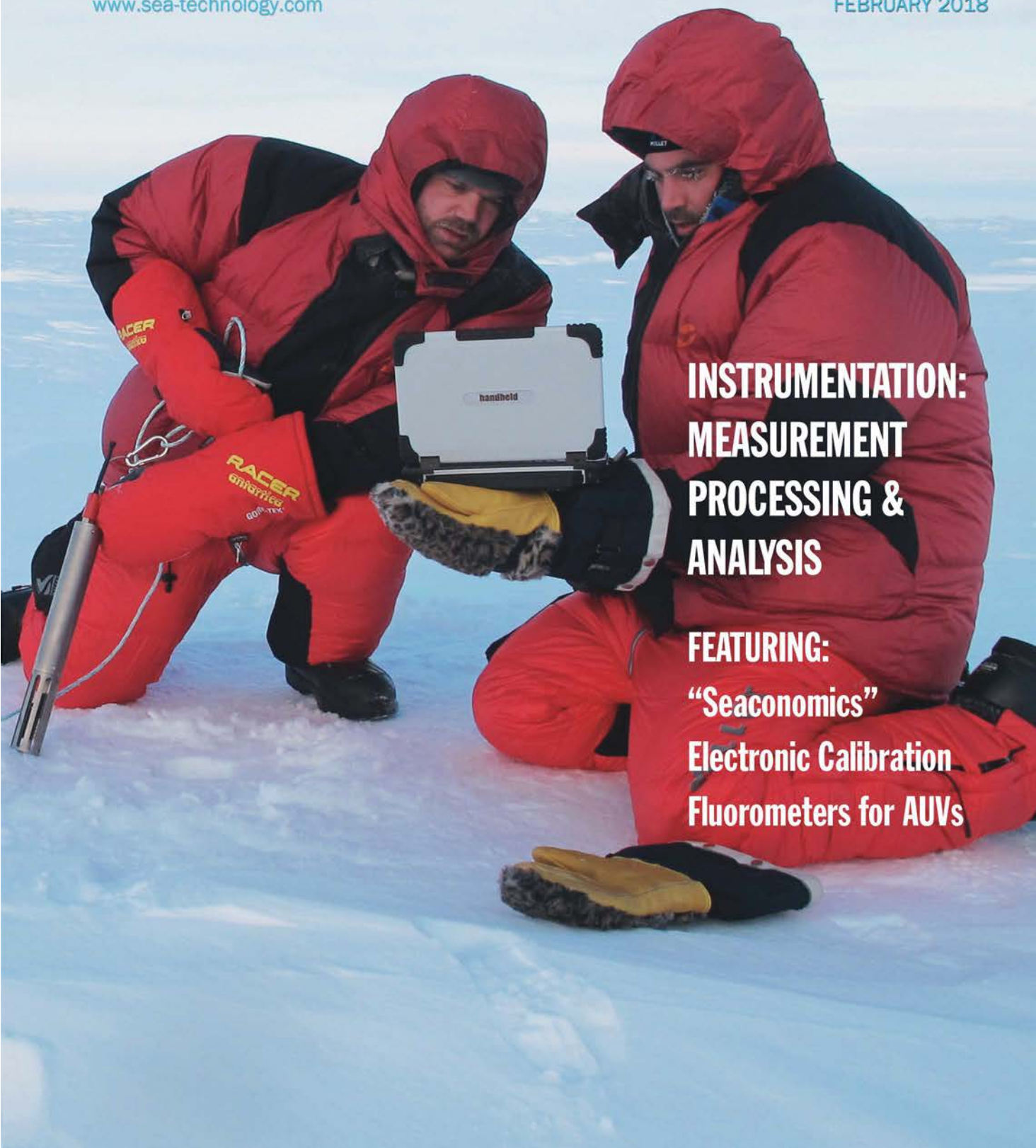


SEA TECHNOLOGY

www.sea-technology.com

FEBRUARY 2018



**INSTRUMENTATION:
MEASUREMENT
PROCESSING &
ANALYSIS**

**FEATURING:
“Seaconomics”
Electronic Calibration
Fluorometers for AUVs**

Mobilized for Science.

World-class CTDs with twist
activation and Wi-Fi connectivity.

Extreme ease of use means never
needing to open the instrument on
location.

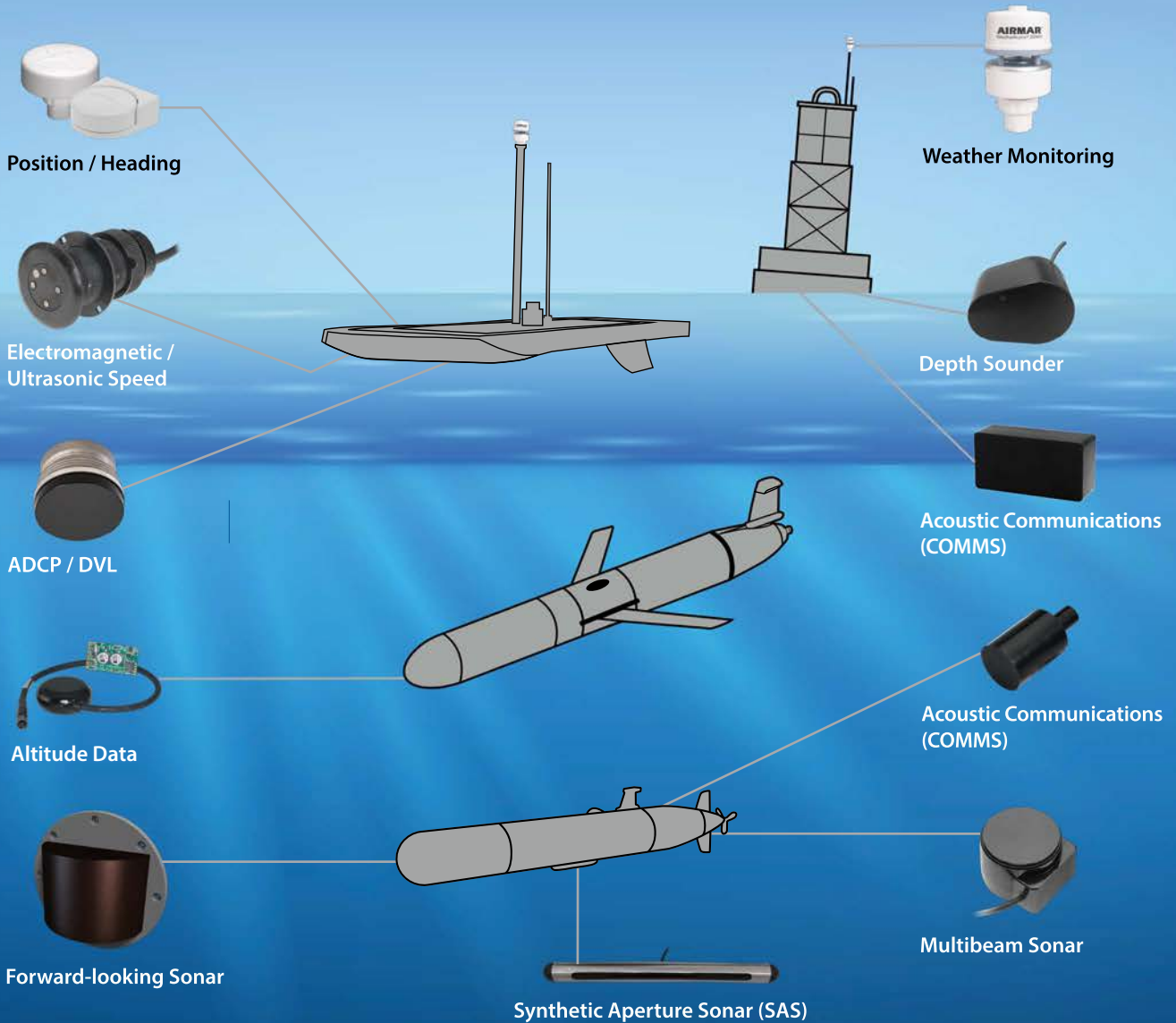
Deploy and download using Windows,
macOS, Android, and iOS.

Science made mobile.



RBR
rbr-global.com

Sensor Intelligence for the Ocean's Explorers



Collecting and connecting from surface to seafloor, AIRMAR and MSI push the boundaries of ultrasonic technology to deliver multi-sensor and array solutions that ensure the highest level of data integrity. Consult with our engineering teams to source or design the perfect combination of sensors to achieve your mission's goals.

Visit us at Oi 2018 stand C151



AIRMAR.COM



MSITRANSDUCERS.COM

NOBSKA: The Perfect Current Meter

We at **NOBSKA** realize that there isn't a perfect Current Meter. If anyone tells you there is, **BEWARE!!!**
 The perfect current meter does not exist, but the right one for you may exist.
 This Chart can help you select the right **NOBSKA** Current Meter.

Model	3-D Vel	3-D Compass	3-D Tilt	Battery	RS-232	Memory	Comment
MAVS-5SD	✓	✓	✓		✓		2000 m. Real Time
MAVS-5SL	✓	✓	✓	✓	✓	✓	2000 m. Logging
MAVS-5DD	✓	✓	✓		✓		6000 m. Real Time
MAVS-5DL	✓	✓	✓	✓	✓	✓	6000 m. Logging
MAVS-5WTG	✓	✓	✓	✓	✓	✓	Directional Wave/Tide
★ MAVS-5-90DEG	✓	✓	✓	✓	✓	✓	90 Degree Bent Sensor
★ MAVS-5MMP	✓	✓	✓	✓	✓	✓	Moored Profiler MAVS



OPTIONS

Pressure, Temperature, Conductivity, Turbidity, RS-485, 90 Deg Right Angle Bent Sensor, Power and Comm Box, Mooring Frame, Sensor Guard Cage, Long Cable for Real Time Data Transmission, 1 Gigabyte Logging Memory Option

All **NOBSKA** Current Meters are Single Point Meters and utilize the Differential Travel Time measuring technique. This technique does not require scatterers in the water to make the measurement. A major benefit: you can measure the smallest currents in any kind of water—clear, turbid, fresh or saline. Another benefit is that the circular faired rings support the sensors, keep wake turbulence at a minimum and provide an ideal cosine response. Another major feature is the **THROW-AND-GO** operation whereby either you or we can preset the MAVS for its deployment schedule in the lab and then simply deploy it at the most convenient time.



Go to www.nobska.net and click on [WhyMAVS.ppt](#) to learn more



NOBSKA
 Owned by Scientists - Serving Science



Sales & Marketing: 319 Seasons Dr. • Punta Gorda, FL 33983 • Tel: 941-766-0706 • Fax: 941-766-0707 • Email: dan-schaaf@att.net
Corp. Headquarters: P.O. Box 308, 12 Nobska Circle • Woods Hole, MA 02543 • Tel: 508-548-6450 • Email: awilliams@nobska.net

<http://www.NOBSKA.net>

CONTENTS

February 2018, Volume 59, No. 2

FEATURES

- 10** **THE MARITIME WORLD ENTERS THE FOURTH INDUSTRIAL REVOLUTION**
Rafael Ponce (Esri) calls for a revolution in the processing, analysis and use of data in today's new era.
- 15** **OCEANOLOGY INTERNATIONAL**
—Conference Preview
- 17** **PROPER CALIBRATION OF ELECTRONIC EQUIPMENT**
Todd Chaikin (NSCA Technologies, Tra-Cal Lab) and Darwin Phillips (Tra-Cal Lab) outline techniques for calibrating essential defense technology.
- 23** **CANADIAN HYDROGRAPHIC AND NATIONAL SURVEYORS' CONFERENCE**
—Conference Preview
- 26** **FLUOROMETERS: EXPERIENCES WITH AUTONOMOUS VEHICLES**
Lawrence Younan (Turner Designs Inc.) explains how integrating fluorometers into AUVs enables extensive ocean studies.

DEPARTMENTS

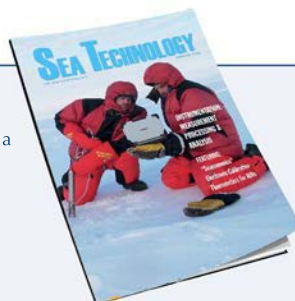
- | | |
|-------------------------------|---|
| 7 Editorial | 42 Ocean Research |
| 9 Soundings | 44 Marine Electronics |
| 31 Ocean Business | 46 Contracts/Meetings |
| 33 International | 47 People |
| 36 Marine Resources | 48 Professional Services Directory |
| 38 Marine Renewables | 49 Soapbox |
| 40 Product Development | 50 Advertiser Index |

COVER IMAGE

Measurement during a French North Pole expedition using a CTD probe from Sea & Sun Technology GmbH.

NEXT MONTH

Removal of rust staining caused by crevice corrosion ... Analyzing changes in coastal areas using satellite data ... New techniques in ship design and CFD ... A docking station for underwater drones with port monitoring applications.



©Copyright 2018 by Compass Publications, Inc. Sea Technology (ISSN 0093-3651) is published monthly by Compass Publications, Inc., Suite 1010, 1600 Wilson Blvd., Arlington, VA 22209; (703) 524-3136; FAX (703) 841-0852. All rights reserved. Neither this publication nor any part of it may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior permission of Compass Publications Inc. Periodicals postage paid at Arlington, Virginia, and additional mailing offices. Subscriptions may be purchased at the following rates: domestic, \$60 one year; \$80 two years; foreign air mail, \$144. Single copies \$4.50 plus shipping and handling (current issue only). POSTMASTER: send address changes to Compass Publications, Inc., P.O. Box 600, Deer Isle, ME 04627-0600. CUSTOMER SERVICE, Tel. 1-800-989-5253 or 1-207-348-1057.



Let's cut the cable.

Teledyne Benthos ATM-900 Series Acoustic Telemetry



Modems are the culmination of over twenty years of experience in the design and manufacture of advanced acoustic communication technology, ensuring the success of your next mission.

From shallow water to the depths of the ocean, Teledyne is there to deliver proven a-comms solutions.

Contact us today to learn how we can assist you!

+1-508-563-1000 or
benthos@teledyne.com
www.benthos.com

We bring advanced wireless communication capabilities to these platforms:



TELEDYNE MARINE
Everywhere you look!
www.teledynemarine.com

Riptide set out to change the undersea vehicle market by combining best in class hydrodynamics, ultra low power processing, and game changing new energy technology, while significantly reducing vehicle costs. To accomplish this, we introduced the small, yet highly-capable micro-UUV.

And now, the
Family just got
BIGGER

Visit us at
**OCEANOLOGY
INTERNATIONAL 2018**
13-15 March
London ExCel Center
BOOTH F571

Introducing the Riptide Family of Low-Logistics, Man-Portable UUVs



Micro-UUV
4.875" Diameter
~25 lbs
300m rated



1 Man-Portable UUV
7.5" Diameter
~65 lbs
300m rated



2 Man-Portable UUV
9.375" Diameter
~120 lbs
600m rated

Riptide 
Autonomous Solutions

Email: info@RiptideAS.com • Website: www.RiptideAS.com

Phone: +1 617-820-4586 • Address: 36 Farmside Drive, Pembroke MA, 02359 USA

ADVERTISING REPRESENTATIVES:

HEADQUARTERS

C. Amos Bussmann
1600 Wilson Blvd., Suite 1010
Arlington, VA 22209
Tel: (703) 524-3136 • FAX: (703) 841-0852
e-mail: seatechads@sea-technology.com

NORTH AMERICA, EAST COAST

MJ McDuffee
Director of Business Development
Tel: 772-485-0333 mobile
e-mail: m-j@comcast.net

NORTH AMERICA, WEST COAST

John Sabo
Barbara Sabo
Gregory Sabo
John Sabo Associates
447 Herondo St. #305
Hermosa Beach, CA 90254
Tel: (310) 374-2301
e-mail: bsabo@jsaboassoc.com

EUROPE

John Gold
John F. Gold & Associates
"Highview"
18a Aultone Way
Sutton, Surrey, SM1 3LE, England
Phone/FAX Nat'l: 020-8641-7717
Int'l: +44-20-8641-7717
e-mail: johnfgold@gmail.com



Sea Technology back issues available on microform.

Contact: NA Publishing, Inc.
P.O. Box 998, Ann Arbor, MI 48106-0998
1-800-420-6272

COMPASS PUBLICATIONS, INC.

1600 Wilson Blvd., Suite 1010
Arlington, VA 22209-2510
Tel: (703) 524-3136
FAX: (703) 841-0852
oceanbiz@sea-technology.com
www.sea-technology.com

publishers of:

Sea Technology
Commercial Fisheries News
Fish Farming News
Commercial Marine Directory
Fish Farmers Phone Book/Directory
Sea Technology Buyers Guide/Directory
Sea Tech e-News

*Celebrating more than 54 years
of serving the global ocean community
- Since 1963 -*

Smart Ships Are Coming

The opening of a third Norwegian on-water autonomous vessel test bed December 2017 capped what turned out to be the year that autonomous shipping became tangible.

Autonomous and unmanned ships have been under discussion for several years already, but developments in the last year showed that the future is closer than we think.

As merely one example, the *Yara Birkeland*, a project announced May 2017 by partners Yara and Kongsberg, will be the world's first fully electric and autonomous container ship, with zero emissions.

Yara Birkeland will be built to meet a very specific need in the short-sea segment: It will replace 40,000 truck journeys a year from Yara's Porsgrunn fertilizer plant in southern Norway to the ports of Brevik and Larvik, significantly reducing local NO_x and CO₂ emissions produced by haulage trucks. The vessel has an accelerated schedule; it will be delivered and operational by early 2019.

Currently, the most potential for autonomous shipping is in the short-sea segment—not because of any technology limitations but because of a lack of internationally agreed upon regulations for autonomous ships in international waters. Initiatives such as establishing autonomous vessel test beds are a good step toward building national and international relations between the stakeholders and official bodies that will be involved with autonomous vessels, and these connections will help to expand the market for smart ships.

The new vessel test bed facility in Horten, Norway, has been specially designated for autonomous trials by the Norwegian Maritime Administration and the Norwegian Coastal Administration. Kongsberg has worked closely with the town of Horten, DNV GL, FFI (Norwegian Defence Research Establishment) and the University College of Southeast Norway to establish the new test bed, which is situated adjacent to its Horten facility. The focus of testing thus far has been on collision avoidance, sensor fusion and a common autonomous control engine.

Testing in November 2017 at this facility for the SEA-KIT USV/AUV concept, based on the use of a USV as the mothership for an AUV, provided insight into the potential of unmanned maritime operations.

SEA-KIT is the GEBCO-NF Alumni Team's entry into the \$7 Million Shell Ocean Discovery XPRIZE competition. The testing in Horten was an official round of the XPRIZE, showing autonomous navigation and AUV tracking capabilities of the SEA-KIT USV enabled by the integration of custom-developed automation and software with Kongsberg's K-MATE autonomy controller system.

K-MATE has been developed in collaboration with FFI. The involvement of the Norwegian government in the development of autonomy for vessels is likely to be a catalyst that will help drive the discussions on creating international autonomous vessel regulations.

But we won't be able to achieve these international agreements without sharing and collaboration in the maritime industry itself. Momentum is building as there is already a huge amount of interest in the development of vessel autonomy.

For instance, Oceanology International 2018 (see preview on p. 15), taking place in London March 13 to 15, will have its biggest focus on maritime autonomy to date, with an Unmanned Vehicles and Vessels technical track spanning two days and featuring 24 papers presented by industry experts on the topic.

