

liquid robotics





- Project Start: April 2005
- Company Founded: January 2007
- Product Introduction: 2009
- Today: 48 employees
- Headquarters:
Sunnyvale California
- Test & Development:
Big Island of Hawaii

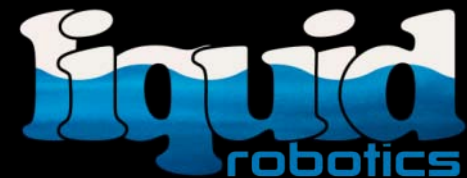


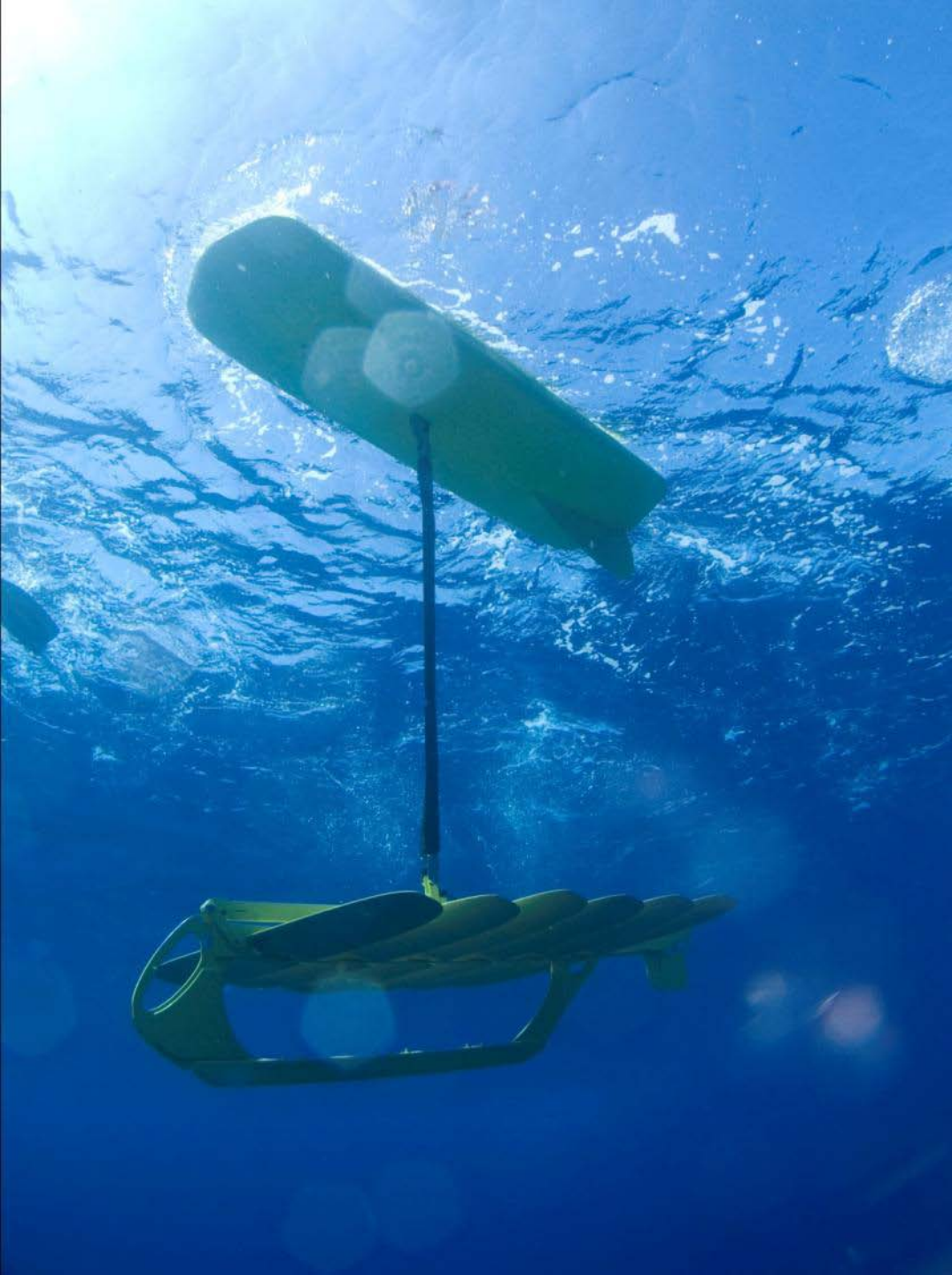


