

January 2016

MARITIME REPORTER AND ENGINEERING NEWS

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Ship Repair
Spain's Winning Streak

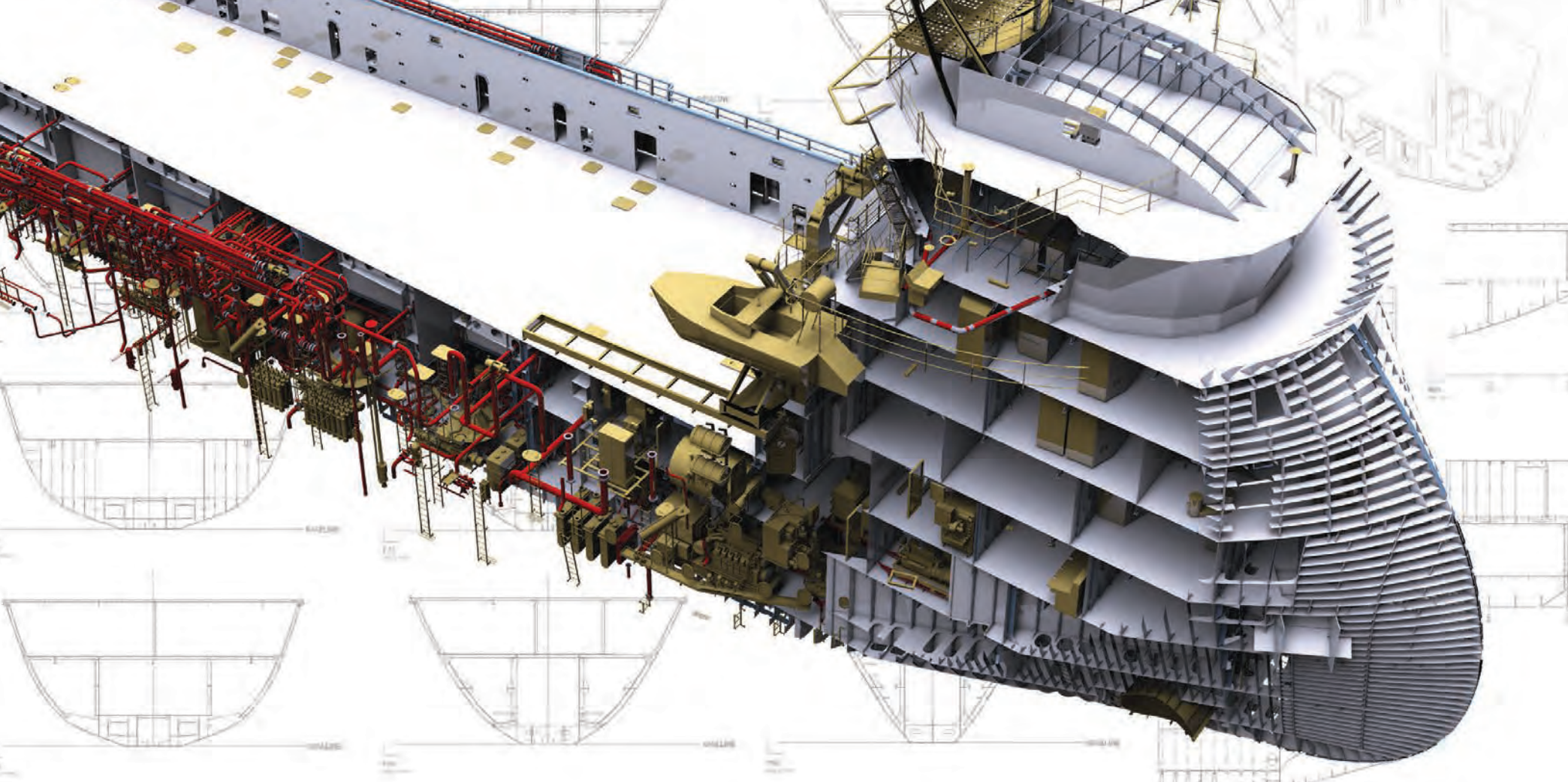
Cyber Security
The Top 10 Threats

Marine Salvage
SUPSALV &
Finding El Faro

Passenger Vessels
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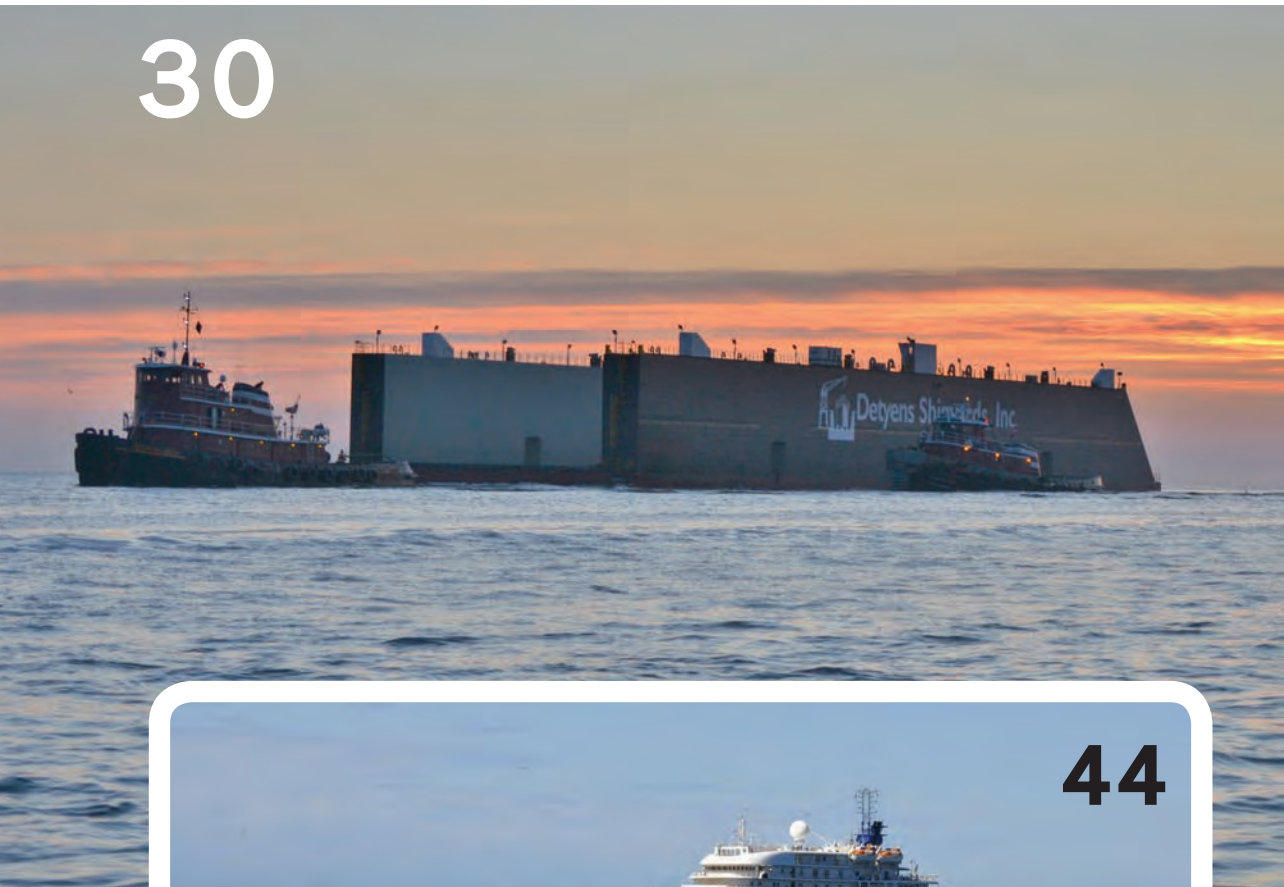
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THE COVER

Odfjell chose Bahrain's ASRY to upgrade the propulsion systems on three of its chemical tankers, a significant job from the perspective of both owner and yard as it involved the install of a new energy efficient concept to reduce fuel consumption and emissions by 20% per vessel. Odfjell, ASRY, MAN Diesel & Turbo, Grenna Motorfabrik and ABB Turbocharging AS team on innovative propulsion project.

Photo: ASRY



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Finding El Faro

This month we discuss marine salvage with Captain Gregg W. Baumann, U.S. Navy, Director of Ocean Engineering, Supervisor of Salvage and Diving. Captain Baumann (below) and his team have a long and proud history regarding difficult missions accomplished, including most recently the location and filming of the lost TOTE containership El Faro.

By Greg Trauthwein



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New Year ... Same Story ...



GREG TRAUTHWEIN, EDITOR & ASSOCIATE PUBLISHER

New Years means many things for many people, some attaching a somewhat mythical quality of renewal, goal-setting and prognostication. Personally it means a good dinner with good friends the night before, and the turning of the clock following yet another 24 hour period; watching a ton of football for a day and digging back into work. This year is certainly no different, and when I look at the global maritime market as a whole, on January 1, 2016, I see nearly the same picture as the day before: energy pricing remains in a historic slump and China's economy is stuck in neutral, both with varying ramifications across the maritime sectors; and overall the world is a bit more chaotic, a bit more politically unstable. This is neither good nor bad, it simply is reality re-lived. Our industry seems to be particularly poor at finding and maintaining equilibrium. When oil was selling for \$120 per barrel, many companies literally could not build and bring into service offshore assets fast enough; those same assets now sitting inactive, stacked and waiting for the inevitable rebound, whenever that may come. That's the bad news. The good news?

There are always new opportunities.

Maritime Reporter & Engineering News has published since 1939, and we have seen our fair share of market cycles. Personally, when I joined *MR* in 1992 the industry was engaged in another 'historic' energy slump: Oil was trading at about \$12 per barrel, the boat builders in the Gulf of Mexico were simply closing their doors and Houston was a ghost town. Then, lo and behold, the business of building "Casino Vessels" caught fire. While it was certainly no substitution for the building binge surrounding the oil patch, it provided a modicum of business for a core of builders and suppliers. If you should happen to have a copy of *Maritime Reporter's* August

1993 edition handy, I invite you to glance through one of our signature "Riverboat Gaming Supplements," complete with advertising for slot machines in our pages! (If you don't have a copy, find it online at <http://magazines.marinelink.com/Magazines/MaritimeReporter/199308/flash/> and turn to page 35). My point is not an aimless stroll down memory lane, simply a reminder that there are always opportunities.

This month I'm happy to present the first of a new quarterly series of reports on the rebuilding of the world fishing vessel fleet, authored by Oslo-based correspondent William Stoichevski. Stoichevski sits in Norway, which has been hit with a good deal of economic pain from the precipitous drop in oil pricing. Norway and North Sea oil go hand in hand, and while no one is proposing that fishing vessel design, supply and construction will replace oil money, the fishing industry strikes to the very core DNA of the Norwegian industry, and as always, innovation of design and outfit is the hallmark. His report starts on page 26. The small cruise vessel market is another interesting niche, and design and construction in this small but vibrant market is on record pace. While there is still voracious appetite for the big cruise sector, there is a growing demand for smaller vessels with access to more exclusive locales. Our report starts on page 44.

Finally, a personal note of thanks to **Captain Gregg Baumann**, U.S. Navy, Supervisor of Salvage & Diving; Director of Ocean Engineering for taking his time to share his insights in our Salvage Report, starting on page 38. I had the good fortune to meet Capt. Baumann at the American Salvage Association's annual meeting in Stamford, Conn., last year. Capt. Baumann and his team have a long and storied history of engineering solutions to make the impossible possible, including success in its latest high-profile mission: finding the ill-fated El Faro in more than 15,000 ft. of water.

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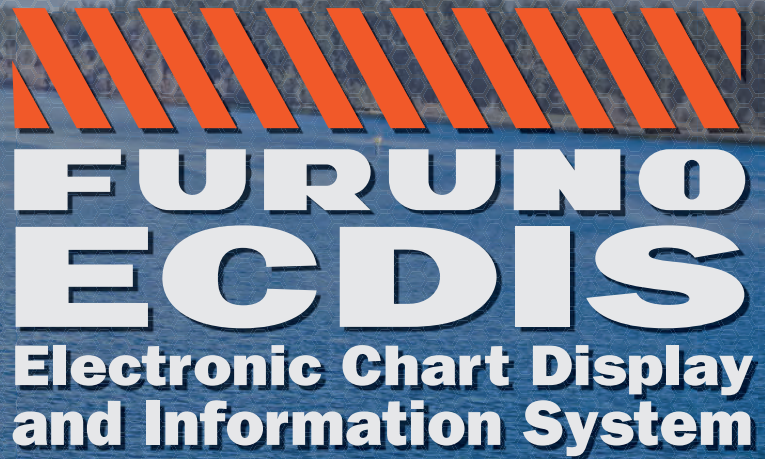
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ECDIS Adoptions: Halfway Home

“For the first time, vessels without ECDIS now represent a minority of the internationally trading fleet. This is an important moment for the shipping industry, as it signals that we are moving out of the ECDIS adoption phase and into a new era.”

Thomas Mellor, UKHO's Head of OEM Technical Support and Digital Standards

According to UKHO figures, large cargo ship fleet well prepared for July 2016 ECDIS regs

More than 50% of ships trading internationally are already living with ECDIS, according to the latest figures published by the United Kingdom Hydrographic Office (UKHO). Of an estimated 41,500 internationally trading ships around the world, 24,300 or 58% are now using an ENC (Electronic Navigational Chart) service on ECDIS as a result of the SOLAS-mandated carriage of ECDIS, which is being introduced on a rolling timetable for different ship types and sizes. Moreover, when those that do not trade internationally are included, 45% of all ships that are subject to the SOLAS regulations are ECDIS ready. On this basis of this trajectory for ECDIS adoption, the UKHO believes that the shipping industry is broadly on course to comply with the SOLAS-mandated timetable for ECDIS carriage across the global fleet by the end of this decade.

Tankers and Cargo Ships

The incorporation of ECDIS onboard the world's fleet of ships is not specific to size or type, as adoption is being made



by different categories of ship types and sizes. For example, the percentage of tankers greater than 3,000 gt that are ECDIS ready has risen from 54% in April 2015 to 69% in October 2015, following the ECDIS carriage regulations entering into force from July 1, 2015 for tankers. The SOLAS regulations on ECDIS carriage will be extended to all existing cargo ships greater than 50,000 gt from July 1, 2016. At present, 62% of the 3,500 large cargo ships that will be

subject to these regulations are already ECDIS ready.

This is significantly higher than the equivalent figure for the tanker fleet from 12 months ago, indicating that the large cargo ship fleet is relatively more advanced in terms of its preparations for the ECDIS deadline. While the trend is generally positive, there certainly are some variations by ship-type regarding ECDIS readiness. For example, 57% of bulkers are living with ECDIS com-

pared to RoRos (65%) and container-ships (71%). When looking at the trend regionally, however, it is nearly a level playing field, with 63% of large cargo ships in Asia ECDIS ready, closely followed by 62% in Europe.

“These figures show that the majority of internationally trading ships have made the transition to digital navigation and are now living with ECDIS,” said Thomas Mellor, UKHO's Head of OEM Technical Support and Digital Standards.

“For the first time, vessels without ECDIS now represent a minority of the internationally trading fleet. This is an important moment for the shipping industry, as it signals that we are moving out of the ECDIS adoption phase and into a new era.

“It's important to understand that ECDIS compliance and effective ECDIS use are not the same thing. All shipping companies need to ensure that they have put in place revised bridge policies and procedures that reflect the requirements of safe, effective and compliant ECDIS operation, that ECDIS software is upgraded to comply with the latest IHO ENC Standards, and that its bridge teams are competent and confident in using ECDIS to its full potential.”

Hatteland's 4K High-Resolution 55-in. Chart Table

In step with the increased level of information flowing into a ship's bridge, so too has evolved the means and method to display this information in an ergonomic and reasonable manner. Coming in 2016 from Hatteland – a company which recently was acquired by Noratron Group from Herkules Capital – is a high-resolution 32 in. and 55 in. chart table. While the two products are clearly two different concepts, they do share a common electronics platform since they are both 4K high resolution displays. The larger 55 in. display is scheduled to be the first one released, with a target of Q3 2016, driven by current project needs. The 32-in. version is scheduled to follow shortly thereafter, either in late 2016 or early 2017. Hatteland has traditionally pushed the technological envelope in the maritime display sector since its inception in 1989, and it is eager to communicate the new units' capabilities in advance of its release to market, as the 4K resolution is still a new concept among many system integrators.