Discussion is growing on what is becoming the future of the maritime industry, and that future is not far away. **ST**

EMPOWERING



WORLD LEADER IN UNDERWATER e-ROBOTIC SYSTEMS



SAAB

SAAB SEAEYE

THE FUTURE IS ELECTRIC

) US Coast Guard to Launch Arctic Satellites. Two small satellites, scheduled for launch mid-2018, will provide the U.S. Coast Guard with the opportunity to test the effectiveness of satellite communications in supporting Arctic search and rescue missions. These satellites, or cubesats, are capable of detecting transmissions from emergency position indicating radio beacons (EPIRBs), which are carried on board vessels to broadcast their position if in distress. The Coast Guard will deploy the cubesats in cooperation with the Department of Homeland Security Science and Technology Directorate's Polar Scout program, the Air Force Operationally Responsive Space Office and NOAA. Each Polar Scout cubesat will pass over the North Pole every 90 to 100 minutes and will be able to detect EPIRB signals from vessels in the Arctic for about 12 minutes on each orbit. The cubesats will circle the Earth 15 or 16 times a day, providing more than three hours of search and rescue coverage in the Arctic daily.

) Marine Cable, Connector Market Highly Competitive, Growing. The global market for marine cables and connectors features a largely fragmented vendor landscape, according to a new report by Transparency Market. In 2016, more than half of the market was held collectively by 10 companies. The intensity of competition is likely to remain high owing to the presence of many companies. To grow, companies could benefit from increased focus on strategic collaborations and innovative marketing strategies, with the view of expanding in emerging markets. The global marine cables and connectors market will exhibit a promising CAGR of 5.3 percent from 2017 to 2025 and rise to \$14,081.3 million by 2025 from an estimated valuation of \$8,869.8 million in 2015. The market was dominated by Europe in 2016 due to the growing demand for energy-efficient and reliable fiber-optic cables with enhanced performance. The rise in investments by government and telecommunication companies to increase connectivity, the growing demand for higher bandwidth for data transmission, and substantial investments by the defense sector are anticipated to drive the growth in the global marine cables and connectors market.

) Coastal City Aims for Marine Leadership in China. The municipal government of Qingdao, a city located along the east coast of China in Shandong province, has issued new criteria for the development of its marine economy, with the goal of becoming the leader in the transformation of the country's maritime economy, as well as serving as a model for other coastal cities and regions. Qingdao proposes to speed up the conversion of the economic model through the launch of 44 demonstration projects that showcase innovation in an ocean-based economy. The city plans to achieve a number of goals by 2020, including attaining an average annual growth rate of gross marine product (GMP) exceeding 10 percent; developing a GMP that accounts for more than 30 percent of the city's GDP; and attaining a production value in emerging strategic marine industries that exceeds approximately \$15 billion and grows by 15 percent annually on average. Qingdao plans to aggressively expand the breadth and scope of the city's industrial portfolio with a focus on innovative marine-based drugs, biomedical materials, functional foods and biological products for agricultural use while speeding up construction of an end-to-end emerging marine industry chain and enhancing the industry's competitiveness. Three designated areas in and around Qingdao—China Blue Valley, Qingdao West Coast New Area and Hongdao Economic Zone—will serve as a composite national demonstration area for marine economic development.

) Financial Institution Joins Marine LNG Coalition. SEA\LNG, the multisector industry coalition aiming to accelerate the widespread adoption of liquefied natural gas as a marine fuel, announced the addition of the first financial institution to the coalition: Société Générale, whose commitment to financing alternative solutions that support the development of green maritime transport is demonstrated by its pioneering involvement in the first transaction for the European Union's recently instituted Green Shipping Guarantee program. Société Générale acted as the sole mandated lead arranger, lease investor, facility and security agent, hedge provider and lender in a French lease financing of the first LNG-powered ferry to be commissioned by Brittany Ferries, with a funded guarantee from the European Investment Bank.

) Tech Development for Live 3D Subsea Data. Rovco has secured Innovate UK funding to develop a cutting-edge 3D visualization system as part of a two-part artificial intelligence (AI) demonstrator project. Working in partnership with the Offshore Renewable Energy (ORE) Catapult, the first phase of the project will see Rovco develop the equipment and software required to produce live 3D data from challenging and extreme subsea environments. The technology will be trialed and tested at ORE Catapult's renewable energy test facility in Blyth. Phase two will include the development of a complete 3D vision-based survey solution using AI. The technology could reduce offshore inspection costs by up to 80 percent and could revolutionize the way energy companies manage and inspect their subsea assets, potentially saving hundreds of millions of pounds in offshore inspection costs each year. The first phase of the project will be 70 percent supported by Innovate UK, and the remaining 30 percent will be funded by Rovco. Phase two is expected to be further backed by Innovate UK once technical feasibility is proven. ORE Catapult will provide access to its marine energy testing facilities and assist in the delivery of project outputs to end-users. **ST**

The Maritime World Enters The Fourth Industrial Revolution

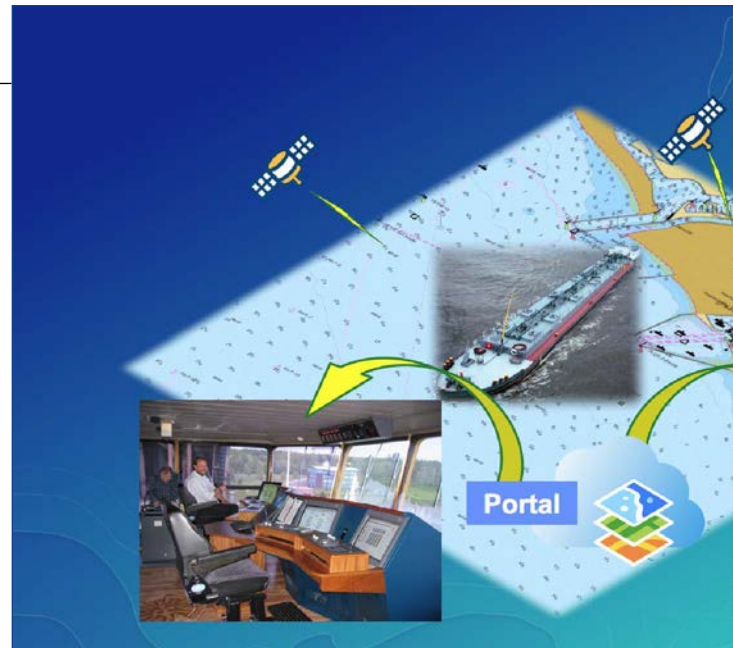
New Era Requires Revolution of Data Processing, Analysis and Use

By Rafael Ponce

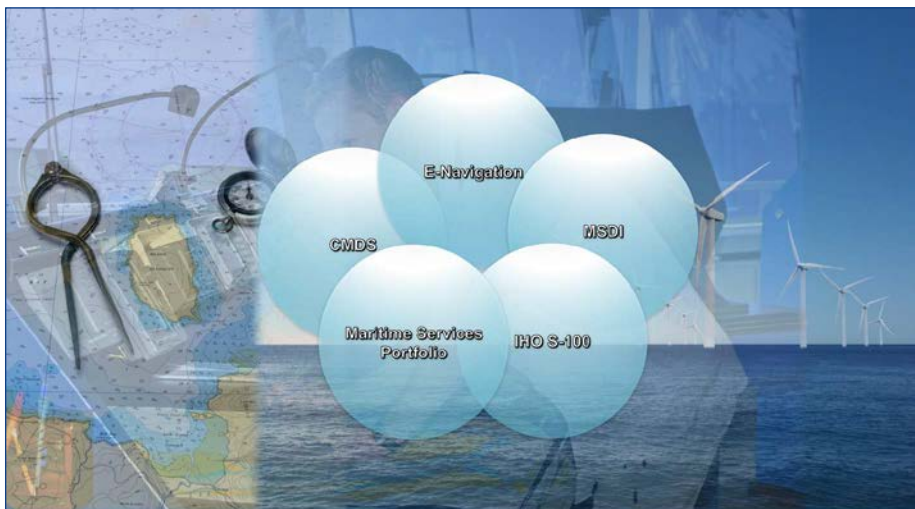
People around the world are calling our times the beginning of a new industrial revolution, one where the physical, biological and artificial aspects of technology are combining to alter our lives fundamentally in a way never before experienced.

The first industrial revolution started with mechanization and the use of water and steam power; the second industrial revolution used electricity and created mass production and assembly lines; the third industrial revolution saw the advent of electronics, computers and automation; and the fourth one is building on top of the third to create cyber-physical systems, where physical and software components are intertwined and controlled by computer-based algorithms, integrated with the Internet and users. In this new industrial revolution, growth that used to be linear is now exponential, happening very fast to the point that we can no longer use the past to predict the future.

Change in general is accelerating; the technological and cultural changes that we will see in the next 50 years are going to happen faster than the changes that happened in the past few hundred years. And this



has meaningful consequences; it is disrupting almost every industry, and the maritime industry is no exception. Emerging technologies and new concepts such as artificial intelligence (AI), robotics, the Internet of Things (IoT), big data, unmanned vehicles and augmented reality are already affecting the maritime world. We can see some hints of that in the economics of the shipping industry; for instance, GDP and cargo volumes have become decoupled.



Some experts in the field call this a new “Seconomics” era. Technology and a new generation (millennials) are changing the economic dynamics. The focus is no longer on the lowest price, the most profitable thing or the best cost-benefit balance; the focus now is on sustain-



According to the World Shipping Council. This industry is constantly looking for ways to improve efficiency, so it's no surprise to see it embrace new technology faster than other fields.

Starting from the basics, a set of standards and governance rules for safety and efficiency of navigation must be established that favors environmental protection and sustainable growth—and I'm not just talking about the shipping industry's growth, but the related growth of ports, coastal areas and entire countries. Here, the International Maritime Organization (IMO) e-navigation initiative is an attempt to ensure safe berth-to-berth

navigation. To enable this, a series of maritime services portfolios (MSPs) are being developed as part of the improved provision of services to vessels. MSPs are the means of providing electronic information in a harmonized way. Currently, there are 16 MSPs being considered, including VTS information services, maritime safety information services, pilotage services, nautical chart services and real-time hydrographic and environmental services. In order to enable these services, a common infrastructure is required, referred to as common maritime data structures (CMDS), the desired infrastructure supporting e-navigation.

CMDS would include and organize parameters for priority, source and ownership information, for example. In essence, CMDS are very similar to spatial data infrastructures (SDI), "the relevant collection of technologies, policies and institutional arrangements that facilitate the availability of and access to spatial data," according to the accepted definition. CMDS could be a subset of a marine SDI. We can consider CMDS as the binding blocks between and within all MSPs and with users. In that sense, we can conclude that CMDS constitutes a geographic information system (GIS), where data need to be organized in databases and models with well-defined feature classes and attributes that can be converted into information products to be used under the e-navigation concept, ashore and on board, through a series of services (MSPs) by any GIS type of application, including but not limited to ECDIS and ECS (on board) and VTS (ashore).

For overcoming the challenges of data harmonization, there is an important new International Hydrographic Organization (IHO) series of standards development, based on a new universal hydrographic data model, S-100. This is motivated not only because of the need to replace the old S-57 Electronic Navigational Chart (ENC) standard but also to provide support to a much larger set of GIS-based standards beyond traditional navigational products demanded today in anticipation of the effects of the fourth industrial revolution. The S-100 is a GIS based on the ISO TC 211/ISO 19100 series, providing a framework for developing product specifications in several maritime domains. For instance, the S-101 to S-199 series



(From top to bottom) An illustration of the GIS concept. The e-navigation concept. Maritime initiatives for the fourth industrial revolution.

ability, environmental friendliness, added value, efficiency and resiliency.

These fast changes create new challenges and new opportunities for everyone. In light of the new technologies, a "digital vision" is necessary, powered by data, in space and time.

In the maritime world, autonomous ships and autonomous/remotely operated port terminals are not science fiction; they are happening right now and require handling geospatial data in new ways. The key is not getting more data, but getting the right data at the right time and processing data on the fly for decision-making by human or machine.

Maritime Needs

What would be required to enable and process all this information? We need four basic components: people, standards, technology and, of course, data. In the maritime domain, a good starting point is the shipping industry, where cargo transported by liner shipping represents about two-thirds of the value of total global trade, ac-

are under the hydrographic domain for developing product specifications such as S-101 ENC, S-102 bathymetry surface, S-103 subsurface navigation and so on; the S-201 to S-299 is the IALA domain for products such as aids to navigation, inter-VTS exchange format and application-specific messages, among others. There are two other domains so far: S-301 to S-399 for the IOC and a "various" domain with an S-40x series for inland ENCs, ice information, weather overlay and other things that would be developed as necessary. There is actually an initiative through the IMO-IHO Harmonization Group to harmonize S-100 with an IALA Universal Maritime Data Model (UMDM).

The Role of GIS

As we can see, GIS is an important technology player in this new industrial revolution. It brings together the science of where things are and where things should be for the maximum benefit of everyone. Important examples of its use are

projects such as the NOAA Physical Oceanographic Real-Time System (PORTS), <https://arcg.is/1v14Dn>, that takes advantage of some of the concepts and technologies described above to build a system that provides situational awareness of the operating environment. The system gives environmental observations of oceanographic and meteorological conditions and decision support tools to users in more than 25 major U.S. ports for the benefit of maritime commerce and coastal resource management.

Seaports are vital in the shipping industry; they represent the connection with the mainland and a hub in the multimodal transportation network. The Port of Rotterdam is one of the few port organizations that understands the critical role that GIS plays in this new industrial revolution era and has implemented this technology in its broadest sense, enabling the port to grow not in physical extent but in efficiency. It has become one of the most efficient and forward-thinking ports

in the world. With approximately 30,000 seagoing and 110,000 inland vessels a year, the port needed an efficient, up-to-date and reliable port map that is not only essential for vessels but for all parties in the port to conduct their business. Based on GIS, and taking advantage of technological developments mentioned above, the Port of Rotterdam has established the new Portmap system, an interactive, complete, current and clear online map of the port, with detailed views of the terminals, jetties, dolphins, berths, water depths, etc. An example of the public view of the Portmap system can be seen at <http://arcg.is/2kT2nW3>.

Another important initiative is the Ecological Marine Units (EMUs) project, a public-private partnership between Esri and the U.S. Geological Survey that uses ocean-based environmental data to create a three-dimensional map of the world's oceans (<https://arcg.is/00WTXn>).

Under the Group on Earth Observations, as part of the GEOSS Task EC-01-C1 (2014)/GI-14 GECO (2016), the EMUs are a standardized, robust and practical global ecosystems classification and map of the planet, where Esri is engaged in producing and hosting the content. This initiative has put in practice the marine SDI concepts to create an information product that is proving to be very useful for monitoring ocean health, ecosystems valuation, conservation planning, marine data management, fishing management, risk reduction and many other activities that directly and indirectly support coastal and port development, as well as Exclusive Economic Zone and Extended Continental Shelf resources management.

Perhaps one of the largest and most ambitious projects regarding SDI is the Esri Living Atlas of the World, <https://livingatlas.arcgis.com>, a collection of geographic information from Esri and its partners that is a community-based effort of thousands of contributors sharing their best maps, apps and data with the rest of the world. Anybody can use and contribute to the Living At-

KNUDSEN

SONAR SOLUTIONS THAT STAND THE TEST OF TIME & PERFORMANCE....

Customers in 70+ countries trust the **KNUDSEN** brand

12
CHIRP
DEEP WATER SBP

ROVer

9
PINGER
SBP

SOUNDER

MINI

6
320N
NAVIGATION

K

WWW.KNUDSENENG.COM

1-613-267-1165

“Artificial intelligence, robotics, the Internet of Things, big data, unmanned vehicles and augmented reality are already affecting the maritime world.”

las. For example, the U.S. Marine Cadastre at www.marinecadastre.gov is a comprehensive marine information system providing spatial data, tools and support for the U.S. coastal and ocean management community. This information product was created by cooperation between NOAA and the U.S. Bureau of Ocean Energy Management (BOEM). You can find an entertaining story map at <http://arcg.is/1ziDun> explaining its benefits.

Conclusions

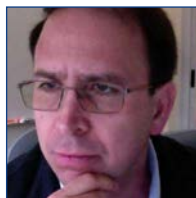
In a nutshell, we have reviewed five important initiatives—e-navigation, CMDs, MSPs, marine SDI and S-100—benefited by the revolutionary technological developments of AI, IoT, big data and augmented reality that are having an impact on the maritime world. I have chosen the shipping industry as the center of this analysis because I consider it very influential for the rest of the maritime domains due to its extensive economic impact. But renewable energy, marine protected areas, deep-sea exploration (mining, petroleum), climate change and security are equally important.

The new industrial revolution will determine our lives in the near future. We not only have to acknowledge it but need to be part of the change as well. The UN Sustainable Development Goals (SDG) illustrate what should be a focus in the new industrial revolution. These 17 goals are in the areas of greatest impact to humanity, and all of them are interrelated. We live on a planet where roughly 70 percent is covered by oceans, so it is not hard to imagine how important the oceans are for everything in our lives. SDG 14 addresses the oceans, specifically conservation and sustainable use

and development of the oceans, seas and marine resources. Our oceans play a critical role in weather and climate change, and accomplishing SDG 14 will help in accomplishing SDG 13, which aims to combat climate change and its impacts. For both these SDGs, shipping regulations will be important; technology will help in making shipping routes and travel more efficient to reduce greenhouse gas emissions; and efficient maritime services portfolios and implementation of e-navigation concepts will increase safety of navigation and reduce risks of accidents and pollution. Accurate and timely oceanographic and meteorological data and EMUs (as well as coastal marine units in the near future) will support better resources management, enabling “responsible consumption and production” (SDG 12) from the sea. We could easily go on making connections between the SDGs.

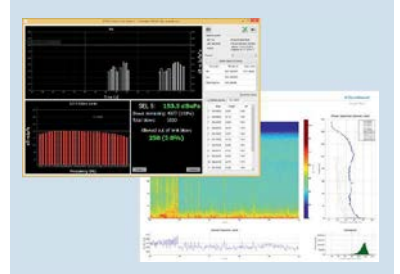
What I want to emphasize is that the core of humanity’s sustainable development resides in the oceans. We are creating the technology to achieve sustainable development goals, but we also need to create consciousness to be part of the change for a sustainable future that will support the coming generations. **ST**

Rafael Ponce graduated from the Mexican Naval Academy, served 25 years in the Mexican Navy and retired as a captain. He holds an M.S. from the University of Southern Mississippi and is a Category A hydrographer. Ponce was the deputy director of the Mexican Hydrographic Office. He has worked for Esri since 2007 and is the company’s global maritime consultant.



UNDERWATER LISTENING SYSTEMS

New Noise Processing Features



Versatile Acoustic Recorders



Real-Time Listening Remote Buoys



Powered by SDA

Oiceanology
international
2018
13-15 MARCH 2018, LONDON, EXCEL
VISIT US AT STAND J551



www.rtsys.eu
25 rue Michel Marion
56850 Caudan - France
+33 (0)297 898 580 - info@rtsys.eu





www.CSnetInternational.com • 321.327.7915



EXPERTS IN *SUBSEA DATA COMMUNICATIONS*

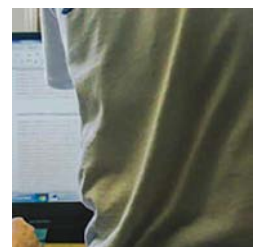
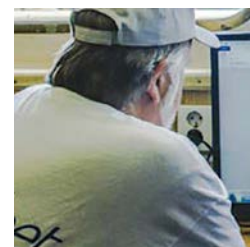
CSnet International provides broadband oceanographic, meteorological, seismological and hydrographic data services worldwide through the use of Ocean Observing Systems.



RELIABLE END-TO-END SOLUTIONS 24/7

CSnet owns and operates the Offshore Communications Backbone that provides researchers, engineers and decision-makers in science, government and the marine industry the most complete, accurate, factual and timely data available.

Get CSnet International on your team when you need reliable data streaming in the world's deepest oceans or in the harshest environments.