Wave Glider™

Autonomous Ocean Vehicle

No Fuel,
No Crew,
Low Capital Cost



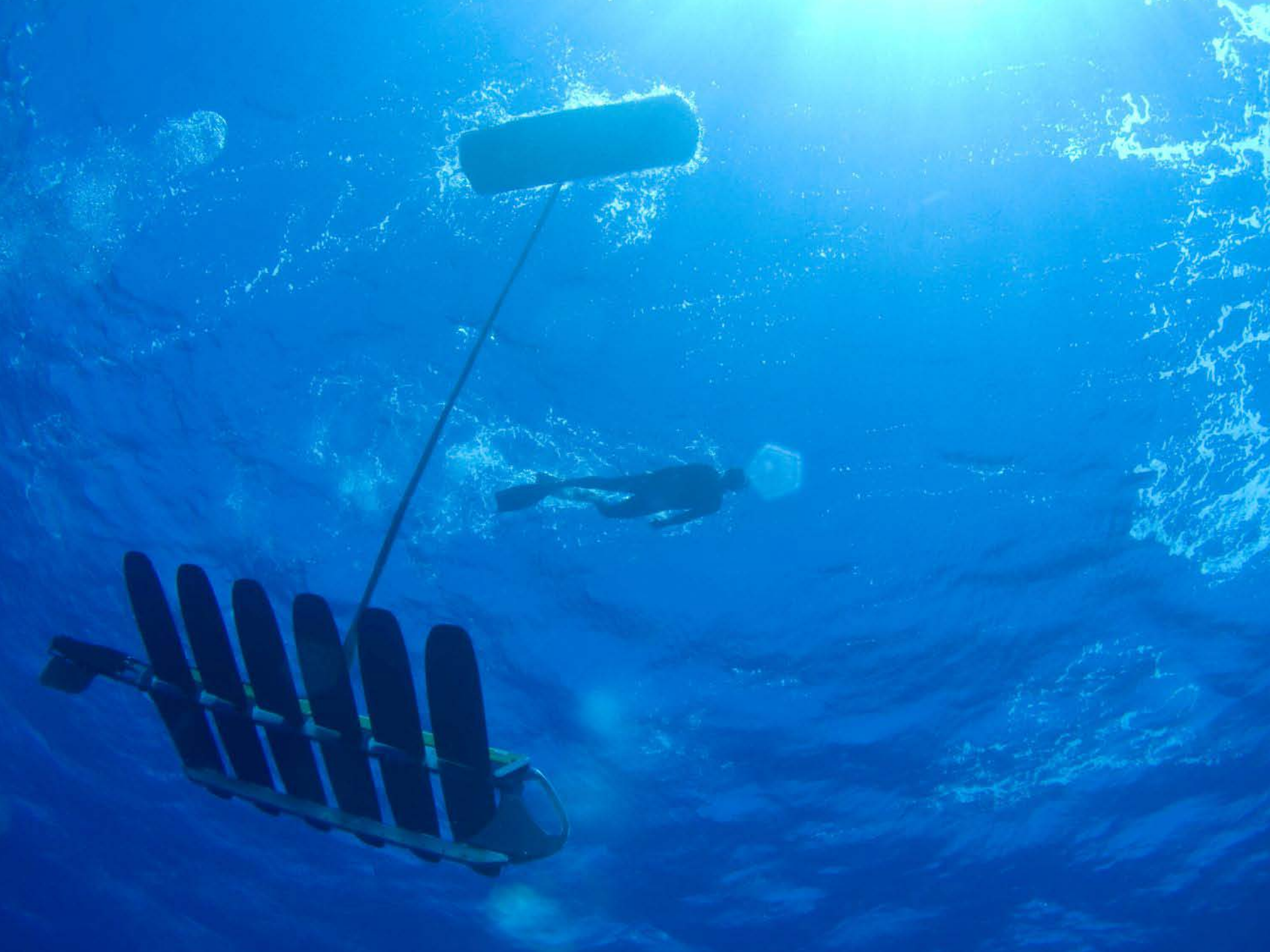


Wave Glider™

Autonomous Ocean Vehicle

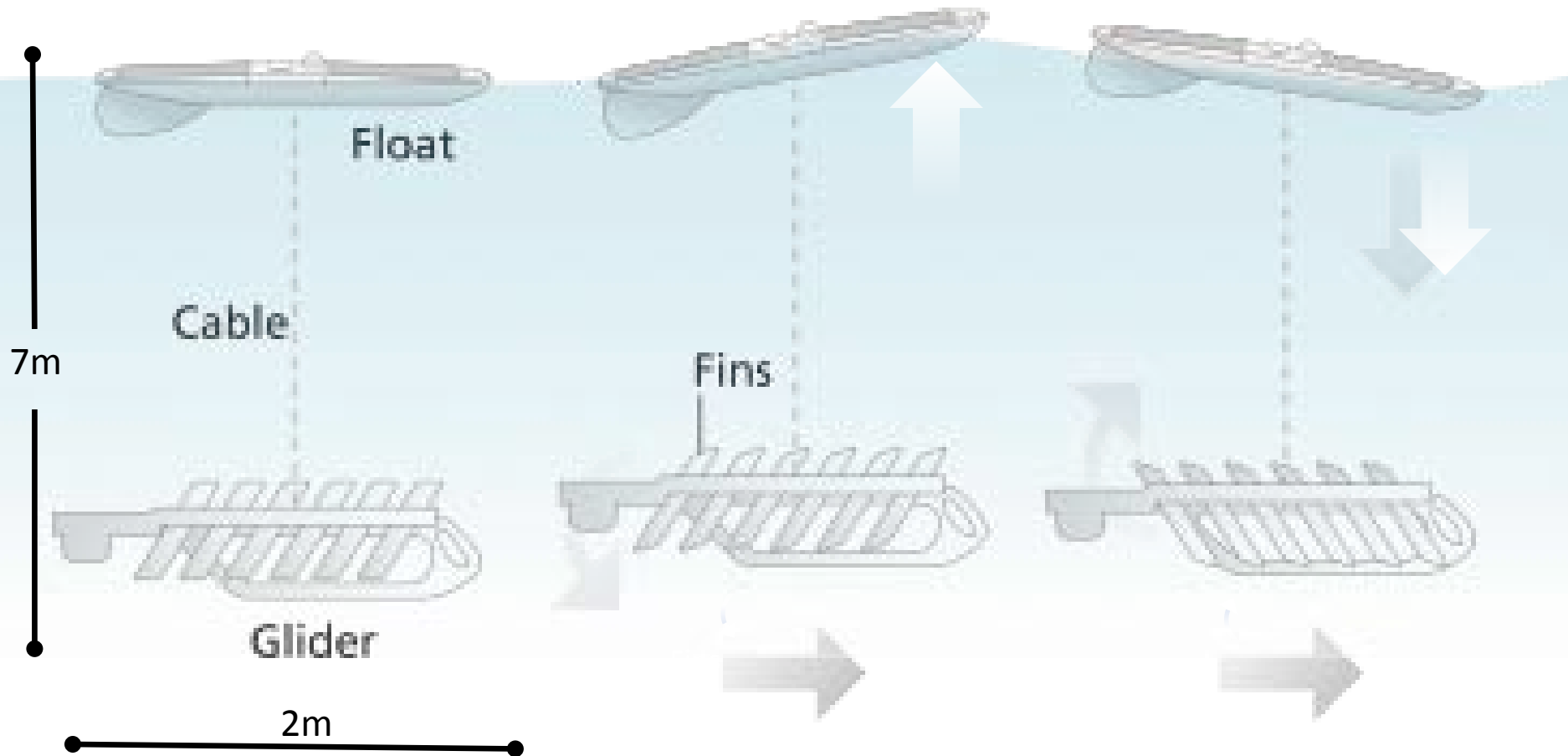
Natural Energy
Conversion Enables
Sustained Unmanned
Ocean Operations