According to Hatteland, the 32-in. display is a prod-

uct with its core 'console' market in mind since the final design aims at fitting it into a 750mm wide console, making it the largest screen that can be integrated in this industry standard dimension, a dimension widely used in the commercial marine segment. Hatteland contends that high resolution on a large screen provides the means to add more data on a single screen, aiming to bring several applications onto the single screen platform.

Conversely, the 55-in. version is a completely new concept Hatteland. According to the company, there is a demand to have a digital display to replace paper charts not only on a console as with the existing displays, but also around a (Chart Table). The Hatteland 55-in. display, standing on an adjustable pod stand, is truly impressive in size, clarity and function, providing a display in the same size as a paper chart with the high performance 40 point Multitouch screen for the interaction of several people around the table.

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Tank (Cleaning) Tech

Statoil Invests in Tank Cleaning Tech



Statoil

Statoil has found a way to make tank cleaning on supply vessels safer and more effective. M-I SWACO developed a new solution, and was awarded a contract with Statoil that is valued at around \$55.7 million. This is the first time that M-I SWACO has commercialized the technology.

It is an automatic system, which means that personnel avoid having to enter the tanks to clean them. Wash water and soap are also recycled so that it is only the actual waste washed out of the tank that has to be delivered for further processing. “The solution increases the safety of our personnel as there is no need to enter the tanks and we reduce both time use and costs,” said Jone Stangeland, VP of logistics and emergency preparedness at Statoil. The supply vessels transport chemicals in tanks below deck. When the tanks are emptied offshore they must be cleaned before being used for other assignments. Tank cleaning is often carried out with the vessels’ own tank cleaning plant, although manual tank cleaning is occasionally needed.

Manual tank cleaning is carried out by emptying the tanks of residual volume before personnel enter them, erect scaffolding and rinse with water and chemical cleaning agents.

Manual tank cleaning normally generates a high volume of waste and a typical clean can involve 10–15 cu. m. per assignment. “By cleaning the water in the same operation, the volume of waste is reduced significantly,” said Stangeland. The new system will fit onto a truck, and once the system has replaced manual cleaning, vessels will spend less time while docked in connection with tank cleaning.

Norway Trials New Age of E-navigation

The Norwegian Coastal Administration (NCA) initiated the first full-scale trial of e-navigation in Norwegian waters in conjunction with e-navigation technology and services company NAVTOR. The test sees the ferry MS Stavangerfjord digitally sharing its routing information with NCA via NAVTOR’s NavStation ‘digital chart table.’

The project focuses on the way NCA receives vessel data. Until now, ships had to contact the authority via maritime VHF radio to verbally communicate routing information before both departure and arrival. NCA could then update vessel navigators on traffic and advise of any necessary changes in speed or routing.

However, NavStation – software that gathers all the information navigators need into a single interface – allows the



(Photo: NAVTOR)

authority and vessel to work together as one, seamlessly transferring information and enhancing maritime safety, efficiency and control.

Stavangerfjord is owned by Norwegian shipping firm Fjordline and sails the popular Bergen-Stavanger-Hirtshals (Denmark)-Langesund return route. The trial is being undertaken in partnership with Kongsberg Maritime and subsid-

iary Kongsberg Norcontrol IT, which worked with NAVTOR to deliver the ship and shore-based software solutions.

NAVTOR already has a working relationship with NCA, having partnered with the organization on the SESAME (Secure, Efficient and Safe Maritime Traffic Management in the Straits of Malacca and Singapore) e-navigation project since 2012.

The firm launched the NavStation software to the market in 2014. Available on touch screen devices and standard computers, the software gathers and overlays an array of information for navigators on a single screen for the very first time. These ‘layers’ of information include ENC’s, weather data, tidal information, digital publications and other services such as passage planning and route monitoring.

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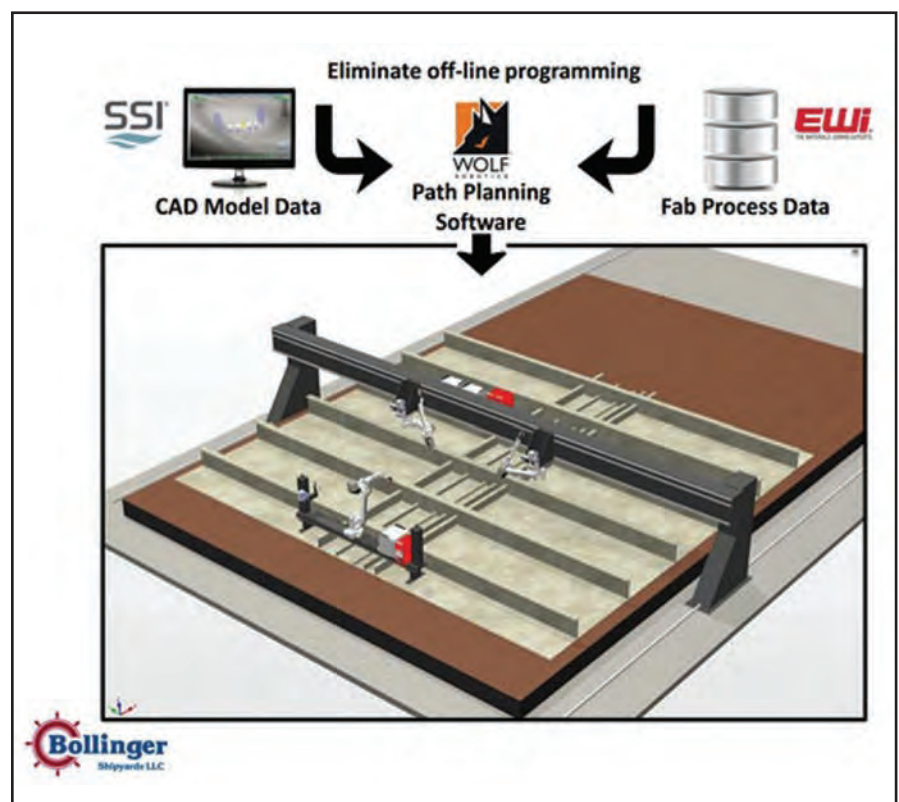
Computer Aided Robotics Welding

CAD/CAM software maker SSI said it is developing solutions for Computer Aided Robotics Welding (CAR-W) consistent with its recent innovations in the area of 3D weld management. This research project is under the aegis of the U.S. Navy’s National Shipbuilding Research Program (NSRP).

In December SSI representatives met with representatives from Wolf Robotics and Edison Welding Institute to advance this project. Other organizations involved include Bollinger Shipyards, Ingalls Shipbuilding, NSWCCD, Purdue University, Colorado State University, Tony Maciejewski and Longview Advisors.

The biggest challenge regarding the widespread application of robotics welding technologies is that it is costly to repeatedly program the robotic cutting machines off-line. This is less of a challenge in commercial shipbuilding where there is a relatively “low mix” of parts that can be cut in high volumes.

However, U.S. Naval shipbuilding features a high mix of parts to be cut in low volume. Therefore, in practice, these are more likely to be cut manually by welders in the field. The way to



increase productivity is via automation, by eliminating off-line programming of the robotic cutting machines. This will involve creating a process to integrate

Wolf Robotics path planning software with CAD model data from SSI’s ShipConstructor software as well as fab process data from Edison Welding Institute.

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Report: Methanol a Viable Alternative Marine Fuel

Methanol has a “historic opportunity” as a marine fuel, according to a new report published by research group FCBI Energy. Despite having many attributes that make methanol an attractive, low-emissions marine fuel, it has sometimes been overlooked in policy and industry discussions, according to FCBI Energy, whose report Methanol as a Marine Fuel finds the chemical to be a well-understood and safe to handle as a viable alternative to changing to low sulfur diesel, installing scrubbers or converting to LNG.

The new report, authored by marine energy systems expert Professor Karin Andersson of Chalmers University in Sweden, set out to examine methanol’s viability as an alternative marine fuel. The study found that methanol is abundant, biodegradable (the effects of a spill on the environment are low), compliant with the strictest international emissions standards, and could even be 100 percent renewable.

From a cost perspective, methanol prices show regional variation, and conversion costs are expected to drop dramatically as experience mounts. Moreover, as it is a liquid, methanol avoids the need for the expensive cryogenic equipment required for LNG, the report found. Infrastructure costs are relatively modest compared to potential alternative solutions, and current bunkering infrastructure only requires minor modifications to handle methanol.

In 2015 Stena Line converted Stena Germanica, a large Ro-Pax ship, to run on methanol. “The handling and installation of a liquid like methanol had clear advantages over gas or cryogenic fuels regarding fuel storage and bunkering,” said Carl-Johan Hagman, CEO, Stena

Line. “I believe this report can help raise awareness of this marine fuel and serve as an important source of facts to anyone

looking for a greener shipping fuels.” The full Methanol as a Marine Fuel report can be downloaded from the FCBI

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(Photo: Stena Line)

Limitless Salvage

Whether driven by treasure hunting or environmental protection, the days of forgotten wrecks, even at great depths, is past.



BY DENNIS BRYANT

It seems like every month we see reports of long-lost maritime wrecks being discovered on the ocean bottom and treasures being salvaged from great depths. We also hear regularly of oil being recovered from sunken wrecks. There is now no practical limit to the ability to recover objects from the sea floor, regardless of depth, currents, weather, or other obstacles. The only existing obstacle seems to be financing - and costs are decreasing regularly.

Early salvors, such as Adolphus von Treileben in the 1664 salvage of cannons from the Swedish warship *Vasa*, used a diving bell to allow personnel to work at a moderate depth and still have access to breathable air. The diving helmet and dry suit were invented by Charles Deane, John Deane, and Augustus Siebe in the 1830s and used to recover cannons from

the wreck of the HMS *Royal George*. Salvage vessels, equipment, tools, and techniques have progressed far in the intervening years. Regular salvage and treasure salvage have advanced apace.

The 1910 Salvage Convention codified the traditional law of salvage, focused almost exclusively on the right of salvage for remuneration. This convention has been largely supplanted by the 1989 Salvage Convention. One of the major developments in the new convention was inclusion of a provision for special compensation to be paid to salvors for work to prevent or lessen damage to the environment caused or threatened by the wreck or its cargo. While the intent of this provision was admirable, special compensation salvage awards under this provision have, in practice, proven to be minimal.

Wreck removal consists of the removal of hazardous wrecks, generally having little or no salvage value. Traditionally, the hazard involved a hazard to maritime navigation - in other words, a wreck where all or part of the sunken vessel had so little clearance above it that other ships might strike it. Government agencies, including the US Coast Guard and the US Army Corps of Engineers, require such hazardous wrecks in navigable waters to be removed by the owner and to be properly marked until such removal is completed.

The 2007 Wreck Removal Convention was primarily intended to provide uniform international rules and procedures to ensure the prompt and effective removal of wrecks and payment of compensation for the consequent costs. It applies within the "Convention area",

defined as the exclusive economic zone (EEZ) of a State Party. Effectively, it makes wreck removal within twelve nautical miles of shore subject to coastal state law and wreck removal between twelve and 200 nautical miles of shore subject to the Convention provisions. Removal is defined as any form of prevention, mitigation, or elimination of the hazard created by a wreck. "Hazard" has been expanded to cover not only dangers or impediments to navigation, but also a condition or threat that may reasonably be expected to result in major harmful consequences to the marine environment or damage to the coastline or related interests of one or more States.

Subject to certain exceptions, the registered owner of the wreck is liable for the costs of locating, marking, and removing the wreck. The registered owner is also required to maintain insurance or other financial security for such costs, up to the amount calculated under the Convention on Limitation of Liability for Maritime Claims. This compulsory insurance provision is applicable to vessels of 300 gross tonnage and above flying the flag of a State Party and to similar vessels, wherever registered, entering or leaving a port of a State Party or arriving at or leaving from an offshore facility in the territorial sea of a State Party.

The Wreck Removal Convention entered into force on April 14, 2015. A total of 25 nations, representing 58.09% of the world's merchant fleet, have ratified the Convention and become State Parties. As a result, the majority of the vessels engaged in international commerce now carry wreck removal insurance.

The United States has not ratified the Wreck Removal Convention. Instead, it

The Evolution of Subsea Tech
As subsea technology has evolved, so too has the ability to work reliably, efficiently and safely in the most harsh environments on earth. Pictured is Herbert Grove Dorsey with the Dorsey Fathometer around 1930.

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relies on statutes such as 33 U.S. Code section 409, which requires the owner or operator of a vessel that sinks in a navigable channel to immediately mark the wreck and to commence the immediate removal thereof. Federal law prohibits the discharge into the waters of the United States of oil or hazardous substances and makes the owner or operator of any vessel from which such discharge occurs responsible for its removal or remediation. In cases where the owner or operator does not immediately undertake removal and/or remediation action, the federal government may do so and, where possible, seek recovery from the responsible person. Vessels may not operate on waters of the United States unless they have met the financial responsibility requirements relating to potential pollution from oil or hazardous substances. The Oil Spill Liability Trust Fund or the Hazardous Substance Superfund (as applicable) is available to cover removal and remediation costs incurred by the federal government.

As salvage technologies have improved, wrecks that have been ignored for years are now being considered for

salvage and environmental intervention. If the wreck or its cargo is valuable, commercial salvors, often in cooperation with affected national governments, are undertaking salvage in extremely deep waters. In 1941, the SS Gairsoppa sank off the coast of Ireland while carrying over 110 tons of silver. Much of that silver and other artifacts were recently recovered, despite the fact that the wreck lay about 15,000 feet beneath the surface, far deeper than the wreck of the Titanic. More recently, a similar amount of silver was recovered from the wreck of the SS City of Cairo, which sank in the South Atlantic in 1942 at an even greater depth.

On the environmental side, oil is being recovered from wrecks that have also been ignored for years due to the depths involved and the previous lack of technology able to effect the needed recovery. In 2001, it was determined that oil was being released from the wreck of the SS Jacob Luckenbach, a freighter that sank in 1953 in 175 feet of water in what is now the Gulf of the Farallones National Marine Sanctuary. The wreck was largely forgotten and ignored, even

though its location was known, until intermittent oil slicks were traced back to the wreck. Monies from the OSLTF were used to pay for removal of more than 100,000 gallons of heavy fuel oil from the wreck. In 2011, the OSLTF was again tapped to pay for a survey of the wreck of the tanker SS Montebello, which was sunk by a Japanese submarine off the coast of Cambria, California in 1942. The survey revealed that the hull is structurally sound and that there is little likelihood of an oil discharge in the foreseeable future. In Lake Erie, federal monies recently were used to fund removal of oil and hazardous substances from the leaking tank barge Argo that sank in 1937 during heavy weather.

The depth record for recovery of oil from a sunken wreck, though, is currently at 13,000 ft. (greater than the depth of the wreck of the RMS Titanic). It was set in 2004, when remotely operated vehicles (ROVs) were used to remove oil from the wreck of the tanker Prestige, which had sunk in 2002 in heavy weather off the northwest coast of Spain. That oil recovery operation, occurring prior to adoption of the Wreck Removal

Convention, was paid for by the Government of Spain. It is expected that similar operations in the future will be at least partially financed via the Convention mechanisms.

The U.S. Coast Guard now routinely requires that oil be removed from sunken, grounded, and damaged vessels in U.S. waters. This is primarily so as to minimize the risk of environmental damage. This practice also avoids later payment for oil removal by the OSLTF and furthers the principle of “the polluter pays”. The days of forgotten wrecks, even at great depths, is past.

The Author

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Continuous Improvement

Implementing Continuous Improvement in Maritime Training



BY MURRAY GOLDBERG

Continuous Improvement (CI) is a term we hear a lot lately. Sadly, despite knowing the term and possibly even applying CI principles to some aspects of operations, CI principles are infrequently applied to in-house job and familiarization training. This is a mistake.

First, it is neither difficult nor expensive to establish and maintain a program of CI for in-house training. Second, there is a good chance that if you do ignore CI, not only will your training outcomes fail to improve, but they will likely deteriorate, resulting in a deterioration of safety and operational performance. After all, if you are not applying improvement principles, you are unlikely to be measuring outcomes. This is a recipe for deteriorating performance.