TYPICAL *PROJECTS SERVED*

- Environmental Assessment and Monitoring
- MetOcean Data Acquisition
- Ocean Observing Systems for Science & Industry
- Tsunami and Seismic Warning Systems
- Pipeline and Infrastructure Monitoring
- In-situ Sensor Evaluations and Sensor Integration



Oceanology International

Arguably, the study, safeguarding and advancement of the world's oceans has never been a more pressing concern—which makes the Oceanology International 2018 exhibition and conference a pivotal nexus for the dissemination and implementation of cutting-edge technologies, practicable solutions and far-sighted strategies.

Running from March 13 to 15, 2018 at ExCel, London, this preeminent forum is the latest iteration of a biennial event first held in Brighton in 1969. Its consistent growth as an international marine business hub, with a commensurately steep increase in attendee numbers, necessitated the move from Brighton to London's ExCel.

In addition, the launches of two recent offshoots—Oi China, which premiered in Shanghai in 2013, and Oceanology International North America (which has since rebranded as Oi Americas) in 2017—bear testimony to the brand's attraction for buyers and sellers alike in established, new and expanding markets.

The 2018 edition of the longest-running symposium of its kind hosts an exhaustive list of exhibitors: 329 are already registered, with more than 500 expected, ranging from primary manufacturers and suppliers of ocean technologies, components and instrumentation to global service providers and contractors.

Top brands confirmed to exhibit at the show include Kongsberg Maritime, iXblue, Sonardyne, Teledyne Marine and Fugro.

"This forum's matchless status as a one-stop shop for the trading of innovative ocean technologies, services and groundbreaking ideas has always rendered it an advantageous event for networking international business visitors," said David Ince, Oceanology International event manager at Reed Exhibitions.

"Over 7,500 people attended in 2016, and we expect the 2018 event to comfortably exceed that figure."

Oi oceanology international
2018 13-15 MARCH 2018, LONDON, EXCEL

ExCel's location, adjacent to the Royal Victoria Dock, will facilitate a plethora of product demonstrations planned for the 2018 show. Visitors can experience these aboard participating vessels, or watch them from a covered meeting area and/or viewing platforms on the dockside.

The 2018 show prioritizes technological advancements in marine science, aquaculture and marine renewables. A FutureTech Hub will help visitors find the newest technologies (including developments in robotics and autonomous systems).

Meanwhile, a generous conference schedule will present 10 technical tracks led by industry specialists, including an Underwater Imaging and Metrology track and an Oil and Gas track.

As Ince pointed out, "The collective knowledge base in the 2018 conference program will make each track a priceless source of top-tier information."

The 2018 program will be augmented by a series of illustrative parallel events. The new Ocean ICT Expo will accentuate the necessity for marine and ocean IT, communications and data storage solutions, as Ince explained. "There will be a succession of directly relevant presentations from industry authorities, while hundreds of experts will be in attendance to engage the audience and brainstorm ways forward."

The Investment, Trade & Innovation Theatre will be accessible to all attendees and will include an Entrepreneur and Investment Workshop, Near and Far Market Trading sessions and a New Technology Showcase. New for 2018, the half-day Ocean Futures Forum (Tuesday, March 13) will examine long-term energy trends. The full-day Catch The Next Wave 2018: Frontiers of Exploration event (Thursday, March 15) will evaluate the relationship between exploration and technology. You can register at www.oceanologyinternational.com to exhibit or attend. **ST**





Looking for
more out there?
WE HEAR YOU

**Electroacoustic System
Design & Manufacturing for
Virtually Any Application**

**Off-the-Shelf & Custom
Transducers and Systems
for Military Sonar and
Oceanographic Research
and Exploration . . .**

Massa is Listening

781-740-6117

innovation@massa.com



**TR-1075
Profiling**



**TR-1055
Beacon**

www.massa.com

Proper Calibration of Electronic Equipment

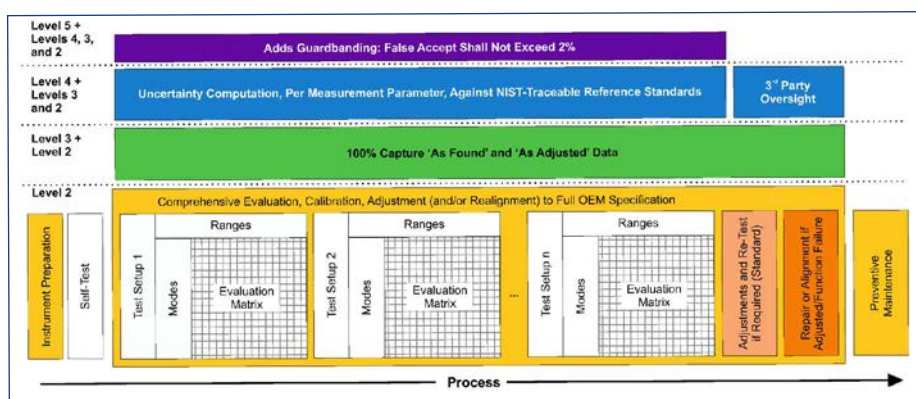
Techniques to Calibrate Essential Defense Tech

By Todd Chaikin • Darwin Phillips

Mission-critical signal analyzers that measure multiple aspects of a signal need to be accurate and consistently perform at optimal levels. Variations in temperature, humidity and the corrosive nature of the environment can cause damage. The most critical challenge is ensuring that there is no signal failure.

Spectrum analyzers are versatile radio-frequency (RF)/microwave measurement tools most commonly used to measure signal. The U.S. Navy required their Keysight model number N9030A PXA signal analyzer to be calibrated to ensure accuracy and integrity for use. The PXA is often used in aerospace and defense wireless communications for signal analysis. It analyzes signals over wider bandwidths, reduces measurement uncertainty and reveals previously hidden signals with noise floor extension. When the Navy needed their PXA signal analyzer calibrated, they sent it to Tra-Cal Lab to ensure that it is calibrated to meet original equipment manufacturer (OEM) standards.

NSCA Technologies and Tra-Cal Lab, which are based in Gaithersburg, Maryland and are service-disabled veteran-owned small businesses (SDVOSB), have served the electronics and military industries since 1988. NSCA and Tra-Cal Lab are ISO/IEC 17025, ANSI Z540.1 and ANSI Z540.3 accredited. Tra-Cal Lab, an electronic test and measurement calibration lab, specializes in RF and microwave calibration and repair services. They perform high-quality testing services to achieve accuracy in modern spectrum analyzers. The company works closely with manufacturers, like Keysight, to ensure that all manufacturer specifications are met when calibrating instruments. Tra-Cal Lab performs rigorous internal and external quality checks to comply with industry standards,



Calibration service level procedures for standard level one to level five (ANSI Z540.3).

plus equipment calibrations and repairs that follow 100 percent of manufacturer specifications. In this way, Tra-Cal Lab assures their customers of reliable, repeatable measurement capabilities. Tra-Cal Lab's procedures require verification that equipment inspection is performed and that the equipment is adjusted, replaced or repaired as needed to prevent future measurement inaccuracies.

What Is Calibration?

Calibration is a comparison of two measurement devices or systems, one of known uncertainty (standard) and one of unknown uncertainty (test equipment). Generally, the targeted accuracy of the standard should be 10 times the accuracy of the measuring device being tested. However, the accuracy ratio of 4:1 is acceptable by most standards organizations.

The objectives of calibrating measurement instruments are two-fold. First, the accuracy of the instrument is checked. Second, the traceability of the measurement is determined. In practice, calibration also includes device adjustments, if it is out of specification. A report is

provided by the calibration expert, which shows the error in measurements with the measuring device before and after the calibration.

Calibration Is Critical

Over time, the accuracy of all measuring devices degrades. This is typically caused by normal wear and tear. However, changes in accuracy can also be caused by other factors in the environment, including electric or mechanical shock, weather-related factors or a hazardous environment (e.g., oils, metal chips, etc.). Many corporations, defense contractors, Department of Defense (DOD) and other government agencies believe that all calibration is the same, and they use whichever calibration lab has the lowest price. The labs that offer an unreasonably low calibration price do so to secure the work, but then they perform only a self-test or an abbreviated calibration. Unfortunately, this is a huge risk. Just because a company provides a calibration certificate and/or a calibration sticker does not mean the unit was fully and correctly calibrated.

In fact, there are a surprising number of calibration labs that rely on the false premise that all calibration labs are basically the same. Frequently, customers who

Tra-Cal Lab Standard Calibration Service Level Agreements

Level 1 – Self Check, Sample Point Evaluation/Calibration (NOT Recommended):
Suitable for yes/no checks, Not Suitable for Quantitative Measurements
Level 2 – Full Evaluation and Calibration to 100% OEM Specifications:
Tra-Cal Lab “Standard” Level Proposed for Measurement Instruments
Level 3 Service (ANSI-Z540):
Provides Comprehensive Level 2 Service to OEM Spec
Adds (ANSI-Z540) “As Found” and “As Adjusted” Data for Every Parameter
Level 4 Service (ISO-17025):
Provides Level 3 Service (ANSI-Z540) and Adds Uncertainty Computations
Provides Audited Third-Party Oversight (from ISO Registrar)
Level 5 Service (ANSI Z540.3):
Provides Level 4 Service (ISO 17025) and Adds Guardbanding
Guardbanding is the additional requirement to provide for verification that quantities are within specified tolerances. The probability that incorrect acceptance decisions (false accept) will result from calibration tests shall not exceed 2% and shall be documented.
Provides Additional Audited Third-Party Oversight (from ISO Registrar)

initially chose a low-cost provider come back to Tra-Cal Lab for high-quality, cost-effective calibration and repair services. For example, calibrating a 26.5-gigahertz (GHz) spectrum analyzer takes a trained technician three to four hours to properly calibrate. In that time, hundreds of points are measured. Consequently, labs that spend a fraction of that time to calibrate a spectrum analyzer are not doing it adequately. In addition, Tra-Cal Lab notes that preventive maintenance should be performed

Inertial Navigation Systems



THE BEST RATIO PERFORMANCE/PRICE

Compact and Robust Enclosure
Easy to install and configure
Various models and level of accuracy

UPTO

- » 0.008° Roll & Pitch
- » 0.025° GNSS Heading
- » 2 cm Delayed Heave
- » 1 cm Position



Booth #D250



Booth #504

www.sbg-systems.com

Tired of Sacrificing Performance Characteristics When Using Coax?



Our revolutionary new coax contacts deliver both open faced pressure resistance and groundbreaking performance capabilities. They provide incredibly low insertion losses—less than 0.7 dB at signal frequencies to 3GHz, with an associated maximum SWR (Standing Wave Ratio) of 1.7:1. Plus, the new design offers ease of assembly and connects directly to a standard MIL-STD-348 SMA connector.

It's Time to Cut Your Losses.

 **BIRNS**[®]

*High Performance . . .
Under Pressure[®]*

www.birns.com



BIRNS is NAVSEA PRO-020 Certified;
Our Quality Management System is
ISO 9001:2008 Certified by DNV

See us at stand G450 at
Oceanology International

at each calibration interval to protect the unit from going out of specification and to avoid expensive repair costs.

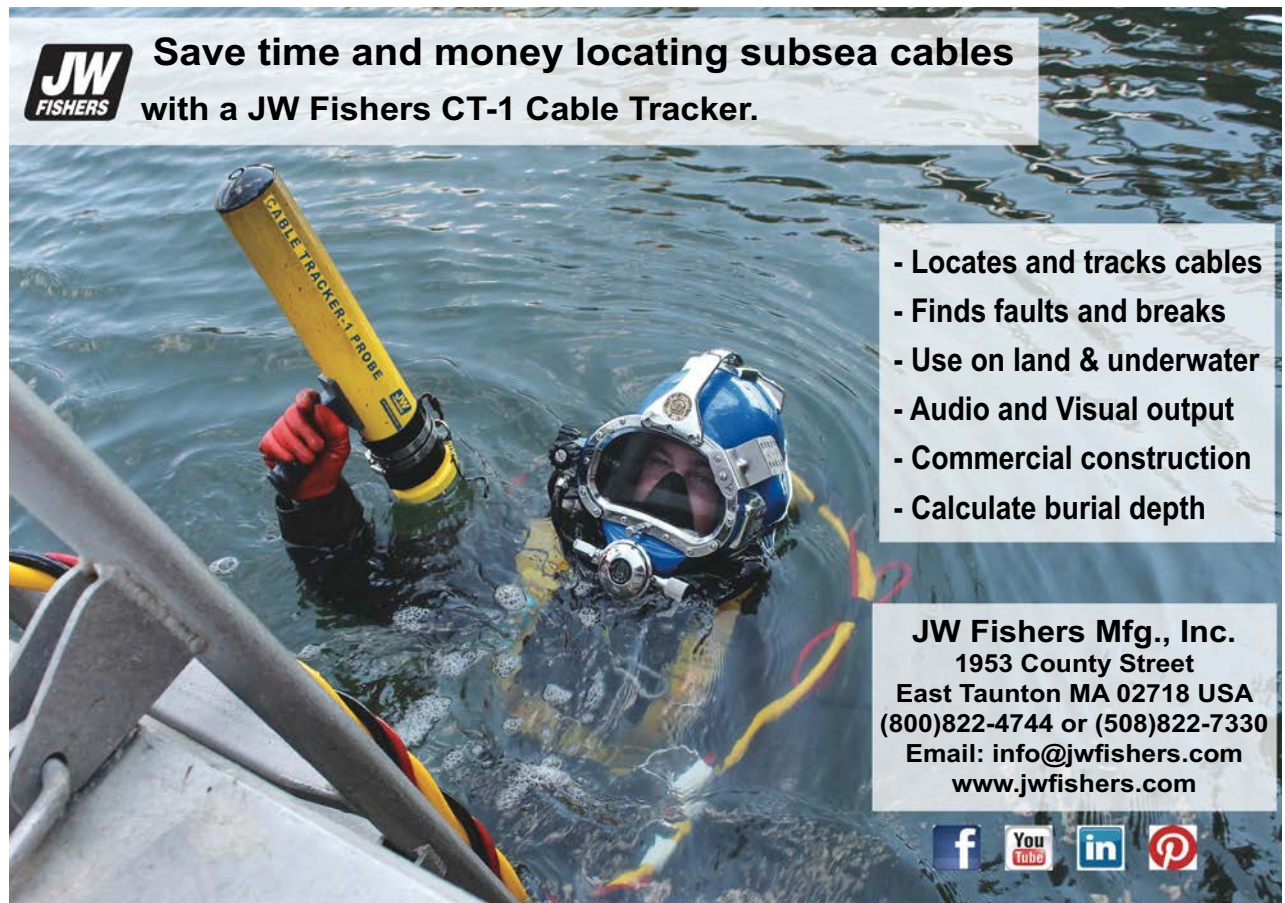
Industry Calibration Service Levels

Level one service is a self-check and sample point evaluation and calibration, which is suitable for yes/no checks. However, level one is not recommended for quantitative measurements. Level two service is Tra-Cal Lab's standard-level calibration for measurement instruments. This includes a full evaluation and American National Standards Institute (ANSI) Z540 standard, without data calibration, to 100 percent OEM specifications, comprehensive instrument inspection and 100 percent parametric evaluation and calibration on all inputs and outputs (I/O) and all options, across all OEM specifications. An auditable hierarchy of procedures, with OEMs as first authority, is used. In addition, preventive maintenance is performed, including standard fuses and most batteries. Level three service adds ANSI-Z540 "as found" and "as adjusted" data for each parameter to the level two service described above. Level four service adds uncertainty computations and audited International Organization for Standardization (ISO) third-party oversight to the level three service. Level five service adds guardbanding to the level four service. Guardbanding is the requirement for verification and documentation that quantities are within specified tolerances. The probability that incorrect acceptance decisions (false accepts) will result from calibration tests must not exceed 2 percent.

Test Methodology

Tra-Cal Lab calibrated the Navy's Keysight N9030A PXA Signal Analyzer in January 2017 to meet the full manufacturer's standard level without customer data. This involved a series of tests to ensure the accuracy and integrity of the analyzer. For proper calibration, the signal analyzer was evaluated by following these steps: 1) instrument preparation; 2) self-test; 3) test setup range from 1 to n (comprehensive evaluation, calibration, adjustment and/or realignment to full OEM specifications with 100 percent capture of "as found" and "as adjusted" data, uncertainty computation, per measurement parameter against National Institute of Technology's traceable reference standards); 4) adjustments and retest, if required; 5) repair or alignment if adjustment/function failure; and 6) preventive maintenance.





The PXA is ideally suited for high-performance research and development (R&D) applications in aerospace, defense and commercial wireless communications. The PXA analyzes signals over wider bandwidths, reduces measurement uncertainty and reveals previously hidden signals with noise floor extension. By using a combination of standards traceable to the National Institute of Technology and vector signal analysis (VSA) software, software for demodulation and vector signal analysis, Tra-Cal Lab can verify that the unit meets manufacturers' specifications. The complete verification of this unit consists of approximately 535 data points depending on the options installed. Due to the complex nature



JW FISHERS Save time and money locating subsea cables with a JW Fishers CT-1 Cable Tracker.

- Locates and tracks cables
- Finds faults and breaks
- Use on land & underwater
- Audio and Visual output
- Commercial construction
- Calculate burial depth

JW Fishers Mfg., Inc.
1953 County Street
East Taunton MA 02718 USA
(800)822-4744 or (508)822-7330
Email: info@jwfishers.com
www.jwfishers.com

and multiple uses of this unit, it is imperative that all specifications are verified.

Calibration for Essential Radio Comms

For many years, Tra-Cal Lab performed calibrations of spectrum analyzers and watt meters for a defense contractor that makes truck radio communications systems for the military. Then, one day, the defense contractor's supervisor in charge of sourcing informed Tra-Cal Lab that they would not be renewing their service contract. Instead, he had found a mobile lab that was cheaper, faster and performed all their calibrations on site.

Tra-Cal Lab educated the sourcing supervisor on what to look for in a calibration service by providing them with the manufacturer's procedures, standard turnaround times and equipment requirements for calibration.

The defense contractor found that the cheaper service provider was performing a 2- to 4-hour spectrum analyzer calibration in only 15 minutes. In addition, they used a 2-GHz generator, when a 26.5-GHz generator was required to calibrate the 26.5-GHz spectrum analyzer correctly. Similarly, the 10,000-watt meter, which normally takes 25 minutes to calibrate, was tested in only 5 minutes. The service provider used a 0 decibel (dB) signal in and a power meter and sensor on the other side to measure whether a signal went through. Instead of checking 120 to 150 test points to ensure complete functionality of the equipment, the low-cost provider just performed a self-test or just a few test points. The steps performed by the cheaper service provider do not properly measure the unit's 10,000-watt elements capability, let alone 5,000, 1,000 or even 5 watts. Ultimately, Tra-Cal Lab properly calibrated the spectrum analyzers and watt meters.

This is an example of how the on-site, faster, low-cost provider is not always the best option. In this case, there is a real risk that uncalibrated spectrum analyzers and watt meters could endanger our military

troops who rely on radio communication for their safety.

Calibration for Navy Ship Antennas

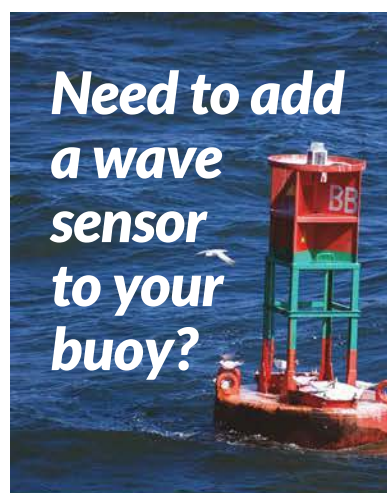
A defense contractor that manufactures Navy ship antennas began using a low-cost calibration service with a mobile lab. The mobile lab routinely came on site to perform all of their calibration services. They calibrated a permeability meter and provided a calibration sticker and calibration certificate. Permeability meters measure the thickness and conductivity, called the mu factor, of the metal in the antenna to determine how the antenna will transmit. These antennas may be used to transmit critical communication between the naval base and the ground troops to ensure the troops' safety.

