SEPTEMBER 2014 > VOLUME 15 > NUMBER 6 > WWW.HYDRO-INTERNATIONAL.COM

Hydro INTERNATIONAL

Casualties of the Nautical Chart

What You See is Not Always What You Get

Multibeam Systems for Exreme Environments

Challenges of an Ice-proof Transducer Design

Combination of Acoustics and Photogrammetry

A New Solution for Subsea Metrology

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Sonardyne COMPATT6 Beacons deployed to be used in a metrology. Aspects of subsea metrology are described in the paper of Eric Guilloux from page 22. Image courtesy: Saipem.

Hydro INTERNATIONAL is an independent international magazine published 8 times a year by Geomares Publishing. The magazine and related e-newsletter inform worldwide professional, industrial and governmental readers of the latest news and developments in the hydrographic, surveying, marine cartographic and geomatics world. Hydro INTERNATIONAL encompasses all aspects, activities and equipment related to the acquisition, processing, presentation, control and management of hydrographic and surveying-related activities.

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The buzz is all about those other purposes, apart from safe navigation, for which hydrography is used nowadays. The blue economy is upon us and we'll have to prepare the field of hydrography for the future, seizing opportunities in oil & gas, renewables, coastal and marine planning, fish farming, etc. This is not only good for the hydrography sector as a whole, but branching out might also be the key to companies' survival in the years ahead. Funds are drying up and surveying vessels are being phased out. As a result, everybody is talking about new ways of acquiring data, such as crowdsourcing or airborne and satellite bathymetry. Among all this, however, it can be easy to lose sight of the core business of hydrography: providing up-to-date charts for the maritime world to ensure safe navigation at sea. A task not to be taken lightly, and a task that is also not easy to fulfil. Governments are not always willing, keen or able to allocate money to a service that is invisible to many, often deeply hidden in the navy or other defence departments, performed by hard-working people who have less well-developed lobbying skills. If a (re)survey of a part of a region is not foreseeable in the short term, hydrographic offices should take up their responsibility and point out the dangers of waters which are uncharted or were last surveyed a long time ago. In this edition of Hydro INTERNATIONAL, Ian Russell's very readable article, 'Casualties of the Nautical Chart' on page 18, outlines the need for crews – for instance, those on cruise ships who are sailing in unfamiliar waters – to better appreciate the limitations of charts when regions have not been fully surveyed to modern standards. The article on pages 15-21 of the previous issue of Hydro INTERNATIONAL on 'The Rocknes Casualty – A Chartmaker's Retrospect' by Kvamme, Langvik and Breivik (see http://bit.ly/1uG6zFW), touches on the same subject. It underlines the responsibility that rests with Hydrographic Offices around the world to share their knowledge about possible flaws and their task to increase the appreciation of charts, instead of covering up the fact that charted data is often very old and little more than an indication. If Hydrographic Offices and other professionals in the chart business were to shoulder this responsibility, in addition to the most significant outcome – fewer shipping accidents stemming from the incorrect use or interpretation of navigational charts – there could also be another worthwhile side effect: demonstrating to the users of the charts, the policymakers and the general public that (re)survey for the sole purpose of safe navigation is still a very necessary goal that deserves funding, and even more importantly that it is downright dangerous to skimp on surveying expenditure. No lobbying skill is required to convey this message that could bring funds back, because it is simply a matter of reemphasising the business that still very much forms the core of Hydrographic Offices and is close to the hearts of many professionals working within them.

Most Shared

Most shared during the last month from www.hydro-international.com

1. Bay of Bengal Maritime Boundary Arbitration Awarded - http://bit.ly/1uG4aLm
2. The Rocknes Casualty 2004 - A Chartmaker's Retrospect - http://bit.ly/1uG6zFW
3. Underwater Search Efforts during 2014 Franklin Expedition - http://bit.ly/1uG6KRL
4. GaugeMap Brings River Data to Life via Twitter - http://bit.ly/1uG6QZD
5. Turbulence in Marine Environments Survey Successful - http://bit.ly/1vxx9VS

Planet Ocean Partners with ASV

The ASV C-Enduro.

Autonomous Surface Vehicles (ASV) and Planet Ocean, UK, have signed a technology partnering agreement which sees Planet Ocean as the ASV technology partner for marine science applications to provide turnkey solutions for the marine science sector. Initially focusing on ASV's C-Enduro, a long-endurance autonomous surface vehicle, Planet Ocean will be working alongside the ASV team to provide standard and customised payloads for marine science missions.
http://bit.ly/1vxvhfO

Commercial Tidal Power Project Secures Seabed

The Crown Estate, manager of the UK seabed, has awarded an 'Agreement for Lease' for a commercial demonstration site for electricity production from tidal currents to the Swedish marine energy company Minesto. Minesto will prepare consent application for the site near Holyhead Island in Wales prior to the construction of a 10MW marine energy array in 2016, which will supply electricity to approximately 8,000 households.
http://bit.ly/1uG4ASd

CWTM Workshop Call for Papers

The Call for Papers for the upcoming IEEE OES Current, Waves and Turbulence Measurement (CWTM) Workshop is now open. The IEEE OES 11th Current, Waves and Turbulence Measurement (CWTM) Workshop is scheduled to be organised from 2 to 6 March 2015 in St. Petersburg, Florida, USA. The workshop theme is 'Quality from End to End'. Abstracts are due Friday 3 October 2014. Authors will be notified of abstract acceptance on Friday 31 October 2014 and final papers are due Friday 16 January 2015.
http://bit.ly/1vxuEmB

2H Offshore Joins Deepwater Mining Consortium

2H Offshore, UK, has joined an international European consortium comprising 19 leading industry and research organisations to develop deepwater mining solutions. Over the next four years, the European Commission funded project Blue Mining will develop seabed mining practices by creating new, cost-effective solutions for environmentally friendly mining and processing in challenging and extreme environments.
http://bit.ly/1vxxpEu

Fugro Support Extended in MH370 Search

The Australian Transport Safety Bureau (ATSB) has awarded Fugro an additional contract for the deployment of two specialist vessels as well as equipment and expertise in the deepwater search for the missing Malaysia Airlines aircraft 370 (MH370). Fugro will mobilise its vessels *Fugro Equator* and *Fugro Discovery,* both fitted with specialist deep-tow survey systems, for the work. The *Fugro Equator* has already been involved in the bathymetric survey of the search area since June.
http://bit.ly/1vxuXO9

Shallow Survey 2015 Common Dataset Collection Has Begun

The first sonar manufacturer has arrived in Plymouth, UK, to start conducting bathymetric and backscatter surveys in Plymouth Sound and Wembury Bay. The aim of the common dataset activity (CDS) is to provide the international hydrographic community with a range of datasets, collected using the latest shallow-water survey techniques, so that comparisons can be made and the merits of the different approaches judged.
http://bit.ly/1vxwGmA

LINZ Formalises Antarctica NZ Relationship

Land Information New Zealand (LINZ) and Antarctica New Zealand have signed a Record of Understanding, formalising their more than 60-year-long relationship and strengthening their commitment to collaborative projects on the world's coldest continent. Key collaborative activities over the next five years include topographic mapping in the Ross Dependency; contributing to an international programme to establish gravity measurements in Antarctica; and hydrographic charting in the Ross Sea region of Antarctica.
http://bit.ly/1vxxgRs

Boskalis Consortium Awarded Singapore Port Expansion

Royal Boskalis Westminster (the Netherlands) has in consortium been awarded work associated with the expansion of the Singapore Tuas Mega Port development. Jurong Town Corporation awarded the reclamation project of Tuas Finger One to the consortium comprising Hyundai, Samsung, Penta Ocean, Boskalis and Van Oord. *http://bit.ly/1vxxGHw*

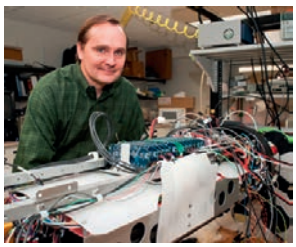
Calecore and N-Sea to Continue Operations in Barents Sea

Calesurvey, Calecore's UK-based offshore geophysical division, has seen a steady increase in demand for ROV survey services over the past two years. In June, work-class ROV operations were undertaken on board the *Kommandor Calum* for a project west of Shetland whilst the *Kommandor Stuart* has been undertaking multiple integrated 2DHR, ROV and seabed testing and sampling campaigns offshore northern Norway. *http://bit.ly/1vxvUGt*

The Kommandor Stuart.

James Bellingham Named as Director of WHOI Center for Marine Robotics

The Woods Hole Oceanographic Institution has appointed James Bellingham as the first director of its Center for Marine Robotics (CMR). Under Jim's leadership, CMR is to advance a vision of the future of marine robotics through world-class research and development; create new technologies; prove them in real-world operations; and apply them to societal problems and economic development through new partnerships between the public sector and commercial enterprises.
http://bit.ly/1vxv4cI



James Bellingham.

US Hydro 2015: Call for Papers

The technical committee of US Hydro 2015 has issued a call for papers. Deadline for submission of the abstracts is 31 October 2014 and the awarded presentations will be notified by 5 December 2014. There are three formats: a 20-minute presentation, a 5-minute lightning talk and a poster or laptop presentation during the poster session. The conference is to take place from 16 to 19 March 2015 in National Harbor, USA.
http://bit.ly/1vxxtUJ

Ice Thickness Measurement from Space

ESA's Soil Moisture and Ocean Salinity (SMOS) satellite delivers key information for science, and its data is used for a growing number of practical applications. Reflecting this versatility along with new synergistic opportunities, the mission will now remain operational until at least 2017. The most recent examples from this multi-talented mission include being able to provide information to measure thin ice floating in the polar seas accurately enough for forecasting and ship routing.
http://bit.ly/1vxwXpP

Antarctic Ice Sheet.

Arcelor Mittal's Canal Dredging Work Starts

LUSCHI will mobilise its vessel *Giovanella* to Espírito Santo, Brazil, to assist in the dredging and final disposal of accumulated sediments in the seawater storage canal of Arcelor Mittal, one of the world's leading steel and mining companies. The canal is approximately 600 metres long and includes a sedimentation volume in the order of 46,000m^3.
http://bit.ly/1vxw6Wd

Aerial view of the canal that is to be dredged.

Turbulence in Marine Environments Survey Successful

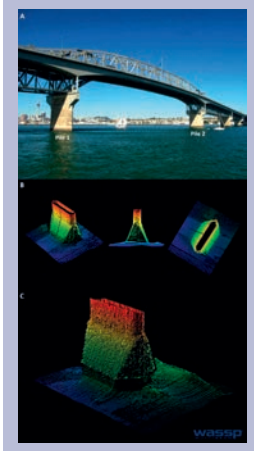
Partrac, UK, has successfully completed a turbulence survey for the Carbon Trust-managed Turbulence in Marine Environments (TiME) project. According to Partrac, this is the first time that a survey has been designed specifically to measure turbulence using different methods and technologies so that each can be evaluated, and turbulence can be mapped across a tidal energy development site. The survey included four standard ADCP units and one advanced five-beam Nortek AD2CP unit, each positioned on the seabed. Three of the locations were at positions where tidal turbines will be installed.
http://bit.ly/1vxx9VS

Australia and Canada Cooperate on IHO standard Development

The Canadian and Australian governments have joined forces to develop the Maritime Limits and Boundaries IHO standard (S-121), which is expected to improve and speed up the development of a flexible and adapted digital standard suiting all Maritime Limits and Boundaries described in the United Nations Convention on the Law of the Sea. The collaboration is aimed at producing well-integrated standards aligned with the modern needs of governments, mariners and industry.
http://bit.ly/1vxuQ5o

C-Nav Brasil Teams with Waypoint

C-Nav Brasil recently signed an agreement with the integrative services company, Waypoint, headquartered in the city of Rio de Janeiro, to become a distributor/representative in the Brazil region. Waypoint provides OSV and shipway integrated services in the region and C-Nav intends to have a strong partnership with them.
http://bit.ly/1vxwO5z



FURUNO and ENL Join Forces

Electronic Navigation Ltd (ENL), New Zealand, and FURUNO, Japan, are joining forces. In a joint announcement the two companies have made it known that FURUNO will take an initial 10% share in ENL and its wholly owned subsidiary WASSP Ltd.
http://bit.ly/1uG3WUM

Example of pile inspection data collection using a WASSP multibeam echo sounder.

William Egan New Institute of Acoustics President

William Egan is the new president of the Institute of Acoustics. William, aged 51, is vice president of Global Sales at underwater acoustic solutions provider Teledyne RESON. One of William's first tasks will be to lead the Institute's 40th anniversary celebrations, which will culminate in a special, two-day conference at the NEC, Birmingham, UK, on 15-16 October 2014. During his two-year term he is determined to do all he can to raise the profile of acoustics – and that of the Institute – as much as possible.
http://bit.ly/1uG5zBK

William Egan.

Winners of 2014 International MATE ROV Contest

At the Marine Advanced Technology Education (MATE) Center's International Student ROV Contest, the prevailing teams represented countries from all over the world. During the event, which concluded in the first week of July, student teams competed using ROVs that they had designed and built. Jesuit High School of Carmichael (CA, USA) and Clarenville High School of Clarenville (Canada) came first in the Explorer and Ranger Classes.
http://bit.ly/1uG59vc

An image of the teamwork required during the MATE contest.

More news
www.hydro-international.com/news/news.php

An Ambassador for the Oceans

Hydro International Interviews Dawn Wright

Chief scientist and Oceanographer Dawn Wright has taken a leading role within Esri over the past few years pushing the possibilities of GIS in the hydrographic and oceanographic world for the benefit of environment, safe navigation and the Blue Economy. She talked to Hydro International at the Esri User Conference in San Diego, last July about the needs for mapping the oceans, not just for charting but for the betterment of humankind at large.