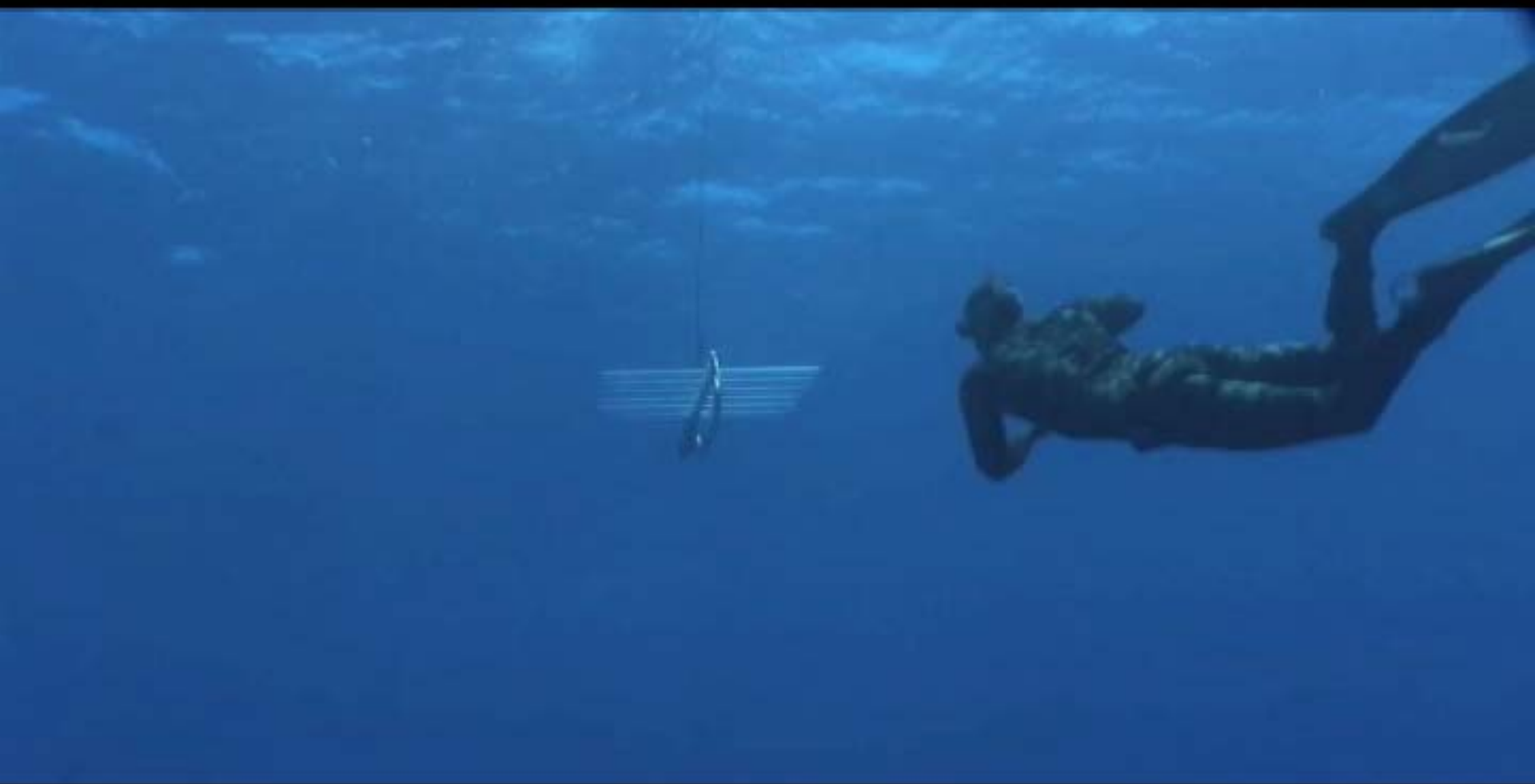


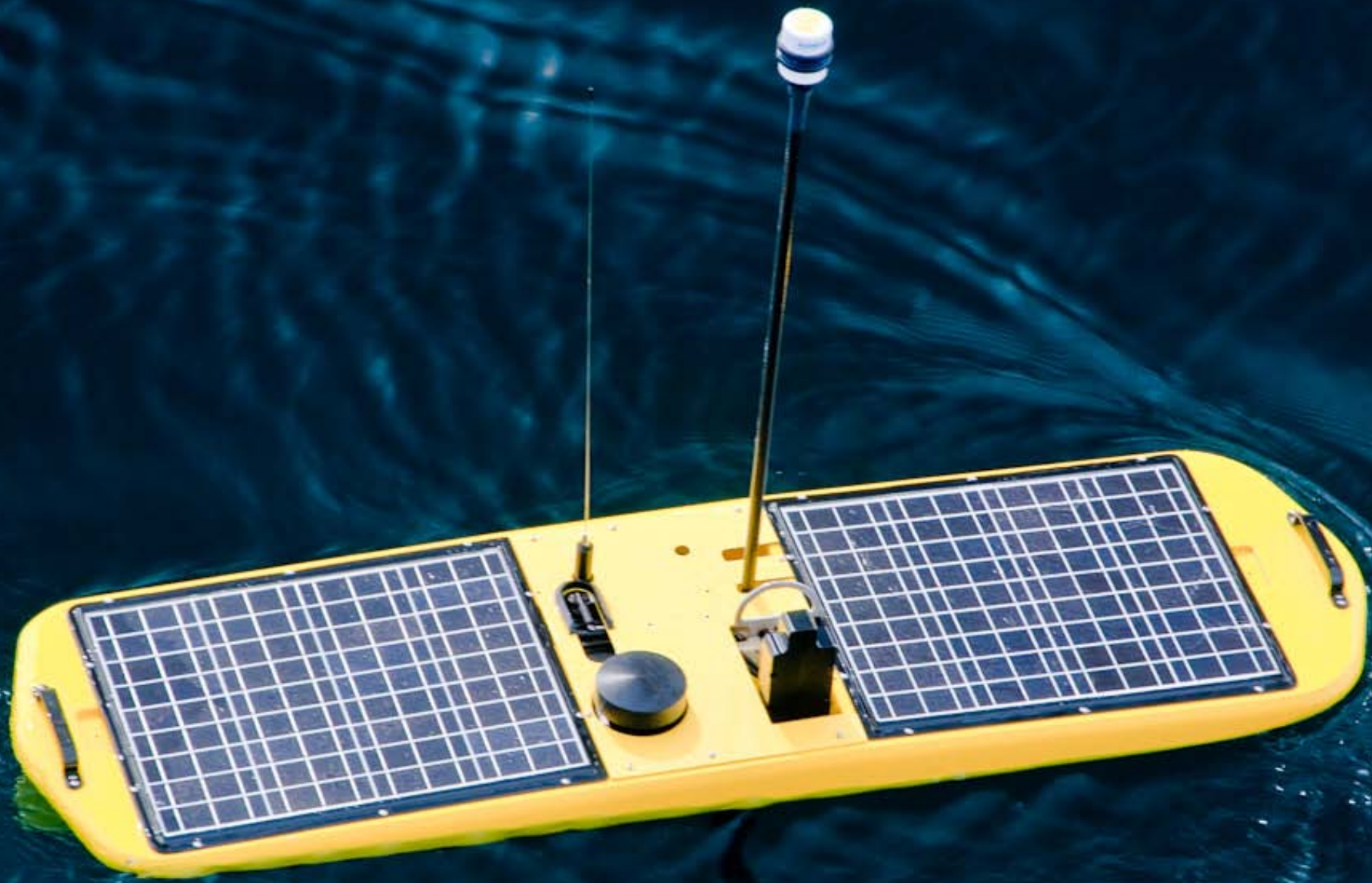


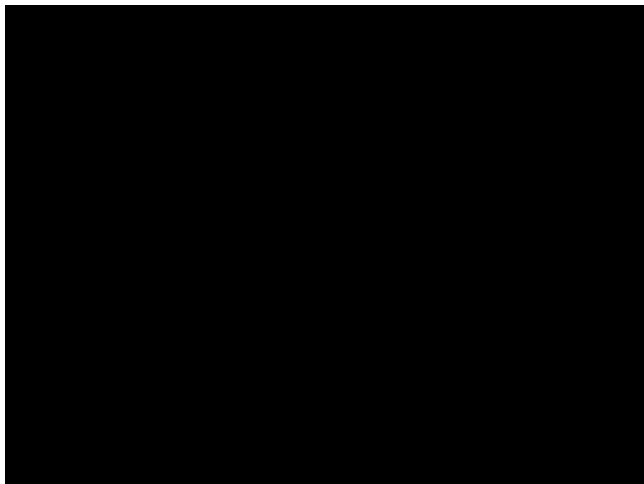
Wave Glider Concept

Submerged glider converts vertical motion into forward thrust



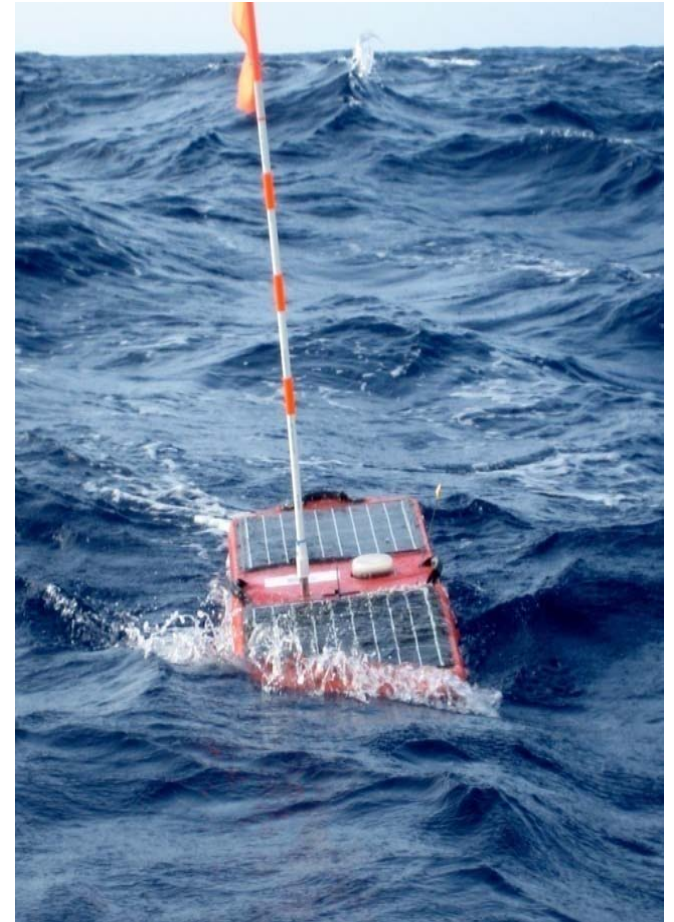






Wave Glider Basics

- Unique Two Part Vehicle:
 - Converts wave motion into thrust
 - Calm and rough seas
 - Thrust generation increases with sea state
 - Long mission durations possible
- Both a Buoy and a Vehicle
 - Travel to operation area
 - Return for maintenance
 - Patrol, survey or hold station
- It's Real:
 - Existing fleet has traveled over 100,000 nmi
 - Long Distance Missions
 - “Iron Man” vehicle approaching two years service



Wave Glider™

Proven Long Range Capability

As of September '09

Kawaihae, Hawaii

April-June '09
Red Flash
Monterey - San Diego - Eureka

August-Sept. '09
Red Flash
Monterey - Alaska

Palo Alto, California

June-August '09
Honu & Kohola
Hawaii - San Diego

What We Sell



Platform

Liquid Robotics Inc.



Apps

LRI
Apps
Team

**Partner
Ecosystem**



Ops

LRI Ops
Team

**Partner
Ecosystem**



Data



The Wave Glider Partner

Marketing Partners



Strategic Relationships



Sensor Manufacturers



Pacific Marine Environmental Laboratory