The good news is that it is easy to begin implementing a program of continuous improvement in your training. Even a modest program can yield significant results. Once such a program has been launched, it can then be gradually and incrementally expanded making it more effective and more sophisticated. The improvement in training outcomes, trainee satisfaction, safety and performance can provide a tremendous return on investment given the low cost and effort of implementing such a program for operational training.

This is the first article in a series of three which provides a “how to” primer for implementing continuous improvement in maritime training. The series provides an introduction to continuous improvement, talks about measurement and key performance indicators, and then discusses some simple metrics and techniques that apply specifically to maritime training.

Why Now?

Before defining continuous improvement, it is important to note that this topic is especially timely now. All vessel operators need to start thinking about this. Vessels, equipment and job routines in the maritime industry continue to become more complicated and sophisticated. As a result, deeper knowledge and more specialized skills are required to operate safely. Much of this knowledge and many of these skills are not or cannot be taught in the required certification courses. Instead, they must be taught as part of job and vessel familiarization training by vessel owners and operators. However, familiarization training in most organizations has not changed much over the years and as a result there is an increasingly large gap between the sophistication of operational training and the training needs of modern seafarers. A program of continuous improvement for operational training is a necessary tool to apply to the task of closing this gap.



What Is Continuous Improvement?

The term “continuous improvement” defines itself pretty well. Paraphrased from Wikipedia:

A continuous improvement process (CIP or CI) is an ongoing effort to improve products, services, or processes. processes are constantly evaluated and improved in the light of their efficiency, effectiveness and flexibility ...

- The core principle of CIP is the (self) reflection of processes. (Feedback)
- The purpose of CIP is the identification, reduction, and elimination of suboptimal processes. (Efficiency)
- The emphasis of CIP is on incremental, continuous steps rather than giant leaps. (Evolution)

So, CIP is the continuous process of reflecting on the task at hand and identifying and eliminating suboptimal practices in a series of incremental, rather than drastic steps.

One possible issue with the Wikipedia definition is that it emphasizes efficiency, but not effectiveness. As a past university faculty member teaching safety-critical software systems, I can attest to the importance of this distinction. Maritime operations are an excellent example of safety-critical systems – ones which can cause significant damage or loss of life if not done well. While it is important to make training in any system as efficient as possible, the primary goal in safety-critical systems is to make training as effective as possible. Effectiveness in our context means ensuring that required

knowledge and skills are learned well by every trainee. This applies equally to assessment. Our assessment techniques must also effectively identify those trainees who did not learn the required knowledge and skills to the level required. Efficiency is important, but secondary.

Measuring and Managing

One of the cornerstones of any CI process is measurement of efficiency and effectiveness. A past mentor of mine is very fond of the saying “If you can’t measure it, you can’t manage it”. His point is that for any business process, including training, unless you implement a system of measurement to keep track of how well that process is functioning, there is no way to improve the process. Only through measurement can we determine whether changes to a process have been beneficial or detrimental. So measurement is a core feature of any CI process.

Key Performance Indicators

In order to measure something, we first need to establish a set of “Key Performance Indicators” or KPIs which will be measured and tracked. These are indicators of effectiveness and efficiency which provide a measurement of “key” or important aspects of training – those aspects which are worth optimizing. For example, if one goal is to create a positive educational culture in your maritime organization, trainee satisfaction with the training process is an important element to optimize. We would then choose a KPI which attempts to measure that aspect as closely as possible.

Whatever KPIs are chosen, they must be closely aligned with the high-level goals of the training organization. Additionally, they must measure aspects of performance that:

- Can be directly measured. Some important parts of any process are difficult or impossible to measure because data is either not easily available, or because there are too many confounding factors which make it difficult to isolate a particular indicator.
- The organization has control over. Even if it can be measured, there may be little point, at least for the purposes of CI, if there is no easy way to influence the metric.

Another consideration is to choose KPIs which react reasonably quickly to changes made to training practices. For example, although “days without safety incident” is a critical KPI for any maritime organization, the value is not likely to change quickly with small changes in training. Therefore as a training KPI it may not be useful because it will be hard to relate changes in

this KPI to specific changes in training. However, if we take care of the “little” things with carefully chosen KPIs (like lifeboat drill frequency and effectiveness) the “big” things (like overall company safety) will take care of themselves.

The Continuous Improvement Cycle

There are many popular variants of CI “systems” including Deming, Six Sigma, Kaizen and many others. However, all of the systems are variations of a very basic CI philosophy which is implemented as a continuously repeating periodic cycle:

1. Run the system for some period of time (in our case, perform maritime familiarization and job training)
2. Collect and analyse KPIs
3. Propose and implement changes hoped to improve the KPIs
4. Go to step 1

At each iteration of the cycle, training changes which have improved the KPIs are kept, and those which have had no or negative effect are removed.

The Period of the Cycle

The period of your CI cycle (the length of time that each cycle lasts) is determined by the organization’s ability to collect meaningful metrics and implement proposed changes. Depending on the size of an organization and the number of people it trains, this might be anywhere from 6 months to a year or more. Remember, however, that CI is generally a process of making small changes, and that it is generally unwise to make too many changes during any one cycle since it may be difficult to determine which change affected the KPIs. Therefore, shorter periods, as long as they allow for meaningful measurement, will create a training organization which is more responsive to trainee and organizational needs, and which can make quick course corrections when a change is found to be detrimental rather than beneficial.

Meta Reviews

In addition to the steps above, it is also important to periodically do a kind of “meta” CI review - a review to improve the CI process itself. This might include:

- Reviewing the KPIs to make sure they optimally capture the aspects of performance most important to the training organization. In other words - do we have the right KPIs? Should any new ones be added? Should any existing KPIs be deleted or altered?
- Review the period of the CI cycle to ensure it is neither too long nor too short.
- Review performance in terms of success in being able implement changes that the organization felt were necessary.

- Review performance in terms of how well the changes made in the past improved the training KPIs.

By doing this you are applying the philosophy of continuous improvement not only to training, but also to the system which ensures the continuous improvement of training.

In the February edition of *Maritime Reporter and Engineering News* we turn our attention to specific CI techniques which can be applied to maritime training. To do so, we will look at KPIs that are useful in this environment, and how to gather those KPIs. Until then, happy New Year and keep safe!

The Author

Murray Goldberg is CEO of Marine Learning Systems (www.MarineLS.com). An eLearning researcher and developer, his software has been used by 14 million people worldwide.

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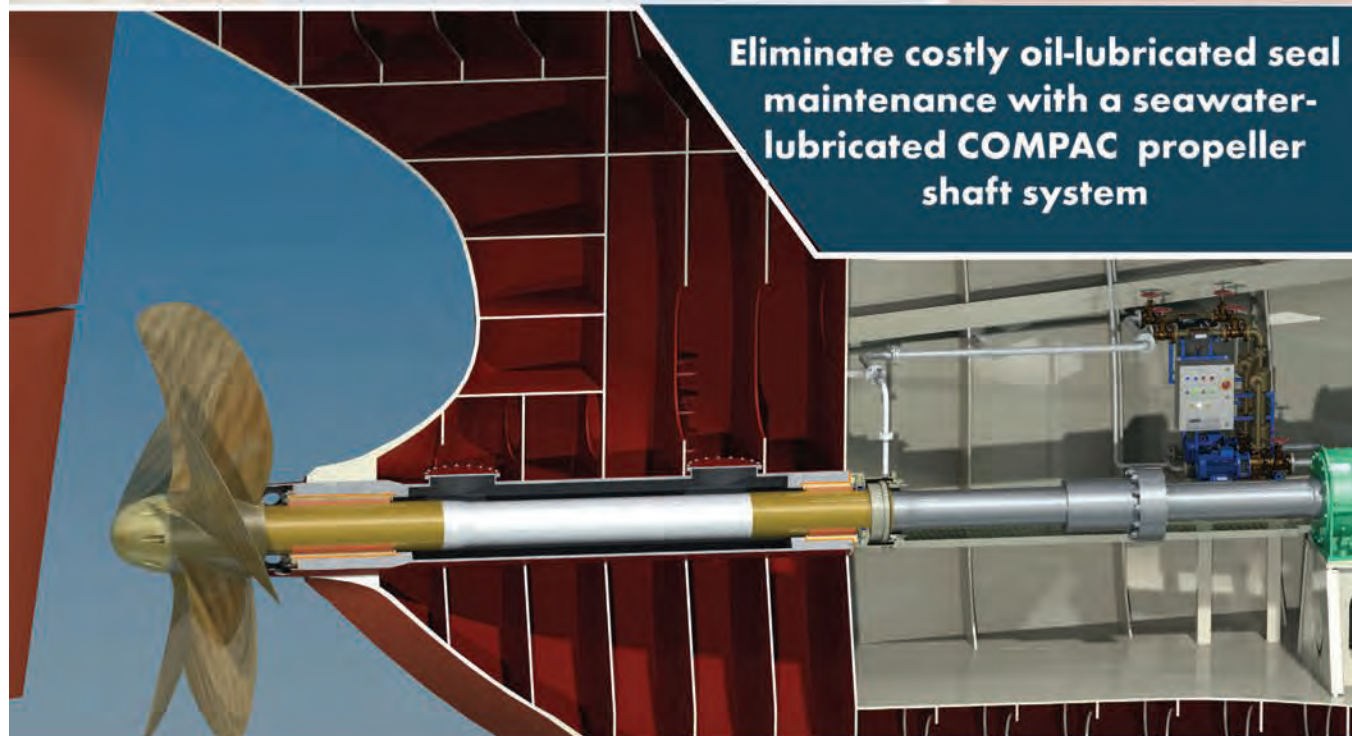
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WSS Ships Agency's Frederic Fontarosa

Wilhelmsen Ships Service (WSS) is aiming to consolidate its position within the Ships Agency segment by building stronger agent-customer relationships. By doing so, Frederic Fontarosa believes the firm can offer enhanced efficiency, understanding and value.

Frederic Fontarosa is a people person. Mixing an easy going, laid back French-American drawl with suddenly energetic outbursts on subjects close to his heart, he's engaging to talk to and easy to like. Seated in his Houston office, although rarely sitting still, the WSS Director Ships Agency Americas is taking Maritime Reporter & Engineering News through his ambitions for a division of the global business that serves 581 regional ports and an average of 2000 vessel calls every single month. "It's about the people,"

he said. "Our people getting closer to the customer, and the customers' customers, to understand their trading patterns, requirements and how our service solutions can help them meet their individual objectives. "We're a big company, but that doesn't mean we can't have close customer relationships – in fact our size actually makes it easier." Fontarosa isn't wrong about being big. Ships Agency is one of the oldest divisions of the worldwide Wilh. Wilhelmsen Group, and over its 40 year history has grown into a giant; boasting 1250 employees, 182 dedicated offices (alongside 438 sub agency offices), with the capacity to service ports in 132 countries. This size, as Fontarosa points out, brings obvious benefits for customers: "With a trading environment of low earnings, tight credit and high costs, a ships agency with our global network can offer international shipowners compelling advantages. These include the standardization of services, global reach, compliance, certified employees, quality assured processes, E&O insurance coverage, data availability, and modern, integrated IT systems. The efficiencies associated with this breadth of offer are immense.

"Small agencies, which are normally represented in only one port, simply don't have the financial capability, geographical spread, or the desire to ensure those standards are embraced. That gives us, and our customers, a clear advantage."

But for all those benefits, some would argue that, in the world of ships agency, small is beautiful. Being small means these 'mom and pop' businesses can be personality focused, allowing them to forge close relationships with repeat customers. Isn't this something an agency the size of WSS struggles with? The return of Fontarosa's smile suggests not.

Local Knowledge, Global Reach

Fontarosa describes WSS' relationship with its customers as 'peer-to-peer,' implying that it views each other as partners, rather than service provider and client. To build the bonds within that partnership the firm has created something called the Global Agent Desk.

"This means we appoint one person that is globally responsible for that shipping company," he explains. "In essence this gives them the chance to build that mom and pop style relationship, but in a global sense rather than just at one port. That person becomes the customer' single point of contact worldwide and, as a consequence, this drives huge efficiencies as the firm no longer needs to deal with a myriad of mom and pops."

Frederic Fontarosa

Joined Wilhelmsen Ships Service within the Operations department in France in 1994. Since then has held roles as Development Manager in the Africa, Middle East & Black Sea region (2001–2005), Vice President International Sales (2005–2009) and, in 2009, was made Business Director, Ships Agency and Bunkers. In 2013 took on his current role as WSS Director Ships Agency Americas. Fontarosa on Fontarosa: "Every day is different, with a different challenge, I love it."

"From behind my desk in Houston, thanks to WSS' global reach, the world is my playground!"

And such through-the-line efficiency, Fontarosa remarks, is key to “the new breed” of international ship operator.

“If you look at the evolution of the industry over the past decade there’s been a shift from traditional maritime to more business orientated values,” he states. “Customers today expect ships agents to understand their entire business, not just the vessel. That means they want us to have an overview of their entire point-to-point trade, but also the needs of their customers – the person who they’re shipping the products or commodities for. WSS’ global reach and resources allow us to achieve this.”

In assessing the evolution of the business, Fontarosa has a long history personally and institutionally from which to draw. “Ships agency, and shipping in general, remain a very traditional business,” Fontarosa said. “If I was to point out one element that drove changes into the industry, it would be the arrival of internet and its various means of communication which brought more transparency.”

Intelligence to the Fore

When outlining the benefits of his firm there’s a coterie of keywords that

continually spring from Fontarosa: The ‘efficiency’ that comes with global reach and scale, the ‘standards’ that one unified international operation can deliver for shipowners, and, the final one, ‘intelligence.’ “Translating the vast amount of information from our ports across the world into relevant intelligence yields real competitive advantages for our customers,” he says. When asked what he means by this he responds with an explanation of WSS’ Trade Talk Desk.

“That encapsulates our added value/intelligence proposition,” and is an area for investment for the company, Fontarosa said. “In 2013 WSS created the Trade Talk Desk in four strategic locations around the world – here in Houston, Singapore, Geneva and Dubai. The desks, which work across their time zones to give our customers 24-hour coverage, deliver relevant, timely and accurate information to our customers. They structure this data and package it in a way that is easy to understand and access.” This information is broad-based and comprehensive, covering everything from port news and port facilities developments, through to cargo statistics, vessel line-ups and breaking news, such as a port closure due to bad weather.

“By presenting this vital information in one package, from one source, customers get the intelligence they need, when they need it,” Fontarosa stresses, “rather than being swamped by a million different emails from a range of different companies all round the world.

“It’s streamlined, intuitive and intelligent, setting a new standard for adding value to ships agency deliverables.”

In addition, Trade Talk Desk is an embodiment of the future of the ship agency business. “I foresee the future ships agent to develop into a relevant source of local market intelligence information enabling customer to make sound commercial decision,” said Fontarosa. To this end, “WSS is investing in dedicated people and system (Trade Talk Desk) who will become customer central focal point of contact for local market intelligence.”

On the Right Road

Despite his passion and obvious enthusiasm for his cause, Fontarosa is candid enough to admit that “seen against the totality of the shipping industry, ships agency is somewhere near the bottom of the food chain.”

He likens the segment to road build-

ing and the wider industry to car owners. “And when people are buying a new car,” he comments, “they’re not thinking about the road. But you take away that road, or give them one that’s full of potholes, and then they notice. So we’re working behind the scenes in a way, ensuring the smoothest, most efficient turn around in port. That’s a fundamentally important role within the industry.”

As the interview draws to an end, WSS’ Ships Agency Director Americas reveals that he is as almost as global as his employer.

“I was born in France, to an Italian mother and Spanish father, moved to the U.S. to study, liked it and stayed. After graduating I’ve lived and worked in the Caribbean, Scandinavia, the Middle East, Southern Europe and now I’m back in the U.S.” He laughs: “That international perspective gives me a foundation to understand and adapt to different business cultures and the opportunities and challenges they represent. WSS is the same. Its global understanding and local knowledge helps it provide the best services to all its customers.

“And, when it comes down to it, that’s what is most important in this industry, and any other, the people.”



