release separates float from tether & glider if an entagled animal submerges the system

PAYLOAD

Architecture	Modular mechanical, electrical & software interfaces to general purpose housing Support for 3rd party payloads
Base Payload	Water speed sensor AIS receiver

NAVIGATION

Heading	Solid state magnetometer
GPS	12 channel WAAS capable
Accuracy	3m radius CEP50
Station Keeping	40m radius CEP90 in WMO sea state 3 (current <0.5kts)

POWER

Propulsion	Mechanical conversion of wave energy into forward propulsion
Battery	665 Watt-hours Lithium-ion rechargeable
Solar Power	80 Watts (peak) for battery charging, onboard electronics & payloads
Cmd/Ctrl	1.5 Watts continuous
Payload Power	Payload ports (3): 3A/13.2V PEP port: 5A/13.2V Glider port: 1A/13.2V System Maximum: 5A, continuous at 13.2V

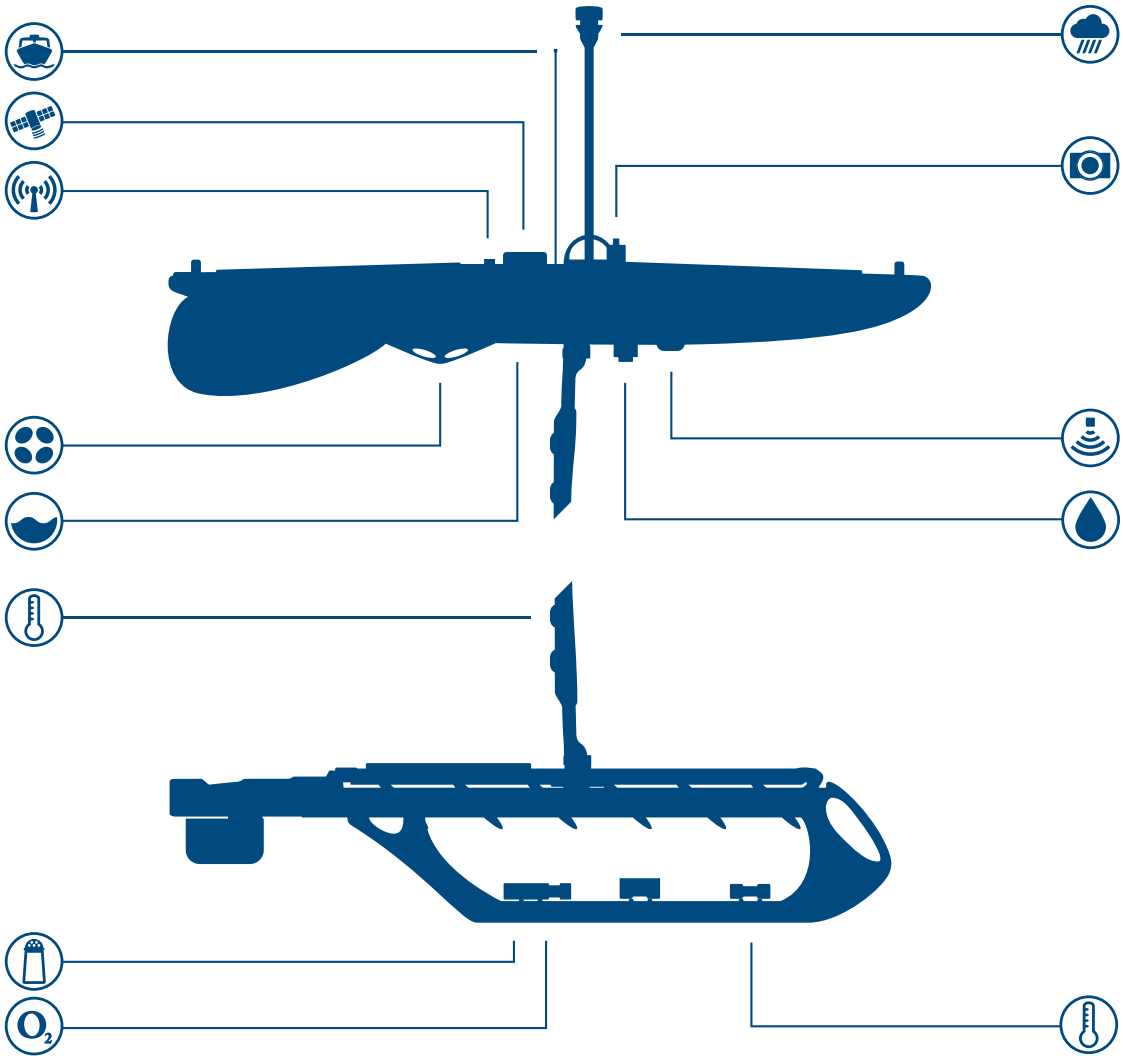
COMMUNICATIONS

Satellite	Iridium® 9602 or 9522B Short Burst Data and RUDICS Cellular modem option
Local	XBee-Pro® 2.4 GHz modem 100 ft range typical

OPERATIONS

Mission Control	Chart-based GUI Waypoint & course generation
Status Monitoring	Text & visual status indicators accessible via web interface SMS and email alerts Programmable in-/exclusion zones
Autonomous Navigation	Programmable waypoint course Follow course and hold/loop Station keeping at target

+ SENSORS



SURFACE SENSORS

- Camera
- Weather station
- Wave sensor

SUBSEA SENSORS

- ADCP
- Hydrocarbon sensor
- Conductivity sensor
- Dissolved oxygen sensor
- Temperature sensor

COMMUNICATIONS

- Acoustic modem
- Iridium: SBD/RUDICS
- Cellular/RF
- AIS

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