Durk Haarsma
Publishing director,
Hydro International

Can you share your thoughts about the liaising and ambassadorial role you hold within Esri?

My role as chief scientist is really to be a liaison between Esri and the scientific community. To do this most effectively means serving on boards and panels internationally, including the National Science Foundation in the US, the US National Academy of Sciences and some of the federal agency science advisory boards such as NOAA. Internationally, I've been working with UNESCO, particularly the Intergovernmental Oceanographic Commission, and similar bodies. My role is to ensure that Esri contributes as a member of the scientific community, rather than just as a software vendor. This is because science underpins most of what we do at Esri and therefore we have to understand the science community as well as using science to produce effective software and services.

What else does your role entail?

The other part of my role is to take information from the science community to Jack Dangermond himself, to other directors at Esri, and to many of the teams in different departments of the company. I help connect scientists within Esri with teams at universities and research institutes. We have over 90 PhD students here, but we also need to collaborate with scientists out in the community to help us move forward.

What's the place of oceanography and hydrography within Esri?

One of the reasons I was hired was to actually help put forward a new oceans initiative at Esri. Part of the initiative actually involves educating people at Esri about the oceans, but also making important connections between Esri and the academic community, NGOs, the hydrographic industry, the marine transportation industry, offshore oil and gas, mining and alternative energy on the importance of oceans. To this end,

ArcGIS for Maritime and the Ocean Basemap are two of our big successes, as they are seeing wide adoption and use around the world.

What do you currently see as the most exciting development in your field of work?
I think one of the biggest developments is the emergence of gliders that are able to be in the ocean or near the coast autonomously, collecting all kinds of wonderful data. They can surface and send that data to shore. They can ping off of devices that are on the ocean floor, thereby picking up that data and sending it to shore. They are cheap, so it is relatively easy to build them, put them in the water and keep them in the water (although keeping them in the water for extended periods of time is a challenge because of batteries, etc.) But overall, I think the development and emergence of autonomous technologies such these is really exciting and really important.

Don Walsh said in the interview with Hydro International of May-June 2014: 'It's absolutely critical to humankind that we map the whole surface of the oceans.' Do you agree with this?
I most certainly do agree. How do we even know what it is that we want to protect, if we don't know the totality of our own planet? Along similar lines, one of the things that amazes me is the Malaysian Airlines 370 disaster. It has highlighted the fact that we really don't know very much about the oceans, and also how very difficult it is to operate in some parts of the oceans year-round in order to find out more, due to poor weather. I think it was Paul Rodriguez, the comedian, who once said that "war is God's way of teaching us geography." My corollary to that is "disasters are God's way of teaching us about the ocean!"

How can we increase that awareness?
We still know more about the surface of the Moon, Venus and Mars than we know about our oceans. It's so hard to get to know more about the oceans because we don't have synoptic satellite sensors that can see all the way through the water in all places. So we need more ship time (to use the acoustics) and more vehicles in the oceans in order to get there. We also need the will of governments to fund these expeditions because they are very expensive.

We need to communicate what hydrography really means: more than nautical charting

Do you see that happening now?
I don't see enough of it. For instance, here in the United States we are still having discussions about whether or not climate change is real, or whether or not it's human caused. The oceans are in crisis and if we don't take action now to gather the needed data and information, we won't reach the greater scientific understanding that we seek, and we also won't be adequately prepared for disasters. We are learning this over and over again with disasters such as Hurricane Sandy, the Deepwater Horizon oil spill, etc. And I'm sure the same goes for Europe, Africa, Asia and Australia. We are getting there but we are still not as prepared as we'd like to be, and nor can we recover as quickly as we'd like.

Does it scare you?
I try not to get scared. On Twitter, there is currently a hashtag going around, *#oceanoptimism*, to highlight the positive efforts that people and governments are making to learn more, to protect, and to use the oceans more sustainably. So there is a lot of positive activity. Even in our US government, the fact that Secretary of State Kerry held his Ocean Summit, shows that he is really paying attention to this and trying to raise awareness throughout the US government and even globally.

Let's talk about Blue Economy; the importance of the seas for our whole economy and the importance of the oceans for a healthy environment on the earth. There could be friction between conservation of the oceans and exploiting the same source for our own energy. How do you see this?
I don't like to see friction but I understand that it's there. I think that everyone needs to be a part of the discussion, for example, with Marine Spatial Planning, where we're trying to plan and allocate the use of coastal and ocean areas. A way to reduce friction is to ensure that we can understand everyone else's needs. Just as we need diplomats and ambassadors in daily life, we need people to be diplomatic and ambassadorial in these discussions about the oceans. Everybody needs to have a common goal of making everything as sustainable as possible so that we can all have our needs met.

Is there enough attention for marine spatial data infrastructure?
I think there is. I think progress with marine spatial data infrastructure is coming along very well, as it is established in so many countries. Even in the United States for the first time in history we finally have a national ocean policy. Implementation is another thing.

You can have all the infrastructure in the world and it still may not effectively do what it was meant to do. But it's a first step. Across the world we've made a good start because there are people who are really devoted

As chief scientist of Esri, **Dawn Wright** aids in formulating and advancing the intellectual agenda for the environmental, conservation, climate, and ocean sciences aspect of Esri's work, while also representing Esri to the national/international scientific community. She also maintains an affiliated faculty appointment as Professor of Geography and Oceanography in the College of Earth, Ocean, and Atmospheric Sciences at Oregon State University. Dawn's research interests include seafloor mapping and tectonics, ocean conservation, environmental informatics, and ethics in information technology. Follow her on Twitter @deepseadawn.

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to it. While a lot of work in marine spatial data infrastructure is centred around developing standards and policies which can be very boring (like balancing your check book, or going to the doctor), it has to be done. If not everything will crumble.

'Hydrography is more than just nautical charting' was the theme of the last World Hydrography Day. What does such a theme mean to you?
I come from the science side of hydrography where we have always focused on surveying and mapping the ocean floor for scientific understanding. I think hydrography is the whole totality of surveying and mapping the ocean floor, and even the water column and the surface, for any use, including science. So to me it's certainly more than nautical charting for safety and transportation.

Do you see crowdsourcing as a possibility for getting more data?
Yes, I think as long as the data are of good quality, bathymetric crowdsourcing has many possibilities. We do some of that quality control, that curation of the data here at Esri in developing our Ocean Basemap. We take that on as our responsibility, whilst also working with the many contributors to the Ocean Basemap. It's very important that there's a level of trust among the users that they are working with very good and authoritative data from contributors.

Are there other interesting projects you are currently working on?
Yes, for example, we have been collaborating with Oregon State University in developing a suite of tools (see genegis.org) to help marine mammal researchers look at their genetics data more spatially, particularly data that come from the photographic identification of endangered humpback whales as combined with DNA analyses. Often geneticists analysing such data are not used to seeing the data spatially, which can open up immediate and interesting insights in the interpretation of the data. As part of my job, it's wonderful to be able to pursue my own research projects like this whilst at Esri, and to have my

own dedicated product engineer to develop the necessary software code.

How long are you planning to stay on with Esri?
Well, I'm going to give an answer that will please Jack Dangermond, because when he hires people at Esri he wants them to see it as their life's work, their passion, and to stay on until they retire. So that's my plan right now."

Casualties of the Nautical Chart

What You See is Not Always What You Get

When ships run aground unexpectedly the initial presumption is that the vessel has struck an 'uncharted' feature. In practice this is rarely so. This article reviews a number of chart-related casualties. These demonstrate that while no charts are infallible, a better appreciation of their limitations might have averted disaster. New cruise ship itineraries in tropical seas and Polar Regions require especial vigilance. Ever deeper draught bulk cargo and crude carriers are transiting sparsely surveyed ocean areas and accessing remote locations in the continuing search for and exploitation of new mineral deposits. Are these accidents waiting to happen?

Ian Russell, UK

TODAY'S NAVIGATORS OFTEN venture where available hydrographic data does not meet the requirements of contemporary shipping. Member States of the International Hydrographic Organization (IHO) acknowledge this deficiency and are pledged to remedy it; but this will take time. The circumstances leading to past mishaps are therefore potentially present both now and in future. Although the charts in use in some of the cited casualties were compiled from lead-line surveys; they provided ample evidence that less water than charted might be expected. Accounts of accidents often reveal the vessel's speed to have been excessive in the circumstances.

The IHO defines inadequately surveyed areas as those where bathymetry is based on older lead-line surveys or other surveys which are either open in nature or not hydrographic surveys. International Maritime Organisation (IMO) Guidelines on Voyage Planning for Passenger Ships Operating in Remote Areas, adopted in 2007, indicate that planning should take into account the source, date and quality of the hydrographic data of charts used. Navigators should remember that the nearest point of land is almost always the seabed, as the case studies demonstrate.

Case 1 (Caribbean Calamity)

In January 1971, the former French passenger liner *Antilles* (length over all (l.o.a.) 183m, beam 24.4m, draught 8m) struck an uncharted reef off the NW coast of Mustique in the Grenadine Islands. As the ship was proceeding at 16 knots the impact caused her to break in two and catch fire.

The passage being attempted was through apparently open water some 640m wide, with charted depths of 13 and 16 metres. It lay between two rock outcrops, in a coral and reef-strewn area last surveyed in the 19th century. This followed a change to the planned route; authorised by the master in order, as the subsequent legal proceedings revealed, 'to provide his passengers with a better look at this enchanting isle and was consistent with his desire to implement the Owner's policy of making Antilles' cruises entertaining and unique'.

Case 2 (Déja vu)

In April 2000, the 'Adventure' cruise ship *World Discoverer* (l.o.a. 87m, beam 15m, draught 4.57m) grounded on an allegedly uncharted feature in Sandfly Passage, Solomon Islands. The ship was fatally holed and the master beached her in Roderick Dhu Bay, where the hulk remains.

Neither the Australian Hydrographic Service nor the UK Hydrographic Office, the Primary Charting Authority, has any record of the incident. The stranded wreck of

Figure 1: *World Discoverer*. Image courtesy: Philjones828, via Wikimedia Commons.

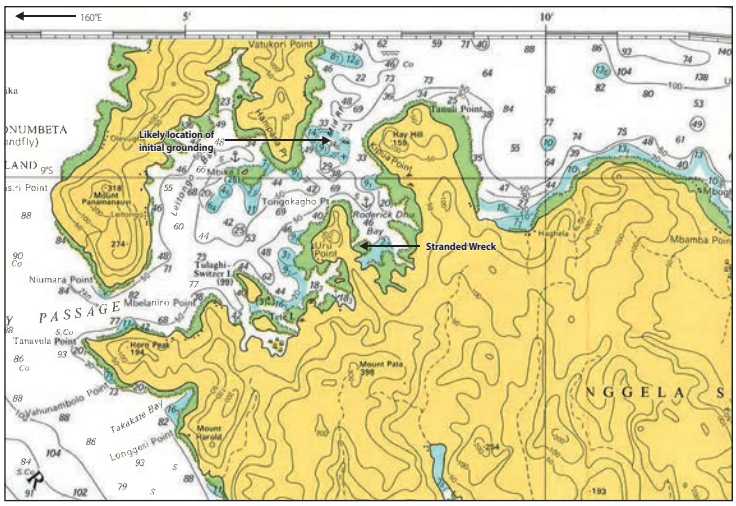

Figure 1a: Portion of Chart BA1713. Image courtesy: Crown Copyright and/or database rights. Reproduced by permission of the Controller of Her Majesty's Stationery Office and the UK Hydrographic Office (www.ukho.gov.uk).

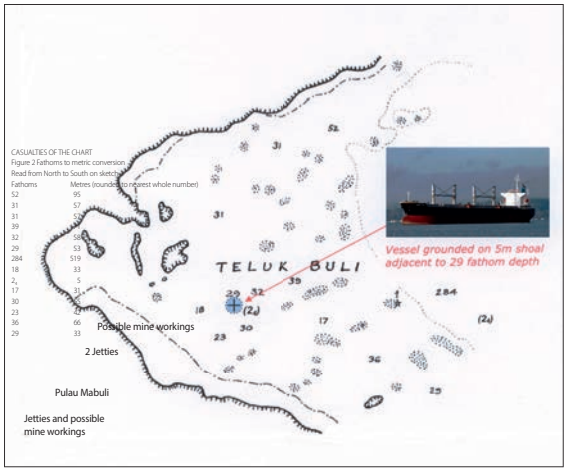

Figure 2: Sketch map derived from Chart BA 2788, compiled from 20th century lead-line surveys, showing position of grounding in relation to *Noble Hawk's* departure point, adjacent depths and shoal areas.

World Discoverer is clearly visible on Google Earth, but is not shown on the latest (2012) edition of chart BA 1713. The Pacific Island Pilot, current at the date of the incident, advises that "Deep-draught vessels should not attempt the passage owing to the reefs in the N entrance." The latest (2007) edition of the Pilot directs vessels west of Mid Reef; passing clear of the 9.1m patch. This remains the least depth shown in the passage other than the reef itself.

Case 3 (Uncharted but not Unexpected)

Such dangers also exist for large cargo vessels navigating in poorly charted waters. In 2010, the bulk carrier *Noble Hawk* (l.o.a.190m, beam 33m, draught 12.5m), outbound from Teluk Buli in Eastern Indonesia to China, grounded on an uncharted 5m shoal. Surrounding depths were 53 to 58m. Her course lay across a large bay encumbered with islets, reefs and shoals. The chart in use was compiled from 20th century lead-line surveys.