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Modern Piracy

& International Shipping ... the Challenge Continues



BY TOM BOWMAN

Travelling by ship, whether for trade, exploration or war, has been one of the most important parts of human history. As the global economy progressed and developed, the importance of shipping skyrocketed. While the advent of the car and plane heralded new eras of transportation, shipping has always been of vital importance to humanity. Vessels have changed dramatically over the years, but continue to be responsible for the bulk of international trade. However, piracy continues to be a major problem, and as developed in line with International Shipping. Attacks cost the international economy an unparalleled amount of money, which explains why crews and companies go to such lengths to protect themselves.

Modern Piracy and its Impact

Piracy is synonymous with two images; swashbuckling, romanticized pirates

of the past, and modern Somali pirates replete with assault rifles and RPGs. Both have been incredibly problematic for international shipping, and their ubiquity is not unfounded; Somali based Piracy cost the international community over \$6bn in 2012 alone. Somalia is not the only source of Piracy either, and it is easy to see just how much these attacks impact on world shipping. However, the past few years has seen a decrease in Pirate attacks, and particularly in and around Somalia. There are many reasons for this, though one important cause is the increased reliance on Maritime Security. International Shipping makes up 80% of all world trade, and so it is no surprise that both pirates and Maritime Security Personnel are so common. Nevertheless, there are a variety of solutions available to vessels and shipping crews, each with their own advantages and disadvantages. While overall attacks may

have decreased, piracy is still rife, and has shifted to areas of increasing trade and shipping. For example, there has been a dramatic rise in Piracy in South East Asia. Similarly, the scope of attacks has widened, meaning pirates are increasingly attacking any and all ships. Surprisingly, even warships can be targeted, with pirates attacking two separate warships in 2010.

As part of this increase in scope, attacks are becoming more and more deadly, with Pirates increasingly using high-powered weapons. The ultimate aim of any attack is to board the target, which happens in 75% of all attacks. The methods used to stop this include 'passive' methods that aim to make boarding physically impossible and more aggressive solutions that directly combat Pirates. These range from Private Maritime Security, to advanced Acoustic Weaponry.

Combating Pirates

The most aggressive methods are often seen as the most effective, as they are said to provide a more permanent solution to piracy. This is not necessarily true however, as attacks from pirates continue to increase despite a more concerted global effort to combat it. Nevertheless, having arms and armor available to crews is a popular method of providing security. The weapons used are not necessarily lethal, however, and non-lethal explosives for example have proven to be effective in keeping pirates away from ships. One of the more 'fantastical' examples of non-lethal weaponry is the Long-Range Acoustic Device (LRAD), which uses focused sounds well above the human threshold to incapacitate potential attackers without any permanent damage.

One of the most common methods of fighting piracy involves the employment

There are multiple methods to successfully thwart piracy, ranging from armed guards to less aggressive means, such as water hoses.



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of Armed Security. Studies have shown that the presence of Private Security dramatically reduces the chances of a successful Pirate attack, and simply by having Security Personnel present potential attackers can be deterred and crews can feel more confident in traveling through certain areas. Security forces can also make use of non-lethal weaponry, making them a more palatable solution for many crafts.

This is important because piracy has increasingly shifted its sights to civilian crafts, and having discreet protection will be important to these vessels. This can be achieved by non-lethal weaponry and covert Kevlar vests, helping to keep the security forces secure.

Preventing Attacks

On the other hand, there are methods that seem far less aggressive. These methods are often referred to as 'passive' solutions, in that they offer static deterrents to Piracy, and in particular boarding. Water hoses, for example, are employed by many ships as a cheap yet effective method of preventing the boarding of a ship. Even at low pressures water hoses can be enough to deter and disorient Pirates, and when used in tandem with other methods can successfully keep ships safe from attack. Using foam, for example, can create slippery surfaces that will make boarding impossible even if Pirates can get past other methods being used.

Other so called 'passive' methods are even less 'active' than the ones mentioned above, but are no less effective. One common example of this is barbed wire, which has been used on some ships simply to provide a psychological deterrence to pirates. Furthermore, it can make it far more difficult for Pirates to board a ship. One method which is completely passive, however, is for ships to simply change course and avoid the major areas of piracy. This does not necessarily guarantee the avoidance of an attack, however, but certainly reduce the likelihood. Research has shown though that piracy shifts to reflect major shipping routes, and evasion adopted en masse may only serve to delay pirates

for a short while. Nevertheless, for some smaller ships evasion may be a viable method of avoiding attack.

The Author

Tom Bowman is SafeGuard's leading ballistics expert and has written a number of articles specializing in Maritime Security and Piracy. He helps guide research and development into body armor through his work on the Shipping Industry.

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Cyber World Safer Seas via Phantom Ships

BY EMIL MUCCIN

Are we that far away from phantom fully autonomous vessels plying the world's seas? Not according to many in the know. Many predict by 2020 that we will see this type of ship with a limited crew in smaller applications such as the marine highway short haul scenarios, local ferry service such as the Staten Island ferry and offshore supply boats in the Gulf of Mexico.

Phantom/drone unmanned ships reportedly would be safer, cheaper and less polluting for an industry that carries approximately 90% of the world trade. However as with aircraft drones and on the horizon driverless auto's, we must be concerned with regulatory and safety issues. Of utmost importance is the safety factor as in most industries it fundamentally comes down to human or "pilot error." So if we can remove the mariner

From a recent conference I attended in Brest, France it was indicated that cyber threats can come from three sources: internal, external, and sabotage/espionage. It was noted that external threats get the most publicity and news but that internal threats had the potential for being the most-costly and severe. Each of these threat categories brings with it specific factors that must be addressed by the maritime community as we move forward in our quest to unmanned vessels. This paradox has taken on a new meaning as we take leaps and bounds to compete with other industries that are successfully using autonomous technology. These include aviation with drones and now automotive with Apple, Google and Tesla in the lead to be the first with a fully automated hands off the wheel automobile. It truly is becoming a science fiction movie in a "Future World".

Control Systems (ICS's) aboard vessels. This will be the primary intrusion mechanism for cyber-attacks via unauthorized access to the vessels control systems and networks utilizing communication channels. Predominantly this will be accomplished via remote Radio Frequency (RF) interception unless the attack occurs on the vessel, most likely through a USB port or a serial port.

Intangible is a key word to look at in the wireless world as every wireless device is simplistically a radio that is constantly sending and receiving data and signals. This makes them and all shipboard systems that require these transmissions extremely vulnerable. A prime example of this vulnerability was the recent University of Texas GPS spoofing of a luxury yacht in the Gulf of Mexico. Researchers, relatively easily with minimal cost, were able to divert this yacht

do plenty of damage.

Another area of significant importance is the use and control aboard vessels of Programmable Logic Controllers (PLC's). Most non-technical personnel are not aware that a PLC is a type of computer that controls most devices and equipment in today's world. Not only does it control the equipment, it also troubleshoots it and acts as the brain of the device. This maybe the Pandora's box or Achilles' heel of the PLC as it is the back door for someone to get in and control your equipment. Engineers use remote PC's to access the PLC to perform maintenance and troubleshoot the equipment.

Research and a recent survey have shown that a typical ship can have anywhere up to 36 PLC's onboard. It provides the opportunity for intrusion by the cyber hackers and relatively new

As technology continues to march forward faster regarding **Autonomy** and **Big Data** usage in the maritime realm, the matters of autonomy and **Cyber Security** become inexorably linked. Cyber threats essentially come from three sources: internal, external, and sabotage/espionage; while external threats get the most publicity, **internal threats have the potential for being the most severe.**

from the equation we have in theory made the shipping industry safer. This factor along with the reduction in cost of crewing and finding competent mariners may make this option much more viable to shipping companies on the fence.

These sudden advances in technology will also bring with them the potential for intrusions via the cyber world so we must stay ever vigilant and "install plan by design measures" to thwart these potential infiltrations. When we contemplate cybercrime and security many individuals think in a narrow focus of the hacking recently of the OPM database and the theft of personnel data as well as the Target chain credit card breach.

How do we in the maritime and shipping industry stay ahead of the curve and plan for success when we fully do not have a solid grasp of the magnitude of cyber threats and crime banging on our portholes?

Although the technology is there many have not fully embraced it from both an evolutionary and defensive posture and much needs to be done before it can be fully implemented or combatted. If we do not move quickly the potential for a catastrophic event with major consequences increases proportionately.

Of utmost importance as we move forward in the autonomous world is the development of safeguards to Industrial

off its intended track with no alarms being sounded. It was truly a remarkable feat with little fanfare. Imagine if a hacker had done this to a commercial vessel coming into New York Harbor? Or what about a hacker getting into the ECDIS chart database and moving one buoy that could put a vessel at jeopardy of going aground or worse.

In our current cyber world these electromagnetic anomalies allow every onboard device that can receive these signals whether the GPS, AIS, ECDIS or a PLC to be a potential source and gateway for cyber criminals to connect to the ships systems. Once inside the device or network, the hackers have the ability to

hacktivists (foreign group of politically active hackers with anti-US motives) at multiple entry points.

What can a ship do to prevent this level of infiltration with the potential of losing control of all or some ship functions to an outside source? Sources such as the U.S. Navy are in the process of developing a Resilient Hull, Mechanical and Electrical Security system (RHIMES) that will perform as a cyber protection system using plan by design measures to make its onboard mechanical and electrical control systems resilient and with the ultimate goal resistant to cyber-attacks.

Mechanical and electrical control systems have been previously attacked with

the most famous being the Stuxnet virus and computer worm. This cyber breach and sabotage attack occurred in 2010 via what is believed was an internally infected USB flash drive that attacked controllers at an Iranian power plant and took control of the nuclear centrifuges, eventually taking control of the PLC's and causing the centrifuges to run at exceptionally high speeds to the point that they destroyed themselves.

It now is up to the maritime community to collaborate with the Navy and the major PLC manufacturers including Siemens, Rockwell, Mitsubishi and GE to safeguard their vessels now and as we move forward with the next generation of autonomous vessels.

How can we in the maritime industry bring these safeguards and technology together to make our business stronger and less vulnerable. Although many may say we are over-regulated it just might be beneficial for the International Maritime Organization (IMO) or some other international body to step in and develop some rules and regulations for both maritime cyber security and autonomous vessels. For as we know they both impact each other greatly and now at the infancy of the later might be the most prudent time.

International conventions that set minimum crewing requirements do not at this time recognize unmanned/autonomous vessels as legal entities. Their fore it falls on the country of registry to regulate these vessels within its own waters and enforce international rules. IMO to

this point hasn't received any requests or proposals concerning unmanned or autonomous vessels. This scenario could lead to a quagmire as without IMO rules pertaining to remote-control or drone

type vessels would marine insurers find them seaworthy?

As we move forward we may find it prudent to bring subject matter experts together at an international forum to es-

tablish protocol, policy and procedures for designing (plan by design measures), developing and implementing our next "Future World" drone ship with a full cyber security suite.

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* The views expressed in this article are the author's own and not those of the U.S. Merchant Marine Academy, the Maritime Administration, the Department of Transportation or the United States government.

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Cyber Security In Shipping & Offshore Ops

BY HENRIK SEGERCRANTZ

Global shipping and offshore oil and gas operations are increasingly dependent on integrated networks, based on various software and data transfer solutions. Systems and equipment onboard are interconnected, monitored and controlled through an onboard automation network. Onboard systems are increasingly also connected ashore to the owners' or technology providers' control centers. Equipment manufacturers want to remotely upgrade the software of their systems and monitor their use to be able to optimize operations and to scheduled

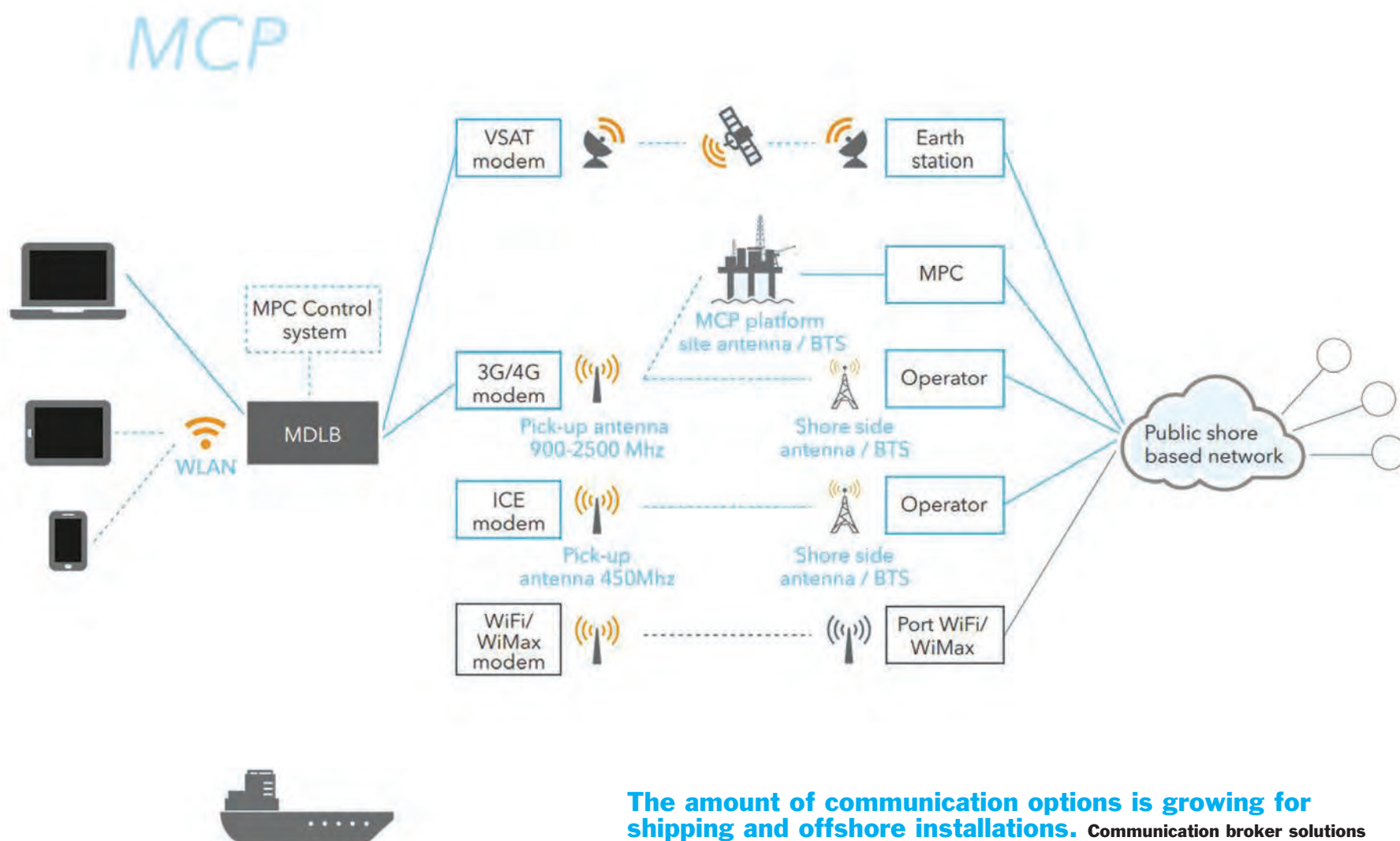
needed maintenance service. Shipowners and oil companies develop their integrated energy management systems. The risks for data security violations are increasing, requiring focused countermeasures including actions by all parties. Potential cyber security threats for shipping and offshore oil and gas installations follow to a large extent those of onshore industries and companies, including also the element of satellite communications.

Major Developments in SatCom

With the increasing sea-shore traffic the future availability of satellite com-

munication capacity was discussed at a conference on future unmanned vessel operations arranged by NorShipping, in Oslo, Norway, June 2015. In that context, security was also touched on by Ronald Spithout, President, Inmarsat Maritime. Inmarsat plc is a leading provider of global maritime satellite communications, and Spithout said that a cluster of satellite cells for communications is currently being built around the world, providing security and redundancy, based on beams and cells, "where each beam will have up to 89 little cells which are all in relation to each other so you get a

truly global coverage and also, at each given time the satellite disk is looking at the next cell as well. The connection gets more secure, it gets more back-up, and the security itself is of highest priority when it comes to designing the new network." The new network was scheduled for launch towards the end of 2015, after Inmarsat having achieved global coverage by adding a third satellite providing a completely new way of dealing with traffic signals increasing security. "In the future there will be more than one satellite connection link with the vessel providing reliability and redundancy."