Nine years later, the defense contractor sent the permeability meter to Tra-Cal Lab. Tra-Cal Lab told the defense contractor that the meter needed to be sent directly to the manufacturer for calibration because the manufacturer's procedures and tools are all proprietary, making it impossible for any other service provider to calibrate the unit. The manufacturer confirmed that the unit could not be calibrated by any other provider and that the unit was so far out of specification that it likely had been out of specification for four to five years.

This is an example of how the convenient, low-cost provider is not always the best option. In this case, there is a real risk that uncalibrated permeability meters could endanger our military troops on the front line by preventing communication with the base.

Calibration for Multimeters, Micrometers

Prior to coming to Tra-Cal Lab, a customer shared that they sent their multimeters and micrometers to a low-cost repair service provider. Any time the units needed a replacement 9-volt battery or a new \$1 fuse, the provider would send them a repair quote, charge a repair fee and keep the meter out of commission for two weeks. Tra-Cal Lab treats this kind of work as part of the



**Need to add
a wave
sensor
to your
buoy?**

BRIZO

**Directional
Wave Height Sensor**

- ✓ **Real time data telemetry**
via Iridium / cell / radio
or store on board
- ✓ **Onboard computation
of coefficients:**
Significant Height,
Max Height, Peak Period,
Peak Direction, Peak Spread
- ✓ **Low power, high accuracy,
simple integration**
- ✓ **No calibration required**



XeosBeacons™

For more information, please
contact info@xeostech.com

www.xeostech.com

“The convenient, low-cost provider is not always the best option.”

standard calibration service, minimizing the amount of time the units are out of commission and saving the customer not just time but money. In this case, Tra-Cal Lab replaced the battery and fuse and promptly returned the meters.

This is an example of how low-cost providers may have hidden fees and may increase the unit's out-of-commission time.

Calibration for Network Analyzer

A customer sent a network analyzer to their low-cost provider for calibration, knowing that there was a problem with the unit. The provider could not find the problem, but claimed to have calibrated the unit.

The customer's engineer then sent the network analyzer to Tra-Cal Lab, and we were able to correctly diagnose the problem. However, the engineer's supervisor insisted that the network analyzer be sent back to their low-cost provider for the repair, telling the low-cost provider exactly what Tra-Cal Lab had identified as the problem. This time, the low-cost provider found the problem and quoted the customer a high price for the repair. Knowing that this price was extremely high, the engineer asked Tra-Cal Lab to show him, his supervisor and the

low-cost provider how to repair the network analyzer. Tra-Cal Lab demonstrated that the only problem was that metal filings had accumulated in the cables. Tra-Cal Lab cleaned out the cables for a small service cost, and this fixed the problem. This is an example of how the low-cost providers may not have the technical expertise to diagnose equipment damage and complete subsequent repairs.

Conclusion

Simply stated, customers know that they can expect integrity and quality from NSCA and Tra-Cal Lab. We believe in being completely transparent and strongly encourage all customers to be educated on how their equipment will be checked and calibrated. Tra-Cal Lab openly shares calibration procedures, time estimates and calibration equipment requirements with customers. Whether a company ultimately chooses to use Tra-Cal Lab or another reputable calibration service provider, the customer should understand what they are getting. **ST**

Todd Chaikin holds an M.B.A. from Johns Hopkins University and has been general manager of NSCA Technologies for 24 years. In 2000, he co-founded Tra-Cal Lab to provide quality repair and full calibration services, as well as metrology and contract testing services of test equipment.

Darwin Phillips is the laboratory manager of Tra-Cal Lab. He has 32 years of metrology experience and has worked in all positions in the laboratory, including: quality assurance, RF spectrum analysis and standard maintenance. He received his training from the U.S. Air Force, where he retired after 25 years of service.



SONARWIZ 7

CAPTURE AND SHARE 3D VIDEO FOR REPORTS

Improved speed, automation, efficiency and ease of use

- Reporting options increase productivity
- Export 3D Video, Google Earth, Geo Image
- Share 3D project as 3D PDF or WebGL
- Save time using automated import settings
- Supports wide variety of sensors and sonars
- Real-time acquisition of LiDAR and MBES

oi oceanology international®
2018 13-15 MARCH 2018, LONDON, EXCEL
VISIT C71 AT BOOTH L120
1-DAY TRAINING - FRIDAY, MAR 16

CHESAPEAKE TECHNOLOGY
www.chesapeaketech.com

Canadian Hydrographic And National Surveyors' Conference

The 2018 Joint Conference of the Canadian Hydrographic Association and the Association of Canada Lands Surveyors will be held March 26 to 29 at the Victoria Conference Center, with guests staying at the Empress Hotel in Victoria, British Columbia.

The Canadian Hydrographic Association is a national hydrographic organization in Canada embracing the disciplines of hydrographic surveying, marine cartography, marine geodesy, offshore exploration, and tidal and currents studies.

The Association of Canada Lands Surveyors is the national licensing body for professionals surveying in the three Canadian territories and the federal parks, on aboriginal reserves, and on and under the surface of Canada's oceans.

Location

Victoria, the capital of British Columbia, sits on the southern end of Vancouver Island. With abundant parkland, it's known for outdoor activities. The city's chief industries are technology, food products, tourism, education, federal and provincial government administration, and services.

Located at the maritime crossroads of the Georgia Strait, Juan de Fuca Strait and many archipelagos, Victoria is a paradise for boaters.

Maritime traffic reaching the main entrance of the Canadian West Coast inevitably passes by this beautiful city, which is surrounded by a craggy coastline that has been, for a long time, a real challenge for hydrographers and land surveyors.



Workshops, Technical Programs

With more than 400 delegates expected to attend, the conference will include workshops on current industry topics and a full schedule of technical sessions on the latest issues, developments and applications in hydrography. More than 60 exhibit spaces will showcase the latest products, services and expertise. Half-day and full-day vendor workshops will be held Monday, March 26.

On-the-Water Demonstrations

Some exhibitors will be able to take small groups of delegates around the harbor to demonstrate the latest hydrographic technologies.

Information is available on the conference website, www.chc-nsc2018.ca.



TOTAL OCEAN MARKET COVERAGE

2018

JANUARY

Annual Review & Forecast

FEBRUARY

Instrumentation: Measurement, Processing & Analysis

***Oceanology International*, March 13-15, Excel London, U.K.

***Canadian Hydrographic and National Surveyors' Conference*,
March 26-29, Victoria, Canada

MARCH

Electronic Charting/Vessel Management/Ports &
Harbors/Dredging/Homeland Security

APRIL

Offshore Technology/Alternative Energy & Ocean Engineering

***Offshore Technology Conference*, April 30-May 3, Houston, TX

***AUVSI XPONENTIAL 2018*, April 30-May 3, Denver, CO

***OCEANS '18 MTS/IEEE Kobe / Techno-Ocean 2018*,
May 28-31, Kobe, Japan

MAY

Communications, Telemetry, Data Processing

***CLEAN PACIFIC 2018*, June 19-21, Portland, OR

***UDT 2018*, June 26-28, Glasgow, U.K.

JUNE

Seafloor Mapping/Sonar Systems/Vessels

JULY

Deck Gear, Cable, Connectors, Power Systems & Salvage

AUGUST

Geophysical Exploration/Seafloor Engineering

***SEG 2018*, October 14-19, Anaheim, CA

SEPTEMBER

Ocean Resources Development & Coastal Zone Management

***Offshore Energy 2018*, October 22-24, Amsterdam,
The Netherlands

***EURONAVAL 2018*, October 22-26, Paris Le Bourget, France

***OCEANS '18 MTS/IEEE Charleston*, October 23-25, Charleston, SC

OCTOBER

Environmental Monitoring, Remote Sensing & Pollution Control

***International Water Conference*, November 4-8, Scottsdale, AZ

***CLEAN GULF*, November 13-15, New Orleans, LA

NOVEMBER

Undersea Defense/Antisubmarine Warfare

DECEMBER

Diving, Underwater Vehicles & Imaging

***Underwater Intervention 2019*, dates TBD, New Orleans, LA

**EXTRA SHOW DISTRIBUTION (additional shows will be added as information is obtained)

SEA TECHNOLOGY®

WORLDWIDE INFORMATION LEADER FOR
MARINE BUSINESS, SCIENCE & ENGINEERING

The only magazine that addresses the
total oceanographic field from undersea
defense to offshore oil...globally

Recognized by tens of thousands as
the authority for design, engineering,
and application of equipment and
services for government and industry.

...and most of all, IT SELLS!

**ADVERTISING CLOSES ON
THE 15TH OF THE MONTH
PRECEDING ISSUE DATE**

BONUS INFORMATION TO KEEP OUR READERS UP-TO-DATE

- Book Reviews
- Capital Report
- Company Profiles
- Contracts
- Environmental Monitoring
- International
- Marine Renewables
- Marine Resources
- Meetings
- Navy Currents
- Ocean Business
- Ocean Engineering
- Ocean Research
- People
- Product Development Reviews
- Soapbox
- ST Looks Back

OTHER OPPORTUNITIES

- *Sea Technology Buyers Guide/Directory* (2019 edition closes October 5, 2018)
- *Sea Tech e-News*
- *Commercial Fisheries News*
- *Fish Farmers Phone Book/Directory*
- *Fish Farming News*
- *Commercial Marine Directory*
- Compass Research Bureau reports
- Direct mail list rentals
- Reprints
- Banner and skyscraper Web ads

EDITORIAL CONTACTS

Aileen Torres-Bennett
Amelia Jaycen

ADVERTISING CONTACTS

C. Amos Bussmann
Sue Ingle Owen

Follow Us On:



Compass Publications, Inc.

1600 Wilson Blvd., Suite 1010, Arlington, VA 22209-2510 • Tel: 703.524.3136 • Fax: 703.841.0852 • www.sea-technology.com
oceanbiz@sea-technology.com (editorial) • seatechads@sea-technology.com (advertising/production)

1963 - 2018 Celebrating More Than 54 Years of Serving the Global Ocean Community

NEW LOGGER RANGE

WiSens

Compact & Robust
Low Power
WiFi



Temperature & Depth
CTD
Wave - Tide
Turbidity

Oi **BOOTH**
2018 **B401**

nke

INSTRUMENTATION



www.nke-instrumentation.com

Sponsors

The platinum sponsor is iXblue. The gold sponsor is Kongsberg Maritime. Other sponsors include AML Oceanographic, Terra Remote Sensing, IIC Technologies and Teledyne CARIS as bronze sponsors. Additional conference details and sign-up information are available at www.chc-nsc2018.ca. **ST**

Exhibitors List

The following list of exhibitors was updated as of press time:

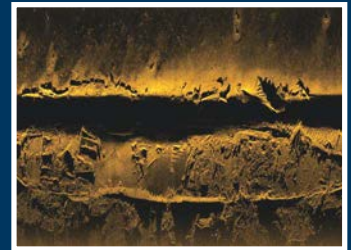
AML Oceanographic
Applanix Corp.
Aquatic Environmental Services Inc.
Armstrong Marine USA Inc.
Canadian Hydrographic Service – Service Hydrographique du Canada
Canal Geomatics Inc. / TerrisGPS Ltd.
Carlson Software Inc.
Challenger Geomatics Ltd.
EdgeTech
Fugro
Hoskin Scientific Ltd.
Hydro International
HYPACK Inc.
IIC Technologies Inc.
iXblue
KISTERS North America Inc.
Klein Marine Systems Inc. / DASCO Equipment Inc.
Knudsen Engineering Ltd.
Kongsberg Maritime
Leidos
McElhanney
NORBIT Group AS
Oceanalpha Co. Ltd.
PARC Systems Inc.
Ping DSP Inc.
QPS Inc.
R2Sonic LLC
SBG Systems S.A.S.
Seafloor Systems Inc.
Solv3D Inc.
Spatial Technologies
Technodigit
Teledyne CARIS
Teledyne Marine
Terra Remote Sensing Inc.
The Hydrographic Society of America
Universal Geomatics Solutions Corp.
University of New Brunswick



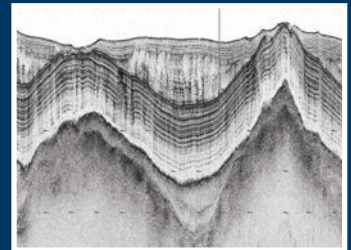
Clearly Superior Imaging

SONAR SYSTEMS

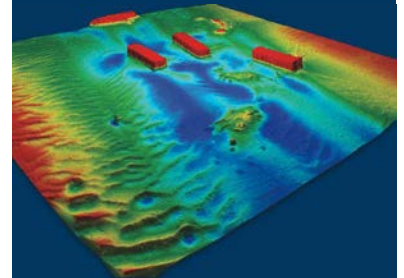
SIDE SCAN SONARS



SUB-BOTTOM PROFILERS



BATHYMETRY SYSTEMS



EdgeTech.COM

info@edgetech.com
USA 1.508.291.0057

Fluorometers: Experiences With Autonomous Vehicles

Integration with AUVs Enables Extensive Ocean Studies

By Lawrence Younan

Our oceans provide us with invaluable resources that are being threatened by observed global shifts. There is a need to not only increase our understanding of the physical, chemical and biological dynamics within oceanic environments, but also to do our best to characterize, document and monitor the state of our oceans to raise awareness of changes that will affect our way of life.

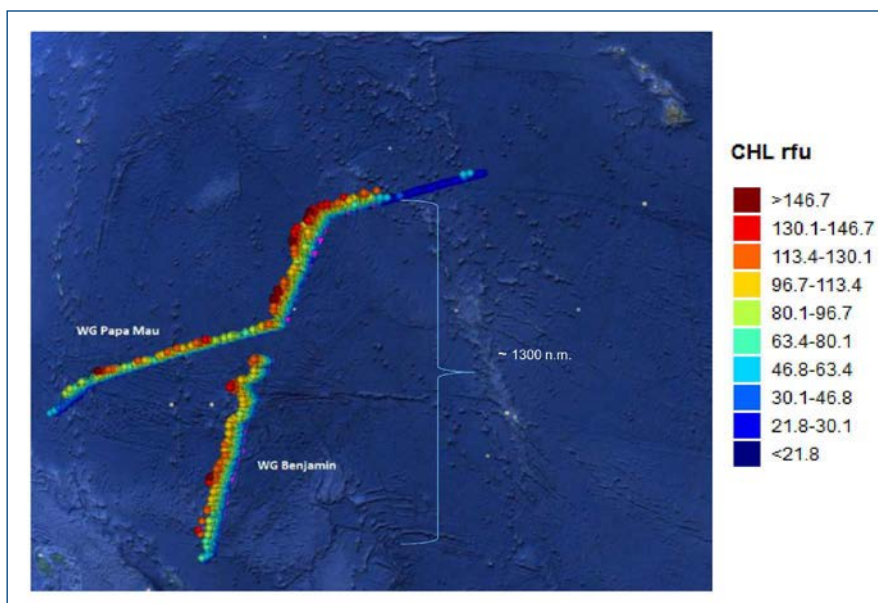
To date, less than 5 percent of the world's oceans have been explored, primarily due to the fact that it is not feasible to reach the deep-ocean layers, much less sample at those depths. We are limited to exploring the expansive surface waters that cover more than 70 percent of the Earth, and with this endeavor comes a new set of challenges. Imagine the amount of time, resources and money it would take to sample a small fraction of the ocean, even just the upper 100 m.

There are numerous researchers around the globe who have committed to oceanic studies, but in a world of more than 7.5 billion people, we are a niche group.

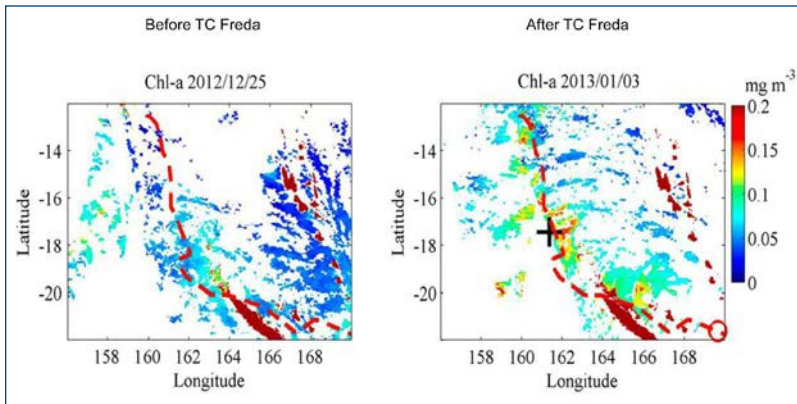
Fortunately, technological advances have brought us into the age of robotics. We are now able to configure unmanned vehicles (AUVs) to dive deeper, sample more quickly and cover more areas than old-fashioned manpower ever could. Our current efforts using autonomous vehicles have already given us a better understanding of oceanic currents, plankton migrations, nutrient cycling, temperature change and organism distributions, to name a few. Now, with satellite imaging, we have taken another big leap forward to the next age of sampling in which we can analyze large swaths of the ocean in a relatively short amount of time. This type of sampling (satellite imaging) requires laying the groundwork to verify and corroborate data and then fine-tuning and highlighting the role of autonomous vehicles.

Autonomous Underwater Vehicles

AUVs are unmanned vehicles that carry scientific instrumentation for specific research projects. The battery-driven AUV powers instruments and can be automated to sample at specific intervals as mandated by the project's specifications or controlled remotely, giving researchers the ability to customize sampling methods while underway. Standard configurations can include solar panels, cameras, GPS, telemetry and instrumentation that provides researchers with near-real-time data. A key factor in furthering our understanding of ocean dynamics is the development of new tools that



Wave Glider tracks for Papa Mau and Benjamin showing large fluorescence response from mid-ocean waters.



MODIS chlorophyll data taken before and after Tropical Cyclone Freda. The crosshairs in the plot to the right indicate the point of intersection between the Wave Glider and the cyclone.

can be integrated with AUVs, such as fluorometers, spectrophotometers, imaging microscopes and other technology. Although these analytical instruments exist and are market-ready, they require modification for integrating into AUVs, and this is where there may be disconnect between scientific research and business.

Turner Designs' expertise with AUVs has been primarily gained through our collaborations with companies such as Liquid Robotics, Navocean or Slocum gliders, so we are limited in our knowledge of the detailed workings

of AUVs. However, we have picked up on some very important characteristics users need when deciding which fluorometric instruments to integrate with their AUVs. Understanding these characteristics will help bridge the gap between instrument vendors and integrators to help increase the sampling power of AUVs.

Instrument Integrations

In many AUVs in which Turner Designs instruments have been integrated, the most requested feature is higher-powered fluorometers. This is understandable considering that these AUVs have a standard configuration and power scheme that was designed for power-hungry instruments such as ADCPs and CTDs as part of their standard package for measuring temperature and salinity or looking at bathymetry. For most missions, fluorescence is a new parameter and doesn't seem to be a priority unless there is a specific need or request to be fulfilled, so the burden falls on vendors to make their instrument fit within the power requirements specified by the integrator. The benefit in this case is two-fold because it is in the interest of the vendor to make low-power instruments for expanding integration possibilities.

Other requests include the ability to configure the instrument for different applications and form factors so that an instrument can be shared among different AUVs.



DEEPSEA
Power & Light

Apex™ SeaCam®

4K UHD and HD



The *pinnacle* of performance

- Superior Performance** - Proprietary corrector optics with low-distortion 70° horizontal FOV.
- Zoom Capabilities** - 12x optical zoom in 4K UHD and HD output formats, and 24x combined lossless digital zoom in HD.
- Robust Design** - 6,000 m rated titanium housing and optical dome tested with over 10,000 pressure cycles.
- Flexible Configuration** - FleXlink®, CWDM fiber optic, and coax output options. Sony VISCA compatible.

Contact us today for more information: 1 800 487 3775 sales@deepsea.com www.deepsea.com/apex-seacam



are you covered?