In 2012, the Indonesian Navy Hydrographic Service (DISHIDROS) carried out a survey of the grounding site and found a least depth of 3m and an adjacent depth of 15.3m in general depths of 50m. Mindful of the significant activity of large cruise ships and bulk carriers in these waters DISHIDROS recommended that the new shoal be marked.

Case 4 (Ennerdale Rocks)

In 1970, a Royal Fleet Auxiliary vessel the tanker *Ennerdale* (l.o.a. 227m, beam 30m, draught 12m) struck a rock pinnacle about 8 miles NNE of Port Victoria in the Seychelles and sank. The pinnacle, which was charted at 9 fms (16.5m), lay adjacent to a 10 fm (18.3m) sounding in general depths of 13 to16 fms (23.8 to 29.3m). The vessel, travelling at 12kts, was crossing a line of pinnacles and islet outcrops which extend north-eastwards from the north tip of the Island of Mahé within the 20 fathom line.

The chart in use was compiled from a 19th century lead-line survey, as stated in the title. The least depth of water over the pinnacle (subsequently established at 10.8m (35ft)) was not shown on this chart. However, there was sufficient indication on the chart that shoaler water may well have existed in the vicinity. The previously unnamed feature is now charted as Ennerdale Rocks.

Cases 5 & 6 (Dangers of the Deep)

In 1973, the cargo ship *Muirfield*, drawing 16m, was on passage from the Cape of Good Hope to Selat Sunda. There was a 2-3m swell running when she struck the top of a seamount, 75 miles south west of the Cocos Islands. A subsequent survey found a shoal with a least depth of 18m in charted depths of over 5,000m.

Submarine Surprised

More than 90% of all seamounts greater than 1km in height (estimated to be more than 100,000) are unobserved by either ship soundings or satellite gravity (Sandwell & Wessel, 2010). This observation is consistent with the statement in IHO publication C-55 that renewed attention needs to be given to the disproving of vigias especially adjacent to the maritime shipping routes in the Pacific and adjacent seas. The danger to submarine navigation is self evident.

In 2005 USS *San Francisco*, a nuclear powered submarine, collided with a seamount about 364 nautical miles southeast of Guam. The submarine was travelling at maximum speed at a depth of 160m. The seamount that she struck did not appear on the chart in use at the time of the accident. Other charts available showed an area of 'discoloured water', an indication of the probable presence of a seamount. Subsequent investigation determined that information regarding the seamount should have been transferred to the charts in use, particularly given the relatively uncharted nature of the ocean area that was being transited.

Discussion

Despite a steady increase in the length of cruise ships the draught of the current vessels in service has not increased proportionately and averages 8.4m. However, these ships are venturing into increasingly remote and poorly charted areas. Itineraries that seek to provide optimum passenger experience are potentially hazardous. Many of the smaller vessels (l.o.a. <100m) that offer adventure

cruises are fitted with forward looking sonar and can deploy portable echo sounders in their tenders. The report of an investigation into the incident in the Canadian Artic highlights the necessity for such provision.

The significant draughts in Table 1 are those of the large cargo vessels. New Panamax vessels transiting the Caribbean may not be able to do so with the same confidence as their predecessors. Elsewhere ULCC and large bulk carriers are vulnerable to an encounter with an uncharted seamount rising close to the surface. In the deep areas of the ocean, most mariners consider that there is little chance of a vessel running aground on such a feature. Unfortunately, this is a misconception.

Examples of navigationally significant seamounts include Vema Seamount (with a charted depth of 11 metres - about 1,000km west-north-west of Cape Town) and Walters Shoal Seamount (with a charted depth of 15 metres - about 400 nautical miles south of Madagascar). These seamounts rise up from ocean depths of about 4,000 and 2,000 metres respectively.

Conclusions

Many locations being accessed by cruise ships and deeper draught cargo vessels are unlikely to be surveyed to full modern standards in the foreseeable future. Navigators of these vessels therefore need to ensure that they fully appreciate the limitations of available hydrographic data and act accordingly. More owners should perhaps consider installing forward looking sonars for vessels operating in Polar Regions and away from recognised routes elsewhere. Such action might well have saved *World Discoverer*. It should also have prevented the damage to *Noble Hawk*, which incurred significant salvage and repair costs as well as the associated loss of revenue".

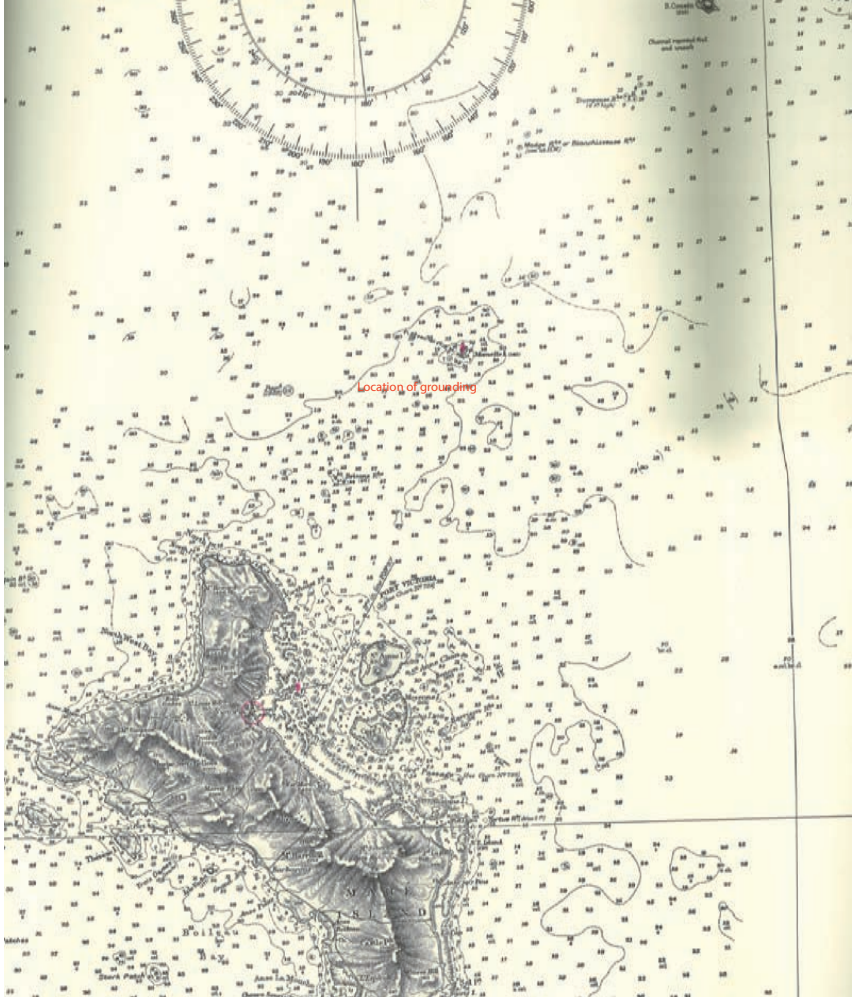

Figure 3: Portion of Chart BA 1072, current at the time of the grounding, showing the 9 fathom shoal patch on which the vessel struck and the adjacent 10 fathom patch. Image courtesy: Crown Copyright and/or database rights. Reproduced by permission of the Controller of Her Majesty's Stationery Office and the UK Hydrographic Office (www.ukho.gov.uk).

The Authors

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Further Reading

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No.	Vessel	L.o.a. metres	Beam metres	Draught metres	Remarks
1.	Great Eastern (1858)	211	25.0	8.5	4,000 passengers and 418 crew
2.	Panamax (Panama Canal transit Limits)	294	32.3	12.0	Permitted vessel dimensions
3.	Queen Mary (1936)	311	36.0	11.9	Trans Atlantic Liner
4.	USS Iowa (1942)	270	33.0	11.3	Transited Panama canal (1945)
5.	QE 2 (1969)	294	32.0	9.85	Liner specification also cruised
6.	Cape Size (1997)	305	53.0	17.0	Can now use Suez canal
7.	Carnival Spirit (2001)	294	32.3	7.8	Now cruising in SW Pacific
8.	Ultra Large Crude Carrier (ULCC)	380	68.0	24.5	TI Class (4) Entered service 2003
9.	Queen Mary 2 (2004)	345	41.0	10.1	Liner specification but also cruises
10.	Royal Caribbean Oasis of the Seas (2009)	362	60.5	9.3	Beam @ W/L 47m
11.	Valemax (2011 -)	362	65.0	23.0	Ore Carriers Brazil - Asia
12.	Maersk Triple E class (2013 -)	400	59.0	14.5	Container Ship (18,000 TEU)
13.	Royal Caribbean Quantum Class	348	41.0	8.5	Delivery 2014
14.	New Panamax	427	55.0	18.3	Planned new lock dimensions

Table 1. The progressive increase in the size of vessels. The dimensions of those now at sea and on order, reflect the shipping industry's response to changing operational and trading patterns.

A New Solution for Subsea Metrology

Combination of Acoustics and Photogrammetry

Subsea metrology is amongst the most challenging tasks for surveyors engaged in marine construction. Metrology involves determining the distance and relative attitudes of objects on or close to the seafloor. Accuracies of a few centimetres are achieved with objects 15m to 80m apart. Several methods are used, each with its own advantages and disadvantages.

Eric Guilloux, SAIPEM Project Surveyor, France.

INVARIABLY, METROLOGY IS required at the critical stages of field development and the main goal for improvement is to reduce the time taken for acquiring data. The technique discussed offers significant improvements in terms of time and required equipment.

Offshore Construction

During offshore construction several structures have to be interconnected by means of spools or jumpers. In order to determine the dimensions and relative attitudes of the connections, surveyors deploy ROV-mounted instrumentation.

IMCA S019 *Guidance on Subsea Metrology* offers the following combined accuracy guideline:

- 50mm to 150mm in X,Y and Z axis
- 0.5° to 1° for relative pitch, roll and heading.

As in most surveying activities, it is good practice to get two or more different measurements to allow QC.

The final combined accuracy of acoustic metrology can be estimated by considering the contributing error sources, as shown in table 1.

It is seen here that 30% of the error is due to the metrology interface (bucket and centralising collar). Over 20% is added by the necessity to perform the measurement on an offset point in order to allow installation of the measurement tool. Avoiding the use of metrology interface greatly improves the achieved accuracy.

Spool or jumper life duration is potentially affected by metrology accuracy as too is the time spent on installation – this is clearly the case where a unit cannot be installed and is recovered for modification.

Metrology Methods

Four main methods are in use:

- Acoustic LBL (Long Base Line)
- Inertial instruments used alone or in association with acoustics
- Photogrammetry
- Divers using taut wire

Acoustic and inertial methods allow for long range measurement, but also require installation aids and an onshore dimensional control survey. Attitude and Z values are obtained by measurement using additional tools such as pressure sensors and gyrocompass.

Calibration and the merging of onshore measurements during the dimensional control survey are a source of error, not always easily detected by QC. They also require a metrology interface, itself a source of error and best avoided to improve the final accuracy.

Taut wire method is limited in term of depth and distance and QC is very limited. This solution is also time consuming due to the necessity to operate with divers in saturation. Photogrammetric methods do not require any physical contact with the points of interest and are

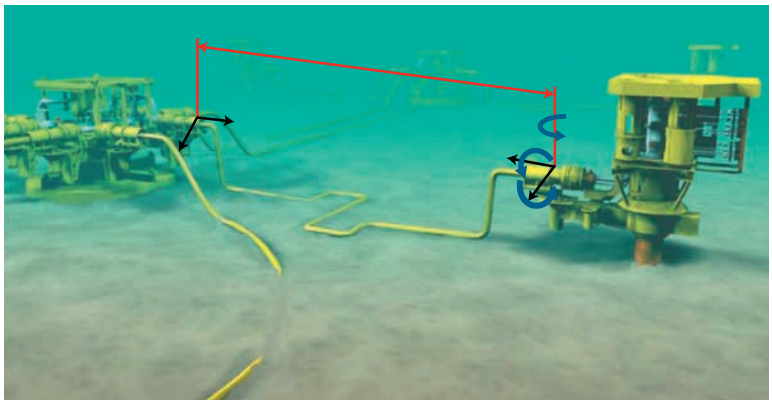


Figure 1: Typical metrology requirement.

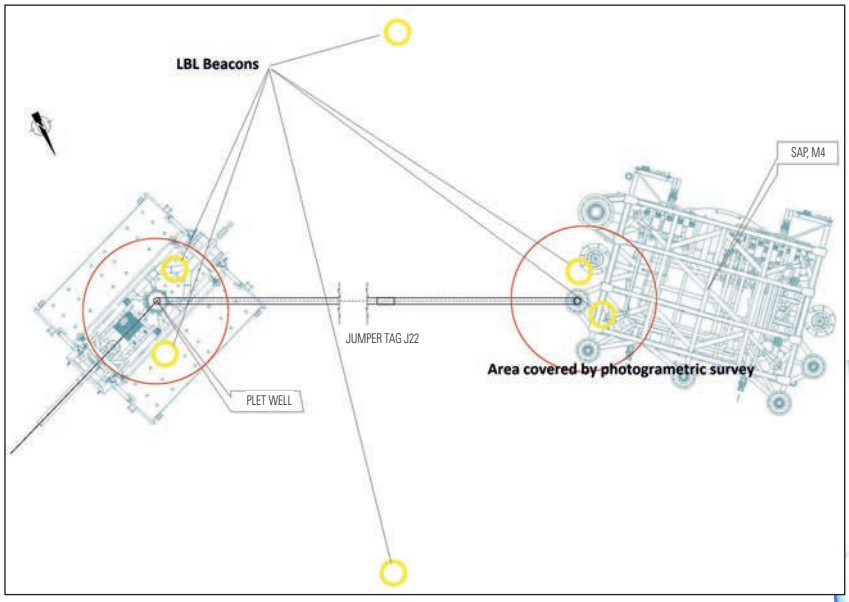


Figure 2: Photogrammetric survey coverage and LBL array.