The amount of communication options is growing for shipping and offshore installations. Communication broker solutions from Maritime Communication Partner (MCP) is shown at left and Inmarsat Plc at right.

Sources: DNV GL, MCP, Inmarsat Plc



(Photo: Nina Rangøy)

“In theory, all programmable components may be exposed to cyber threats, be it machinery, navigation or communication systems.”

**Tor E. Svensen,
CEO, Maritime, DNV GL**

TOP 10 Pressing Cyber Security Needs

A study made by DNV GL (*) revealed the top ten most pressing cyber security vulnerabilities for companies operating on the Norwegian Continental Shelf. These were:

1. Lack of cyber security awareness and training among employees
2. Remote work during operations and maintenance
3. Using standard IT products with known vulnerabilities in the production environment
4. A limited cyber security culture among vendors, suppliers and contractors
5. Insufficient separation of data networks
6. The use of mobile devices and storage units including smartphones
7. Data networks between on- and offshore facilities
8. Insufficient physical security of data rooms, cabinets, etc.
9. Vulnerable software
10. Outdated and ageing control systems in facilities.

* Published by DNV GL on November 30 for Norway's Lysne Committee

He described how, together with Cisco Systems Inc., a software layer is being developed around the Inmarsat satellite network.

“It is an enormous project which will see the light in 2016. The ownership of the terminal will be separated from the ownership of the traffic, where the ownership of traffic can be defined based on the type of application or the type of sensors or the destination of the traffic and then the application providers will deal with the traffic and the costs of it so that they can provide flat fees of their applications towards the vessel.”

He said there might be hundreds (of applications) which will see the light in a year or two. Inmarsat reported in November that the I-5 F3 (the third satellite mentioned above) had been successfully launched, in August, ‘putting Global Xpress (GX) on track for the introduction of global commercial service by the end of the year.’ Inmarsat will also launch Fleet Xpress, its maritime service based on Global Xpress which will be the world’s first hybrid Ka/L-band mobile satellite system.

‘Class’ Intensifies its Work

The maritime and offshore Oil and Gas industry has seen cyber events such as manipulation of AIS, ECDIS and GPS data and as hacks on port IT systems and breaches in the bunkering community, such as the cyber attack that was reported to cost World Fuel Services an estimated \$18 million.

According to DNV GL just in year 2014 more than 50 cyber security incidents were detected in the Norwegian energy and oil and gas sector. The maritime industry with related authorities, such as the USCG in the United

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A cluster of satellite cells for communications is currently being built around the world, providing security and redundancy, based on beams and cells, **“where each beam will have up to 89 little cells which are all in relation to each other so you get a truly global coverage and also, at each given time the satellite disk is looking at the next cell as well. The connection gets more secure, it gets more back-up, and the security itself is of highest priority.”**

Ronald Spithout
President, Inmarsat Maritime



(Photo: Inmarsat)

States and ENISA in Europe, as well as classification societies have their full focus on cyber security matters.

Classification societies such as ABS Group and DNV GL provide advice, consultation, services and updated regulations aiming at minimizing the threat of malicious attacks.

ABS provides a range of cyber security services including the identification of a company’s Security Baseline and level of potential risk to an attack, examining and assessing the physical and logical security of the industrial control

systems against well-known standards and best practices. Using a combination of software failure mode knowledge and offshore industrial control system experience solutions required to reduce the risk of downtime or safety incident are assessed, for complex, high consequence vessels such as semi-submersibles, drillships and FPSOs. Reference standards mentioned by ABS include ISO-IEC 62443, NIST 800-53&82, WIB, and other Industrial Control System specific cybersecurity standards.

At DNV GL, Tor E. Svensen, CEO of

the Maritime sector, said that high-speed ship to shore data communication will offer the opportunity for malicious attacks, and attempts to actually control or damage ships or property. The area of cyber security will see a lot more attention in the years to come, addressed in the rules and procedures. Earlier in the year he summarized that “in theory, all programmable components may be exposed to cyber threats, be it machinery, navigation or communication systems.”

He recommends self-assessments and also third party audits, such as those

offered by DNV GL’s own Marine Cybernetics unit. Through combining so called Hardware In-the-Loop (HIL) testing with cybersecurity testing, typical threats such as network storms and penetrations, password attacks, disconnections and communication failures can be addressed. The Integrated Software Dependent Systems (ISDS) standard, originally developed for the offshore industry look aim at ensuring reliable and safe operation of the vessel’s integrated and stand-alone control-systems. “If you have already taken care of software in-



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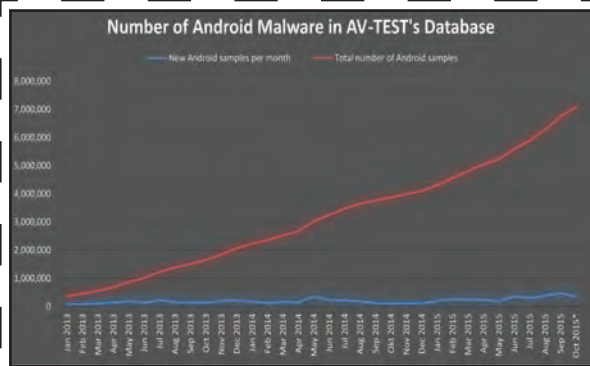


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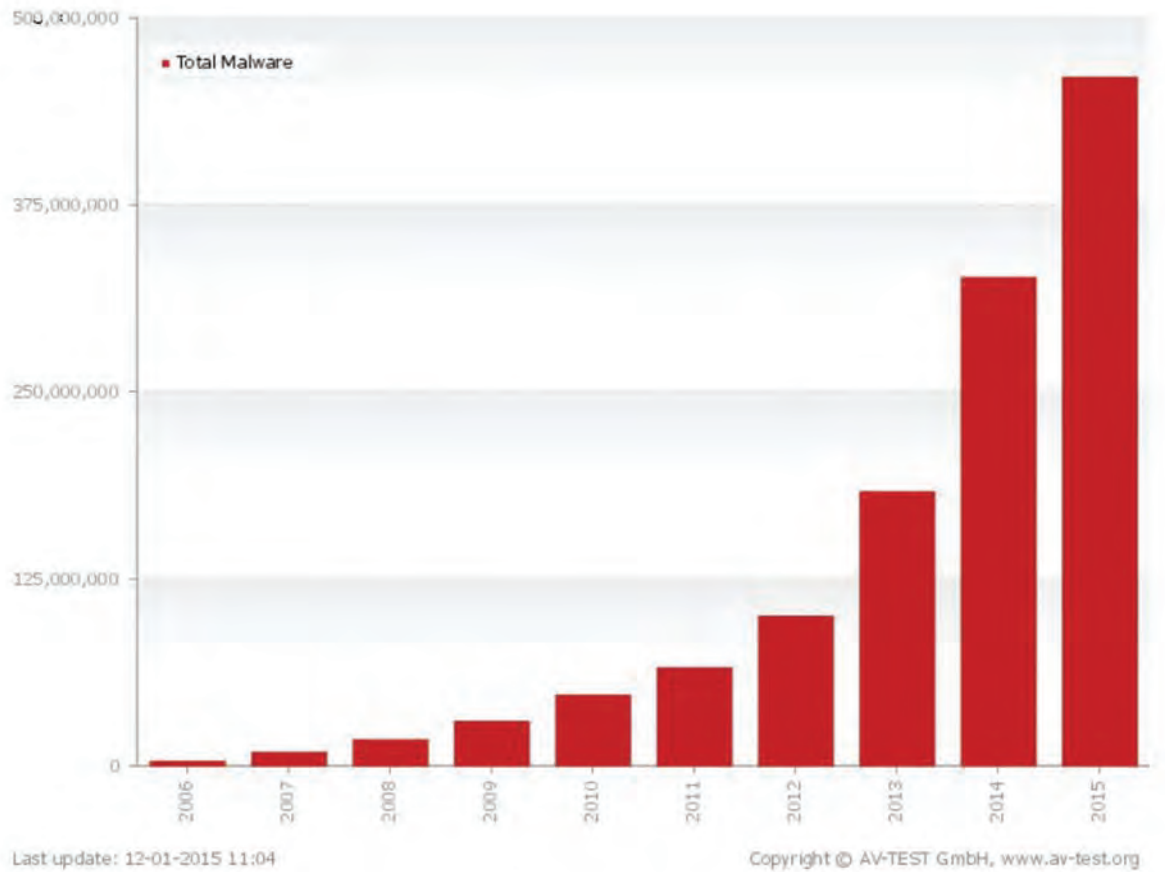
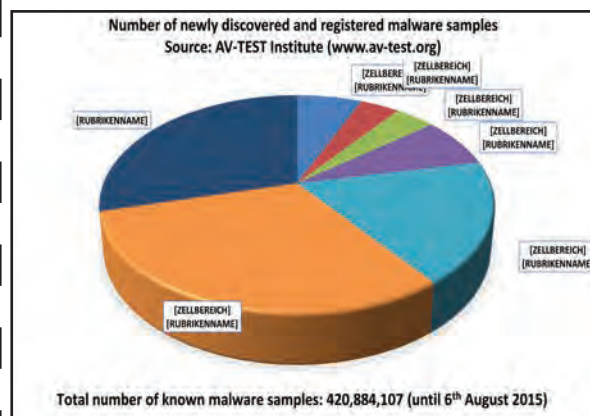
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tegrity, installed data protection and assessed the risks e.g. with HIL testing or ISDS, you are in a good position to take the next step in improving cybersecurity,” Svensen said.

Classification companies have much to contribute when defining cyber security requirements and in establishing rules, class notations, recommended practices and guidelines, and also in supporting companies with industry protocols such as ICCP, UCA and DNP. Also the U.S. Coast Guard works with DNV GL on building a regulatory framework and providing comments to the USCG “Guidance on Maritime Cybersecurity Standards.”

USCG Guidance on Cybersecurity

After a year-long development process the U.S. Coast Guard launched its cybersecurity guidance initiative on January 15 this year, through hosting an interagency public meeting on the subject ‘Guidance on Maritime Cybersecurity Standards.’ It has its original background in the Maritime Transportation Security Act law enacted after September 11, 2001, and in more recent set governmental requirements which also base on the Cybersecurity Framework of the National Institute of Standards and Technology. Through the initiative the Coast Guard looks for the industry and public to participate to help develop policy and the most effective cybersecurity regulations for the maritime industry. In this process, the Coast Guard asked for feedback or questions on various cybersecurity issues through a dedicated website, to be considered when developing their relevant guidance, which may include standards, guidelines, and best practices to protect maritime critical infrastructure. In the process USCG stressed the importance of full transparency and cooperation with its interagency partners and the maritime community.

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Fishing Fleets of Non-EU Europe: Europe's Profitable "Outsiders"

BY WILLIAM STOICHEVSKI

With three species of migrating cod to fish and new commercial species arriving as oceans warm, Norway is a fisheries Valhalla. Yet, recent boat sales suggest the Scandinavian country's role is changing. Vessel orders and rules in Norway are propping up yards and designers on Europe's fringes. Medium-sized hull orders for Romanian, Russian and Turkish boat builders are new, while large vessel orders for Denmark or Spain continue apace.

Unconventional Icelandic designs, too, are gaining ground here as catches and profits soar.

Stirring the stream of new-builds are rules, anticipated rules and cross-border catch agreements. In Norway, authorities have dropped limits on a coastal vessel's length in favor of regulating the size and type of its hold (tank design rules and DNV Class 1A1). The result has been owner interest in new ship designs and modifications amidships. Crucially, for now, rules allowing larger vessels to ac-

cumulate fisheries quotas look set to become true in 2016 for smaller vessels of 11 meters to 15 m length. The optional new regime creates a "free (coastal) fisherman" class who need not buy quotas. Those that do can also buy two "extra quotas" beyond the ones they're allotted. These strictures and new catch agreements with the EU mean quotas are going unused in Norway, where catches have grown just as vessel numbers have fallen (from 6,500 in 2009 to 6,000 in 2014).

Change-Aware

"There's certainly no crisis," Norwegian Fisheries Directorate spokesman, Olav Lekve, says. Directorate numbers show margins are up 13%. "(Norwegian fishermen) sell to the whole world and there are many products that vary a lot in price."

Wild salmon sell at "pretty high prices" in Europe. Lekve also points to the "very detailed regulation" that boat owners submit to. He says they've learned to take advantage of every change thrown

Modern Flagship The Havyard-built Smaragd, autumn 2015. (Photo: courtesy Havyard)





Modern Upgrade
The Seacon Stokke Senior.

(Image: Courtesy Seacon)

at them: “Quotas, fishing areas, equipment, measures to protect young fish ... They’ve been pretty positive about it all. They are used to being regulated.”

One of those changes affects vessels of 60 m and longer and appears to allow them to pursue coastal cod, the Barents Sea’s shoals and the under-pressure North Sea cod shared with EU fleets. In 2016, these large vessels will fill six quotas — three for pelagic (schooling species) and three for “bottom feeders” — and they’ll have “more freedom to choose the gear they use,” said Lekve.

Booming

Norwegian shipyard Kleven seems to be capitalizing on the new rules and limits. With Denmark’s quotas for most species rising after a recent Norway-EU round of negotiations (minus Iceland), Kleven will supply a 90 m SALT 0155 design for Danish Gitte Henning. Tolerances on equipment choice allow for a combined pelagic trawler and purse seiner 17.8 m wide. The newbuild will be the largest pelagic vessel in its segment, Kleven says.

The deal is the fourth fish-related new-build for Kleven’s Myklebust Verft since June and a suitable prize on its 100th birthday. Norwegian suppliers Brunvoll, Scana Volda, Hareid Elektriske, Karmøy Winch and MMC are in on a build due at year-end 2017. Kleven’s order book now stands at 16 vessels worth NOK10 billion.

Pretty Big

With 25 percent of a catch shared with Europe, large vessel order in Norway are sure to continue. The 74 m, Havyard-designed Smaragd for an owner of the same name attracted much attention for its cutting-edge equipment and ability at its baptism this fall. Its cargo hold, at 2100 cu. m., is 300 times the smallest vessels. The purse-seiner and pelagic trawler is built for the open Atlantic’s herring and mackerel and will pump these aboard from nets astern and amidships.

Pon Power delivered the main Caterpillar 4,000 kW engines and two auxiliary C32’s of 994 kW. Rolls-Royce delivered the propulsion and Finnøy Gir & Propeller the gears. Brunvoll supplied the tunnel thrusters and Norwegian Electric Systems the electric thruster motors. Rapp Marine, Adria Winch and Seacon

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(Illustrations: courtesy Season)



(Illustrations: courtesy Season)

Rolls-Royce Secures Trawler Contract

Norway's Kleven won a contract to build a fishing vessel to be designed and equipped by Rolls-Royce. The stern trawler has been ordered by French fishing company Compagnie Des Peches Saint-Malo S.A. & SAS Comptoir Des Peches D'Europe Du Nord – Euronor.

The vessel owner has decided on the Rolls-Royce NVC 374 WP design, which features an onboard factory for the production of fish filets, and has a storage capacity of 1,400 cu. m.. There's also a 550 cu. m. fishmeal storage hold. The ICE 1A classed vessel will be 80 m long,

and equipped with a range of Rolls-Royce equipment, including main engine, auxiliary engines, thruster, automation, hydraulic winches and the Wave Piercing design. The vessel is scheduled to be delivered from the yard in September 2017.



(Image: Rolls-Royce)

Seacon TA Senior Innovation

FAR LEFT: An LNG-fueled concept, the Roadsnæs.

The Seacon SC 34 Breivik Junior and the Seacon T.A. Senior.

Biggest in class: Kleven's Gitte Henning newbuild.



(Illustration: Handout)

ics delivered the capstan and winches. For the crew of 16, Maritime Monitoring put in the cabin furnishings. With the all-important winter season and fisheries talks in London underway, all four Smaragd captains were out at sea or occupied and could not be reached for comment.