AN RJE PINGER IS YOUR INSURANCE POLICY

Never lose sight of what you need.

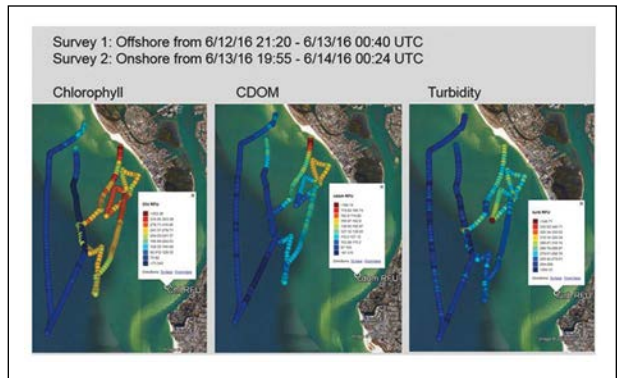
- Easily mark or relocate anything in the water
- Assortment of off-the-shelf pingers
- Capability to develop specialty products





RJEINT.COM | 949-727-9399




Results for chlorophyll, CDOM and turbidity from the day-long Nav2 surveys off of Florida's Gulf Coast.

This is a difficult task for vendors to achieve when designing an instrument for a specific AUV and application. Even if vendors can configure the instrument for different applications, integrations are not always straightforward. Vendors may deal with a number of constraints when designing the instrument's form factor for a specific AUV. In this case, integrators face the burden of purchasing multiple instruments, each configured or adapted to a specific AUV or application.

Integration Issues

A big concern shared among both vendors and integrators is biofouling. From a vendor point of view, biofouling on or around instruments can result in poor data sets, giving integrators a false sense of poor instrument quality. It is in the vendor's best interest to develop anti-biofouling measures into new instrumentation to maintain data integrity. If anti-biofouling measures are not included in the development, then integrators would be at a big disadvantage for several reasons, which may include AUV operability, damage to AUV components and data loss. Because it is in both parties' interest to actively combat biofouling, vendors will typically use multiple anti-fouling measures such as copper or mechanical wipers to keep organisms from growing on instruments, and integrators will aid these efforts by using sacrificial anodes to minimize growth.

Over the years, instrument calibration has been a controversial subject full of confusion as to how, what and why to calibrate. The primary objective when integrating fluorimeters should be to ensure that the instrument has not drifted or changed during the mission. To check this, a calibration is not necessary. Instead, a measurement of a stable material is best. Calibration is used specifically for converting a raw response to engineering or concentration units when you read a solution with a known concentration and want to set that correlation as the conversion factor for converting all raw data to estimates. This process would be required for end-users who want to view real-time or log concentration data without further processing and is independent of the instrument integrated as long as the instrument has not changed. Technology has allowed for increased instrument stability through components like light-emitting diodes and photo diodes




pCO₂

General Oceanics, Inc. introduces its **new model 8050 autonomous pCO₂ monitoring system**. Continuous measurement, recording and transmission of sea surface CO₂ levels.

- **Efficient equilibration of sea water and confined air head space.**
- **Infrared analysis of CO₂ concentrations.**
- **Automatic calibration.**
- **Integrated computer and control software.**
- **Integrated GPS location and atmospheric conditions.**
- **Satellite data transmission.**

<http://generaloceanics.com/home.php?cat=69>

General Oceanics Inc.
1295 N.W. 163 St., Miami, FL 33169
Tel: (305) 621-2882, Fax: (305) 621-1710
E-mail: Sales@GeneralOceanics.com
<http://www.GeneralOceanics.com>



that have a long life, but vendors should still offer a peace-of-mind check for integrators since it is important to check when dealing with long-term data sets. For example, Turner Designs offers a solid reference standard that will not change, so integrators can be assured that if a change is observed, the change is with the instrument and not the reference material. This is the problem most users encounter when using solutions to check stability: Was it the solution or instrument that changed?

The following are just a few examples of the issues that are encountered when integrating instruments with AUVs.

Liquid Robotics' PacX Mission

On November 17, 2011, Liquid Robotics launched four AUVs (Wave Gliders) from San Francisco on a mission to cross the Pacific Ocean, two going to Japan and two to Australia. This mission, dubbed PacX, collected millions of data points and set a new Guinness World Record for the furthest distance traveled by an unmanned surface vehicle (7,939 nautical miles). Wave Gliders are surface vehicles that use wave power for thrust. The smallest waves can be used to propel the AUV forward, and the vehicle's heading can be changed by remotely controlling it from an operations facility. Each vehicle in the PacX mission carried identical scientific equipment including a CTD, weather station, wave sensor, camera and Turner Designs fluorometers. There were many interesting data sets collected along the way, one of

which documented a mid-ocean bloom and another that showed the aftermath of a tropical cyclone.

Mid-Ocean Bloom. The detection of open-ocean primary productivity is a scientifically critical capability facilitated by combining reliable fluorometry with AUVs. The two Wave Gliders carrying Turner Designs' fluorometers as they voyaged across the equatorial upwelling zone measured high-chlorophyll fluorescence responses.

Tropical Cyclone Freda. On December 31, 2012 one of the Wave Gliders intersected with a tropical cyclone in the Coral Sea. Wind speeds were an average of 95 kt., resulting in 10-m waves. The AUV captured data throughout the event that shows the biological response after the cyclone had passed: estimated chlorophyll concentrations increased, indicating bloom activity.

Navocean HAB Mapping

Harmful algal blooms (HABs) significantly affect ecosystem health, resulting in mass fish mortalities and threatening mammals and seabirds. They also prove to be a threat to the public, with numerous recorded accounts of human death from ingestion of contaminated finfish and shellfish. Combating HABs is best approached through development of HAB-specific instrumentation and integrations with AUVs, such as the Nav2 autonomous vehicle manufactured by Navocean, based in Seattle, Washington, to conduct preemptive ocean-mapping exercises that will provide information on HAB distribution or "hot spots."



What
goes
down
must
come
up

Deploy and recover with confidence.

For over 35 years our subsea buoyancy product line has been the first choice amongst ocean engineers for projects from near surface to full ocean depth.

deepwaterbuoyancy.com | +1.207.502.1400

DeepWater[®]
BUOYANCY

SUBSALVE
USA

UNDERWATER LIFT BAGS
ENGINEERED FROM THE BOTTOM UP!

The World's Best
Underwater Lift Bags
from 25 lbs. to 50 tons,
Water Load Test Bags to 50 tons.
IMCA Compliant.
ABS Approved.

INNOVATORS IN BUOYANCY AND ENGINEERED INFLATABLES.

MARK VORCA • RAPID RECOVERY SYSTEMS • AIRCRAFT LIFTING BAGS
WATER LOAD TEST BAGS • VEHICLE RECOVERY SYSTEMS • CABLE & PIPELINE FLOATS
LIFEBOAT DAVIT TEST KITS • FEND-AIR • INFLAT-A-TANK • PIPE PLUGGERS

P.O. Box 2030, North Kingstown, RI 02852, USA
Tel: +1 401 884 8801 Fax: +1 401 884 8868
www.subsalve.com richard@subsalve.com

In 2016, the Nav2, equipped with Turner Designs' CDOM, chlorophyll and turbidity sensors, completed two surveys off Florida's Gulf Coast and recorded real-time fluorescence data for identifying and tracking potential HABs. The first survey was conducted offshore, whereas the second survey was nearshore with several data points collected over the period of a day. This successful integration shows faster sampling rates spanning a large area can easily be achieved using fluorometers integrated with AUVs to quickly identify areas of concern and track distribution of HABs in any aquatic habitat.

Slocum Glider Darwin

Ocean stratification plays an important role in biological processes, such as vertical migration of phytoplankton or carbon flux, and it cannot be examined using satellite imaging due to subsurface formations. Characterizing subsurface events requires specialized AUVs called buoyancy gliders that have the ability to sample at depth, adding another dimension to ocean exploration, relative to surface gliders.

A cooperation between Rutgers I-COOL program and Teledyne Webb Research allowed for the integration of a Turner Designs fluorometer onto the Slocum Glider Darwin, which was deployed off the East Coast of the U.S. for 45 days beginning September 7, 2012. The integrated fluorometer had a sensor package that included a chlorophyll sensor to look for the vertical distribution of phytoplankton in the water column. A time-series image shows a persistent subsurface chlorophyll maximum (SCM) at about 30-m depth that could not have been detected using satellite imaging. Typical methods for determining SCM include vertically profiling a rosette from research vessels and collecting grab samples for lab analysis that require a lot of time and money, but with buoyancy gliders we can obtain results rapidly with minimal effort.

Summary

Tools such as AUVs and other unmanned vehicles offer oceanographers a chance to explore areas that are not easily accessible and address new questions. The ability of unmanned vehicles to reach these undersampled parts of the ocean is enough to motivate researchers to install, equip or attach as many sensors as possible—physical, chemical and biological—to obtain measurements at a fraction of the cost of manned research vessels.

Acknowledgements

The author would like to express special thanks to Tracy Villareal (University of Texas at Austin) and Chris DeCollibus (Teledyne Marine).

Further Data

For PacX or Slocum Glider data, contact Lawrence Younan at LawrenceYounan@turnerdesigns.com. **ST**

Lawrence Younan is a senior applications scientist at Turner Designs Inc. He began working for Turner Designs in March 2006 after completing graduate coursework at Moss Landing Marine Laboratories, California. His academic research focused on the use of pigment separation techniques to determine the temporal and spatial resolution of phytoplankton in Elkhorn Slough.

icListen

The New Digital Hydrophone Array

- ◆ Track, Locate and Detect
- ◆ Improve Signal Performance
- ◆ Use Beam Steering

Ocean Sonics

The Smart Hydrophone Company

OceanSonics.com

Canadian Coast Guard Icebreakers Undergo Upgrade and Modernization

ABB concluded the first modernization on a Canadian Coast Guard (CCG) icebreaker, the 38-year-old CCGS *Pierre Radisson*, including installation of 12 new DC drives and a complete propulsion control system.

ABB fitted twin AC/DC diesel-electric propulsion systems for greater redundancy, with each featuring a DC electric motor connected directly to the vessel's propeller. ABB also attached digital sensors to a variety of on-board equipment to provide its shore-based engineers with a virtual presence on board the ship.

The project kicked off an upgrade program that will ultimately cover 10 ships in the Canadian Coast Guard fleet, to be completed by 2020.

Art Anderson Has \$3 Million Contract To Construct Detroit Floating Screen Structure

Bremerton-based naval architecture and marine engineering firm Art Anderson Associates is working with the U.S. Army Corps of Engineers (USACE) in Portland to provide architectural and engineering services for the design of a downstream fish passage floating screen structure (FSS) in the Detroit Reservoir. The FSS has an estimated maximum cubic feet per second (cfs) between

1,000 and 4,500 cfs and is intended to attract and collect juvenile fish in the reservoir and expected to increase outmigration.

The USACE Portland District (CENWP) is simultaneously designing a selective withdrawal structure (SWS) with a weir box to provide temperature control in the North Santiam River, intending for the flow to pass through the FSS, screen out the fish, pass through the SWS and ultimately pass through the turbines and further down river. The fish that were separated from the flow and collected will be passed further downstream. The project is one of seven floating fish collectors in the Pacific Northwest.

Oil Seepage Mapping Collaboration Wins Environmental Leadership Award

Fugro received an Environmental Leadership Award from The Maritime Alliance, a California-based nonprofit organization that promotes sustainable, science-based ocean and water industries.

The recognition was received in San Diego during the organization's BlueTech Week, an international gathering of more than 485 marine professionals from academia, government and industry.

Sharing the award was Planck Aerosystems, a drone intelligence company specializing in highly autonomous unmanned aerial systems with whom Fugro collaborated on a project to identify and map oil seepage from abandoned offshore well sites in Santa Barbara County.

Visit us at OI 2018
Stand No. K10

Next-generation
cable solutions *for a*
connected world

Custom cable engineering for the
world's most mission-critical
Marine and Subsea applications.

FALMAT
CUSTOM CABLE TECHNOLOGIES

www.falmat.com

Ocean Engineering



pCO₂ Analyzer
 ■ Los Gatos OA-ICOS & LI-COR® NDIR

Li-Ion Batteries
 ■ Highest capacity, reliability, safety
 ■ Your power source for subsea, AUV, ROV



Shell OCEAN DISCOVERY **PRIZE**
 clean seas
 with the power of green

Booth G300
 Oceanology International
 2018 23-25 MARCH 10th - 12th CADIZ, SPAIN

Added Value
 ■ Customizing and personal support
 ■ Longest lifetime
 ■ Simplest operation on board

ISO 9001
 info@subctech.com
 www.gosubsea.com
 SubCtech GmbH www.subctech.com



pCO₂ Analyzer



OceanPack™ (FerryBox)



Subsea Inspection



Vehicle Batteries



Battery Systems

Results from this project prompted the California State Assembly to pass legislation SB-44 funding a legacy oil and gas well removal and remediation program through 2028.

C-Innovation Forms Subsea Projects Group

C-Innovation LLC (C-I) announced the formation of a turnkey subsea projects group based in Edison Chouest Offshore (ECO)'s Houston, Texas, office. C-I provides engineering support, procedure development and review, project execution and final reporting requirements and offers ECO's various port facilities, logistics company, tank cleaning services, shipyards and dry docks located throughout the U.S. Gulf Coast and Brazil. With corporate headquarters in Mandeville, Louisiana, C-I's ROV capabilities provide support to subsea construction projects, as well as drilling, intervention, maintenance and heavy-lift assignments.

New Woods Hole Group Will Provide Environmental Monitoring and Planning

Representatives from CLS America Inc., Horizon Marine Inc. and The Woods Hole Group Inc. announced the merging of the three companies, effective January 1, 2018 and resulting in the new company: The Woods Hole Group Inc.

CLS America specializes in satellite technology and enhancing security through direct operational support to government, institutions and industries in the environmental field, while Horizon Marine's expertise lies in offshore oceanography for the energy industry. The merger with Woods Hole Group provides services including: environmental assessment, fisheries and wildlife satellite tracking, ocean current forecasting, coastal engineering, ocean monitoring systems, habitat restoration and climate change planning projects.

Metal Shark Offers Next-Generation Damen Fast Crew Supplier

As an extension of its existing relationship with Netherlands-based Damen Shipyards, Louisiana-based shipbuilder Metal Shark announced the availability of the new Damen FCS 7011 for the U.S. market.

The all-aluminum monohull FCS 7011 incorporates Damen's "Sea Axe" bow and a ride control system for roll and pitch reduction in offshore sea states. Steerable skegs allow for highly accurate course corrections, while a gyroscope maintains stability during crew transfer via a motion-compensating gangway.

Hydro Purchases Ownership Stake in Corvus

Norwegian aluminum supplier Hydro purchased 25.9 percent of the shares in Corvus Energy, a provider of modular lithium-ion battery systems that is jointly held by BW Group, Statoil Technology Invest and investors affiliated with El Cuervo Holdings Ltd. Partnership.

Rooted in more than a century of renewable energy innovation, Hydro was attracted to Corvus as the commercial viability of battery power technology in all-electric and hybrid marine applications increases. **ST**



AMT Analysenmesstechnik GmbH
 Joachim-Jungius-Strasse 9
 D-18109 Rostock, Germany
 Tel.: +49-381-4059380, Fax: -383
 E-mail: info@amt-gmbh.com
 www.amt-gmbh.com

Optical CO₂ Sensor for Monitoring



Characteristics:

- Principle: Single-Beam Dual Wavelength NDIR
- Measuring ranges: 15 mg/l or 50 mg/l or 340 mg/l
- Accuracy: ± 0.06 mg/l CO₂ ... ± 6 mg/l CO₂
- Maximum deployment depth: 1,000 m
- Outputs: 4...20 mA, 0...5 V DC or RS485
- Power supply: 12-30 V DC or 20-30 V DC
- Temperature range: 0...60°C
- Internal temperature compensation
- Compensation of humidity and other influences
- Dimensions: 225 mm length, 36 mm diameter
- Housing material: Titanium
- Connector: Subconn MCBH4M
- Power consumption: < 0.5 W
- Warm-up time: < 12 seconds

international

Chelsea Technologies Scrubber System Receives ClassNK Certification

Chelsea Technologies' Sea Sentry washwater monitoring system for ship exhaust gas cleaning systems has been certified by ClassNK. Sea Sentry provides a fully autonomous washwater monitoring system that monitors both the water inlet and outlet of wet exhaust gas scrubber systems.

Sea Sentry has the ability to accurately measure the polycyclic aromatic hydrocarbon, absorbance, turbidity (to ISO 7027: 1999), temperature and pH of scrubber washwater. It can monitor open-loop, closed-loop and hybrid scrubber systems, setting the gold standard for accurate washwater monitoring.

ABS Approves Innovative Vessel with LNG Power Generation and Storage

ABS granted approval in principle (AIP) to Hudong-Zhonghua Shipbuilding (Group) Co. Ltd. for its LNG power vessel, which is designed in accordance with the applicable requirements of ABS rules and IMO regulations.

The Hudong-Zhonghua Shipbuilding vessel concept offers efficient LNG power generation and storage. The LNG power supply vessel integrates LNG receiver, stor-

age, regasification, electric power generation and transmission, with LNG storage tank volume of 32,000 m³ and 100-MW power capacity.

Teledyne Participates in Multinational Exercise

Teledyne Gavia and Teledyne SeaBotix participated in a multinational explosive ordnance disposal (EOD) exercise: the Northern Challenge held in Iceland to provide training for members of NATO's Partnership for Peace program. Thirty groups were assigned EOD-focused tasks based on realistic scenarios and using the equipment provided, which included a Gavia AUV and a SeaBotix vLBV300 ROV.

Participants included Austria, Belgium, Canada, Denmark, Finland, France, Germany, Iceland, Italy, the Netherlands, Poland, Norway, Sweden, the United Kingdom, the United States (including Army, Air Force and Navy) and other NATO members and partners.

Wärtsilä's Joint Venture in China is Operational

Wärtsilä opened CSSC Wartsila Electrical & Automation (Shanghai) Co. Ltd. (CWE&A), a joint venture with China State Shipbuilding Corp. (CSSC). The opening was announced at the Marintec 2017 conference and exhibition in Shanghai. The new joint venture company will be headed by General Manager Christian Heinsohn.

Wärtsilä and CSSC also have joint venture engine and propeller companies, including the most modern controllable pitch propeller manufacturing facility in China

RUTTER

HIGH DEFINITION RADAR SYSTEMS



SEE MORE - SEE BETTER - WORRY LESS

Rutter high definition radar systems allow you to **SEE MORE** and **SEE BETTER**. Our systems provide invaluable information for the detection and tracking of small targets, oil spill management, wave & current monitoring, and ice navigation. **WORRY LESS** as you make the most informed decisions using our reliable radar solutions.

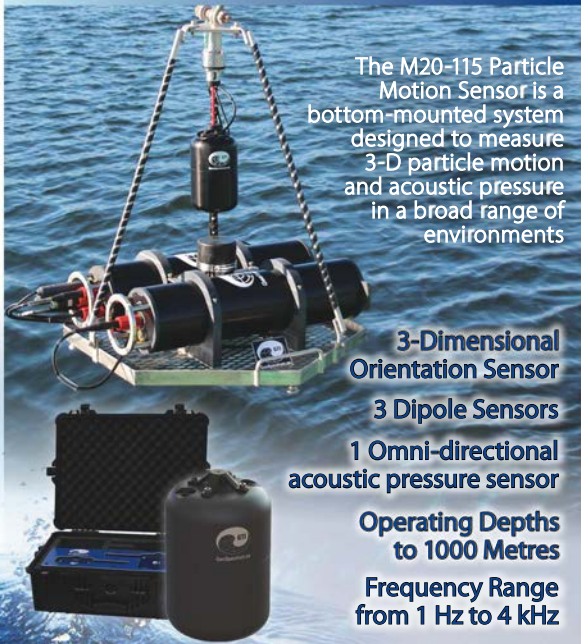
RUTTER WILL BE ATTENDING OCEANOLOGY INTERNATIONAL LONDON, 13-15 MARCH 2018.
CONTACT SALES@RUTTER.CA FOR MORE INFORMATION.

www.rutter.ca



GeoSpectrum Technologies Inc
Optimizing Underwater Acoustics

M20-115 Particle Motion Sensor



The M20-115 Particle Motion Sensor is a bottom-mounted system designed to measure 3-D particle motion and acoustic pressure in a broad range of environments

- 3-Dimensional Orientation Sensor**
- 3 Dipole Sensors**
- 1 Omni-directional acoustic pressure sensor**
- Operating Depths to 1000 Metres**
- Frequency Range from 1 Hz to 4 kHz**

One of the M20 family of particle motion sensors from GeoSpectrum Technologies

GeoSpectrum.ca
sales@geospectrum.ca

and one of the biggest fixed-pitch propeller manufacturers in the world.