A leader in developing ocean observational systems to address NOAA's mission



International Channel Partners



Australia & New Zealand



France



Communication Technology
Italy



Spain



Norway



India



Japan



Germany



The Top Tech Ideas

The Journal Report



THE WALL STREET JOURNAL.

DOW JONES
A NEWS CORPORATION COMPANY

MONDAY, SEPTEMBER 27, 2010 - VOL. CCLVI NO. 74

★★★★ \$2.00

Last week: **DJIA** 10860.26 ▲ 252.41 2.4% **NASDAQ** 2381.22 ▲ 2.8% **NIKKEI** 9471.67 ▼ 1.6% **STOXX600** 263.97 ▲ 0.4% **10-YRTREASURY** ▲ 1 6/32, yield 2.610% **OIL** \$76.49 ▲ \$1.57 **EURO** \$1.3491 **YEN** 84.25

The Wall Street Journal 2010 Technology Innovation Awards

Among the winners: computer screens that can bend, adjustable eyeglasses, a low-cost genetic test, an online marketplace for receivables and a new way to battle malware

organizations and individuals in 30 countries. Journal editors reviewed the entries and forwarded about 275 to a panel of judges from

The Winners, Category by Category

This year the Innovation Awards judges chose winners in 17 categories. Here's a look at the winning entries.

BY Michael Totty

Robotics

Liquid Robotics Inc., based in Sunnyvale, Calif., is the winner in this category for developing an unmanned seagoing craft propelled by the power of ocean waves.