Rise of Seacon

The 90-foot MS Stokke Senior being built for a similarly named owner is a combi-boat for coastal waters and part purse seiner, side hauler and trawler. The build at Yaroslav Shipyard in Russia will include Stadt-built diesel-electric and Heimdal propellers; Triplex cranes and SMV Hydraulic winches. This SC 90 — third of its type — will process pelagic and whitefish, cooled in tanks or kept live in wells.

Recent oversized catches of mackerel, herring and cod have topped what Lekve says has been 10 years of stable earnings. The savings are now being reinvested. Attracting that investment is Nordfjord's Seacon and nearby Stadyard, builder of the Seacon SC 15 (emphasis on "15 m"), the yard's 39th new-build and a combined purse- and side-seiner. A Polish yard will build the hull, with its 8 m beam, for Seacon's 15th sale in Norway. Seacon says the new-build T.A. Senior will "replace" a 2001 version of the same name (now quayside and laden with fish).

Seacon's SC34, at 34 m, is also hitting the mark with metal hulls and fittings pieced together in Russia, Romania and Turkey for customers in northern Norway. Build No. 10, the coastal seiner MS Breivik Junior for Breivik AS, will deliver in the fall of 2016 from VARD's Romanian yard.

Fantastic Plastic

Norway has been good, mostly, for Icelandic builder and designer Seigla, deliverer of over 120 boats, 30 of them to Norway. Seigla's vacuum formed plastic designs are selling. The traditional Norwegian and Icelandic sjark (say shark) has been made by Seigla into a high-speed (if desired) custom-build.


Two Seigur T1100-Liberty auto-liners will be delivered to Norwegian fleet owners in Bodo in 2016. Three sjarker are on order for coastal fishermen. "2015 was a fantastic year. 2014 was very good year," says Dutch expat Sander Nieuwstad. "We are working now on 2017 and five large auto-liners for Norway and Iceland."

Nieuwstad claims skippers have been calling the T1100 and related designs "catch machines" that use up every centimeter of space while providing overhead cover for the work of fishing.

Seigla celebrated 25 years this year by introducing the S XWL 1500 Liberty, "14.99 m and 6.5 m wide" and featuring six single cabins or — "to increase the size of the hold" — four cabins of two bunks. Cargo holds range from 70 m³ to 90 m³. Autoline systems of up to 40,000 hooks are handled by the Liberty's Mustad Autoline system. In response to Class and the authorities, Seigla has adjusted the ballast and, it is understood, the keel.

One skipper reported in the Norwegian press had his first Seigla-made vessel catch fire at harbour. He said he had no qualms about ordering another.

"I called (Seigla) the same day (the vessel was destroyed) and ordered a new one," owner Benn Joeren Jenssen was quoted as saying.





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(Photo: Astican)

Spanish Ship Repair *On a Winning Streak*

BY JOSEPH FONSECA

Strategically located Spain, linking countries in Europe, Africa and the Americas, along with a dynamic coast line dotted with number of highly proactive ports have bolstered its progress helping it to become a global leader in the ‘ship’ repairs and conversion. Spearheading the ship design and construction operations in Europe, the sector is witnessing an unusual boom with an annual volume of about 400m€. One can find 13 shipyards competing in

this ship repair/conversion market. The smaller ones being able to repair vessels of up to 100m in length and the bigger ones – considered to be the biggest shipyards in Europe in terms of docking facilities – have dry docks that service vessels of up to 400m.

There are state-owned repair yards vying with number of private players attracting new cruise, passenger, ferry and gas shipping clients, while maintaining their traditional specialization in large fishing, oceanographic, research and

military vessels.

On the one hand, the state owned group NAVANTIA, with three shipyards dedicated to repairs besides shipbuilding activity in their whole group, has been successful in cornering 50% of the above mentioned market, the rest being with the private operators. Among the private players, two shipyards Astican & Astander stand out prominently exclusively focusing on ship repairs and conversion have mushroomed in a short time to become the biggest private company in

Spain, with more than 30% of the total turnover in the market.

Notably NAVANTIA is an EU leader accomplishing complex repairs on LNG carriers of all size as well as cruise vessels. It was NAVANTIA that docked in 2015 the cruise vessel “Allure of the Seas” which is presently deemed to be the largest such vessel in the world.

Astican shipyard on the other hand is strategically located in Port of Las Palmas on the crossroads of the Atlantic Ocean (Canary Islands, Spain) and is the



(Photo: Astican)



(Photo: Astander)

Belle Carnell

Western African leader for Inspection, Repair, and Maintenance of all kind of vessels of up to 36,000 DWT besides upgrading, commissioning, and punch list work on shallow water and deepwater rigs. Whereas, Astander – based on the North Coast of Spain (Port of Santander) - is one of the major players in the ship conversion market within Spain enjoying a high value-added repair capability and prominent track record for Seismic vessels, Fish trawlers & seafood harvesting vessels, and Ro/Ro passenger ferries,

among others.

What keeps private yards, Astican & Astander ahead of others, is its 135-year experience, backed by shareholders from the shipping industry with experience as shipowners have set out the key corporate values that any shipping industry customer wishes to see in a good shipyard and the location in two geographically differentiated Spanish regions targeting two clearly differentiated shipping markets which allow them to handle a very well diversified portfolio

of clients and projects. Their outstanding reputation in executing heavy tasks on complex repair and conversion projects as well as in meeting strict delivery schedules has earned them worldwide reputation.

On a conservative note Germán Carlos Suárez Calvo, CEO of Astican & Astander Shipyards contends, “Although 40 or 50 years ago Spain and other European countries were top of the list in shipbuilding, I would not say that the Spanish Maritime sector leads the world

in ship design and construction as ship construction and design are clearly led by China and Korea. Europe barely gets 10% on an average, of the world orders and amongst the European countries Spain could be one of the top ten countries in terms of construction. Because of Astican shipyard’s strategic location that Spain can easily be said to be the western Africa’s ship repair hub.”

He goes on to explain that the type of shipyards as the ones they run currently had to adapt during the eighties and the



“We are in the process of setting up new business lines that were unthinkable some years ago,” said Germán Carlos Suárez Calvo, CEO of Astican & Astander Shipyards. “We are also signing strategic alliances with major players in the industry and service providers to turn our yards into a one-stop-shop yard. A big part of this plan came to fruition in early November 2015, with the opening of the third – and the largest – Rolls-Royce Service center in the world.”

nineties by evolving themselves into the so called “synthesis shipyards,” where the shipyard itself acts as a leading main contractor which promotes, manages, and coordinates a bunch of small and medium sized highly specialized third party contractors who regularly work for the shipyard as much as many of them happened to even move their workshops and production facilities nearer to the shipyard.

“We are now in the process of setting up new business lines that were unthinkable some years ago,” said Mr. Calvo. “We are also signing strategic alliances with major players in the industry and service providers to turn our yards into a one-stop-shop yard, offering even logistics services and adapting our facilities to accommodate complex equipments to be maintained by OEM’s. The opening ceremony held in one of our premises on 5th of November in 2015 of the third and the largest Rolls Royce Service center in the world right now to do overhauling of big thrusters and other equipment on their marine division gives a clear view of the kind of added value

we are looking for.”

Nils-Reidar Olsvik Valle, Service Center Manager of Rolls-Royce Marine España, which recently set base, points out that Las Palmas’ position in the Atlantic allows Rolls-Royce and Astican to enhance its support to rig and drillship owners undertaking ongoing exploration, production and development operations in Europe, Africa and the Americas. “The center also services future growth in the offshore supply and service market as well as the fisheries sector,” he said. “The alternatives and different options provided by government and local companies have been helpful to ensure that this is an important and correct investment and also for the possibility to future growth. The safety and security of operating in the EU means that there are no surprises when it comes to regulations and policies. The logistics and transportation possibilities for personnel, equipment and spare parts are an important factor in this kind of business. We cannot have delays or unexpected problems during our service.”

Rolls Royce sees Spain to be one of

the major hubs of offshore repair as it is able to service customers operating in South America, Europe and West Africa. When their workshop is fully up and running, it will have 10 full time employees working with Astican and customers to deliver top notch service. Like all their service centers, Rolls Royce is positioned to grow in the location subject to demand.

Spain only accounts for 10% of the total EU market share because it is currently existing in Europe’s more than 90 shipyards dedicated to the ship repair & conversion market where 125,000 workers are directly or indirectly involved and where 28,000 of them are direct employees whose work production accounts for more than 3.500 m€ total turnover compared to 400 m€ in Spain. New challenges continue to plague the repair industry with the low oil prices forcing the Oil & Gas industry to absorb a lot of changes. When the going gets tough, players have to consider various drastic measures to keep afloat.

“Nowadays we are entitled to share cost savings with our clients being more

productive while getting shorter delivery time on the projects where information technology tools provide us better results, says Mr. Calvo. “Moreover, complex vessel conversions normally require state-of-the-art equipment to be handled or manufactured depending if the finally delivered vessel is a highly sophisticated project as the one we carried out this year for the Canadian listed company Clearwater Seafoods’ “Belle Carnell”, the only one of its kind Seafood Harvesting vessel in the world. Only employing well trained people and using proper technologies, make you succeed in meeting your customer needs, on time.”

On top of all this, the industry has to meet up with other obligations such as environment protection and new convention coming in. It is here that R&D has helped to adapt new techniques to meet today’s shipping industry enquiries from clients who look for environment-friendly shipyards as a place to get their projects carried out as well as a contractor capable of delivering emission-reduction solutions in compliance with incoming IMO regulations.

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Enseada Shipbuilding & *Surviving the Petrobras Crisis*

BY CLAUDIO PASCHOA



(Photo: Odebrecht)

Enseada Shipbuilding was established to build deep-water drillships for Petrobras. Seventy percent of the company is owned by a consortium composed of Brazilian companies, Odebrecht (50%), OAS (25%), UTC (25%), with the remaining 30% belonging to Japanese shipbuilding giant, Kawasaki Heavy Industry (KHI). With all the Brazilian shareholders involved in the Car Wash “Lava Jato” operation, investigating corruption and embezzlement schemes with Petrobras, Kawasaki is a key partner, as is it not only responsible for technology transfer and providing professional training for the local workforce and operational consultancy in several areas within the shipbuilding process, as it also offers credibility to the shipyard. Kawasaki is the pillar, which may well guarantee the brand new shipbuilder’s survival.

Brazilian Shipbuilding in Crisis

“In December 2014 there were around 80,000 workers in the Brazilian shipbuilding industry, and six months later at least 15,000 jobs were lost in shipyards throughout the country. By August, we at Enseada Shipbuilding, were forced to lay-off 7,500 workers and this number may reach 9,000. On top of that we have the city of Maragogipe in Bahia, (where the shipyard is located) which had a very quick and intense growth due to the implementation of the shipyard and now finds itself paralyzed,” said Humberto Rangel, Director of Enseada Shipyard.

Sete Brasil

Sete Brasil was created in 2011 for the construction of part of the 29 drillships which Petrobras was to use on its pre-salt drilling campaign, however this number

has been cut to 19 drilling units due to Petrobras’ decreased investment plans. Sete Brasil is partnered with banks, pension funds and Petrobras itself. It was dependent on \$3.2 billion of funds from the National Development Bank (BNDES), which has decided to withhold the money in the light of Operation Car Wash. Sete Brasil had commissioned Enseada Shipbuilding to build the four FPSOs, at a cost of \$800 million each. But with Enseada struggling due to Sete Brasil’s \$324 million debt following the Brazilian Federal Police’s Operation Car Wash, Kawasaki decided to persuade other investors in Japan to participate in the project. If the new investors go ahead with the plan, Sete Brasil will no longer participate in these four FPSOs, which Petrobras will instead rent directly from Odebrecht Oil and Gas (OOG) and the Japanese partners.

Enseada Shipbuilding Order Book

Enseada Shipyard has a delivery portfolio valued at \$ 6.5 billion, including the conversion of the hulls of four FPSOs for Petrobras, as well as the development of six deepwater drill rigs for Sete Brasil. “Enseada shipyard is investing heavily in state-of-the-art equipment and technology transfer with our Japanese partners from Kawasaki, in order to become internationally competitive. We are working on innovations to the fabrication process through research, to develop new technologies. We believe we can increase our productivity, but the whole production chain, including equipment suppliers, needs to be productive and presently there is little government support for the local maritime equipment production chain,” said Guilherme Guaragna, Vice-President of Enseada Shipyard, during the Marintec

South America conference in Rio de Janeiro.

Shipyards

In the Brazilian Northeast state of Bahia, Enseada is implementing the state-of-the-art Paraguaçu Unit worth around \$930 million, and is expected to be finalized by early 2016. Designed to develop complex naval engineering projects, using the latest technology, the facility has been planned to match the quality, productivity and technology standards of the best shipyards in the world, through technology transfers and supervision by KHI. It aims to maximize efficiency and minimize waste at every stage of operations. This Paraguaçu shipyard project, in turn, has given rise to actions for the development of the supply chain with the Federation of Industries of the State of Bahia and the Ministry of Development, Industry and Foreign Trade. It represents the largest private investment in the state in the past 10 years.

At the São Roque Unit, also in Bahia, located at the other side of the Paraguaçu River, workers are cutting the plate for the topsides for FPSOs and drillships. The São Roque Unit is located at the São Roque do Paraguaçu Construction Site, established in 1976 and covering an area of 400,000 sq. m. The unit has infrastructure to build modules, drillship topsides, production platforms, FPSOs and fixed steel jackets. It has three finishing docks with a 10-m draft, plus workshops for welding, painting, block assembly and mechanical cutting of steel plates, with a capacity to process 2,700 tons of steel, up to 1,300 employees. Eight topside modules for the drillship Ondina are being built at São Roque.

In Rio de Janeiro, Enseada operates the Inhaúma Unit in the Caju District,

leased by Petrobras since 2010. The company has revitalized 97% of the facilities, as well as renovating and purchasing equipment, and has performed preliminary services on the P-74, P-75, P-76, and P-77 hulls. The Inhaúma unit in Rio de Janeiro is working on the conversion of four VLCCs into FPSOs. Intended for the “Cessão Onerosa” (Onerous Concession) areas, in the Santos Basin pre-salt, the FPSOs will produce up to 150 thousand barrels of oil and compress up to 7 million cubic meters of natural gas a day at the giant Búzios pre-salt field. The P-74 hull has been in drydock at the Inhaúma unit in Rio de Janeiro for nearly three years. In order to avoid further delays, most of the conversion work on the other two FPSOs (P-75 and P-77) will be done at the Dalian Cosco shipyard in China. It is quite possible that the P-76 will be the first to be launched as it is already docked at the Inhaúma quayside, and the rest of its integration process will be undertaken at Techint’s Pontal do Paraná shipyard, which has been modernized with carbon and special steel pipe workshops, and upgraded integration quays. 15 of the 20 modules contracted to Techint are being built locally, with other structures and modules being imported from Indonesia, Turkey and Vietnam.

FPSOs & Kawasaki

Kawasaki and a group of Japanese partners are planning to take over the four FPSOs commissioned by Sete Brasil to Enseada. Last June, Shigeru Murayama (President of KHI), Tomotsu Saito (President of the IHI Corporation), and Seiji Shiraki (President of Mitsubishi in Latin America) met with Brazilian President Dilma Rousseff in the country’s capital Brasília, hoping to ensure



(Photo: Enseada Shipyard)



Above Left
Aerial view of **Enseada Shipyard**
in Paraguaçu, Bahia.

Above Right
FPSO P-74 at the Inhaúma drydock
in Rio de Janeiro-photo Enseada Shipyard

the government's support for the venture. Their efforts were successful, and since then, government executives and executives from the partnership have been assessing the project. If the investment is approved, the Japanese group will assume the 85% currently in the hands of Sete Brasil. JBIC (Japan Bank for International Cooperation) is also expected to join the venture.

Drillships

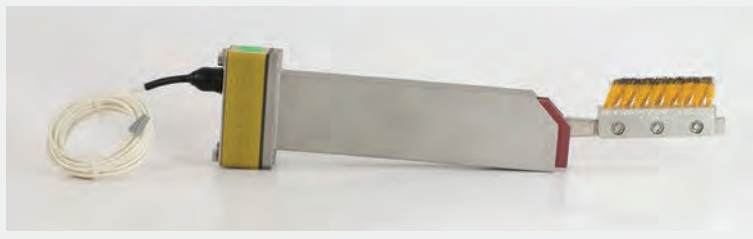
The Paraguaçu Unit is also building six deepwater drillships for Sete Brasil.