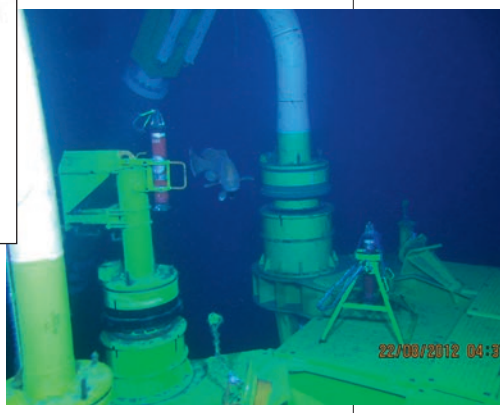


Figure 3: Beacons deployed.

capable of high accuracy but the range is very limited. As can be seen, only photogrammetry does not require contact with the reference measurement point. This is a significant advantage for manifolds and installed subsea assets in production where metrology interface installation and onshore dimensional control surveys are not possible.

Avoiding metrology interface use greatly improves achieved accuracy

Proposed New Method

On one gas field development project in Egypt, we had to perform one metrology between a production manifold and a new PLET (Pipeline End Termination), while avoiding a production shutdown during the measurement procedures.

Our basic proposal was to take two existing methods to develop a third improved option by merging the strong points of each. A combination was devised using LBL acoustics for their long range capability and photogrammetry for short-range high accuracy over each end of the new connector.

Photogrammetry offered tri-dimensional views of the areas of interest with an expected accuracy of a few millimetres. Then the two photogrammetric scenes were combined using acoustic methods with two LBL beacons from the seafloor array located within each photogrammetric scene. The acoustic array provided a common reference frame to link the two scenes.

On each side, there are then two points (the beacons), which after processing are known in terms of local 3D photogrammetric coordinates and the absolute LBL coordinate system (see Figure 2).

Applying rotation and translation matrices transformed the coordinates of all points of interest into a common 3D reference system.

The relative attitude (pitch, roll, heading) of the two hubs was obtained from beacons with inclinometer end caps.

The LBL array was deployed with six beacons (in this case SONARDYNE COMPATT 6)

- 2 beacons with SVP sensor
- 2 beacons with inclinometers
- 2 beacons with pressure sensor

Beacons with SV (sound velocity) sensors were used to correct measured distances, and inclinometer and pressure sensors provided information to determine a common vertical reference on each side.

Photogrammetric processing requires some known distance measurements

MF acoustic baseline measurement	±20.0mm
Fabrication error in PLET metrology bucket (transponder mount)	±5.0mm
Fabrication error in PLEM metrology bucket (transponder mount)	±5.0mm
Fabrication error in PLET centralising collars	±1.5mm
Fabrication error in PLEM-Y centralising collars	±1.5mm
Error in PLET inclinometer beacon (0.1 degree over 1.200m)	±3.5mm
Error in PLEM-Y inclinometer beacon (0.1 degree over 1.200m)	±3.5mm
Total Error in Slant Range Measurement	±40.0mm

Table 1: Contributing error sources in slant range measurement.

in order to scale the results: targets were added directly onto the beacon or brackets and distance between targets accurately measured.

In the field the process required, firstly, a routine ROV and LBL array deployment and calibration. Secondly, the photogrammetric shooting of each survey area was undertaken – the basic rules were for pictures every 30° around the area of interest and an overlap of 50% between two consecutive pictures.

Expected Accuracy

Photogrammetric processing offers an expected internal accuracy generally around 0.2mm/m and in this case >5mm.

The LBL beacons utilised during the project were specified by the manufacturer as accurate <20mm, after sound velocity corrections. On this project, after network adjustments, the total overall error on the baseline was estimated <7mm.

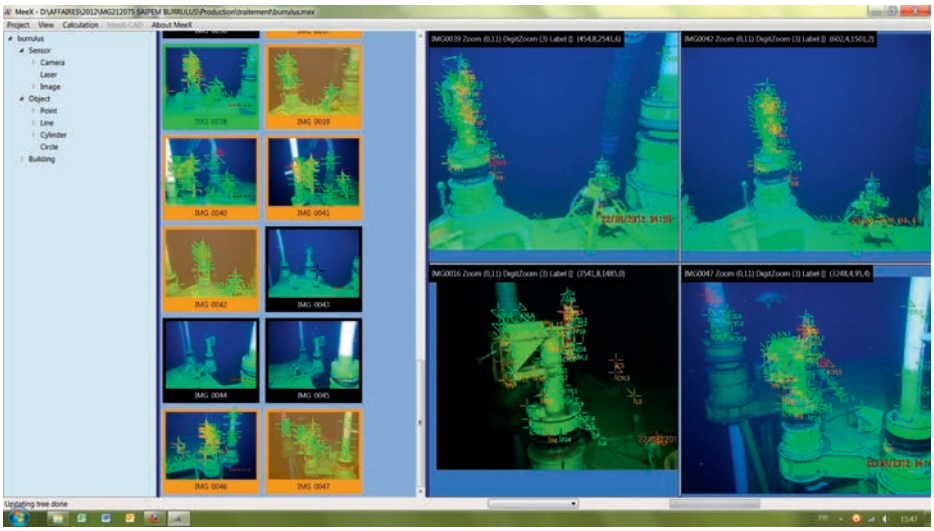


Figure 4: Processing software.

Comparison of existing methods	inertial	acoustic	photo	diver
Dimensional control survey required onshore	Y	Y	N	Y
Relative hubs attitude	Y	N	Y	Y
Contactless metrology	N	N	Y	N
Absolute positioning	Y	Y	N	N
Metrology interface to be installed on structures	Y	Y	N	Y
Additional tooling required for attitude and orientation	N	Y	N	Y
Estimated duration for one metrology on a 25m spool	10h00	18h00	15h00	variable due desaturation
Quality check and/or redundancy	Y	Y	Y	limited
Good visibility required	N	N	Y	Y

Table 2: Comparison of existing methods.

Processing and QC

Photogrammetric processing is performed onshore using specific software and generates a CAD file for each hub in the local coordinate framework.

QC is performed using distances already measured such as between the beacons included in the photogrametric survey and/or known distances taken from as-built drawings of the structure.

Final measurements are obtained using the CAD drawing.

Results

This method was successfully implemented during a jumper installation on the project in the Mediterranean Sea in 750m water depth. The results were compared to results obtained using standard acoustic metrology.
The accuracy expected by the photogrammetric processing was around 5mm; the check performed on the distance between two beacons versus distance measured on the photogrammetric CAD file was 0.5mm in X and Y axis and 5.0mm on Z axis. The spool length comparison with the acoustic metrology was less than 70mm. This difference was accounted for by some non-managed offsets on the bracket used during acoustic metrology.

The duration of the combined metrology was approximately 6 hours (post processing not included). This method does not require a metrology specialist on board as LBL deployment and photo shooting are standard tasks for a survey team.

The most surprising aspect of this trial was how straightforward we found the computations.

QC is performed using distances already measured

Conclusions

This method could result in significant improvements in terms of accuracy, simplified operation and a cost reduction for subsea metrology. Additionally, the QC performed allows for precise quantification of errors and increases confidence when engineering the final piece.

Work is underway on a new approach to perform the processing on board vessel to reduce time lost during processing offshore and image transfer. This method could also be applied to other short range / high accuracy methods like laser or acoustic 3D scanning.

Acknowledgements

Thanks to David Hulbert for his review of this paper.

The Author

Eric Guilloux is a project surveyor who has been employed by SAIPEM France for the past 4 years. He has worked in the hydrographic survey and positioning industry over the past 25 years and he is a Category B hydrographic surveyor (FIG/OHI). Eric has gained experience in projects both on and offshore including machines guidance, subsea asset installations and reference GPS network deployment.

Multibeam Systems for Extreme Environments

Challenges of an Ice-proof Transducer Design

The search for resources and energy reserves for the future is continuously increasing in the polar region. More and more states are trying to stake their claims and to register their rights. For the same reasons, the clarification of the exact borders of the continental loop is becoming important and is thus a subject of exact examination. The exploration of the existence of methane, in particular in polar waters, is a challenging task for the future and requires robust and reliable equipment.

Axel Banasch
L-3 Elac-Nautik, Germany

Ulrike Schulte-Rahde
L-3 Elac-Nautik, Germany

SURVEY OF POLAR WATERS WITH the assistance of modern multibeam systems on icebreakers is a challenge to the acoustic and mechanical design. Current designs, proven on traditional research vessels, fail under the extreme conditions in the eternal ice. Therefore, the ability to safely endure the considerable mechanical load from the ice is the main consideration in the design of a multibeam system for an icebreaker. Ultimately, not only the integrity of the multibeam system but also the security of the whole vessel is at risk. Hence, just as in the nearly 150 years of development history for the icebreakers themselves, these requirements will lead to individual and characteristic features in design, defined by the medium of ice.

The development process of icebreakers was continuously attended by the responsible national classification companies, who helped to define the special requirements for such vessels and to summarise their experience in construction regulations. Over time, diverse construction regulations were issued by the nations such as Finland, Russia and Canada who build and operate icebreakers. Unfortunately, this resulted in manifold definitions of ice classes, since some companies also considered the age of the ice, and the snow lying on it, in addition to the strength of the ice. However, the various national construction regulations became increasingly similar as identical ice strengths produce similar technical requirements, which in turn lead to comparable solutions. Today, these are summarised in the IACS Unified Requirements.

Since comparison of the national ice classes can be very confusing, one should rather concentrate on the common design features of most of the actual and planned research icebreakers:

- Conventional propulsion (no nuclear propulsion)
- Net weight approximately 12,000t
- Gross weight approximately 17,000t
- Length approximately 130m
- Draft approximately 9m
- Width approximately 25m
- Research and survey operations in Arctic regions during summer
- Continuous icebreaking of ice with 1.1 to 1.5m strength
- Ramming of ice with approx. 3m strength

Most of these icebreakers are also used to supply the Antarctic/Arctic research institutions. Therefore they correspond to the Russian ice class Arc. 7 and to the IACS polar class PC5-PC6.

Extreme Environments Require Special Know-how

In 2006, the Japan Maritime Self-Defence Force (JMSDF) placed an order for the construction of a SeaBeam multibeam system for the type of vessel defined above with no compromises whatsoever in regard to ice resistance and acoustic performance. To secure the latter, the installation area was set as far as possible in the bow; the accepted limit was only the directly necessary geometric space requirement as defined by L-3 ELAC Nautik. Auxiliary constructions such as ice deflectors or special keel forms were prohibited in order not to interfere with the ideal form of the icebreaker design. Furthermore, the latest transducer and system technologies for multibeam systems were to be installed.

The installation in the bow created design-related ice loads of 30MPa on the complete surface of the location of the multibeam system. Determination of these design loads is generally achieved by tests and empiric formulas. During the quasi-static continuous icebreaking procedure, the direction of the ice flows is in most cases still predictable since the form of the bow is constructed to press the broken ice under the unbroken ice, thus

Figure 1: Icebreaker *Shirase*.

Figure 2: Frames in Mills Cross configuration.

producing an ice-free fairway. In case of ramming, however, this prediction becomes significantly less predictable and 'rebound' effects may occur, including in the bow area. This also applies to the contact in the ice edge area with floating ice in heavy sea.

It was also mandatory to ensure that broken ice, which within this area could come into contact with the outer hull of the vessel and therefore also with the outer surface of the multibeam system, would not cause any damages or scratches which could subsequently negatively influence the acoustic system performance by flow noise.

Special Development of an Ice-proof Multibeam System

Various characteristic features of multibeam systems for installation on icebreakers resulted from the demanding environmental requirements for such special research vessels, while avoiding compromises and high risks. An acoustic window for protection of the Rx/Tx transducers at the acoustically best installation area in the bow is inevitable. It protects the transducers against shocks by rebounding ice floes which have been pressed under the vessel during the ice breaking process. The transducers must additionally be protected against abrasion by ice floes slipping along the hull – these can cause considerable notches, even in the steel of icebreakers. The windows must also be able to withstand the extremely high pressures during these processes and convey the resulting forces safely into the supporting ship structure. The extreme forces can be concluded from the bottom construction of the steel of an icebreaker in these areas: steel sheets of 30mm and more for the outer hull are the rule rather than the exception. Frame spacing of 600mm or less is also common in these areas, thus demonstrating the extreme loads.

These loads can only be withstood when the frames for fixing the transducers of the multibeam system are an integral structural part of the total vessel construction in the installation area. Even if they are possible, 'open', non-supporting constructions to redirect the flow of forces increase the expenditure for the vessel's construction to a disproportionately high extent and are therefore extremely unfavourable, both technically and financially.