Hyundai and Lloyd's Register Cooperate On LNG-Fueled Ship Design and Development

Hyundai Heavy Industry (HHI) Group and Lloyd's Register (LR) are cooperating to facilitate a number of LNG ship design projects. Hyundai Mipo Dockyard (HMD), part of the HHI Group, will deliver one of the world's largest LNG-fueled ships, a 50,000-dwt bulk carrier with a high-manganese LNG fuel tank. HHI also recently signed a contract to build the world's first LNG-fueled Aframax tanker.

HHI and LR previously announced a joint development project to design 180,000-dwt-class bulk carriers; the design development is now almost finished and is in the process of receiving approval in principle. This design is optimized for short- to medium-haul bulk trade and long-haul bulk trade service. HAZID analysis was recently completed by Woodside, Anangel, GE, LR and HHI, who are cooperating to develop an LNG-fueled 250,000-dwt very large ore carrier.

Report Shows £7.5 Billion Subsea Industry Supports 45,000 Jobs after Oil's Downturn

Subsea UK, whose 300 members make up the bulk of the country's subsea supply chain, conducted a business activity review that revealed the industry is currently generating annual revenues of £7.5 billion, compared to £8.9 billion in 2014. The report also revealed that, despite the downturn in oil and gas, the subsea sector still supports around 45,000 jobs in the U.K. This compares to around 53,000 three years ago. Neil Gordon of Subsea UK said the impacts are a reflection of the crash in oil prices and subsequent global downturn that led to deferral or cancellation of major subsea projects.

Robotic Mining Prototype to Uncover European Mineral Resources

U.K.-based Soil Machine Dynamics Ltd. (SMD) successfully completed first-stage testing in the VAMOS (viable alternative mine operating system) project, a 42-month international research and development venture partly funded by the European Union's Horizon 2020 program. SMD and its partners in the VAMOS consortium designed and built a robotic underwater mining prototype to perform field tests at four EU mining sites, at a cost of approximately €12.6 million.

Subsea Hard Coating is Chosen for Exhaust Scrubber Application in China

Subsea Industries' glass-flake, nontoxic hard coating Ecospeed will protect the exhaust scrubber outlets of three new container vessels under construction in Zhoushan, China. Coatings that can withstand very high exhaust gas temperatures and chemical pollutants are required in exhaust scrubber applications. Shipowners have experienced damaged pipework at the outlet end of the scrubber system due to the highly corrosive wash-water produced during the exhaust gas cleaning process. Ecospeed's coating has B1 classification by DNV GL.

PROVEN TOUGH





YOUNG

DESIGNED &
BUILT IN USA

PRECISION METEOROLOGICAL INSTRUMENTS

VISIBILITY • WIND • PRECIPITATION • TEMPERATURE

HUMIDITY • PRESSURE

WWW.YOUNGUSA.COM • 231.946.3980

UAE is First Arab Country to Achieve IMO Council Category B Membership

The United Arab Emirates (UAE) is the first Arab country to win Category B membership into the International Maritime Organization (IMO) Council. The council election included nominees from 11 countries in the international marine trade sector including Germany, Sweden, Netherlands, Brazil, Argentina, France and Australia. The announcement of UAE's membership was made during the 30th General Assembly IMO meeting.

New Company Offers Differential GPS

International Geomatics Group is a recently launched marine startup focused on differential global position system (DGPS) provision, as well as marine positioning services, exploration, inspection and digital data delivery. Co-founders include: Steve Rampton (CEO), who has more than 30 years of experience in offshore oil and gas, including ROV support and trenching; and Ken Adams (COO), an engineer and graduate of Aberdeen University and Robert Gordon University in Scotland.

Subsea Installation Completed In Record Time

Hydratight supplied and supported the subsea installation of three remote connectors within three weeks for Statoil off the west coast of Norway. The installation was performed using remotely operated equipment from the


Pipeline Repair and Subsea Intervention Pool (PRSI Pool) managed by Statoil. The MORGRIP mechanical connectors were deployed on two 12-in. risers and one 16-in. riser at depths more than 300 m. Site integration trials were completed at Statoil's PRS Base facility in Haugesund, Norway, prior to the connector deployment offshore.

Marlink and Radio Holland Strengthen Long-Term Partnership

Marlink acquired Radio Holland's connectivity business to further strengthen its offerings of maritime VSAT while Radio Holland will focus on providing efficient NavCom, ICT and maintenance solutions to the shipping industry. Radio Holland will be a global sales and service partner and offer Marlink's satcom connectivity portfolio. Radio Holland and the Marlink Group, including Telemar, will intensify their existing cooperation in NavCom sales and servicing.

OSIL Supplies Modular Multiple Corer For Papua New Guinea Project

Ocean Scientific International (OSIL) delivered a 12-station multiple corer to Australia for use in a project near Papua New Guinea. The multi-corer is constructed from stainless steel, features detachable core assemblies and collects up to 12 samples simultaneously, which include a high-quality sediment sample and the overlying supernatant water. **ST**



Ocean Sensor Systems

For Details Visit Us on the web or call 954-796-6583 USA

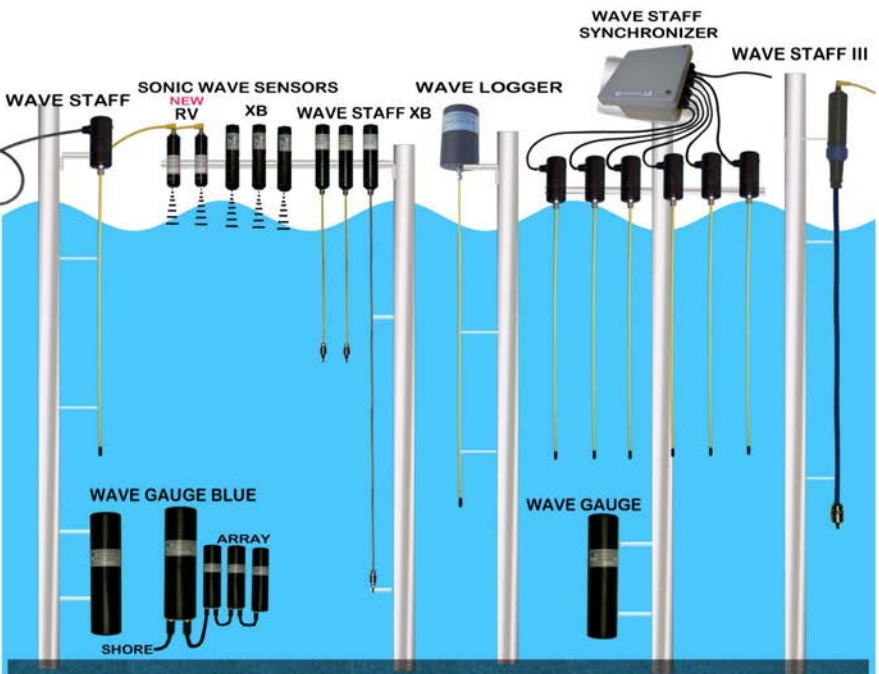
WWW.OCEANSENSORSYSTEMS.COM

SENSORS FOR:
Ocean, Harbors
Intracoastal
Lakes, Ponds
Wave Tanks

MEASURE:
Waves
Tides
Levels

DATA VIA:
Cable
Logger
Wireless

WE SUPPLY:
Tech Support
Software
Accessories
Custom Work



Canada Protects Critical Habitat for Eight Species

The government of Canada has signed eight Critical Habitat Orders under the Species at Risk Act. The approved orders will allow for further protection of eight at-risk species, including two whales (the North Atlantic right whale and beluga whale of the St. Lawrence Estuary), three fish species (spotted gar, eastern sand darter, Rocky Mountain sculpin), and one mollusc species (northern abalone). Also approved is the Proposed Critical Habitat Orders of the northern bottlenose whale and the lake chubsucker fish species.

A Critical Habitat Order focuses on protecting specific geographic locations and conditions essential for the survival and recovery of the species, such as where they give birth, hatch, feed or raise their young. Fisheries and Oceans Can-

ada is especially concerned about the plight of the North Atlantic right whale following multiple mortalities in the Gulf of St. Lawrence during the summer of 2017.

The Critical Habitat Order approved for the North Atlantic right whale will provide protection for the whale's critical habitat in the Grand Manan Basin (Bay of Fundy) and the Roseway Basin (off southwestern Nova Scotia).

Open Ocean, VORTEX Partner On Offshore Metocean

Open Ocean, which launched Metocean Analytics in 2015 to offer metocean studies on demand, teamed up with Spanish wind expert VORTEX to make Metocean Analytics a complete online solution for site analysis during offshore project development. Metocean Analytics is upgraded by including the SERIES and FARM solutions from VORTEX.

VORTEX is an independent private company that has been providing wind data and analysis to the wind energy sector since 2005.

Metocean Analytics simplifies and accelerates the analysis process for offshore development sites, providing average metocean conditions, extreme value analysis and operating weather windows.

UK Pledges Funds To Fight Plastic Pollution

The U.K. will use funds from its foreign aid budget to fight plastic pollution in developing countries.

"We've all been very concerned by the pictures we've seen in recent months of the impact of pollution on marine life, the impact of plastic pollution," U.K. Prime Minister Theresa May said, according to UN Environment.

"We are looking at what more we can do and how we can use overseas aid money to ensure we're... reducing this terrible pollution that is taking place and affecting marine life so devastatingly."

IT'S IN OUR DNA...

...to engineer and manufacturer the broadest range of **MARINE ANTENNAS** for the most demanding Positioning, Navigation, Timing and Communication applications the world over.

Antcom produces GNSS and Communication antennas optimized for Marine and Submarine Vessels, AUVs, Buoys, and Hydrographic and offshore equipment. Our deep-sea proven antennas are precision crafted to the highest metrics and to the most rigorous operational certifications.

Turn to Antcom for antenna capability, knowledge, and readiness to customize its antenna product line to customer-specific needs. For all of this and more, **ANTCOM KNOWS NO EQUAL.**

antcom.com | Excellence in Antenna and Microwave Products



The details of the U.K.'s pledge have not been announced yet. There are suggestions that the funds should be used on engineering, waste management strategies and innovative technology.

A new study by the Helmholtz Centre for Environmental Research in Leipzig, Germany, revealed that 90 percent of plastic waste entering the oceans comes from just 10 rivers, all in Africa and Asia.

Real-Time Data Reveal Cause of Algal Bloom

Aptly described as "guacamole soup," the 2016 algal bloom in Florida's St. Lucie Estuary prompted a state of emergency in response to mounting health, environmental and economic concerns.

Sea-Bird Scientific's Dr. Ian Walsh worked alongside scientists from Florida Atlantic University to study the bloom. Using real-time data from a network of land/ocean biogeochemical observatory (LOBO) systems, the scientists were able to determine probable causes of the algal bloom by utilizing real-time broadcasts of salinity, dissolved organic matter and nutrient data to trace the movement of water.

The result: high freshwater discharge from Lake Okeechobee into St. Lucie appeared to be "clogging" the natural exchange of freshwater and seawater, allowing blue-green algae to flourish in the trapped high-phosphate freshwater.

Real-time data can act as a lens to dynamic systems; as conditions change and variables interact with one another, up-to-date access to data is crucial for creating accurate models and making a timely response in a state of emergency. Access to a diverse array of sensors is crucial for piecing together a data-driven story.

Survey on LNG As Marine Fuel

Over the last 12 months, the ECA regulations have continued to drive many decisions in the LNG market. As new LNG infrastructure became operational, and with further projects in the pipeline, LNG as a

marine fuel has seen more traction with new LNG vessels on order.

Oil & Gas IQ surveyed more than 500 LNG specialists involved in the LNG bunkering supply chain to gain a deeper understanding of how the sector is continuing to move forward in challenging market conditions; as well as new opportunities and trends for the coming years.

This survey revealed that while the industry is on the cusp of dra-

matic change, it isn't moving forward as fast as original predictions suggested. Slow infrastructure development, the regulatory landscape and competition from alternative fuels are all contributing to the challenges in the sector.

Respondents highlighted that alongside lower costs, technological innovation and partnerships are critical to driving LNG forward as the fuel of the future. **ST**

POWER AMPLIFIERS SWITCHING & LINEAR

For more than 30 years we have been building amplifiers to drive reactive loads.



Model S16-20
20kVA continuous; 50kVA 20% duty
35 x 31.5 x 35.5 inches; 985 lbs.

Visit our Web site www.instrumentsinc.com



7263 Engineer Rd., San Diego, CA 92111-1493
(858) 571-1111 FAX (858) 571-0188 info@instrumentsinc.com
Copyright 2018

marinerenewables

Funding to Advance Clean Energy in Canada

The University of Victoria (UVic) is getting \$2.4 million in new funding to accelerate clean energy projects. The funding is from the government of Canada and the Dennis and Phyllis Washington Foundation in conjunction with Seaspan.

An investment of \$1.4 million will establish the Pacific Regional Institute for Marine Energy Discovery (PRIMED) at UVic. The institute will help develop and commercialize wind, wave and tidal energy technologies and help support the adoption of alternative technologies in remote coastal communities.

A \$1 million investment will significantly advance the work of the green transportation research team at UVic's Institute for Integrated Energy Systems. The funding will move forward solutions for heavy-duty marine, mining and transportation

sectors working to meet their greenhouse gas reduction targets and climate change mitigation goals.

Wind Energy Economical For Ship Propulsion

Analysis from BMT has revealed that the wingsail technology pioneered by Oceanfoil could achieve an average fuel consumption and emissions savings of 14 percent on a mid-sized tanker vessel and up to 20 percent in certain wind and sea conditions.

The results put renewable wind energy for ship propulsion in a key role as the shipping industry seeks to lower its carbon footprint and save fuel costs.

The assessment considered a system of four Oceanfoil wingsails over the course of a year on a 183-m, 50,000-tonne deadweight Panamax vessel operating in the north Atlantic. The study identifies the thrust

benefits for all wind angles around the ship and uses the average to define the Oceanfoil wingsail thrust at a given ship and wind speed.

Oceanfoil is in discussions with its classification society to obtain approval for its proposed advanced all-weather camera solution to provide enhanced bridge visibility that would ensure compliance with IMO regulations.

Dudgeon Now Powering UK Grid

The Dudgeon offshore wind farm 40 km off the coast of Norfolk, England, is officially open. All 67 turbines at the 402-MW farm are now delivering electricity to the U.K. grid, providing renewable energy to about 410,000 homes. Dudgeon is a key part of Statoil's strategy to complement its oil and gas portfolio with profitable renewable energy solutions.

It is estimated that the installed capacity of offshore wind in Europe can grow from 12 GW in 2016 to 70 GW in 2030.

Join **IOSTIA** and our members

Oi oceanology
international[®]
2018 13-15 MARCH 2018, LONDON, EXCEL

IOSTIA
ADVANCING THE BUSINESS OF OCEAN TECHNOLOGY

N608

3D 3D
at Depth

G250

anekconnect

N121

Aquatica
SUBMARINES
& SUBSEA TECHNOLOGIES

N608

BlueRobotics

M550

EXOCETUS
AUTONOMOUS SYSTEMS

Q501

PREVCO
SUBSEA HOUSINGS

F20

RJE

J451

SIDUS

A100

International Ocean Science & Technology Industry Association | www.IOSTIA.org

MacArtney Winches for Borkum Riffgrund

The Borkum Riffgrund Offshore Wind Farm 2 is located in the North Sea approximately 55 km off the northwest coast of Germany and is one of the world's biggest offshore wind farms. It comprises 56 wind turbines and will power 460,000 homes annually.

MacArtney provided winches for the wind farm to pull both interarray cables and export cables into the substation that forms the heart of the wind farm, collecting and exporting power generated by turbines through specialized submarine cables.

Sparrows Expands Wind Energy Market Presence

Sparrows Group has acquired Danish wind energy specialist Alpha Offshore Service A/S. Already a supplier of capital equipment to the wind energy industry, the deal significantly strengthens the group's operations and maintenance capabilities in the sector.

Alpha Offshore provides engineering personnel and inspection services to the energy industry, specializing in the delivery of operations and maintenance, and supervisory and commissioning services to onshore and offshore wind developments. The company will continue to be run under the same management as a separate entity within the Sparrows Group, ensuring operational consistency while providing access to a wider pool of expertise and resources.

Canada Funds Clean Tech For Fisheries, Aquaculture

The government of Canada launched a program that will provide up to \$20 million over four years to help Canada's fisheries and aquaculture industries incorporate existing clean technologies into their day-to-day operations. Potential projects include helping fish harvesters convert their vessels to clean alternative fuels and reducing energy use on aquaculture sites. Clean technology and innovation

are key components of the government's approach to promoting clean economic growth. The Fisheries and Aquaculture Clean Technology Adoption Program will provide funding to help a sector made up of primarily small and medium-sized businesses adopt innovative clean technologies that otherwise may not be possible.

Load Shackles for Tidal Energy Data Monitoring

Strainstall has been selected to provide two of its load shackles to increase the survivability and reliability of a floating tidal energy converter (TEC) platform for Sustainable Marine Energy Ltd. (SME). PLAT-I hosts four SCHOTTEL SIT250 turbines. Following installation of PLAT-I by SME, instrumentation and data gathering are being carried out for a project in partnership with Swansea University. Strainstall's load shackles will be installed on PLAT-I to help better understand the effects of extreme conditions and fatigue loads on TECs. **ST**

NEW class of ROV Propulsion

Powerful and silent subsea thrusters from Copenhagen Subsea A/S have been developed with reliability as the highest design priority.

The ROV thrusters are responsive, powerful and easy to integrate – and will provide vehicles with a unique combination of silent power and high maneuverability.

COPENHAGEN SUBSEA A/S

sales@copenhagensubsea.com • www.copenhagensubsea.com

productdevelopment

For more information on any of these products, visit our website at www.sea-technology.com/products

Windfarm Apparel and Equipment



Marine drysuits and diving gear are available for use in offshore, commercial, military and rescue activities, including SOLAS-approved transit suits and twin-chamber 275N life jackets, harnesses, helmets, lighting, footwear, waterproof socks, thermal garments and dry bags. Northern Diver.

Tidal Prediction Software

ADMIRALTY Total Tide provides accurate tidal height and tidal stream predictions for more than 7,000 ports and 3,000 tidal streams. Version 18 provides frequent data and ADMIRALTY e-Nautical Publications updates. United Kingdom Hydrographic Office.

Port Virtualization Technology

Eltima Port Virtualization Technology allows remote access to vessel equipment. It can be added to the core of specific shipping equipment

and redirect any number of serial devices over TCP/IP or UDP networks. Eltima Software.

Eco-Friendly Hull Cleaning

HullWiper uses high-pressure seawater instead of brushes or abrasives to minimize damage to anti-fouling coatings. Removed residues are collected in a waste unit on the ROV to reduce cross-pollination of waters. HullWiper.