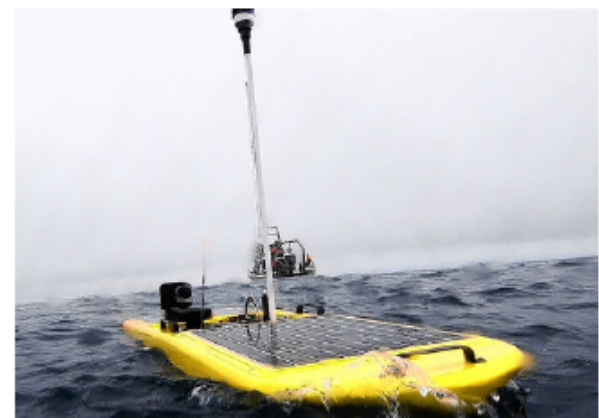
Most unmanned ocean craft can remain at sea for only a short time, relying on batteries to power propellers or pumps. The heavier their payload, the less time they have.

Thanks to its propulsion system, Liquid Robotics' Wave Glider avoids those limits

panels, converts the up-and-down motion of waves into forward thrust, making it possible to propel the buoy indefinitely without relying on batteries or other power sources.

The craft can be controlled remotely via satellite over an Internet connection. Instruments are powered by a solar panel on the surface of the floating buoy. Innovation Awards judge William Webb says the technology is "simple, novel and very workable."

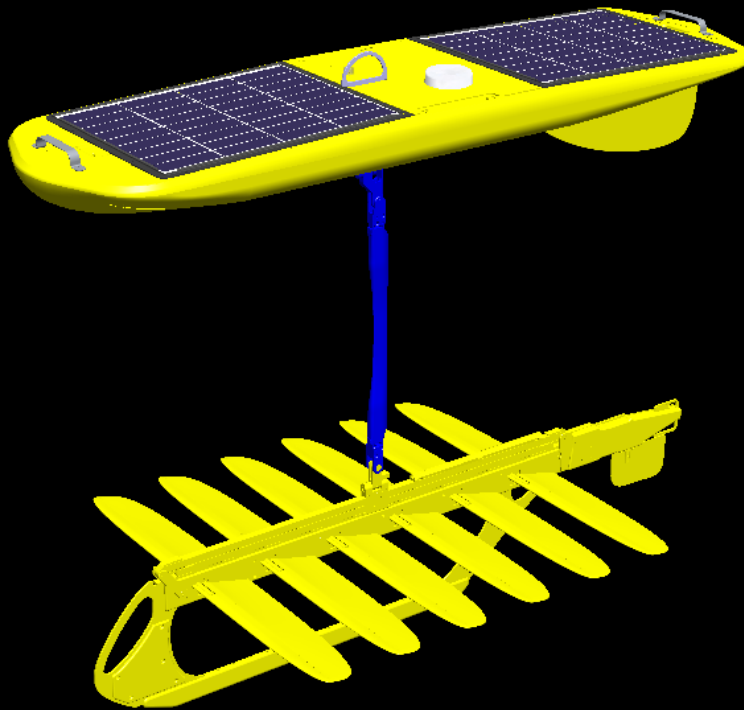
The vehicle originally was designed by co-inventor Roger Hine, a Silicon Valley engineer and now the company's chief executive, to monitor the activities of humpback whales. It can also be used for tsunami warnings, observing weather and ocean conditions



LIQUID ROBOTICS Wave Glider

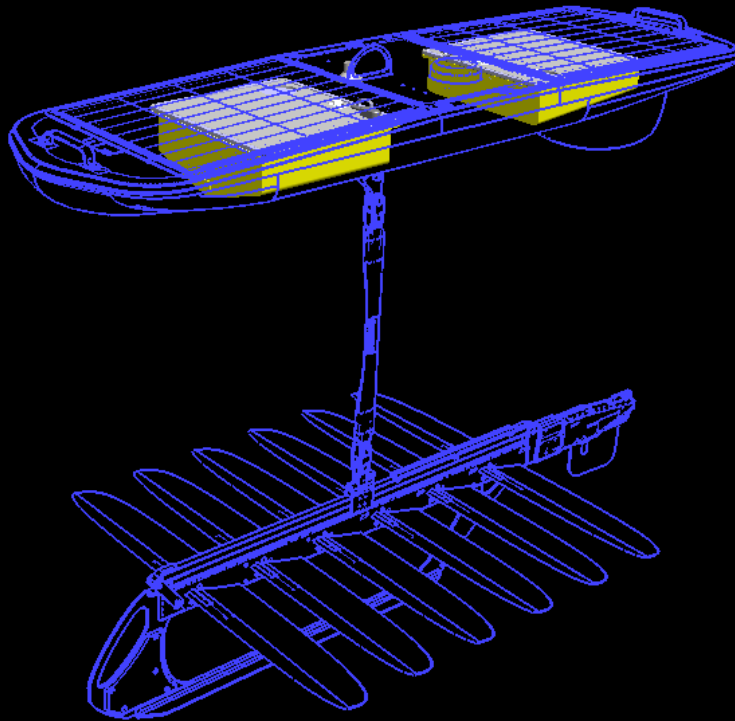
This summer, BP PLC deployed two Wave Gliders to the Gulf of Mexico to monitor water quality near the site of the well that exploded in April and spewed millions of gallons of oil into

Core Platform



This is the core Wave Glider™ vehicle. It comprises the float body with two photovoltaic panels; removable foam spacers; umbilical release; antenna mounting deck; core electronics package with Iridium uplink, GPS, command, control, navigation, and payload interfaces; submarine wave-powered thruster with shock-absorbing composite spring-bar; streamlined umbilical ; documentation; crates and packaging. Customer must select a Paint Option and a Comms Option.