Installation in the bow created design-related ice loads of 30MPa on the surface of the multibeam system

This also means that within the arrays itself a universal support of the acoustic windows is required for the ship's structure. When even a 30mm outer steel hull must be supported at least every 600mm, an acoustic window cannot suffice with less if it is to guarantee a similar stability. These supports must also be integrated into the frames and the vessel in order to transfer the forces safely. A simple calculation shows that unsupported windows will not be able to carry these loads. It has to be considered that the window size is usually bigger than the normal 'footprint' of a multibeam system since the transducers

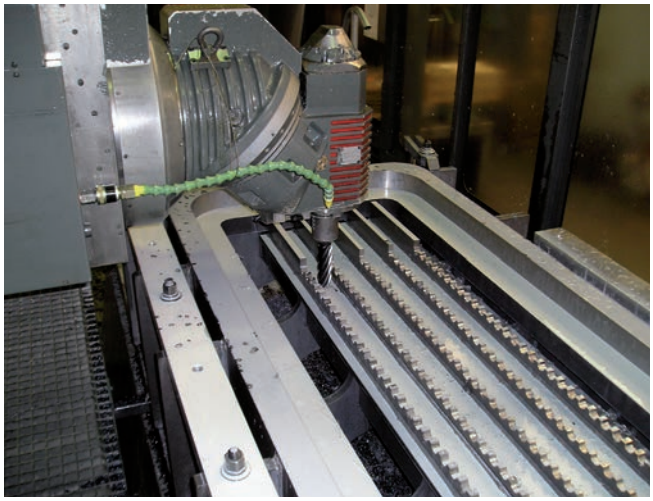


Figure 3: Production of an ice-proof frame.

Figure 4: Installing an ice-proof window.

unavoidably have to be shifted inwards, whereas the beam angle including the motion compensation should comply as far as possible with the coverage angle of a traditional system.

However, in contrast to the standard multibeam systems, steel braces are installed between the projector modules for reinforcement purposes. The braces increase the spacing of the transducer elements in the along-ship direction, resulting in modified transmission beam-forming algorithms and slightly increased side lobes on the transmission side. This effect must be minimised to an uncritical level for the overall system performance. For the hydrophone arrays of these multibeam systems, specific non-standard hydrophone modules are utilised which support mechanical reinforcement measures while keeping the spacing of the hydrophone elements the same as for the standard multibeam systems.

Due to the acoustic windows for ice protection, the depth performance decreases slightly (by approx.15%), and maximum coverage of the ice-proof multibeam systems is <130° compared to the 140° of standard multibeam systems.

What Protrudes Will Break Off

In order to make optimal use of the available space while also guaranteeing a high resolution, a multibeam system based on 20kHz is ideally suitable for two reasons: it covers the sea depths in the polar region securely and offers sufficient reserves for most of the sea areas worldwide. By choosing this frequency, the unavoidable acoustic windows and their necessary supports are restricted to a manageable size. Ice-proof solutions for 30 or 50kHz multibeam systems are also possible for installation on vessels that only need to detect in medium water depths.

Ice deflectors and special keel forms for integration of multibeam systems on icebreakers are not necessary. Usually they are merely a very expensive way of concealing the deficient design of such systems and do not eliminate their problems. In particular for icebreakers, the following rule applies: 'What protrudes will be broken off'. The protection of extensions and annexes as well as anything that does not correspond to the 'ideal' form of an icebreaker can become very expensive. L-3 ELAC Nautik's many years of experience with installations on icebreakers have furthermore shown that it is of great benefit to construct the installation area of the transducer with the acoustic window as a closed system. The disadvantage of the slightly higher expenditure for such a system is quickly compensated by its advantages. It is very expensive to protect open systems with acoustic windows internally against biological growth, rust and sediments. It is mandatory to frequently dismantle the windows for cleaning purposes. However, the installation in a closed system is maintenance-free. The latest statistics provide evidence of the robustness: up until this day, all ice-proof SeaBeam systems are working properly and no damage has occurred. In addition to Japan, the ice-resistant SeaBeam multibeam systems are at present in successful operation on icebreakers in the Russian Federation and the Chilean Navy.

It is of great benefit to construct the installation area of the transducer with the acoustic window as a closed system

The Authors

Axel Banasch graduated in mechanical engineering from Technische Universität Braunschweig, Germany, and has more than 20 years of experience in CAx. He joined the R&D department of L-3 ELAC Nautik in 2002. He is in charge of design, structural analysis and mechanical integration of underwater acoustic systems for sonar and multibeam applications. This includes research as well as military equipment on surface vessels and submarines focusing on customisation and structural adaption to different platforms.

Ulrike Schulte-Rahde graduated from Christians-Albrecht University in Kiel, Germany, and has been director of marketing & public relations at L-3 ELAC Nautik since 2008. Besides managing all marketing activities, she is dedicated to presenting the company's technical developments and products to a broad professional audience.

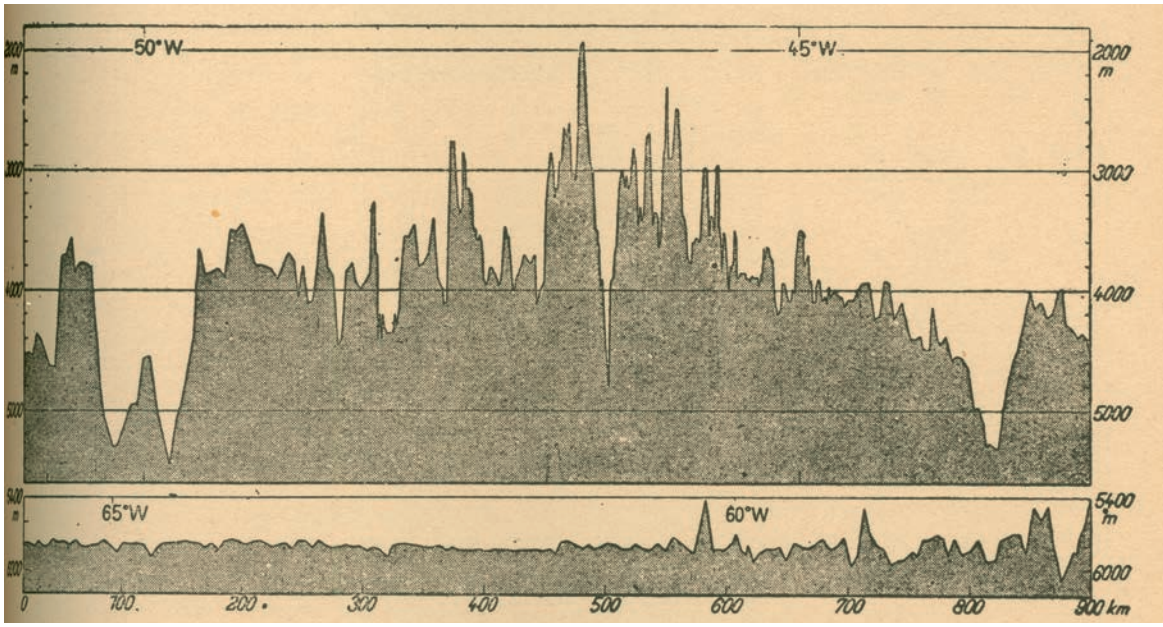


Figure 1: Echo sounding profile across the North-Atlantic Basin. Height exaggerated 100 times.

Discovering the True Nature of the Mid-Atlantic Ridge: Part I

Albert E. Theberge Jr., Contributing editor, Hydro International

Prior to the mid-19th century, the floor of the world ocean was virtually a clean slate. Nothing was known of the bottom of the deep sea with the exception of a few sporadic soundings. In the early 1850s, this began to change as Matthew Fontaine Maury obtained use of one small ship, the USS *Dolphin*, and sent it out on two expeditions, one in 1852 under Lieutenant Samuel Philips Lee and the second in 1853 under Lieutenant Otway. Apparently one sounding of 1,720 fathoms was by Lee southwest of the Azores Islands, but under Berryman a number of relatively shoal soundings were made north of the Azores. Maury contoured these soundings as a continuous shallow zone and by 1858 had called the area north of the Azores 'Middle Ground', the first name for the Mid-Atlantic Ridge (MAR).

Nearly twenty years later HMS *Challenger* embarked on its famous voyage. Although adding little to knowledge of the MAR in the North Atlantic, on its return voyage it ran a line up the spine of the MAR in the South Atlantic. These soundings led to the first maps showing the continuity of the ridge, first published in 1876 as a preliminary report by Commander T. H. Tizard and Captain Frank Thomson. They called the northern portion of the MAR the Dolphin Ridge, the equatorial part the Connecting Ridge, and the southern part the Challenger Ridge. Two years later, the chief scientist of the expedition, Wyville Thomson, published a modified map version of the MAR in *The Voyage of the Challenger: The Atlantic*.

Little additional information was obtained about the MAR until the advent of acoustic sounding systems. Between 1925 and 1927, the German research vessel *Meteor* traversed the Atlantic Ocean from Antarctic regions to the tropics of the North Atlantic. In a grand reconnaissance, it made thirteen cross-ocean transects and collected 67,000 acoustic soundings. Thirteen profiles were produced from this work, which, although not noted, hinted at the existence of a depression associated with the axis of the ridge.

In the spring of 1938, two legendary oceanographic ships, the Woods Hole Oceanographic ship *Atlantis* and the German vessel *Meteor* met off the coast of Florida and discussed their research efforts. The scientist in charge of echo sounding on the *Meteor* was Dr. Gunter Dietrich, destined to become one of the greatest of German oceanographers and a future head of the Institut fur Meereskunde. Information was exchanged and Dietrich reported that he was informed of the seismological

exploration work of Maurice Ewing from the *Atlantis*. Unfortunately, Ewing was not aboard. If Dietrich and Ewing had met at this time, perhaps the history of the exploration of the Mid-Atlantic Ridge would have been substantially altered.

The meeting with the *Atlantis* occurred on the last expedition of four that Dietrich made on the *Meteor* between 1935 and 1938. The *Meteor* traversed the Atlantic four times during the 1938 expedition including a diagonal line from the English Channel to Puerto Rico and three profiles designated *Meteor* profiles XX, XXI, and XXII. On the initial diagonal, Dietrich directed the *Meteor* to run a dogleg pattern in the vicinity of the MAR axis such that it was traversed three times between latitudes 27 18 N and 23 25 N. On profile XX, the center of the Mid-Atlantic Ridge was crossed at approximately 16 46 N, profile XXI at 23 50 N, and profile XXII near 30 N. Following the completion of the cruise, Dietrich wrote a four-page article as part of a larger report on the 1938 German North Atlantic Expedition. This larger report was published in the *Annalen der Hydrographie und Maritimem Meteorologie* in January 1939 under the title 'Bericht uber die zweite Teilfahrt der Deutschen Nordatlantischen Expedition des Forschungs- und Vermessungsschiffes *Meteor*: Januar bis Juli 1938.' Dietrich's sub-report was titled 'Einige Morphologische Ergebnisse der Meteor -FAHRT, Januar bis Mai 1938'. In an English translation of his sub-report, it was titled 'Some Morphological Results of the Cruise of the *Meteor* January to May 1938' and published in the *Hydrographic Review* in 1939. Accompanying this article were two illustrations. The first was a spectacular cross-section of the crest of the ridge showing a remarkable depression in its center; the second was of his interpretation of parallel ridges and troughs determined along his dogleg profiles.

In his essay, Dietrich reported the following: "… in Profile XX, the sea bottom in the middle of the Mid-Atlantic Ridge drops from a peak height of 1,930m to 4,790m… within a distance of 21 kilometres... A certain similarity in the succession of deep depressions is shown with Profile XX and the previous northernmost *Meteor* profile of 1927. Such striking depressions in the Ridge occur also in the other five *Meteor* profiles, the most impressive of which is in Profile XXI…" The six profiles noted, which spanned over 10 degrees of latitude, referred to the three diagonal cuts and three ESE-WSW profiles obtained on the 1938 trip. Although using the terminology 'striking depressions', Dietrich was the first to declare he had traced the continuity of what has become known as the MAR rift valley. (It is noted that, like later investigators, he interpreted two deeps that were associated with the Kane Fracture Zone as being two of his 'striking depressions'.)

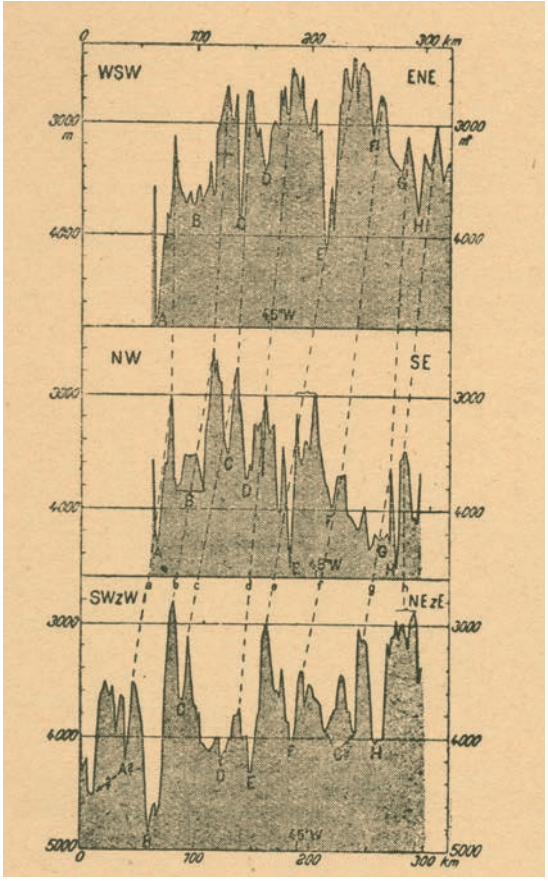


Figure 2: Echo sounding cuts across the Mid-Atlantic Ridge by *Meteor* in 1938. Height is exaggerated 100 times.