The vessels will operate in the exploration of the pre-salt reservoirs, at depths of up to 3,000 m. Four of these ships, the Ondina, Pituba, Boipeba and Interlagos, are being built in partnership with Odebrecht Oil & Gas. The other two, Itapema and Comandatuba, involve another partnership, Etesco/OAS. The total value of the contract is of around \$ 4.8 billion and these will be the first drillships ever built in Brazil. The drillship Ondina is already under construction, and will be delivered to the client in 2016. The last ship, the Comandatuba, is due for delivery in 2020.

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Cruise Ship Leaves Damen Repair Yard



Damen Shiprepair Vlissingen (DSV), part of Damen Shiprepair & Conversion (DSC), last month bid farewell to Marco Polo, an 800-passenger cruise ship owned by Global Maritime and operated by Cruise & Maritime Voyages.

Launched in 1964 as the Aleksandr Pushkin, the ship was in for her 10th special survey and general maintenance and refurbishment, a project which took around five weeks to complete. Marco Polo is an elegant vessel with a design from an earlier era. It had a full schedule of works during its time at DSV, including an exterior repainting, interior repairs and maintenance to bring her back up to her usual high standards. Other actions included work on the propellers and propeller shafts, reconditioning the bearings on the main engines and servicing the air-conditioning units and gensets. The life-rafts and other safety equipment were also removed and serviced, the cranes and winches overhauled and various minor steel works performed. Marco Polo arrived at Damen Shiprepair Vlissingen on November 3 and departed on December 14, 2015. DSC has recently won a series of maintenance and repair contracts for cruise ships, having gained a reputation for short lead times, flexibility, safety, good communication and high quality work. As well as the works on the Marco Polo and Astor, recent projects by DSC include repair and maintenance contracts on the 3,220 passenger MSC Magnifica and the 720 passenger Saga Sapphire, both undertaken at Damen Shiprepair Rotterdam. In the summer the 1,250 passenger Magellan also completed a five-week scheduled maintenance stopover at Damen Shiprepair Amsterdam while the 4,100 passenger Norwegian Epic departed Damen Shiprepair Brest on the 17th of October following a three week scheduled refit and maintenance program.

Ship Tanks Inspected with Drones

Autonomy in the air takes on a role in ship maintenance & repair

DNV GL surveyors tested a camera-equipped drone to visually evaluate structural components through video streamed to a tablet. One surveyor operated the drone, while a second checked the video feed in real time. DNV GL recently completed several tests using drones to support the hull survey of two vessels.

Conducted by the classification team based in Gdansk, Poland, the tests took place at the Remontowa shipyard, where the drones equipped with cameras were employed to visually check the condition of remote structural components. According to DNV GL, this practice has the potential to not only reduce survey times and staging costs, but at the same time improve safety for surveyors.

“Camera equipped drones are now much more widely available and affordable, and by using them for a first screening we can identify areas that require closer inspection quickly and without extensive staging, which can be both costly and time-consuming,” said Cezary Galinski, Manager of the DNV



(Photo: DNV GL)

GL – Maritime classification flying squad based in Gdansk.

The tests used a camera-equipped drone to visually evaluate structural components through video streamed to a tablet. One surveyor operated the drone,

while a second checked the video feed in real time. The stream was also recorded for review and documentation purposes. Equipped with a powerful headlight, the drone was able to produce a video of sufficient quality for initial inspection purposes. In the event any damage is detected, a traditional close-up survey may still be required.

“We used a modified off-the-shelf drone for our tests,” Galinski said. “Because there are currently no drones formally certified as explosion-proof commercially available, we performed a risk assessment. Of course, before the drone operation started, we also ensured that the cargo tank was gas-free and certified for safe entry.”

“Our next step is to work with a more advanced tailor-made drone in early 2016,” Galinski said. “We are also developing a special guideline for performing drone-based surveys. This could open the way to remote or even autonomous inspections being carried out as part of our survey scheme in the near future.”

www.dnvgl.com

Odfjell Propulsion Conversions

Odfjell, ASRY, MAN Diesel & Turbo, Grenna Motorfabrik and ABB Turbocharging AS team on innovative propulsion project, reducing emissions 20%

Odfjell chose Bahrain’s ASRY to upgrade the propulsion systems on three of its chemical tankers, a significant job from the perspective of both owner and yard as it involved the install of a new energy efficient concept to reduce fuel consumption and emissions by 20% per vessel. The conversions, which involved fitting new energy efficiency propeller blades and rudder bulbs, as well as modifications to main engines, turbochargers and shaft generators, have already begun. Work on the first tanker, the 37,000 dwt Kvaerner-class Bow Clipper, one of 11 sisterships, was undertaken in August 2015. The 49,500 dwt Bow Summer, the first of eight Polandclass vessels, underwent conversion in October, followed by a second Kvaerner-class tanker Bow



Cardinal in November 2015. All 19 vessels will undergo similar conversions by 2017. The new propulsion concept is seen as a major step forward for energy-saving and emission reduction initiatives. Sea trials before and after the conversion of Bow Clipper showed an overall efficiency gain of more than 20% which lead the Bergen-headquartered

owner to additionally upgrade its eight Poland-class 49,000 dwt vessels.

The propulsion system upgrade was developed by Odfjell in co-operation with MAN Diesel & Turbo, Grenna Motorfabrik and ABB Turbocharging AS. Work includes the retrofitting of the highly efficient Kappel propeller, fairing cones and rudder bulb, shaft generator gearbox and Odfjell determined propulsion settings. Prior to the upgrade the chemical tankers were rated D+ by RightShips energy rating, part of its Ship Vetting Information Services (SVIS), following conversion this has been upgraded to A+, RightShips highest energy rating, making the tanker on par with the latest eco-design vessels currently being delivered from shipyards.

New Floating Drydock for Detyens

Photo: Detyens Shipyards



Detyens Shipyards took delivery of a newbuild floating drydock on December 11, 2015. The 400 x 108-ft. floating drydock, which will eventually replace Detyens' existing floating drydock, was built by Corn Island Shipyard in Indiana. The drydock was pushed down the Ohio and Mississippi Rivers by Excell Marine's inland tug boat, the Arthur E Snider. McAllister Towing and Transportation's ocean towing tug boat, the Eileen McAllister took over the tow in New Orleans for delivery to Detyens Shipyards' Cooper River facility.

www.detyens.com

\$88.5M in Floating Production Contracts

Keppel Offshore & Marine Ltd (Keppel O&M)'s local and overseas subsidiaries continue to win support from repeat customers by securing four contracts worth a total of about \$88.5 million.

In Singapore, Keppel Shipyard Ltd. won two conversion contracts, the first is for a Liquefied Natural Gas (LNG) Floating Storage Unit (FSU) vessel awarded by Armada Floating Gas Storage Limited, a wholly-owned subsidiary of Bumi Armada Berhad (Bumi Armada); the second is for a Floating Production Storage and Offloading (FPSO) vessel awarded by Yinson Production (West Africa) Pte Ltd (Yinson), a wholly-owned subsidiary of Yinson Holdings Berhad.

Work on the LNG FSU conversion for Bumi Armada is scheduled to be completed in 3Q 2016. As for the FPSO conversion for Yinson, work is expected to commence in 1Q 2016.

As for Keppel O&M's overseas yards, Keppel FELS Brasil SA's (Keppel FELS Brasil) BrasFELS shipyard in Rio de Janeiro, Brazil, secured a FPSO integration contract awarded by MODEC Offshore Production Systems (Singapore) Pte Ltd. (MODEC), while Caspian Shipyard Company LLC (Caspian Shipyard Company) in Baku, Azerbaijan, secured a barge enhancement contract awarded

by BP Exploration (Shah Deniz) Limited (BP), operator of the Shah Deniz gas field development. For MODEC's contract, BrasFELS will be carrying out integration and commissioning works on

the FPSO vessel, Cidade de Caraguatubá MV27. Cidade de Caraguatubá MV27, which is to be deployed in the Lapa field, Santos Basin, Brazil, will depart from Keppel Shipyard and arrive

at BrasFELS in 2Q 2016. For BP's contract, Caspian Shipyard Company will be strengthening the steel structure of the hull of STB-1 Vessel, a purpose-built jacket transportation and launch barge.

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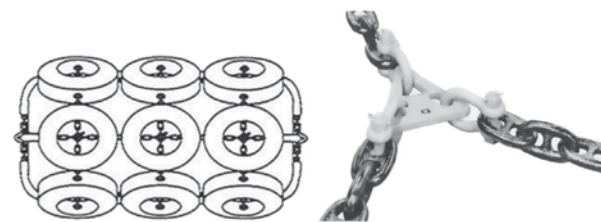
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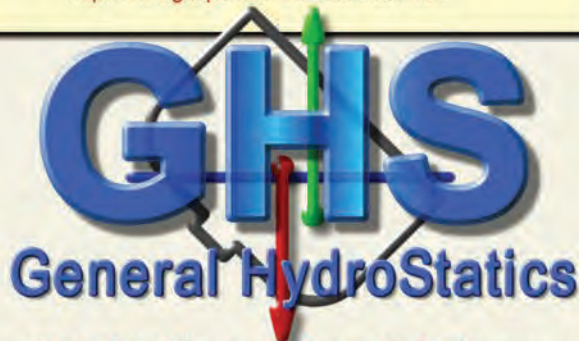
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SUPSALV

[A]

Salvage Masters

Last month we were offered an in-depth discussion on marine salvage with **Captain Gregg W. Baumann, U.S. Navy, Director of Ocean Engineering, Supervisor of Salvage and Diving.** Captain Baumann and his team have a long history regarding difficult missions accomplished, including most recently the location and filming of the lost TOTE containership **El Faro.**

(Courtesy of U.S. Navy)

By Greg Trauthwein

What is the scope of the responsibility of the Supervisor of Salvage & Diving; Director of Ocean Engineering?

▶ The responsibilities of the Supervisor of Salvage & Diving; Director of Ocean Engineering (SUPSALV) include being the Center of Excellence for diving for the Department of Defense (DoD), the system safety certification authority for DoD diving and manned hyperbaric equipment, the technical authority for military diving equipment, the technical authority for underwater ship's husbandry repairs & inspections, and salvage; By authority of the "Salvage Facilities Act" (10 U.S.C. 7361-7364) SUPSALV provides salvage facilities for public and private vessels and provides Admiralty legal support to settle claims for salvage services rendered by the Navy. Within the context of this authority, SUPSALV provides for the equipping and maintenance of a national salvage capability for use in peacetime, war, or national emergency.

I would like to put your office into scope. Please give an overview of the personnel and physical assets under your guidance.

▶ SUPSALV has more than 565 military, civil servants, and full time contracted employees supporting our Washington, District of Columbia headquarters office, our Naval Experimental Dive Unit research laboratory in Panama City, Florida, our deep ocean search and recovery equipment program, our Emergency Ship Salvage Material (ESSM) warehouse system, diving

engineering services, and our world-wide, underwater hull cleaning services for fleet vessels. Our facilities include a headquarters office, eight ESSM warehouses and support centers around the world, a Deep Ocean Search and Recovery warehouse and engineering facility in Maryland, and diving services support offices in Virginia, California, Hawaii, Japan, and Bahrain. Our inventory of search equipment, diving support material, oil spill recovery equipment, and spares total more than 30,000 items, more than 500,000 sq. ft. of facilities, and a world class diving and equipment research facility. SUPSALV maintains national mission assets of search and recovery systems with capabilities ranging from shallow water to 20,000 ft. that include the Towed Pinger Locators, towed Side Scan Sonars, and Remotely Operated Vehicles. Additionally, we maintain three worldwide commercial salvage services contracts for which we can immediately surge in personnel and equipment. Our annual average operating budget is approximately \$110-120M, but increases significantly when we conduct large reimbursable salvage and oil spill operations. The value of our non-facility related inventory is in excess of \$110M.

We understand that you assumed this post in October 2014. A little more than a year into the position, what do you find most rewarding? The most challenging?

▶ What is most rewarding and most challenging is one in the same. Specifically, SUPSALV is the backbone for providing the U.S. Navy fleet with div-

ing support and salvage capabilities as a national level first responder. Providing all of these services on a daily basis so that the Navy fleet can maintain its strong military presence at sea and keeping our sailors, airmen, soldiers, marines, and guardsmen safe is what drives me each and every day. However, meeting all of these challenges with limited budgets and resources, requires making difficult decisions to keep the warfighter prepared and safe while still operating in a difficult fiscal environment. Helping our forces accomplish their missions safely and effectively is the reward for our team's hard work and diligent efforts.

For this interview, we are interested to focus on salvage and diving safety. Given that scope, could you share a 'case study' or two which best exemplifies the capability of your office?

▶ First, I'd cite two recent marine incidents. The first is the **M/V El Faro** which went missing on or about Oct. 1 in the Bahamas. The National Transportation Safety Board (NTSB) in the conduct of their safety investigation deemed they needed SUPSALV's experience and resources. With our long standing working relationship, we quickly partnered and developed plans to search for, locate, conduct a Side Scan Sonar survey of the accident area, video document the ship, and retrieve the ship's Voyage Data Recorder (VDR). Utilizing our 20,000 ft. Side Scan Sonar "ORION", our 20,000 ft. Remotely Operated Vehicle "CURV", and the Military Sealift Command's ocean going tug USNS Apache (T-ATF 172) we mobilized and satisfied three of the four



(Courtesy of U.S. Navy)

[B]

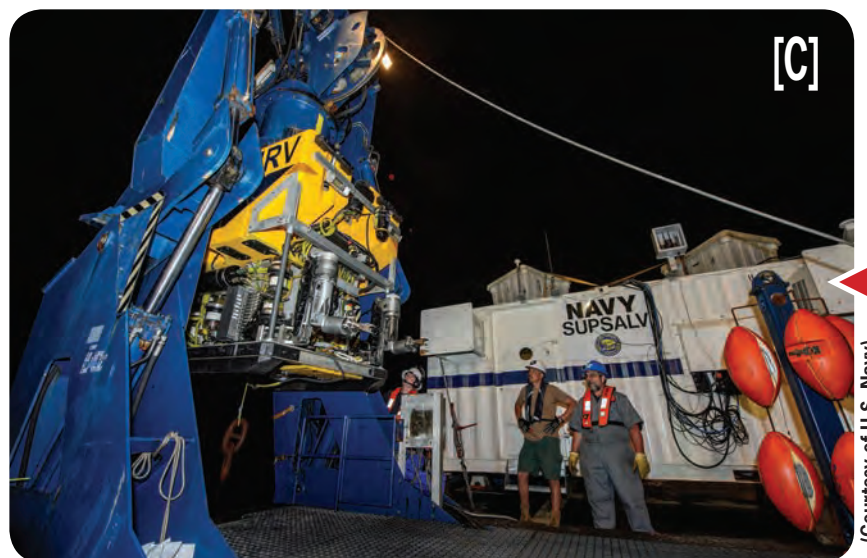
Photo: (Start above left, proceed clockwise): [A] The removal of **USS Guardian (MCM 5)** in 2013 which ran hard aground on Tubbataha Reef in the Sulu Sea in the Philippines; [B] **Apache** departing Norfolk in the hunt for **El Faro**; [C] The **CURV ROV** is prepared for the search; [D] **Side scan sonar** helped to find the **El Faro**; [E] **Stern of the El Faro**; & [F] Close up view of **El Faro navigation bridge**.