Standard Options



- Payload Boxes
- Maintenance Contract
- Data Infrastructure
- Training
- Ops Support



U.S.
COAST
GUARD
BEGG

2000 L.P.
STEAM

Government Weather Services



NOAA National Data Buoy Center

“1058 stations deployed

878 have reported in the past 8 hours”

\$500M/10year SAIC contract to operate ~160 buoys

Does not include cost of 65 USCG buoy tender vessels

Station Keeping Comparison – WG: 50m M2 1700m



Alarms: Duration: 1 day Prior To: 4/11/2009 12:00 pm Most Recent Submit Map Options

Red Flash

Gliders:
[Roger Hine](#) ([Sign Out](#))

[End Mission](#) California

[Show System Menus](#)

Mode: Follow Seq
Course
Ave Speed: 1.11
Last Speed: 0.00
Target Waypoint: 6
Distance to Target: 14.1

Light: IR: XBee:

[Follow Sequential Course](#)

[Hold Station At Waypoint](#)

[Rudder Left](#)

[Rudder Right](#)

[Rudder Center](#)

[Hold Current Position](#)

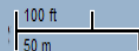
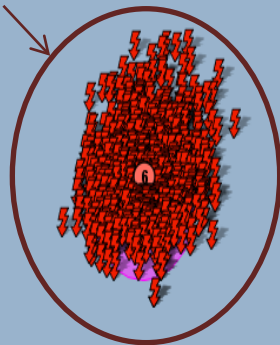
[Follow Fixed Heading](#)

[Set Parameter](#)

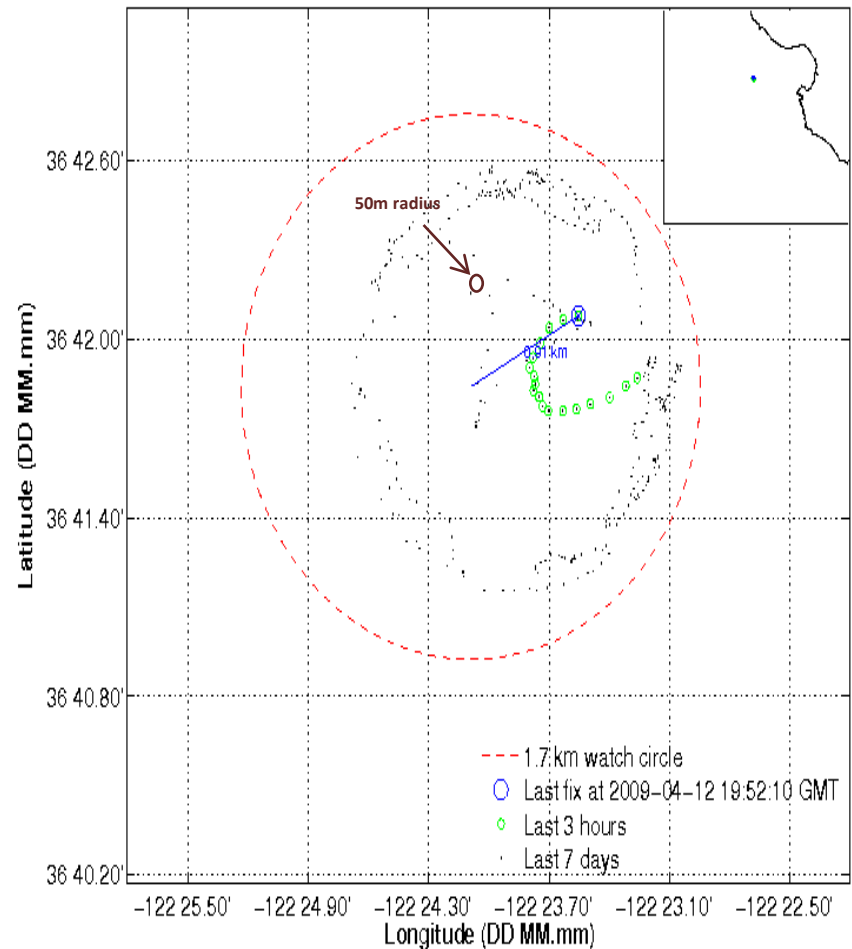
[Comment](#)

[More Commands ...](#)

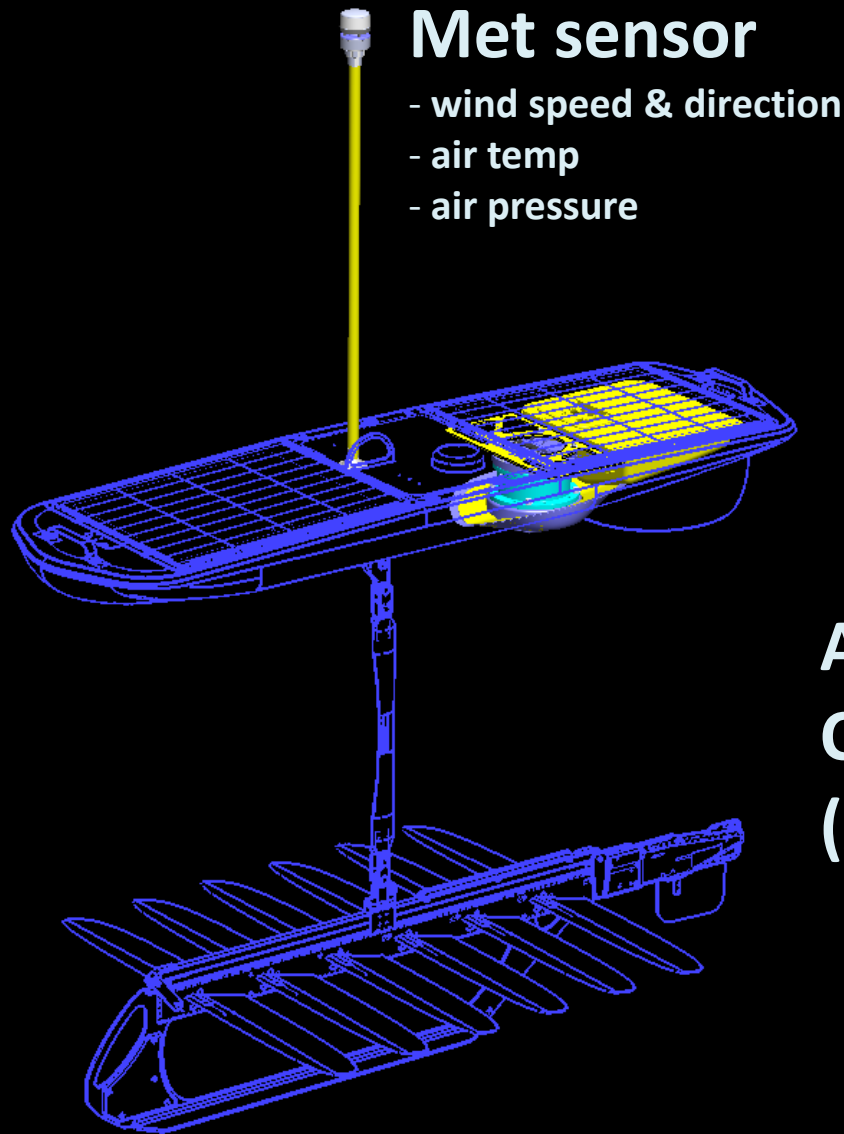
50m radius



Position of M2 – APRIL 2008 (36° 42.08'N -122° 23.55'E)