Ice and Oil Detecting Radars

The FICE100 hybrid ice radar detects the structure of ice out to a 3 nm radius and locates rifts, clean ice and channels to determine ice-breaker routes. The FOIL200 oil radar uses raw data from the X7 processor to identify oil spills and create an image with up to 100 radar antenna scans. Furuno.

Biocide Mapping

TraxBio maps biocidal surfactants in oil and gas systems using the chemicals' propensity to form micelles, clusters of surfactants. Nanoscale clusters of the biocide chemical can be detected using the TraxBio chemical mapping tool, aiding decisions about how much biocide to dose and alerting of potential biofouling risks. LUX Assure.

Synthetic Beam Bathymetry

The Hydro-2F multifrequency synthetic beam bathymetric and seafloor sonar provides 200-kHz precision bathymetry and narrow-beam, low-frequency bathymetry, as well as acoustic backscatter data. It provides depth data overlaid with GPS position and satellite photographs and can generate an augmented reality video and paper chart. Unabara.

Fleet Compliance Portal

FleetManager enables access to live ship management and tracking data on a centralized portal with environmental, piracy and regulatory overlays. It links with the PassageManager e-navigation platform in real time. ChartCo.

Rugged Handheld Device



The Nautiz X9 Android handheld can be used as a mobile computer, data collector or field controller. It has a quad-core processor, optional high-speed 2D imager, rear- and front-facing cameras, a 1.3-GHz processor with 2-GB RAM, 16-GB flash and a 4,800-mAh battery. Waterproof and dust-tight, it has been tested to MIL-STD-810G certification. Handheld.

www.innomar.com

3 m
5 m
7 m
9 m
11 m
13 m

River bed
Laminated strata with individual layers <10 cm
Anticline with erosional truncation

Data courtesy of Statnett Norway

Data Example Innomar SES-2000 standard (8kHz, range 2–14 m)

SES-2000 compact | standard SES-2000 towfish

SES-2000 medium | deep

SES-2000 Parametric Sub-Bottom Profilers

Discover sub-seafloor structures and embedded objects with excellent resolution and determine exact water depth

- ▶ Different systems for shallow and deep water operation available
- ▶ Menu selectable frequency and pulse width
- ▶ Two-channel receiver for primary and secondary frequencies
- ▶ Narrow sound beam for all frequencies
- ▶ Sediment penetration up to 200m (SES-2000 deep)
- ▶ User-friendly data acquisition and post-processing software
- ▶ Portable system components allow fast and easy mob/demob

Visit booth N350 at OI 2018 London / UK, March 13–15

Innomar
20 YEARS
1997-2017

Innomar Technologie GmbH • Germany • Schutower Ringstraße 4 • D-18069 Rostock • Phone (Fax) +49 (0)381-44079-0 (-299)

Battery Analyzers

Models BA6010 and BA6011 analyzers provide auxiliary measurement parameters including inductance, capacitance, dissipation factor, impedance, reactance and phase angle in degrees and radians. Both work with battery chemistries that are responsive to a 1-kHz AC stimulus signal. B&K Precision.

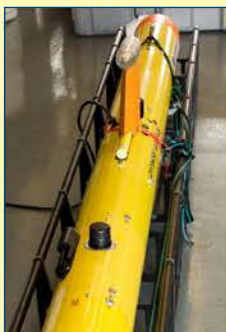
Magnetometer Detection System

The Proton 5 system includes a 200-ft.-depth-rated towfish, 150 ft. of Kevlar tow cable and a topside control box. There is also an optional altimeter, USB data output and Tracker 3 mapping software. JW Fishers Mfg.

Enhanced Current Profiling

The Sentinel V acoustic Doppler current profiler supports data rates up to 16 Hz. It has an option for bottom tracking and utilities software to interface with the existing VMDAS program and simplify vessel-mounted data applications. Teledyne RD Instruments.

iXblue Phins C3 Integration



A new navigation module for the Gavia AUV incorporates the iXblue Phins Compact C3 with a Teledyne RDI 1,200-kHz Workhorse to offer 0.3% CEP50 distance-traveled navigation accuracy in a compact module. Teledyne Gavia.

Broadband Marine Antenna

The 6500-WB broadband antenna has a wind rating of 125 mph and operating temperature range of -67° to 160° F. It has a nominal impedance of 50 ohm and an input power rating of 100 watts continuous with a 3-dB gain. Its polarization pattern is vertical (omnidirectional). Shakespeare Co. LLC.

Professional Navigation Software

TZ Professional combines a variety of navigational data into an integrated interface. Version 3.3 offers Furuno DFF3D multibeam sonar compatibility, FLIR M200 compatibility, Marport trawl positioning integration, marks and objects database optimization and import of OLEX tracks and marks. Timezero.

Electronic Instrument Connector

Air Link facilitates connection of electronic devices such as anemometers and GPS chartplotters. Air Link now supports temperature readings and has Wi-Fi, so users can send wired NMEA 0183 data to mobile devices. SailTimer Inc.

Real-Time 3D Sonar

Echoscope4G Surface enables vision, mapping and measurement in real time for shallow-water operations to 20-m depth. The sonar is available in single, dual and XD triple models with three independent frequency and 3D volumes. Coda Octopus Group Inc.

Cable Detection System

The HydroPACT 660 pipe tracking system works with small ROVs using a 1,200 mm x 600 mm coil. The system operates to 3,000-m depth with 24 VDC or 110 VAC power and either a vessel-mounted PC or a rack-mounted computer. Teledyne TSS.

Ultrasonic Anti-Fouling System

Soni8 uses ultrasonic anti-fouling technology to prevent marine organisms from colonizing solid surfaces that are exposed to raw seawater. It has one panel, eight transducers and eight independent and programmable outputs. PYI Inc.

Anchor Pole Lights

NaviLED 360 anchor pole mount lamps use multivolt 9- to 33-VDC electronics, and they are approved to a range of 2 nm. The circuitry provides reverse polarity, spike and overvoltage during instances of severe voltage fluctuations and low battery operation. Hella Marine Inc. **ST**



www.blueprintsubsea.com
sound by design

oculus

Multibeam Imaging Sonars
Single and Dual Frequency Operation



seatrac

Micro-USBL Tracking Beacons
Bidirectional Acoustic Data Modems



starfish

Portable Sidescan Sonars
Towed, OEM, Hull and Pole Mounted



Oi 2018

OCEANOLOGY INTERNATIONAL
13-15 MARCH 2018, LONDON, EXCEL

Visit us on **stand F650**

CFD Methodology for Slim Vessel Regulation Testing

For the past two years, Damen has been working on a CFD-based research project called "Gone With The Wind" (GWTW) to study the capability of CFD to accurately model the aerodynamic forces that act upon vessels above the waterline. The specific issue being addressed has been the challenge of meeting the requirements of the IMO regulation 749.18. Its objective is to ensure that vessels have sufficient transversal stability to resist over-rolling in severe side winds. It is difficult for long, slender vessels to satisfy the empirical requirements of the rule without undertaking extensive and costly experimentation.

This has a direct impact on the time needed and the cost of gaining certification for vessels such as Damen's monohull fast crew suppliers (FCS) and their variants. Typi-

cally, data have to be gathered from physical assessments using scale models in towing tanks and wind tunnels. The objective of GWTW has been to develop a CFD methodology to replace the physical assessments for vessels such as Damen's FCS range that will demonstrate compliance to the satisfaction of the classification societies.

Damen has been developing the CFD methodology in partnership with Numeca while conducting the physical tests needed to validate and verify the CFD calculations, using a 1:18 scale model of Damen's FCS 3307. Work is now underway to adapt this methodology to full-scale prediction.

SeaBat Sonar for Greenland Seabed, Marine Mapping

The Greenland Climate Research Centre will take delivery of a Teledyne RESON SeaBat T50-R Extend-

ed Range high-resolution multi-beam sonar early 2018. The sonar will be hull mounted on RV *Sanna*, a research vessel operating on the west Greenland coast. Researchers will utilize the sonar to map seabed topography and marine habitats in the 200- to 800-m deep waters of the Greenland Shelf.

Citizen Science Aids Global Shark Research

Vital scientific information about whale shark behavior, biology and ecology is being uncovered by ecotourists and other citizens.

Whale shark habitat spans the globe, making long-term research over wide geographic ranges a challenge for whale shark researchers. Researchers have harnessed modern technology to create an online photo database called "Wildbook for Whale Sharks" and enlisted the help of ecotourists and citizens across the globe to upload any images of whale sharks they happened to see anywhere in the world. Photos of nearly 30,000 encounters

Operational Clarity. Instant Confidence.

Visualising the Future of Sound through the 4th Generation of Live, Real-Time 3D Volumetric Imaging Sonars.

The **Echoscope^{4G}® Surface** produces real-time, 3D, high definition visualisation and mapping for increased project efficiency and safety.

Your Underwater Eyes



**VISIT US AT
STAND A220 AT
OI 2018**

See moving objects with our **smallest** and **lightest** sonar yet


Coda Octopus
Sound Underwater Intelligence

codaoctopus.com
sales@codaoctopus.com

representing 6,000 individually identified sharks across 54 countries over 22 years has given scientists a rich data set to analyze and better understand the nature of this endangered species.

Through this effort, researchers have now identified 20 whale shark aggregation sites globally.

ROV Video Informs Deep-Sea Food Web Study

MBARI researchers have done the first comprehensive study of deep-sea food webs using hundreds of video observations of animals feeding off the central California coast. The study shows that deep-sea jellies are key predators and provides new information on life near the ocean surface.

Since the late 1980s, MBARI researchers have used ROVs to study deep-sea animals in their own environment. In the process, MBARI has amassed more than 23,000 hours of deep-sea video footage.

In this new approach, they used deep-diving vehicles to observe animals feeding on one another in the deep sea. Technicians in the MBARI Video Lab painstakingly analyzed every deep ROV dive, identifying animals and their behaviors and entering this information into the Video Annotation and Reference System (VARS) database. Combining through the VARS database, researchers discovered almost 750 different video observations of animals eating one another.

The video footage shows that jelly food webs encompass animals that live near the surface. Gelatinous animals have been found in the stomachs of animals ranging from penguins and albatrosses to sunfish and leatherback sea turtles.

AI for Eco-Friendly Ship Tech

Eco Marine Power (EMP) will begin using the Neural Network Console provided by Sony Network Communications Inc. as part of a strategy to incorporate artificial intelligence (AI) into various ongoing ship-related technology projects, including the further development of the Aquarius MRE renewable en-

ergy power system and EnergySail.

The Neural Network Console uses deep learning for AI creation and has been used in deep-learning applied technology development within Sony since 2015. Various functions include recognition technology and a full-fledged graphical user interface. Deep learning refers to a form of machine learning that uses neural networks modeled after the human brain.

An initial area of focus will be studying how the Neural Network Console and AI can assist with the development of the automated control system for EMP's EnergySail. This system automatically adjusts the position of the EnergySail depending on variables such as wind speed and direction. AI will also help analyze the results of computer simulations related to the Aquarius Eco Ship. **ST**



Choose your frequency
Choose your depth rating
Choose the industry innovator

Rowe Technologies state-of-the-art SeaWATCH Acoustic Doppler Current Profiler (ADCP) is applicable to an array of oceanographic current measuring deployments. Operating at 300, 600, and 1200 kHz, and available in 300 to 6000-meter depth rated capsules, record all-inclusive current flow data from up to 200 cells worry-free on an industry leading 32 GB internal memory card. Rapidly download via standard Ethernet port into customizable data formats in MATLAB, CSV, and PDO.

Find out more at rowetechinc.com

marineelectronics

Subsea Power Systems Testing

The first full-scale prototype of a subsea variable speed drive has been successfully tested in a sheltered harbor in Vaasa, Finland, taking the vision of an all-electric subsea processing facility one step closer to reality. A variable speed drive is needed to boost the productivity of oil and gas processes and improve energy efficiency while providing the highest reliability.

The test is the latest in a five-year joint industry project (JIP) between Statoil, Total, Chevron and ABB that aims to develop transmission, distribution and power conversion systems for subsea pumps and gas compressors operating at depths of 3,000 m and over vast distances. By providing the large power needs closer to the reservoir, production improves due to the increased flow and pressure of the stream. The subsea variable speed drive designed

for subsea gas compression was operated over three weeks in 2017, in a back-to-back configuration directly with the grid, without motor loads. This “power-in-the loop” test means that only a few hundred kilowatts of losses need to be supplied from the grid.

Following the success of the test, the JIP is now preparing for a 3,000-hour shallow-water test of a subsea power system with two variable speed drives in parallel, combined with subsea switchgear and controls, to start late 2018. The first installation of the new subsea power systems in offshore production sites is expected to begin in 2020.

Push to Digitalize Offshore Supply Chain

Kongsberg Digital is purchasing a 34 percent ownership share in NSG Digital, a subsidiary of the supply base and logistics company

NorSea Group, which is controlled by Wilhelmsen and is joining forces with Kongsberg Digital to digitalize the supply chain in the oil and gas and offshore wind industries.

Kongsberg Digital and NSG Digital have collaborated since the beginning of 2017 on developing a new logistics system called NSG E2E.

NSG E2E (end-to-end) is offered as a part of Kongsberg Digital’s application platform, Kognifai, and is a solution that improves logistics management through increasing information sharing and collaboration in the supply chain.

Wireless Diver Body Temp Monitoring System

WFS Technologies Ltd. of Edinburgh, Scotland, has partnered with EERS Global Technologies Inc. of Montreal, Canada, to develop Seatooth, the world’s first underwater wireless ear-based core body temperature monitoring system for divers. Seatooth comprises a custom earpiece with integrated tem-

CHC-NSC 2018

Land and Sea Shaping the World
Terre et Mer Façonnant le Monde

www.chc-nsc2018.ca

Victoria, B.C.
March 26-29, 2018

Victoria, C.B.
26 au 29 mars 2018



perature sensor wirelessly enabled by a Seetooth wPAN (wireless personal area network) node.

Diver core body temperature is transmitted wirelessly to Seetooth SWiCOM, a wireless underwater tablet so that diver core body temperature can be monitored. This information can be transmitted securely to a diver buddy using Seetooth wireless communications.

A demonstration was held at a Department of Defense Special Operations Command event in Florida.

ROVOP Receives Funds For Bigger ROV Fleet

ROVOP Ltd., an independent operator of ROVs, will immediately increase its fleet by 50 percent to meet ongoing customer demand following a funding boost of £56 million.

Blue Water Energy and BGF have jointly committed to the funding that underpins ROVOP's ambitious future growth plans. The funding is financing an increase of the fleet to 24 ROVs, with the new assets being

acquired from Tidewater in Houston. Tidewater owns and operates one of the largest fleets of offshore support vessels globally.

ROVOP focuses on the provision of ROV services to the oil and gas, offshore wind, telecom and power transmission industries. Along with ROVs, the company provides experienced operators trained in house.

Hacking Demo Shows Maritime Vulnerabilities

Naval Dome has demonstrated the maritime industry's nightmare security scenario with a series of cyber penetration tests on systems in common use aboard tankers, containerships, super yachts and cruise-ships. Test results revealed with startling simplicity the ease with which hackers can access and override ship critical systems.

With the permission, and under the supervision, of system manufacturers and owners, Naval Dome's cyber engineering team hacked into live, in-operation systems used to control a ship's navigation, radar,

engines, pumps and machinery. While the test ships and their systems were not in any danger, Naval Dome was able to shift the vessel's reported position and mislead the radar display. One attack resulted in machinery being disabled, signals to fuel and ballast pumps being overridden and steering gear controls manipulated. Another was able to alter draught/water depth details in line with the spurious position data displayed on screen.

The test ship's radar was hit in another attack, with success in eliminating radar targets, simply deleting them from the screen. At the same time, the system display showed that the radar was working perfectly, including detection thresholds.

A separate controlled attack was performed on the machinery control system. In this case, Naval Dome's team chose to penetrate the system using an infected USB stick placed in an inlet/socket. The virus infecting ship systems can also be unwittingly transferred by the system manufacturer. **ST**

Aanderaa MOTUS Wave Buoys

Powered by the **NEW** Aanderaa MOTUS Directional Wave Sensor

Measure wave direction with market-leading accuracy

- Measure accurate wave characteristics with the flexibility of a Met Ocean (ODAS) buoy
- High sampling rate and mechanical dampening, ensuring low noise
- Compensate for buoy wave response, off-center placement of sensor and payloads by configurable settings
- Distinguish direction of swells and wind driven waves

Get more from one system

- Current profile with intelligent compensation for movement
- Full suite of water quality parameters with anti-fouling
- Wide range of meteorology and 3rd party sensors
- Extendable with Navigational Aids and AIS

Maximize uptime

- Real-time data management and display system
- Get the support you need with Xylem product experts in your region
- On-board processing of wave parameters resulting in lower demands for bandwidth and power

Aanderaa Data Instruments AS
Sanddalsringen 5b,
PO Box 103 Midtun, 5843 Bergen, Norway
Tel +47 55 60 48 00 | Fax +47 55 60 48 01
aanderaa.info@xylem.com | www.aanderaa.com

**Stand #F301
Oi 2018 London**

AANDERAA
a xylem brand

contracts

Briggs Marine, Burntisland, Scotland, will support more than 100 submarine electricity cables that provide power to islands and rural communities from Shetland to the Isle of Wight. The agreement includes survey, inspection, repair, removal and installation services. Scottish and Southern Electricity Networks.

Expro, Aberdeen, Scotland, received a five-year contract extension for surface-well testing services for an operator in the North Sea. The \$5 million contract includes clean-up of existing wells and testing of a series of newly drilled wells. Undisclosed.

Damen Maaskant Shipyards, Stelendam, Netherlands, will build a new twin-rig fishing trawler with onboard equipment designed for efficiency and sustainable fishing using diesel-electric propulsion, three generators and a supplemental battery pack. Ekofish Group.

MacGregor, Singapore, signed an order for the fabrication, engineering and project management of a complete subsea mooring and riser system to serve a floating storage and regasification unit (FSRU). Delivery will be completed in 2018, and the FSRU will be ready for operation during the first quarter of 2019. Summit LNG Terminal Co.

Saab Seaeeye, Fareham, England, will build a 300-m-rated version of its Falcon ROV with iCON behavior-based intelligent control architecture. The order follows the sinking of MV *Sewol*, which resulted in 304 deaths and highlighted the need for advanced search and rescue tools. Korean Coast Guard.

Valeport, Totnes, England, will supply four customized MIDAS SVX2 probes to a Swedish naval surface vessel and stealth technology designer. The MIDAS SVX2 is an advanced probe, combining sound

velocity with salinity and density technologies to provide a versatile instrument that delivers data profiles. Saab Kockums.

Evoqua Water Technologies, Pittsburgh, Pennsylvania, SeaCURE ballast water management system is now not only sold in China but manufactured and distributed by a Hong-Kong-based company, signaling the expansion of Asia-Pacific ballast water treatment system installations with locally built electrochlorination technology. Hai Cheung.

Craig International, Aberdeen, Scotland, will provide its procurement services to the Armada, Everest and Lomond gas platforms located 233 km east of Aberdeen in the U.K. Continental Shelf for one to three years. Chrysaor. **ST**

meetings

MARCH

March 7-8—Operations and Maintenance for Offshore Wind, London, England. +48 616 467 040, rafael@acieu.net or www.wplgroup.com/aci/event/maintenance-offshore-wind.

March 7-9—World Ocean Summit, Riviera Maya, Mexico. +44(0) 20 7576 8118, oceansummit@economist.com or <http://bit.ly/2kZbB62>.

March 12-16—International Marine Debris Conference, San Diego, California. info@6IMDC.org or <http://internationalmarinedebrisconference.org>.

March 13-15—Interspill, London, England. info@interspill.org or www.interspillevent.com.

March 13-15—Oceanology International, London, England. zoe.tatton@reedexpo.co.uk or www.oceanologyinternational.com.