Figure 3: The first bathymetric map of the North Atlantic by Maury, 1853.

Dietrich went on to say: "On the basis of the sounding profiles on the Ridge, we are enabled to take a stand with regard to the problem of morphology of the ocean. That is – is it possible to find a certain correlation of form in the continuous up-and-down of the ocean bottom in the region of the Ridge between the profiles? In other words, are we dealing here with a confused and unrelated rise or with a Ridge which can be resolved into a series of more or less parallel trains of undulations?" He refers to the earlier work of Theodor Stocks and George Wust in studying *Meteor* profiles from the 1925-1927 expedition who thought it appeared possible, but not practicable. Because Dietrich had surveyed the portion of the ridge on diagonal lines as noted above, he stated "The soundings taken… [by the *Meteor* in 1938] over this Mid-Atlantic Ridge appear to present this question in a new light… there appears to be a meridional correlation between the forms. Nine continuous undulating trains may be correlated in these three traverses, although the nature of the relationship is very different in individual cases…" Dietrich had interpreted the top two of his dogleg segments correctly, but the third crossed the Kane Fracture

Figure 4: Maury's map in 1858 showing the first name for the Mid-Atlantic Ridge.

Zone causing a misinterpretation of his data.

World War II intervened during which Dietrich served as an oceanographer in the German navy and did not return to academia until 1950. His short paper that had large ideas was ignored by the ocean science community for nearly 10 years. In 1947, Maurice Ewing made his first expedition to the Mid-Atlantic Ridge. He had recently recruited Bruce Heezen to join his group. Heezen thought he was going to join the cruise, but Ewing instead detailed him to search out documents and references relating to the Mid-Atlantic Ridge. Ewing instead brought along Ivan Tolstoy to conduct echo sounding operations.

Heezen's recollection of this job is included in H.R. Frankel's work, *The Continental Drift Controversy* : "I looked up, in their rather good cross index catalogue, subjects such as the Mid-Atlantic Ridge, the Atlantic Ocean Floor … And the principal thing I ran into was a full volume of the *Geologische Rundschau* … and they devoted about a three or four hundred page issue to the Atlantic Ocean. This was probably the most significant [collection of] papers I found. Also, I found very skimpy references to some work done by the *Meteor* in the late thirties in the North Atlantic…."

These 'skimpy references' apparently related to Dietrich's paper as that is the only late thirties reference to *Meteor* work found by this author in the works of Ewing, Heezen, or Marie Tharp, and that only twice. The following year Ewing was sole author of the National Geographic article 'Exploring the Mid-Atlantic Ridge'. In this article Ewing echoed Dietrich: "Would the ridge be just a chaos of peaks or would it follow some understandable pattern? At first the topography seemed the wildest confusion, but as we studied more and more profiles a definite pattern began to emerge." However, Ewing's question had already been answered by Gunter Dietrich in 1939: "However, the echo sounding profiles show definitely that there are no closed massive Ridges, such as they necessarily appear on the small scale bathymetric charts. The confused and tangled mass of crests and valleys in the Mid-Atlantic Ridge can be resolved into a series of approximately parallel trains of undulations rising from the ocean bottom…"

The 1947 Atlantis cruise also discovered a deep valley that Ewing described: "The combination of steep slope and deep ditch suggests that the feature may be a fault scarp and rift valley – a zone of slippage between earth masses – and that earthquakes may have occurred there in historic times." This was the first time that Ewing referred to a rift. He would not do so again in print for nearly ten years. He was correct in all but calling it a rift - the fault scarp and rift valley turned out to be the east-west trending Atlantis Fracture Zone, later incorrectly interpreted as a rift valley by Heezen and Tharp.

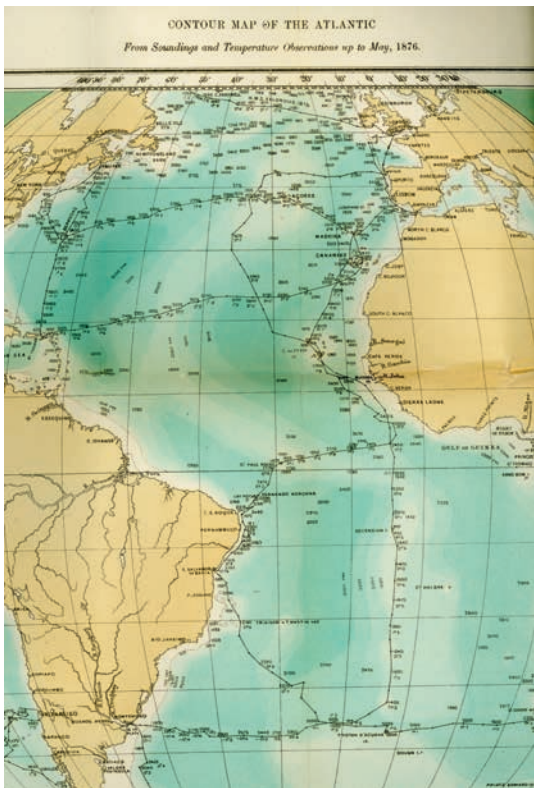


Figure 5: Wyville Thomson's 1876 version (published 1878) of the continuous Mid-Atlantic Ridge.

In 1949, Tolstoy and Ewing published *North Atlantic Hydrography and the Mid-Atlantic Ridge* in the Bulletin of the Geological Society of America. Dietrich's paper is included in the bibliography although no reference is made to his 'striking depressions'. Tolstoy and Ewing produced a map of the area surveyed in 1947 supplemented by two additional cruises. The location of the Great Meteor Seamount is shown with a question mark indicating that Tolstoy and Ewing had reviewed Dietrich's paper, as prior to 1949 it had only been mentioned in Dietrich's paper where it occurred directly above the Profile XX graphic. Tolstoy's map correctly showed the parallel structure of the various ridges and troughs in the vicinity of what is today called the Atlantis Massif. He also published a detailed map of the east-west 'trough' discovered in 1947. Although minimal indication of the median valley of the Mid-Atlantic Ridge is shown, it was not identified as such. Thus ended the 1940s. The next issue will investigate continued mapping of the ridge in the 1950s.

Figure 1: Charles Quartley.

Figure 2: Matt Quartley.

UK Manufacturing is Alive and Well

Valeport

Matt Quartley, managing director, Valeport, UK.

Valeport is based in the historic town of Totnes, Devon, in the South-West of the UK, where it designs, manufactures and supports its range of oceanographic, hydrographic & hydrometric monitoring instrumentation. Last year they opened a new 1,600m² production facility next to their existing offices on the banks of the picturesque River Dart.

VALEPORT WAS ESTABLISHED in Dartmouth in 1969 by Jim Stevens, an engineer with a keen interest in flow measurement. The company was then sold in 1981 to Oceonics Ltd, who was looking to expand its portfolio before floating on the stock market. Four years later, Charles Quartley, Oceonics' technical director, acquired Valeport in a management buy-out and the company remains in the Quartley family's private ownership to this day. Having seen consistent growth for a number of years, the company moved to bigger premises in Totnes in 2003 and in 2005 and Charles's son Matt took over as managing director. Since then, the business has trebled in size.

Current Profile

The company currently employs around 80 staff, with a projected turnover this year of just over GBP8m. One of the key policies is to keep as much of the business as possible in-house, so the single site in Totnes contains all necessary facilities for development, manufacture and after sales service of the product range, including a CNC machine shop, anti-static assembly areas and twin calibration laboratories, as well as all service staff, R&D engineers and sales, marketing and back-office functions. All staff buy into the overall philosophy of putting the interests of the customer first, believing that this is the foundation of our strength and the key to future success.

International Scope

Valeport exports around 70% directly and at least half of the remainder is sold to UK offices of multinational companies, or as OEM to other British exporting companies, so approaching 90% of production ends

> These sectors are less dependent on the global economic situation than other market areas

Figure 3: Production facility and offices of Valeport on the River Dart.

Figure 4: Product in calibration lab.

up overseas. Matt Quartley, managing director, says that in common with many manufacturers in the industry, Valeport's biggest single commercial market is the oil and gas sector, but the company is fortunate to be well recognised across the surveying and scientific communities, regardless of whether the work is being done for energy, dredging, defence, construction or environmental client groups.

Staff buy into the overall philosophy of putting interests of the customer first

Resisting the temptation to open overseas offices, Valeport instead relies on a network of international distributors across nearly 50 countries. The best of these are extremely proactive in promoting Valeport products and work closely with the company to ensure that they are trained in the technical details of all the latest products – an exercise that is significantly easier with the recent expansion in facilities.

Geographically, Valeport has seen most export success into Europe in recent years, fuelled partly by the establishment of long-term supply partnerships with key customers. The Middle East is steady, which is a satisfactory situation given the geo-political issues in the region, whilst the Far East and India continue to grow and will likely overtake Europe in the near future. Certainly the hardest market to crack so far has been the Americas and whilst the distributors continue to work hard, most success has come from supplying equipment through rental companies into the Gulf of Mexico and offshore Brazil.

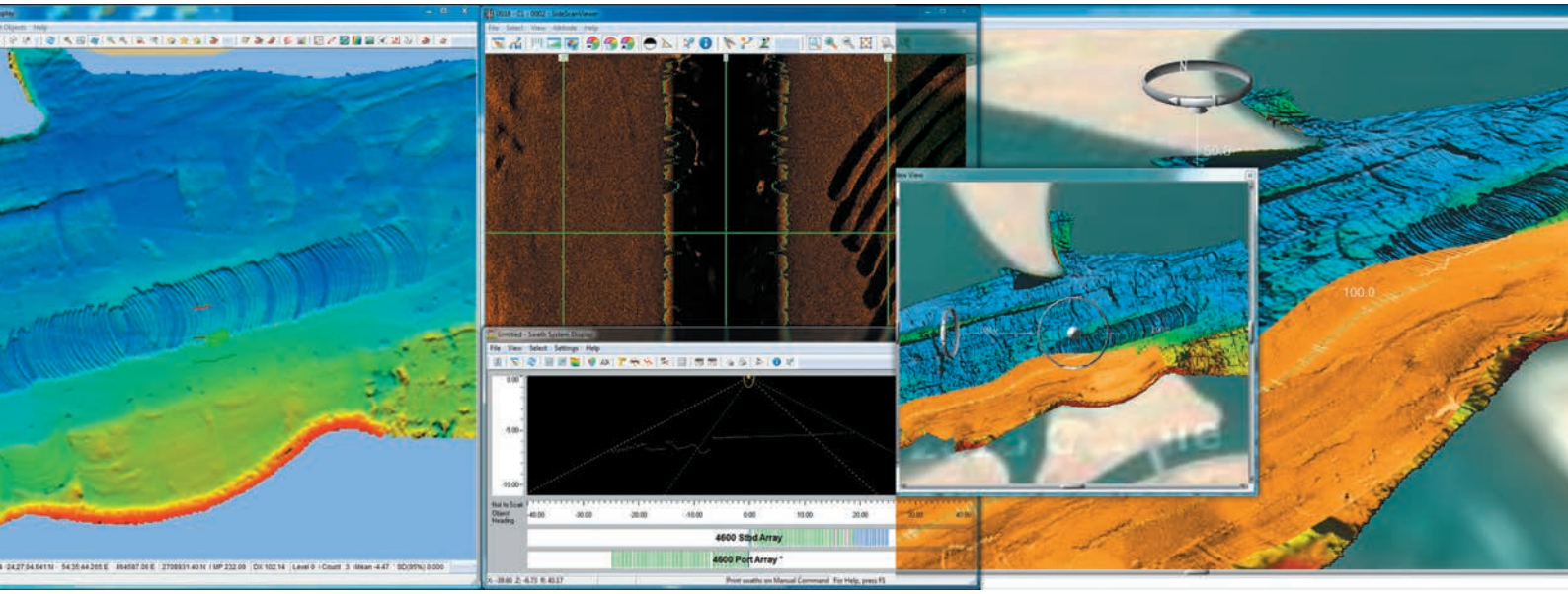
View on the Future

There is no doubt that measurement of the oceans and what lies beneath them will continue to grow in importance as the world both tries to exploit potential resources (energy, minerals and others) and to learn more about the marine environment as a whole. Valeport also has a number of products aimed at the onshore water distribution and processing markets and this is an equally secure sector. To a large extent, these sectors are less dependent on the global economic situation than other market areas, which explains the continued growth of Valeport and other similar businesses over the past few years. Success does not just happen though and the company continues to invest significantly in R&D with the twin aims of protecting existing market share and developing exciting new product ranges.

However, customer expectations continue to change in terms of what is expected from the technology they buy. Now, stakeholders expect to be able to see data all the time, from anywhere in the world, simply as a result of the proliferation of the internet and mobile communication devices. Niche manufacturers must work hard to keep up with these expectations and become increasingly reliant on third party solutions such as improvements in communications technology. The successful companies will be those who stay ahead of these shifting expectations, or even better, drive them. That is where Valeport wants to be – a strong, trusted brand supported by leading-edge technology and the ethos of a family business that insists on putting the customer first.

www.valeport.com

GEOSPATIAL TOOLBOX



Our geospatial toolbox is a powerful enabler for acquiring, processing and sharing maritime geospatial data. We are working with those engaged globally in maritime projects to have seamless systems that meet needs for integrated tools to improve effectiveness in data management and production. The modern maritime geomatic business process starts with data collection and input, through validation and visualisation, to producing and sharing data deliverables. Fundamental to this workflow is the use of common data files and the avoidance of intermediate exchange data files.