Met-Ocean Configuration: (in development)



Wave Sensor

**Acoustic Doppler
Current Profiler
(ADCP)**

US Met Ocean Leadership

Rear Admiral White, Navy CNMOC Commander

Captain Brown, NAVO Commander

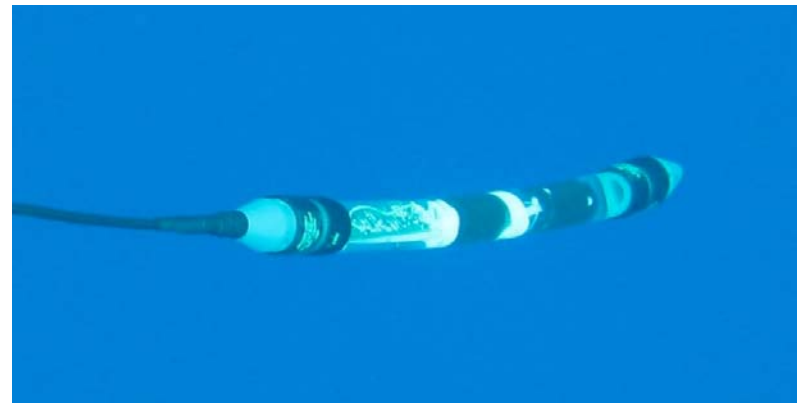
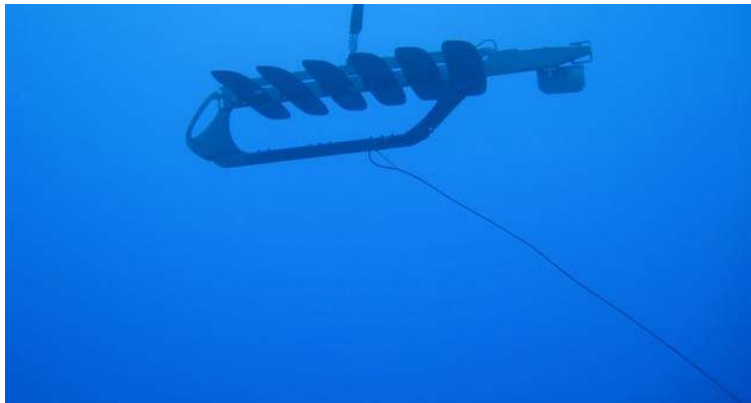
Helmut Portman, NDBC Director

Eddie Bernard, PMEL Director

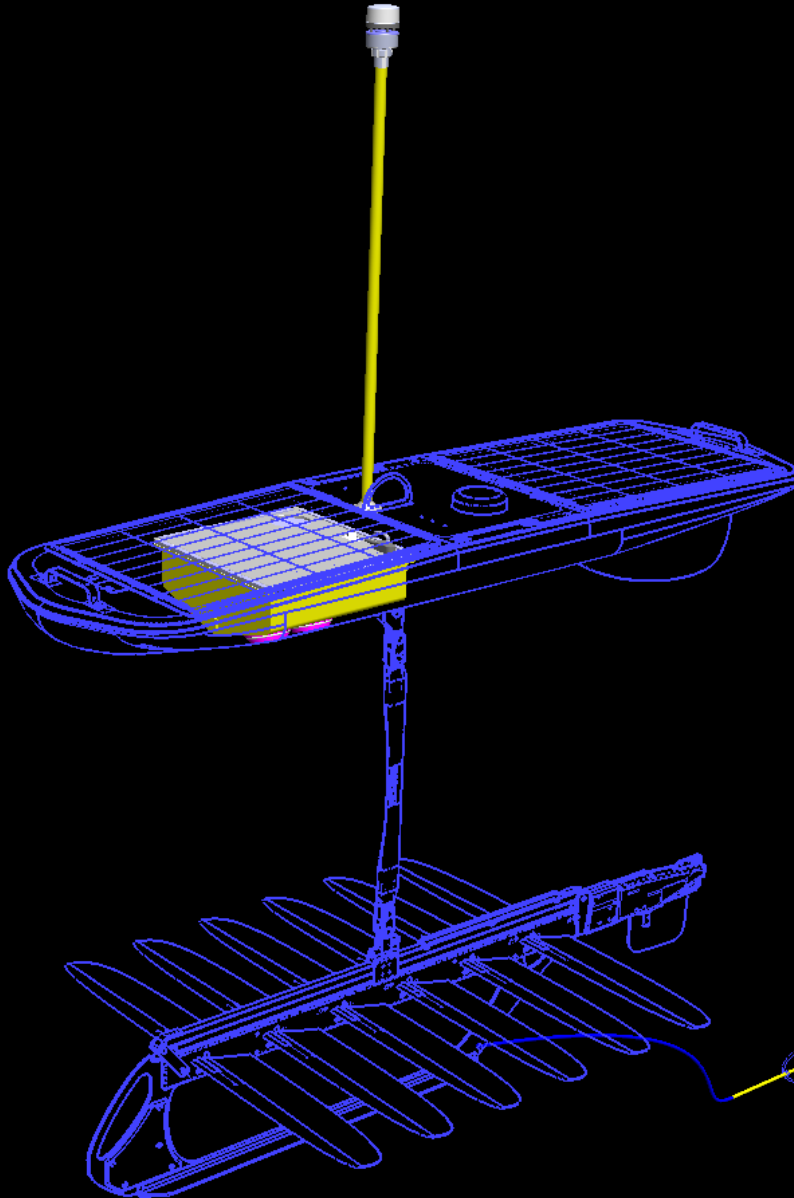


HARP Integration

- Hydrophone
 - Designed to be towed behind the Wave Glider
 - small cross-sectional area (25.4mm diameter)
 - small diameter (6.3mm) electro-mechanical cable
 - Consists of two transducers:
 - Benthos AQ-1 cartridge for 10Hz - 2kHz
 - Sonar Research HS-150 for 2kHz - 100kHz.
 - Both are amplified and filtered with electronics inside the oil-filled hydrophone tube. Conditioned analog signals are digitized and stored to disk by the HARP data logger.