March 13-15—Subsea Tieback Forum & Exhibition, Galveston, Texas. 713-963-6251, gailk@pennwell.

com or www.subseatiebackforum.com.

March 20-21—International Symposium on Ship Operations, Management and Economics, Athens, Greece. www.sname.org/some2018/home.

March 20-22—Flood and Coast, Shropshire, England. info@floodandcoast.com or www.floodandcoast.com.

March 26-29—CHC-NSC 2018, Victoria, Canada. Roberta@strategicmeetingdesigns.com or chc-nsc2018.ca.

APRIL

April 9-11—MCE Deepwater Development, Milan, Italy. 281-491-5900, Bo.Howard@questoffshore.com or <http://mcedd.com>.

April 9-12—MTS Buoy Workshop, Ann Arbor, Michigan. 508-289-2456, jrizoni@whoi.edu or <http://mailman.whoi.edu/mailman/listin/fo/buoy-workshops>.

April 18-20—Mari Tech, Victoria, Canada. 250-797-0711, concierge@mt18.ca or www.mt18.ca.

April 24-26—Singapore Maritime Technology Conference, Singapore. register@ibcasia.com.sg or www.smtcsingapore.com.

April 25-27—European Mediterranean Oil & Gas Summit, Valletta, Malta. Mike@EPGSummit.com or www.euromed-og.com.

April 30-May 2—Waterpower Week in Washington, Washington, D.C. 918-831-9160, registration@pennwell.com or www.waterpowerweek.com/index.html.

April 30-May 3—AUVSI XPONENTIAL, Denver, Colorado. www.xponential.org/xponential2018.

April 30-May 3—Offshore Technology Conference, Houston, Texas. meetings@otcnet.org or <http://2018.otcnet.org>. **ST**

people

Kongsberg Digital appointed **Gilbert Haydamous** as vice president of drilling and wells within its energy division to focus on drilling management and decision-support solutions for Kognifai, the new digital ecosystem.



KVH Industries Inc. announced **Elizabeth Jackson** as chief marketing officer and senior vice president for strategy. Jackson has worked at a variety of companies including Proctor & Gamble, Campbell Soup Co., Summer Infant and HookLogic.

Chris Rodricks has been appointed in a business development role for the International Marine Contractors Association (IMCA) in their Middle East and India Region. Rodricks joined the India Steamship Company in 1971 as an 18-year-old cadet and has since worked for Essar Shipping, GAL Offshore, Seabulk Offshore and Seamec.

Jim Mosquera joined General Atomics Electromagnetic Systems as vice president and chief technology officer. Mosquera will be responsible for achieving strategic

technical, business and financial objectives in support of technology, platform and next-generation product development. Mosquera will lead the development and management of technology roadmaps that execute growth opportunities.

Teledyne Oceanscience hired **Vitad Pradith** as technical sales manager. Pradith was previously the project lead for unmanned systems at HYPACK, where he successfully led the development of the NEXUS unmanned aerial LiDAR system.

Dr. Amy Wright of the Harbor Branch Oceanographic Institute has been named one of two National Academy of Inventors (NAI) Fellows, the highest professional accolade for inventions that have made a tangible impact on quality of life, economic development and the welfare of society. Wright's research focuses marine natural products with potential uses against neurodegeneration, infectious diseases and cancer.

Greensea hired **Matthew Parrilla** as robotics engineer in its emerging technologies group to work on next-generation supervised autonomy and navigation and hired **Karl Lander**, previously with the U.S. Coast Guard, as account executive. Greensea also created two new positions: **Marybeth Gilliam** will be chief operating officer and **Galal Hamdy** will be vice president of business development and partnerships. **ST**

IOSTIA and SEA TECHNOLOGY magazine
Announce the first Annual
BLUE Tech EXPO
Ocean Technology Exhibition and B2G Networking Event | June 4, 2018 | Washington, DC

Save the Date for this unique two-tier marketing and networking event!
Join us on the eve of CHOW (Capitol Hill Ocean Week) for this distinctive business platform. The event brings together companies involved in ocean science & technology with government procurement officers and key decision-makers, global investors, and industry leaders from all over the world.

Gain Product & Services Marketing Exposure
BlueTech Expo: 10:00 a.m. - 3:00 p.m. Rayburn House Office Building Foyer

Meet with Federal Government Agencies & Industry Leaders
B2G Networking Reception on The Hill: 5:00 - 7:00 p.m. Hart Office Building

For Information:
EXPO: Exhibit Information, contact: Rich Lawson, 202-389-9009; rich.lawson@iostia.org
NETWORKING SPONSORSHIPS: Rich Lawson, 202-389-9009; rich.lawson@iostia.org
MJ McDuffee, 772-485-0333; m-j@comcast.net

www.BlueTechExpo.org

Relax.
We can take the pressure.



PREVCO
SUBSEA HOUSINGS

Subsea Instrumentation Housings and Junction Boxes
Contact us for a FREE Brochure

10,000 N. Technology Drive, Fountain Hills, AZ 85268
877-3PREVCO (Toll-Free) 480-837-0100 480-718-7723 (Fax)
noleaks@prevco.com www.prevco.com



SEA CATCH
TOGGLE RELEASE

McMillan DESIGN, INC
9816 Jacobson Lane
Gig Harbor, WA 99332
USA

Tel: 253-858-1985 Fax: 253-858-1986
Email: jmcmillan@seacatch.com

WWW.SEACATCH.COM

MetOcean Equipment Leasing

ADCPs, CTDs, Water Quality Loggers (Tu, DO etc),
Acoustic Releases, Ice & Zooplankton Profilers,
Mooring Frames & Cages, Pingers, etc.

Reliable Rentals at Reasonable Rates



www.ASLNV.com

SONOTRONICS
MARK YOUR EQUIPMENT



Mark your underwater equipment for later recovery in case of loss. With *over 40 years* of experience in the manufacture of sonic pingers, hydrophones, and receivers, SONOTRONICS can provide equipment for your underwater tracking needs

www.sonotronics.com
(520)746-3322

GALVANIC TIMED RELEASES

Cost-effective electrochemically degraded links available in durations ranging from one minute to 100 days. Trigger closure mechanisms, open escape panels, release cable support buoys or subsurface instrument locator floats. Stock and custom-designed releases available from:

International Fishing Devices, Inc.
935 Town Hall Ave., Unit 1, Jupiter, FL 33458
Ph: (954) 574-9517

André LaBonté
P.O. Box 60, Waipou, New Zealand 0545
Ph.Fax: 011-64-9-432-0645

underseareleases.com

HYDROSPACE Group
PVHO Windows and Acrylic Pressure Vessels



Fabrication – Certification – Engineering – Repair
Replacement – Hydrostatic Testing – Custom Design

Contact: Michael Azer Tel + (909) 989-7773 - pvho@HydroSpaceGroup.com
www.HydroSpaceGroup.com

R/V MICHAEL UHL	R/V SURVEYOR
 <ul style="list-style-type: none"> • 95 x 24 x 8 • 5000 mile range • 5 crew • A-frame • Current USCG COI • 32 passengers • Assorted winches • Hydro Pro Marine Crane 	 <ul style="list-style-type: none"> • 103 x 24 x 8 • 3000 mile range • 5 crew • A-frame • Current USCG COI • 28 passengers • Assorted winches • Marine Knuckle Crane

Maritime Logistics has available for charter two versatile research support vessels. Based in central California. Vessels have open 50x22 aft steel decks & rails for easy attachment of equipment. Operations supported but not limited to: diving, construction, towing, vibra-core, SEAmagine Submarine deployment & recovery, torpedo, mine, buoy, target placement & recovery ROV, AUV, CPT, fisheries and ECO studies, hydrographic, sonar, side scan, 3D towed and attached surveys systems; and many others.

MARITIME LOGISTICS
1538 Oak St. Paso Robles, CA 93446 805-431-7393 kayak38@aol.com

SUBSEA MODULES

CUSTOM BUILT HOUSINGS FOR 100, 300, 1000 meter plus
IDEAL FOR SCIENTIFIC, ELECTRONIC AND VIDEO SYSTEMS

Contact: **Steve Greenaway, Research Director UK**
Tel. UK. 44. (0) 1793 814992
www.greenawaymarine.com



SIGN UP ONLINE TO RECEIVE SEA TECHNOLOGY magazine!

Available free of charge to qualified individuals (those involved in the marine industry) – in print or in digital format or both.

www.sea-technology.com/subscribe.html

Also available, at no charge: our bi-weekly e-newsletter, *Sea Tech e-News*. Sign up here:

https://www.sea-technology.com/form_aboutenews.html.

If you prefer a more personal touch, please contact us at +703 524 3136 or seatechads@sea-technology.com.

Investigation Must Continue into WWII Munitions Dumping—Sergii Kornieiev

Sergii Kornieiev is the CEO and president of BaltRobotics. He has been the manager of many large, innovative international projects and has business administration experience in engineering companies. He has worked with IFS AB, Siemens, PETRONAS and many others. His scientific interests include artificial intelligence, telecommunications and control systems. He has published more than 50 articles.



Chemical weapons (CW) were produced en masse during World Wars I and II, but those made during WWII were never used in the European theatre.

At the end of WWII, vast quantities of German chemical warfare agents (CWA) were stored in Wolgast on the Baltic shore. From the end of the war until 1948, a total of 296,103 tons of chemical munitions and CWA were found on German territory. These were then dumped in the Baltic Sea and Skagerrak Strait on the orders of British, Russian and American occupation authorities. At least 170,000 tons of CW were dumped in the Skagerrak, mainly in the Norwegian trench, and in the eastern Skagerrak, off the Swedish coast. Entire ships were sunk with their cargo.

In the Baltic Sea, at least 50,000 tons of CW were dumped, supposedly containing roughly 15,000 tons of CWA. In most cases, the CW were thrown overboard, either loose (bombs, shells) or in containers, but some ships were also sunk. In most cases, the dumped materials contained explosives. In some cases, dumping of conventional munitions was carried out in the same locations as CW dumping.

CHEMSEA (Chemical Munitions, Search and Assessment) was a flagship project of the Baltic Sea Region Strategy to study munitions dumped from WWII. The project was fi-

nanced by the EU Baltic Sea Region Program 2007 to 2013 (*Sea Technology*, January 2017). CHEMSEA was conducted from 2011 to 2014.

After WWII, in Germany, there were supposedly 302,875 tons of chemical munitions (gross weight), translating into nearly 65,000 tons of pure toxic substances (CWA). From these, 35,000 tons were located in the U.S.S.R. zone of occupation, and 30,000 tons were in the zones occupied by the U.S., U.K. and France. The 1945 Potsdam Conference required that all Germany's chemical munitions must be destroyed. The Allies planned to move the munitions to old vessels and dump them in depths of more than 1,000 m. Most of the chemical munitions were mustard gas and lewisite. Mustard gas is an agent that can cause mutations and can remain stable on the seabed for decades after its metal encasings have corroded.

In the Baltic Sea alone, the dumping covered a total of about 2,100 sq. km. Today, the level of chemical pollution in the area is abnormally high.

In addition, during the Cold War, munitions were also disposed of in an unofficial dumping site in the Gdansk Deep off the Polish coast.

CW and CWA remnants continue to be a threat, especially as use of the Baltic Sea floor continues to increase. Projects are on the rise, including submarine cables and offshore wind farms, a tunnel from Germany to Denmark, and several pipelines (e.g., Nord Stream, which stretches over 1,224 km on the Baltic bottom from Russia to Germany). Some of these projects are near areas at risk of contamination from CWA degradation products. Also, trawling with bottom contact gear in areas surrounding CWA dumps is very intensive and comes with the risk of CW bycatch.

Natural processes cannot be relied on to remedy the problem be-

cause Baltic Sea water exchange occurs only once every 27 to 30 years. This means the munitions will remain a problem for decades.

During the last 20 years, 115 incidents involving submerged CWA were reported. From 2003 to 2012, there were 44 reported incidents. Although the number of reported incidents has declined during the last decade, incidents are still occurring, with potentially serious outcomes as activity increases in the Baltic Sea.

Compounding the problem is that there are no precise maps from the U.S., U.K., France and Russia detailing where the CWs were dropped, what type and in what volume. CHEMSEA was a good start to address the problem, but this project is inadequate on its own. This is partly due to the €4.5 million funding for CHEMSEA, which is not enough to tackle 300,000 tons of dumped chemical munitions. Modern technology such as side scan sonars, magnetometers, ROVs and video cameras were deployed for CHEMSEA, but their deployment was very limited in scope. Renting a vessel with an ROV and crew can cost \$100,000 a day. This means that eliminating the threat of dumped munitions for the Baltic Sea requires billions of euros.

But finances shouldn't hobble progress. CHEMSEA should continue. Ideally, the project should advance to localizing CW on the seafloor; testing approaches to destroy or encapsulate the objects; estimating the extent and costs of the workscope; establishing mass medical investigations in the EU population for possible CWA impact; and creating steps for incidents to be registered with EU institutions and thoroughly investigated.

The CHEMSEA project should not simply end. Dumped munitions continue to threaten the environment and the health and safety of EU communities. **ST**

february advertiser index

AMT Analysenmesstechnik GmbH32 www.amt-gmbh.com	IOSTIA38 www.IOSTIA.org
Aanderaa Data Instruments AS45 www.aanderaa.com	Knudsen Engineering Limited12 www.knudseneng.com
Airmar Technology Corporation3 www.airmar.com	MSI Transducers Corp.3 www.matsysinc.com
Antcom Corporation36 www.antcom.com	Massa Products Corporation16 www.massa.com
BIRNS, Inc.19 www.birns.com	nke Instrumentation25 www.nke-instrumentation.com
Blueprint Subsea41 www.blueprintsubsea.com	NOBSKA4 www.nobska.net
<i>BlueTech Expo</i>47 www.bluetechexpo.org	Ocean Sensor Systems, Inc.35 www.oceansensorsystems.com
CHC-NSC 201844 www.chc-nsc2018.ca	Ocean Sonics Ltd.30 www.oceansonics.com
CSnet International, Inc.14 www.csnetinternational.com	RBR Ltd.2 www.rbr-global.com
Chesapeake Technology, Inc.22 www.chesapeaketech.com	*RJE International, Inc.28 www.rjeint.com
Coda Octopus Products Limited42 www.codaoctopus.com	RTsys13 www.rtsys.eu
Copenhagen Subsea A/S39 www.CopenhagenSubsea.com	Riptide Autonomous Solutions, LLC6 www.RiptideAS.com
DeepSea Power & Light, Inc.27 www.deepsea.com/apex-seacam	*Rowe Technologies, Inc.43 www.rowetechinc.com
DeepWater Buoyancy, Inc.29 www.deepwaterbuoyancy.com	Rutter Inc.33 www.rutter.ca
EdgeTech25 www.edgetech.com	SBC Systems S.A.S.18 www.sbg-systems.com
EvoLogics GmbH51 www.evologics.de	Saab Seaeeye Limited8 www.seaeeye.com
*Falmat Cable31 www.falmat.com	Sea-Bird Scientific52 www.seabird.com
*J.W. Fishers Mfg. Inc.20 www.jwfishers.com	SubCtech GmbH32 www.subCtech.com
General Oceanics, Inc.28 www.generaloceanics.com	*Subsalve USA Corporation30 www.subsalve.com
GeoSpectrum Technologies Inc.34 www.GeoSpectrum.ca	Teledyne Marine5 www.benthos.com
Innomar Technologie GmbH40 www.innomar.com	Xeos Technologies Inc.21 www.xeostech.com
*Instruments, Inc.37 www.instrumentsinc.com	R. M. Young Company34 www.youngusa.com

*For more information, consult the 2018 *Sea Technology Buyers Guide/Directory*: <http://stbuyersguide.epubxp.com>

MISSION STATEMENT

Sea Technology is the worldwide information leader for marine business, science & engineering. Our goal is to provide our global audience with current information on the various segments of the worldwide marine/ocean industry through state-of-the-art and application articles, news columns, and staff reports; and to provide our advertisers with a cost-effective, valuable, and useful vehicle by which to promote their products and services.

For permission to photocopy portions of *Sea Technology*, please contact the Copyright Clearance Center • 222 Rosewood Dr. • Danvers, MA 01923 • Phone (978) 750-8400 • FAX (978) 750-4470

Sea Technology news magazine, including Underwater Engineering, UnderSea Technology, Oceanology International Offshore Technology, and its website, is edited for executives, scientists, engineering and technical personnel in industry, government, and education engaged in the field of undersea defense, oceanography, anti-submarine warfare, marine sciences, underwater exploration, diving and construction, drilling, and mining. While effort is made to verify material published, opinions of authors are not necessarily those of the publisher, and the publication accepts no responsibility in connection with any liability that might occur as a result of published material.

Like what you're reading? Keep up to date with **SEA TECHNOLOGY** news on [Twitter.com/seatechnology](https://twitter.com/seatechnology), [Facebook.com/seatechnologymag](https://facebook.com/seatechnologymag), [LinkedIn https://www.linkedin.com/company/sea-technology-magazine](https://linkedin.com/company/sea-technology-magazine), and Blog <http://bit.ly/2152YDI>.



SMART SUBSEA SOLUTIONS

S2C TECHNOLOGY: COMMUNICATION AND TRACKING COMBINED

- time, space and cost-saving solutions
- low power consumption for autonomous operations
- advanced data delivery algorithms, addressing and networking, remotely configurable settings
- extendable platform with multiple configuration options: power-saving Wake Up module, acoustic releaser, additional sensors, custom solutions, OEM versions available

USBL POSITIONING SYSTEMS

simultaneous positioning and communication - no need to switch between positioning mode and modem mode

- flexible SiNAPS positioning software
- reliable data transmissions
- range: up to 8000 m
- accuracy: up to 0.04 degrees

UNDERWATER ACOUSTIC MODEMS

reliable data transmissions even in adverse conditions, customizable R-series modems, light and compact M-series "mini" modems, **new S2CM-HS high-speed modem**, special editions for developers, S2C communication and positioning emulator - remote access or standalone device

- range: up to 8000 m
- depth: up to 6000 m
- data rate: up to 62.5 kbps

LBL POSITIONING SYSTEMS

highly accurate, precise and stable performance, simultaneous positioning and data transmissions

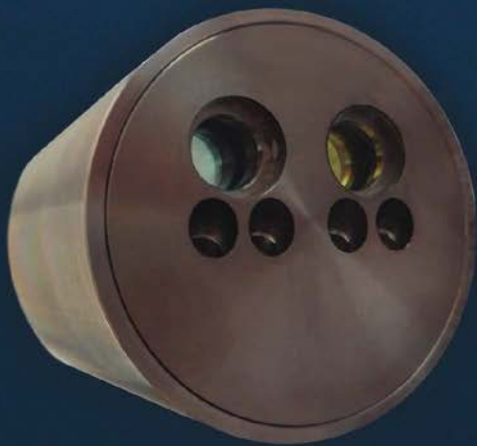
- flexible SiNAPS positioning software
- reliable data transmissions
- range: up to 8000 m
- accuracy: better than 0.01 m

Meet us at
**OCEANOLOGY
INTERNATIONAL 2018!**

13 - 15 March
London, ExCel
Stand C251

SeaOWL UV-A™ Sea Oil-in-Water Locator

The SeaOWL UV-A™, is an in-situ oil-in-water sensor. Based on the highly successful Sea-Bird Scientific ECO sensors, Sea-Bird has developed an industry-leading oil-detection technology with 5X optical resolution improvement over its predecessor.



SeaOWL UV-A™ is configured to measure:

- Chlorophyll fluorescence
- Backscatter
- FDOM (Fluorescent Dissolved Organic Matter)

Features:

- Discriminates crude oil from phytoplankton and other natural FDOM
- Prevents measurement saturation within heavily impacted environments
- Provides three biogeochemical parameters on a single data stream



SEA-BIRD
SCIENTIFIC



+1 425 643 9866
seabird@seabird.com
seabird.com