Acquisition – use QPS QINSy to collect once and use many times

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Hydrographic Elements of INSPIRE

Just before the INSPIRE Conference 2014 in Aalborg, Denmark, about 30 people sat together on board the *Barkentina LOA*, a beautiful tall ship. They discussed how to make better use of marine data within a Spatial Data Infrastructure. Professor Esben Munk Sørensen of Aalborg University and Ellen Vos of the Netherlands Hydrographic Service, Royal Netherlands Navy, organised this marine SDI workshop on Monday 16 June 2014. A short summary of the outcome is given below.

AS WE KNOW SO LITTLE about the European waters and capturing marine data is costly, we need a European focus on marine SDI along the value chain of the data. From planning the measurements or data collection campaigns, to its final use for all types of decision making, research, monitoring or other uses.

Data capturing (both by industry and civil authorities) needs to be coordinated in close cooperation with all stakeholders. Ships can act as sensors and the smart re-use of existing technologies and standards can open up useful opportunities to new sources of crowdsourced data, e.g. depth information measured by the ship included in AIS data. Data distribution should be in accordance with INSPIRE principles and ways to re-use industry data should be investigated.

One important theme is bathymetry/hydrographic surveying under Annex II Elevation. As depth information for safety of navigation always exaggerates dangerous shoal waters, metadata is important for proper re-use of depth information for uses other than navigation.

Requirement capturing should be organised in new ways as new players appear on the horizon contributing to Blue Growth. This should result in clear business cases and can simply mean that the existing business case of the security sector/EMSA in the INSPIRE setting be repeated. Perhaps Spatial Data Services can help to meet these specific needs.

Lessons can be learned from the military that developed concepts like the Recognized Environmental Picture. These concepts have been made operational in procedures and data production programmes, fit for the task at hand. 'Additional Military Layers' are an example of re-using the global hydrographic standards and data for purposes other than navigation.

New partnerships should be stimulated within the golden triangle of academia, industry and government. Traditional players, like Hydrographic Offices, should be mobilised as key players with knowledge about the marine environment, and liaise with European policy makers to overcome barriers to sharing data based on traditional stove-piped business models.

Figure 1: From left to right: Ellen Vos and Prof. Esben Munk Sørensen.

Ellen Vos, Hydrographic Office, Royal Netherlands Navy.

Figure 2: The venue of the marine SDI workshop, *Barkentina LOA*.

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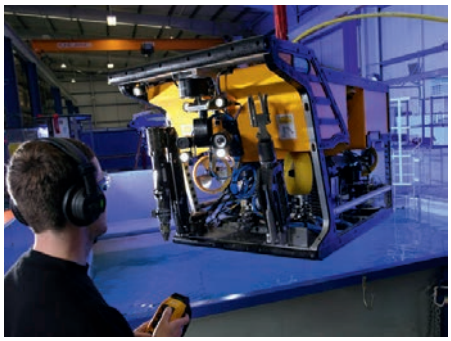
Buoy Solves Swell Challenge

Plymouth Marine Laboratory (PML, UK) has developed a Near Surface Ocean Profiling Buoy that scientists can use to gain accurate measurements from the top few metres of the ocean. By suspending instruments below a floating buoy, which rises and falls with the swell, measurements can be taken at a constant depth. PML's Near Surface Ocean Profiler acts as an instrumentation platform that can be lowered into the sea and left to drift away from the influence of the 'mother ship'.
http://bit.ly/1uGa8ft

Mobilisation of the Swell Buoy.

Sistac Buys Atom Work-class ROV

Brazil-based Sistac has taken delivery of an SMD Atom 100hp 2,000m-rated work-class remotely operated vehicle (ROV). The work-class ROV system will be mobilised during the fourth quarter of this year and will be used initially for survey and inspection duties. The ROV will provide Sistac with the capability to expand services in the future as a fully integrated tooling platform.
http://bit.ly/1uGaDWL



The SMD Work-class ROV over a test tank.

Fast-turnaround Habitat Mapping for Environmental Impact Assessments

Proteus FZC, UAE, has launched a fast-turnaround habitat mapping solution designed for Environmental Impact Assessments (EIAs). Through the service, Proteus delivers high-resolution classification maps of terrestrial areas onshore and the seafloor in shallow-water marine environments.
http://bit.ly/1uGau5P

Deepwater Pan & Tilt Device

SIDUS Solutions, USA, has introduced the SS260 Series Deep Blue Vector pan & tilt positioner. Able to withstand subsea, deep-sea and hazardous areas, this electrically driven, high torque two-axis positioning device has a single turn resolution of 0.001° (precision of movement) and the repeatability of position of .01° incorporates superbly machined, extremely low backlash gears and a field-serviceable modular design.

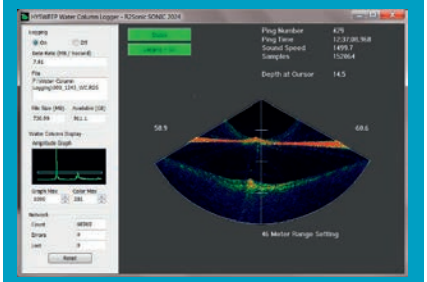
http://bit.ly/1uGb5nR

The SIDUS SS260 Series Deep Blue Vector pan & tilt positioner.

HYPACK 2015 Training in Texas

The HYPACK 2015 USA Training Event will be held in San Antonio, TX, USA, from 5 to 8 January 2015. The Hyatt Regency San Antonio River walk is to provide accommodation and hosting for HYPACK's annual event, during which HYPACK 2015 will be unveiled. Some of the big changes in HYPACK 2015 will be the new 3D real-time point cloud, water column integration and a new anchor handling routine.

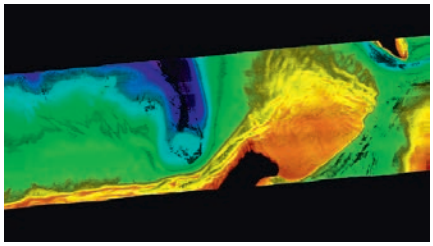
http://bit.ly/1uGaWB3



A screen of the water column feature in HYPACK software.

Pelydryn Buys CHIROPTERA II for Shallow-water Survey

Pelydryn, UK, has bought the CHIROPTERA II topo-bathy Lidar system from Airborne Hydrography and Leica Geosystems. Introduced in early March 2014, CHIROPTERA II is a Lidar system which simultaneously captures the full waveform in both the 35kHz bathymetric channel and the 500kHz topographic channel.
http://bit.ly/1uGcjiU



The bathymetry image is a colour-coded image of the seafloor topography. The deepest area is around 10m. The image shows one flight line from a survey using the Chiroptera II. (Image courtesy: Leica Geosystems).

Mooring Winches for MBARI Research Vessels

MBARI (Monterey Bay Aquarium Research Institute, USA) has recently selected a MacArtney MERMAC SC mooring winch solution to empower the deployment and recovery of scientific moorings on board MBARI vessels R/V *Western Flyer* and the R/V *Rachel Carson* (image). Installed on board MBARI scientific vessels, the winch will be used to effectively deploy and recover scientific moorings - offering a significant upgrade in terms of speed and performance when compared to the current system.
http://bit.ly/1uGbSoT

RV *Rachel Carson* is one of the vessels that has the new moorings installed.

OCTANS and PHINS to be Exported under Commercial Regulations

The US Department of State has issued Commodity Jurisdiction (CJ) rulings for iXBlue OCTANS and PHINS fibre optic gyro (FOG)-based navigation products, confirming that control for export of both units from the United States will be administered through the Department of Commerce under the Export Administration Regulations (EAR) process. The EAR Export Commodity Control Number (ECCN) for both OCTANS and PHINS is 7A003 NS1, AT1.
http://bit.ly/1uGd9w6

Wireless Capability for Fugro ROVs

The Fugro FCV 3000C ROV gets the wireless treatment.

WFS Technologies (UK) and Fugro Subsea Technologies (UK) have entered into an agreement to offer subsea wireless capability on all FCV work-class ROVs from 2015 onwards. This agreement means that Fugro ROVs can communicate with all Seatooth-enabled subsea devices, such as WiPS (wireless pressure sensors), Pipelogger (wireless pipeline integrity monitoring platforms) and Video (wireless video cameras), wherever in the world they are deployed.
http://bit.ly/1uGbua1

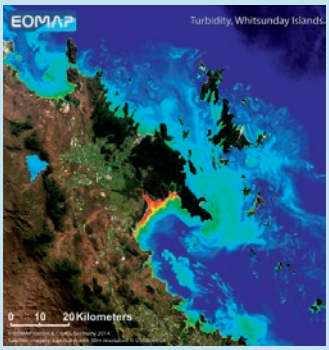
Tritech Gemini Profiling Sonar for STR

Tritech has sold multiple Gemini 620pd multibeam profiling sonars to Subsea Technology and Rentals (STR), UK. The sales of Gemini 620pd for subsea profiling operations follow on from the introduction of the Gemini Narrow Beam Imager (NBI) to the company's multibeam range. Tritech's Gemini 620pd profiling sonar operates at 620kHz and is able to provide 10mm range results with an angular resolution of 0.5°.
http://bit.ly/1uGeSBI

Bluetooth Android App for SonarMite Echo sounder

The SonarMite app is an Android app designed to work with the SonarMite Bluetooth echo sounder used in hydrographic surveying applications. The app is dedicated to connect to the SonarMite and facilitate most simple commands via pre-programmed buttons. Dedicated buttons give a more intuitive interface than using the dropdown keyboard or voice interface.
http://bit.ly/1uGcH0R

Reading the echo sounder values from a smartphone is now possible.



Turbidity observed from space.

Closer Eye on Australian Waters

German and Australian scientists have launched water-quality monitoring tools that will enable anyone in the world to zoom in on what is stirring up under the surface of Australian waters. Germany-based aquatic remote sensing company EOMAP teamed up with Western Australian statutory authority Landgate to deliver these products, which measure visibility, turbidity and chlorophyll concentrations in the water column. The results are digital maps that are continuously updated as these parameters vary across the oceans and coastal waters.
http://bit.ly/1uGdmzD

More product news
www.hydro-international.com/news/productnews.php

Canadian Hydrographic Society

The Canadian Hydrographic Association (CHA) wrapped up another successful conference (CHC2014) in St. John's Newfoundland and Labrador this past April. Partial proceedings are now available through the CHA website, www.hydrography.ca. Proceedings of the past several CHCs are also available through this site.

Plans are underway for CHC2016 in Halifax Nova Scotia at the Westin Hotel from 16 to 19 May 2016 and CHC2018 in Victoria, British Columbia at the Empress Hotel from 5 to 8 March 2018.

Lighthouse magazine, the journal of the CHA, is no more. With the publication of Edition 82, this brings to a close the more recently sporadic publication of a journal that was once regularly published in spring and fall of each year. The lack of a full-time editor, difficulty getting volunteer hours needed for journal production and the dearth of contributors have all led to its demise. A project is underway to make all 82 past issues of Lighthouse available on the CHA website, at the URL given above.

The 2014 CHA Award of CAD2000 has been granted to Stephen Finnis, from the University of Victoria. The award has been given annually to deserving students since 1992. Subsequent to this award, it will be given every other year - in even-numbered, conference years.

Hydro INTERNATIONAL will become the new home of news from CHA for CHA members. CHA members are also encouraged to submit short articles to Hydro for publication. CHA members now receive a subscription as part of their annual membership fee and will receive the balance of the journal issues for 2014 and an entire year of Hydro INTERNATIONAL starting in 2015. Please contact your branch VP to ensure your correct distribution contact information is provided to Hydro INTERNATIONAL for future distribution.

For the benefit of other hydrographic societies, the CHA has five branches: Atlantic, Quebec, Ottawa, Central and Pacific, and a national executive consisting of a national president, treasurer and secretary, plus the vice presidents of the five branches. Central Branch looks after our international members. All branches have both regular and sustaining (corporate) members. News from the branches will regularly occur in these pages. Reports from our Central and Ottawa branches follow.

Figure 1: The dedicated WHD cake. Image courtesy: Andrew Romano, Student CHS.

Central Branch

On 23 June, belated World Hydrography celebrations were held at the Regional Hydrographic Office in Burlington, Ontario. The event was co-sponsored by CHA Central Branch. Local members and retired hydrographers, Earl Brown, Robert Marshall and Al Koudys joined with Hydrographic staff at the Bayfield Institute to help pipe in the event. A National

Figure 2: WHD celebrations in Ottawa.

Film Board of Canada documentary 'Charting the Frozen Sea' on Beaufort Sea hydrography in the 1980s was shown and CHA Central Branch member Glenn Macdonald gave an encore presentation of his CHC2014 paper entitled 'Exploring the use of Sound for Representing Complex Spatial Relations in Marine Navigation'. Afterwards there was a bbq and World Hydrography cake was served.

Ottawa Branch

On 22 May 2014, the Canadian Hydrographic Association, Ottawa Branch, hosted a conference on Standards for Geospatial Interoperability given by Mr. C. Douglas O'Brien from Idon Technologies. This presentation stressed the fact that hydrography is much more than just nautical charts and that in fact it relies on larger structure that consolidates data and information in a standardised format providing sense and quality to the information supporting hydrographic work.

Also, the Canadian Hydrographic Association and CHS Ottawa celebrated World Hydrography Day with an outdoor event. This event was a great opportunity to unite our members and promote discussions. This event was attended by Department of Fisheries and Oceans assistant deputy Minister Dave Gillis.

Figure 1: Chief Hydrography specialist A. Dachin of Fertiong (Saint-Petersburg).