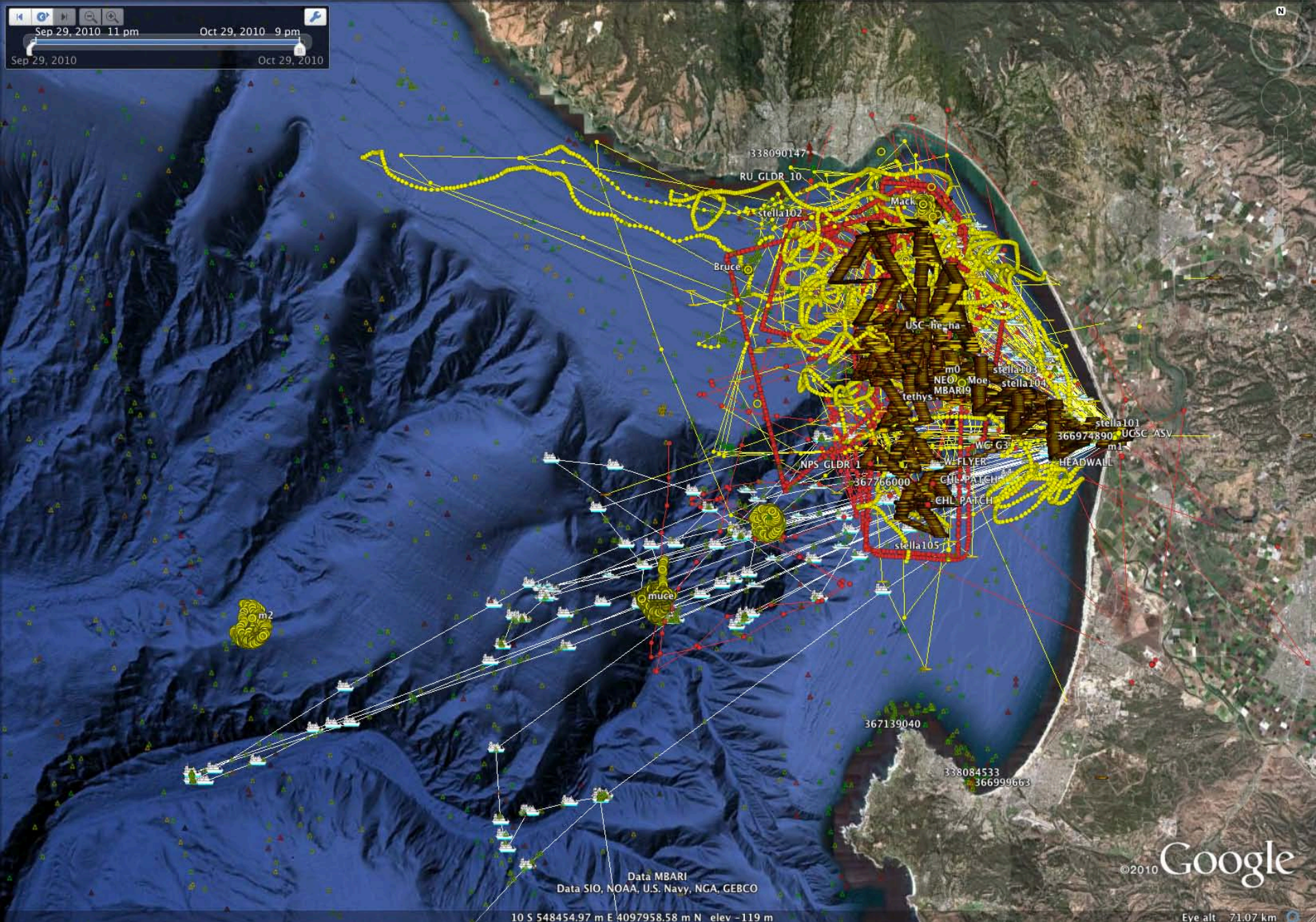


Fully Configured, with Payloads



Environmental Monitor Configuration (BP)

- Marine mammal acoustics
- Water Quality / Surface Oil
 - Refined Fuel
 - Crude Oil
 - Chlorophyll, CDOM, Turbidity
- Met Sensor
 - wind speed & direction
 - air temp
 - air pressure
- Camera



MBARI/BloomEx Demo





Gulf of Mexico response



Latest reports:

BP Deploying Advanced Unmanned Water Quality Monitoring Vehicles in Gulf of Mexico. As part of its long term monitoring and research program in the Gulf of Mexico, BP is deploying a new technology that will enable nearly constant monitoring by two satellite-controlled, unmanned vehicles.

[▶ Read the full press release](#)

Recent updates:

- [▶ Video: A look ahead with BP's Louisiana Incident Commander Brian Bauer](#)
- [▶ Video: Marsh Washer: a Gulf Coast business provides a new technology](#)
- [▶ Press release: BP Provides \\$52 Million To Fund Behavioral Health Support](#)
- [▶ Press release: Nearly \\$400 Million in Claims Payments as Program Transitions to GCCF](#)
- [▶ Live video: From Enterprise 'fishing' operation to remove well drill pipe](#)

Gulf of Mexico
response homepage



Response quick links:

- [▶ Making it right](#)
- [▶ Response in pictures](#)
- [▶ Response in video](#)
- [▶ Claims](#)

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- [BP America Facebook](#)
- [BP on Youtube](#)

Gulf restoration contacts

Unified Command Joint Information
Center: +1 713 323 1670/1

- [▶ http://www.restorethegulf.gov](http://www.restorethegulf.gov)
- [▶ JIC archive website](#)

Gulf Coast Claims Facility:
+1 800 916 4893
TTY: 866 682 1758

- [▶ Gulf Coast Claims Facility](#)
- [▶ www.bp.com/claims](http://www.bp.com/claims)

Environmental hotline and community
information: +1 866 448 5816

Wildlife distress hotline:
+1 866 557 1401

Volunteers: +1 866 448 5816

Vessels of Opportunity:
+1 866-279-7983

[▶ Further contact information](#)

[▶ Alabama response website](#)

[▶ Florida response website](#)

[▶ Louisiana response website](#)

[▶ Mississippi response website](#)

Investors

Sep 20, 2010 5:00 am

n Rouge

New Orleans

Mobile

Santa Rosa Island

Catt Island Horn Island

Dauphin Island
Petit Bois Island

Macondo Wellhead



Wave Glider™

Oil & Gas Data Services

- MetOcean (Meteorological & Oceanographic)
 - Currents
 - Waves
 - Weather
- Ecosystem / Habitat Monitoring
 - Marine Mammal Acoustics
 - Water Quality / Surface Oil
 - Wildlife & Bio-Science
- Seep Detection & Monitoring
- Marine Seismic Survey
- Subsea Support
- Security & Situational Awareness



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