Figure 2: Presidium of the Conference (from left to right) Vice-president of HSR Dr. N. Nesterov, head of the Department of Navigation and Oceanography of the Russian Federation Ministry of Defence captain S. Travin, president of HSR Dr. N. Neronov.

Hydrographic Society Russia

The 2nd Research-to-Practice Conference was held on the eve of the World Hydrography Day on 20 June 2014. It was run by the Hydrographic Society of Russia (HSR) in cooperation with the Department of Navigation and Oceanography of the Russian Federation Ministry of Defence (DNO of the RF MD). The theme of the conference was 'Hydrography - much more than just nautical charts. Research works, innovations, technologies, challenges and prospects'.
Leaders and representatives of the Hydrographic Service of the Russian Federation Navy, leaders and employees of Russian companies focusing on Hydrography, representatives of educational institutions that train hydrographers, members of the Hydrographic Society and veterans took part in the conference. Professor N. Neronov, the president of the Hydrographic Society, and captain S. Travin, the head of the Department of Navigation and Oceanography welcomed the audience.

Many interesting reports were presented during the conference. These reports focused on the theory and practice of navigation, hydrographic support for different aspects of marine areas and professional training problems. Conference attendees discussed the reports and adopted the resolutions that were sent to the leaders of the relevant ministries.

There was a buffet reception at the end of the conference giving all the participants a chance to continue the exchange of ideas in a casual atmosphere.

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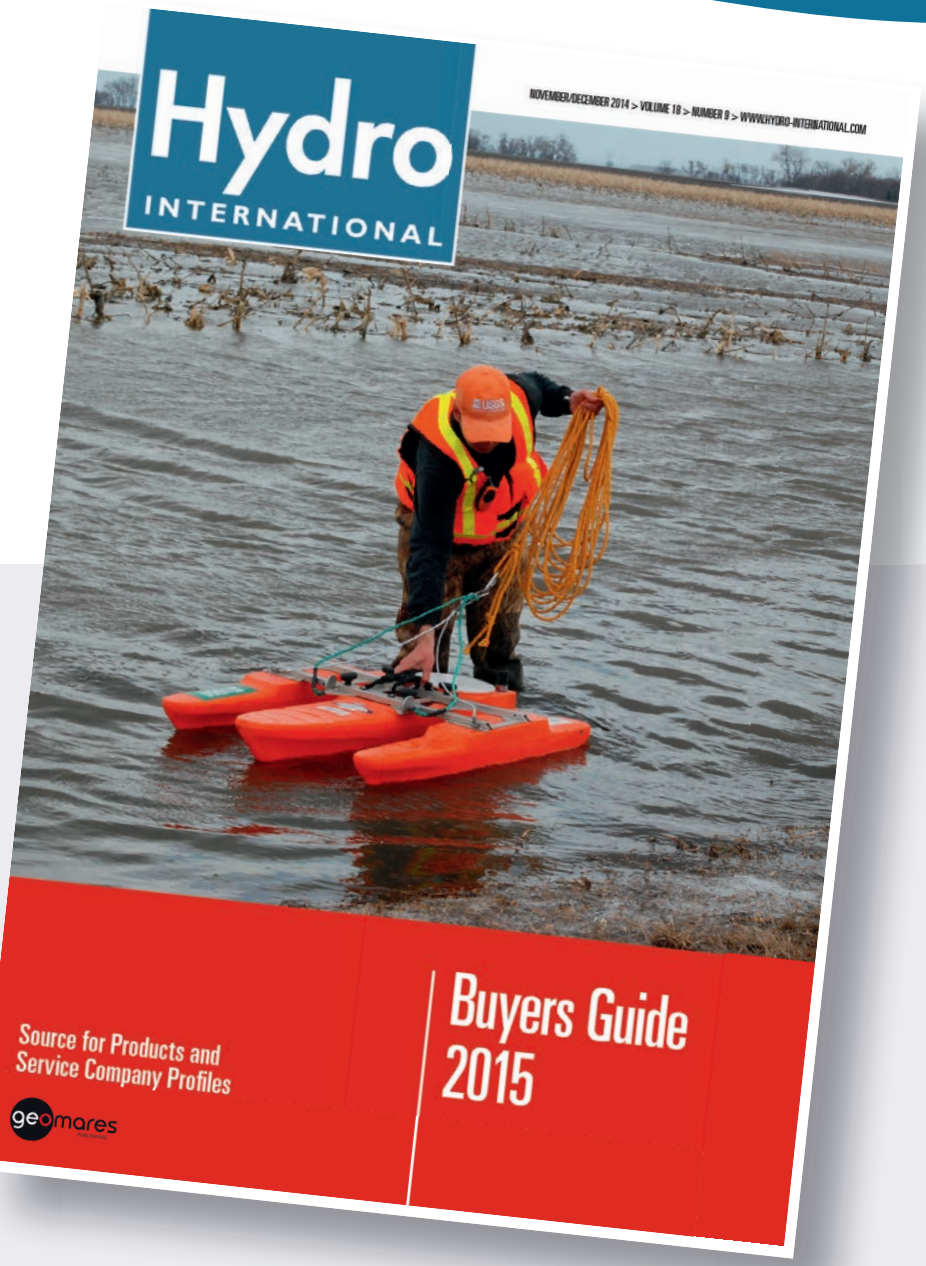

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Hydro Agenda

SEPTEMBER

Oceanology International China 2014
Shanghai, China
→ 03-05 September
For more information:
W: www.oichina.com.cn/en/

SMM 2014
Hamburg, Germany
→ 09-12 September
For more information:
W: smm-hamburg.com

Deep-Water Circulation Congress
Ghent, Belgium
→ 10-12 September
For more information:
E: 2dwc@ugent.be
W: www.2dwc.ugent.be

OCEANS'14 MTS/IEEE
St. John's, Newfoundland and Labrador, Canada
→ 14-19 September
For more information:
E: info@oceans14mtsieeest-johns.org
W: www.oceans14mtsieeest-johns.org

SEPTEMBER

Deep-Water Circulation Congress
Ghent, Belgium
→ 10-12 September
For more information:
E: 2dwc@ugent.be
W: www.2dwc.ugent.be

Teledyne Marine UTS 2014
Hamburg, Germany
→ 16-18 September
For more information:
E: marketing@teledyne-reson.com
W: www.u-t-s.info

SAUC-E: Student AUV Challenge - Europe
La Spezia, Italy
→ 20-26 September
For more information:
E: info@sauc-europe.org
W: www.sauc-europe.org

Edgetech Sonar Training Seminar
New Bedford, USA
→ 23-25 September
For more information:
E: Amy.Larose@EdgeTech.com

euRathlon 2014
La Spezia, Italy
→ 29 September-03 October
For more information:
E: eurathlon@uwe.ac.uk
W: www.eurathlon.eu

OCTOBER

Ocean Energy Europe 2014
Paris, France
→ 01-02 October
For more information:
W: www.oceanenergy-europe.eu/index.php/en/

AUV 2014
Oxford, USA
→ 06-09 October
For more information:
W: www.auv2014.org

Extraordinary International Hydrographic Conference (EIHC)
Monaco
→ 06-10 October
For more information:
W: www.iho.int

Sea Tech Week 2014
Brest, France
→ 13-17 October
For more information:
E: seatechweek@brest-metropole-oceane.fr
W: www.seatechweek-brest.org

ACI's 15th Maritime HR & Crew Development
London, UK
→ 22-23 October
For more information:
E: mmulazzi@acieu.net
W: www.wplgroup.com/aci/conferences/eu-mhr15.asp

SEG Annual Meeting
Houston, TX, USA
→ 26-31 October
For more information:
W: www.seg.org/web/annual-meeting-2014/overview

Offshore Energy
Amsterdam, The Netherlands
→ 28-29 October
For more information:
E: oe@offshore-energy.biz
W: www.offshore-energy.biz

Hydro14
Aberdeen, UK
→ 28-30 October
For more information:
W: www.hydrographicsociety.org

NOVEMBER

Trimble Dimensions
Las Vegas, USA
→ 3-5 November
For more information:
E: trimble_dimensions@trimble.com
W: www.trimbledimensions.com

Seawork Asia
Shanghai, China
→ 04-06 November
For more information:
W: www.seaworkasia.com

Teledyne RESON Training
Santa Barbara, USA
→ 08-14 November
For more information:
W: http://bit.ly/1ic9QnS

E-Navigation Revolution
London, UK
→ 11-12 November
For more information:
E: alison@quaynote.com
W: bit.ly/1qqUWSI

2nd International Ocean Research Conference (IORC)
Barcelona, Spain
→ 17-21 November
For more information:
E: secretariatiorcbcn@fnob.org
W: www.iocunesco-oneplane-toneocean.fnob.org/

5th PLOCAN Glider School
Gran Canaria, Spain
→ 17-22 November
For more information:
W: www.gliderschool.eu

Inmartech
Corvallis, Oregon, USA
→ 18-21 November
For more information:
W: www.inmartech2014.com

DECEMBER

Ocean Tech South China Sea (SCS) Expo & Forum 2014
Guangzhou, China
→ 10-12 December
For more information:
E: daniel.shi@informa.com
W: www.maritimeshows.com/oceantech

JANUARY 2015

HYPACK 2015
San Antonio, TX, USA
→ 05-08 January
For more information:
E: sales@hypack.com
W: www.hypack.com

FEBRUARY

Euromaritime 2015
Paris, France
→ 03-05 February
For more information:
E: sabrina.jonas@euromaritime.fr
W: www.euromaritime-expos.com

Subsea Expo
Aberdeen, UK
→ 11-13 February
For more information:
W: www.subseaexpo.com

MARCH

US Hydro 2015
Gaylord Hotel, National Harbor, USA
→ 16-19 March
For more information:
W: www.thsoa.org

APRIL

Ocean Business
Southampton, UK
→ 14-16 April
For more information:
W: www.oceanbusiness.com

MAY

RIEGL Lidar 2015
Guangzhou and Hong Kong, China
→ 05-08 May
For more information:
E: riegllidar2015@riegl.com
W: www.riegllidar.com

JUNE

TransNav 2015
Gdynia, Poland
→ 17-19 June
For more information:
W: http://transnav2015.am.gdynia.pl

SEPTEMBER

Shallow Survey 2015
Plymouth, UK
→ 14-18 September
For more information:
W: www.shallowsurvey2015.org

OKTOBER

Kongsberg Maritime HiPAP Survey Engineer Training Course
Aberdeen, UK
→ 09-10 October
For more information:
E: km.training.aberdeen@kongsberg.com
W: www.km.kongsberg.com/training

IADC Dredging Seminar
Singapore
→ 27-31 October
For more information:
W: www.iadc-dredging.com

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E: trea.fledderus@geomares.nl
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On the Issues of Overlapping Maritime Claims in the Far East

The marine environment in the Far East has witnessed different types of overlapping claims among neighbouring coastal states' parties. The overlapping claims often occur in cases where states' parties have interests in maritime boundaries and / or associated features, such as islands, reefs, etc. Such claims are subject to many factors, including: available facts, historical documents, landmarks, occupation, physical presence and inhabitation of the claimed areas by their respective ancestors. Furthermore, overlapping claims usually involve litigation and the states' parties need to come to terms in the form of an agreement for a collective understanding towards the exploitation and exploration of the resources within the area of geographic overlap.

This has recently been supported by a call by the Association of Southeast Asian Nations (ASEAN) to settle maritime dispute issues among the states' parties for the Spratly Islands using the international instrument – the 1982 United Nations Convention on the Law of the Sea (UNCLOS). However, this call is yet to be fully supported by all the concerned states. The following states: China, Brunei, Philippines, Malaysia Vietnam and Taiwan, have overlapping claims on the Spratly Islands.

Other overlapping claims include: China and Japan on the island of Diaoyu (China) / Senkaku (Japan) in the East China Sea; South Korea and Japan on Dokdo / Takeshima in the East Sea (Sea of Japan); and the Kuril Islands / Northern Territories claim between Russia and Japan across the Pacific Ocean.

Furthermore, Malaysia and Indonesia have also disputed over the islands of Sipadan and Ligitan . This dispute started in 1969 during the negotiations efforts between Malaysia and Indonesia to extend their common maritime boundaries for the continental shelf. This was purposely left out of the 1969 agreement since both countries failed to agree on their sovereignty. The matter was eventually brought before the International Court of Justice (ICJ) in The Hague, the Netherlands. In 2002, the ICJ decided that the sovereignty of both islands belongs to Malaysia. Until now, the maritime boundary in the Sulu Sea is still under negotiation between Malaysia and Indonesia.

On the other hand, the ICJ announced sovereignty over Batu Puteh (Pedra Branca) to Singapore on 23 May 2008, whilst Malaysia had sovereignty over Middle Rocks. The maritime boundary around the South Ledge is under negotiation between Malaysia and Singapore to determine its sovereignty.

In addition, the governments of Malaysia and Vietnam jointly submitted a notification to the Commission on the Limits of the Continental Shelf (CLCS), for the extension of their continental shelf claims. Although this is being challenged by China and the Philippines, the United Nations will review the joint documents in 2019, and will take into consideration the objections by China and the Philippines on this joint submission. More so as each coastal state has the right to claim the continental shelf limit as stipulated in Article 76 UNCLOS 1982 with scientific support and technical data to CLCS, set up under Annex II of UNCLOS 1982.

Although the ICJ awards claims based on features, the boundaries between the states' parties are left to be determined through discussions, negotiations, and agreements between the states concerned, using UNCLOS 1982 as the basis for their technical negotiations and agreements.

Dr. Mohd Razali Mahmud
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