(Photo:NTSB)

[F]

2/11/2015 12:18:22
CV El Faro
Dive 08 Debris field survey
CURV 21
USN SUPSALV



(Courtesy of U.S. Navy)

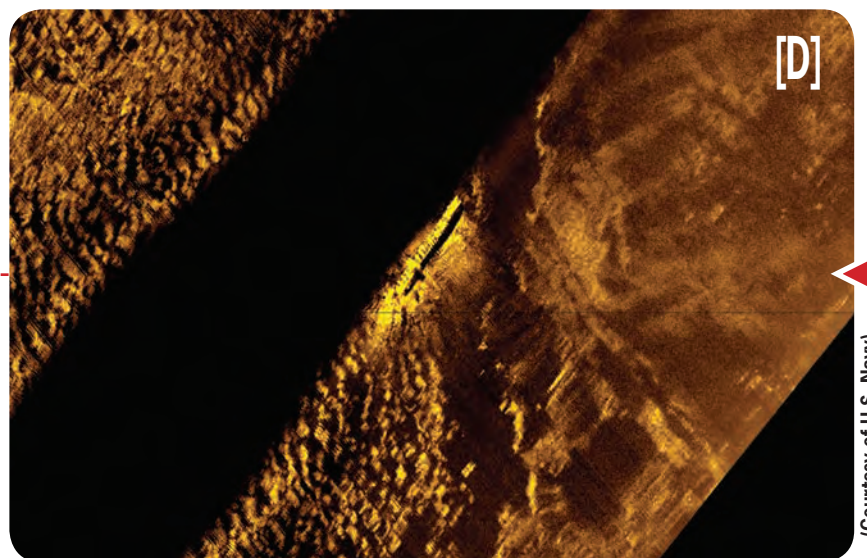
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(Photo:NTSB)

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(Courtesy of U.S. Navy)

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Captain Gregg W. Baumann discusses with CBS '60 Minutes' anchor Scott Pelley

the technology to be deployed in the search for El Faro. The feature El Faro spot aired on CBS on Sunday, January 3, 2016.

If you missed it, view the 60 Minutes video here: <http://www.cbsnews.com/live/video/60-minutes-goes-on-the-hunt-for-el-faro/>

While the search for El Faro was largely a success, the important **voyage data recorder** (pictured right on top of the El Faro navigation bridge prior to the sinking) has not been found.



objectives within just a few weeks. Unfortunately, we have yet to be able to locate the VDR. The accident is still under investigation with the NTSB and United States Coast Guard.

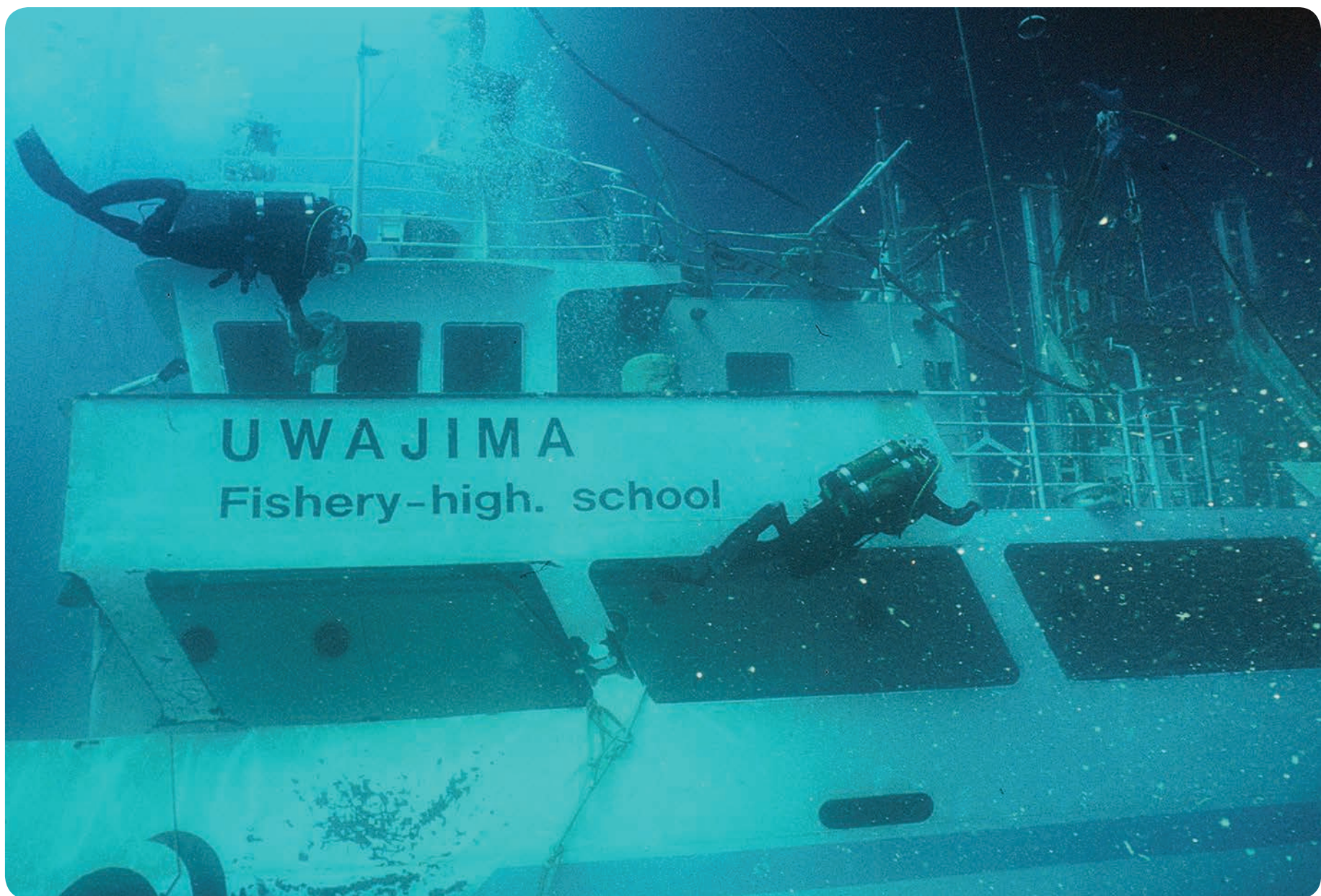
A second salvage example would be the successful removal of **USS Guardian (MCM 5)** in 2013. The ship unfortunately ran hard aground on Tubbataha Reef in the Sulu Sea in the Philippines. Due to the sensitive reef environment, the inability to access the vessel with large removal equipment, monsoon weather and seas, SUPSALV brought together a team of navy divers, a navy salvage ship, salvage engineers, and commercial salvors to safely remove the ship from the reef by cutting it up. Balancing environmental concerns, effective salvage plans, and political sensitivities, SUPSALV safely sectioned the ship into four 250-400 ton lifts, and

removed the ship without causing any further damage to the reef or allowing the release of pollution or hazardous substances into the environment.

Your job by its inherent nature is a dangerous one. Put the emphasis on safety in perspective.

▶ On diving safety, personnel safety is always the primary consideration. This involves ensuring safety is paramount in both the design of Divers Life Support Systems (DLSS) as well as diving operations themselves. We ensure safety is designed into, tested for and eventually certified in all of our DLSS. Tragically though, we lost four sailors in diving accidents in 2013. As a result, we conducted a strategic assessment of the safety of diving operations throughout

the Navy. SUPSALV co-chaired a Diving Operational Assessment Integrated Project Team that conducted a holistic review of Navy Diving Program compliance with requirements with particular focus on supervisor accountability. Integral to this effort was an assessment of the culture within the diving community, as it affects our ability to adequately assess operational readiness, effectively plan missions, accurately apply operational risk management, safely execute dives, and apply lessons learned. The findings of the review found: Navy diving continues to meet Combatant Commander requirements and supervisory accountability, and that navy diving is effective. However, there were specific areas that were deemed to need improvement: improve supervisor decision making, development, qualification, and proficiency; build effectiveness in command



(Courtesy of U.S. Navy)

The operation (of salvaging the Japanese high school training fishing vessel, F/V Ehime Maruwas, which was accidentally struck and sunk by a U.S. Navy submarine during a routine training exercise) was “ by far the most difficult in my career due to the depth of recovering the ship and use of ROV’s to do so, the political sensitivities involved between the two governments, the cultural sensitivities involved, the Sept. 11, 2001 terrorist attacks taking place while recovering the ship, and most importantly the human compassion involved in trying to help the nine families. In the end we were only successful in locating and recovering eight of those lost. In the 29 years I’ve served in the Navy, the memory that has etched itself the deepest in me was notifying the family of the 9th victim that we were unable to locate their teenage son.”

level diving assessments; become a self-learning organization; establish better diving mishap reporting and trend analysis; and update the Navy’s diving program instruction.

Marine Salvage is intriguing, literally an engineered solution each time out. In your career, what one technology do you count as having the greatest impact on allowing salvage to be conducted more efficiently and safely?

▶ Unequivocally, it’s the improvements in the area of information technology that have had the greatest impact in our response capability. In most cases the physical rigors of salvage are basic, rudimentary, and don’t have huge strides to make with the increase in technology. However, the software tools now imme-

diately available to the salvor are game changers. The software packages available today have the capability to rapidly perform very detailed and complex analyses of vessel loading, stability, and structural characteristics for intact, damaged, and grounded vessels and evaluate these properties over the full range of salvage operations. Within SUPSALV, we use a Navy unique software package, Program of Ship Salvage Engineering or “POSSE” for short. As IT systems continued to grow, SUPSALV teamed with a commercial vendor to jointly fund and develop POSSE. It has given us the ability to fully model every ship in the Navy inventory. As a result, when a salvage incident does arise, within minutes we have our engineers conducting risk assessments, developing salvage plans, and providing understandable engineering solutions to complex, and multi-variable problems.

When we speak to commercial salvors, most cite the increasing size of ships as one of their top challenges today. How is the market changing to present challenges to your office?

▶ As it relates to SUPSALV’s participation in the salvaging of commercial vessels, the increased size of ships is certainly at the top of the list of challenges. However, as it relates to SUPSALV’s overall salvage operations, it’s the increased focus on minimizing damage to the environment and pollution discharges while conducting the salvage.

As a result SUPSALV regularly conducts spill exercises with the fleet, provides on-going hands on and table top training, and maintains one of the largest oil spill equipment repositories around the world in our ESSM system.



(Courtesy of U.S. Navy)

Captain Gregg W. Baumann

Director of Ocean Engineering, Supervisor of Salvage and Diving

Captain Baumann is a native of Vestal, NY. He graduated from Clarkson University in 1986 with a Bachelors of Science in Chemical Engineering. Following graduation, he joined the Navy and was commissioned in 1987 through Officer Candidate School in Newport, RI. Baumann also earned a Master's of Science in Mechanical Engineering from the Naval Post Graduate School and completed the Total Ship's Systems Engineering (TSSE) program at the Naval Postgraduate School in Monterey, CA.

Baumann's first assignment was aboard USS Gridley (CG 21) serving as the Electronic Warfare Officer, Boiler's Officer, and the Ship's Material Maintenance Officer. Following sea tour, Baumann was selected to Engineering Duty Officer and completed training at the Naval Diving and Salvage Training Center, in Panama City, FL.

As an engineering duty officer, Baumann served as: Project Officer to the detachment of the Supervisor of Shipbuilding (SUPSHIP), New Orleans for numerous Navy, Marine Corps, and Foreign Military Sales small craft new construction contracts; Production Officer for MCM repair availabilities and tasked with standing up a new SUPSHIP New Orleans repair detachment; Production Officer and Diving Officer at the Navy's Ship Repair Facility (SRF) in Sasebo, Japan; and Assistant for Salvage in NAVSEA's Office of the Supervisor of Diving & Salvage. During this tour, Baumann was the salvage engineer for many diving and salvage operations including the salvaging of the sunken Japanese fishing trawler off Pearl Harbor, Ehime Maru, the grounded USS LaMoure County (LST 1194) off the coast of Chile, and the oil recovery from the sunken USS Mississinewa (AO 59) in Ulithi Atoll, Federated States of Micronesia.

Captain Baumann continued his career with tours as the Engineering Duty Officer Detailer and Community Manager, Navy's Bureau of Personnel; DDG 51 Program Manager's Representative, Supervisor of Shipbuilding Bath, ME; Chief of Staff for the Deputy Assistant Secretary of the Navy for Ship programs and the Executive Assistant to the Assistant Secretary of the Navy for Research, Development, and Acquisition (ASN RD&A) at the Pentagon. In 2010, he was assigned as the Program Manager for the International Fleet Support Programs Office (PMS 326) within NAVSEA's Surface Warfare Directorate (SEA 21) where he was responsible for multiple projects in excess of \$5B that provided ships, weapon systems, and life cycle support equipment to more than 40 foreign partners. Captain Baumann assumed command from CAPT Mark Matthews as the Director of Ocean Engineering, Supervisor of Salvage and Diving in October 2014. In this role, he is responsible for all aspects of ocean engineering for the U.S. Navy, including salvage, in-water ship repair, contracting, towing, diving safety, and equipment maintenance and procurement. Baumann has earned a Legion of Merit (w/ gold star), Meritorious Service Medal (w/ four gold stars), Navy and Marine Corps Commendation Medal (w/ two gold stars), and the Navy and Marine Corps Achievement Medal.

We cover Navy and Government vessels in our pages regularly, and to say current government spending is "challenged" is an understatement. From where you sit, what are your funding issues, if any, and how has this had a material impact on your service.

▶ The center focus of the Navy budget every year is shipbuilding and the 30 year shipbuilding plan. Since the Cold War ended, the Navy's inventory of ships has dwindled and replacement with more complex technologies has become more expensive for the same size of vessel. As a result, finding the right balance of ships in the 30 year shipbuilding plan has become increasingly challenging. Our current inventory of four tugs and four salvage ships is aging and will require replacement in the not too distant future. How the Navy will replace this capability to meet the fleet mission requirements is still being discussed.

Looking at your career, explain in as much detail as possible the most difficult or challenging dive or salvage operation, explaining why.

▶ The operation that clearly stands out the most to me is the salvaging of the Japanese high school training fishing vessel, F/V Ehime Maru, and recovering eight of the nine souls lost off the coast of Hawaii in 2000 ft. In 2001, one of our submarines tragically hit and sunk the Ehime Maru during a routine training exercise. Showing true sorrow and good will to the Japanese families who lost loved ones in the incident, President Bush promised to do everything possible

to recover those who were lost. In looking at the possible solutions at this depth, we came up with few alternatives. At 2000 feet, we couldn't find anyone certified to conduct saturation dives to this depth. We then looked at the idea of penetrating the ship with ROV's. This option was ruled out due to the high probability of ROV entanglement and inability to access the entire interior of the vessel. The solution we eventually arrived at was to place two straps beneath the ship, lift and suspend the ship beneath a ship on the surface, then carry it to shallow water where we could safely and effectively dive on it. A salvage of this nature had never been accomplished before so we were developing innovative solutions as the operation progressed. To obtain expertise conducting complex operations at this depth, we turned to the deep ocean oil field support companies.

Teaming with a handful of these companies and a commercial salvor, we successfully placed two straps underneath the ship and brought the ship into a depth where we could dive on it.

This operation was by far the most difficult in my career due to the depth of recovering the ship and use of ROV's to do so, the political sensitivities involved between the two governments, the cultural sensitivities involved, the Sept. 11, 2001 terrorist attacks taking place while recovering the ship, and most importantly the human compassion involved in trying to help the nine families. In the end we were only successful in locating and recovering eight of those lost. In the 29 years I've served in the Navy, the memory that has etched itself the deepest in me was notifying the family of the 9th victim that we were unable to locate their teenage son.



(Courtesy of U.S. Navy)

SUPSALV has multiple responsibilities to keep the U.S. Navy running efficiently, globally. Pictured above is DDG 1000 USS Zumwalt Brake Wheel Removal.

Toxic Cargo Removal from the Sunken Tank Barge ARGO

In early December 2015, T&T Salvage completed the recovery of a highly toxic cargo from the sunken tank barge ARGO in Lake Erie. The ARGO, constructed in 1911, sank in 1937 with a cargo of benzol that contained a high percentage of the carcinogen benzene.

The sunken barge was previously ranked as the National Oceanic and Atmospheric Administration's highest submerged oil threat in the Great Lakes based on their Risk Assessment for Potentially Polluting Wrecks in U.S. Waters, published in March 2013.

To safely remove the cargo, T&T designed a diver directed hot-tapping and pumping system to recover the high benzene cargo from the sunken barge at a depth of approximately 50-feet below the lake's surface. Divers were required to wear a positive-pressure contaminated water diving suit to prevent exposure. Additionally, support personnel on the surface were also equipped with air-purifying respirators and self-contained breathing apparatus to protect against potential releases of the carcinogenic cargo.

Due to the limited availability of tank vessels on the Great Lakes, T&T designed a receiving vessel that included a series of storage tanks onboard a barge equipped with built-for-purpose inert gas and vapor recovery systems to ensure the safety of the public and responders.

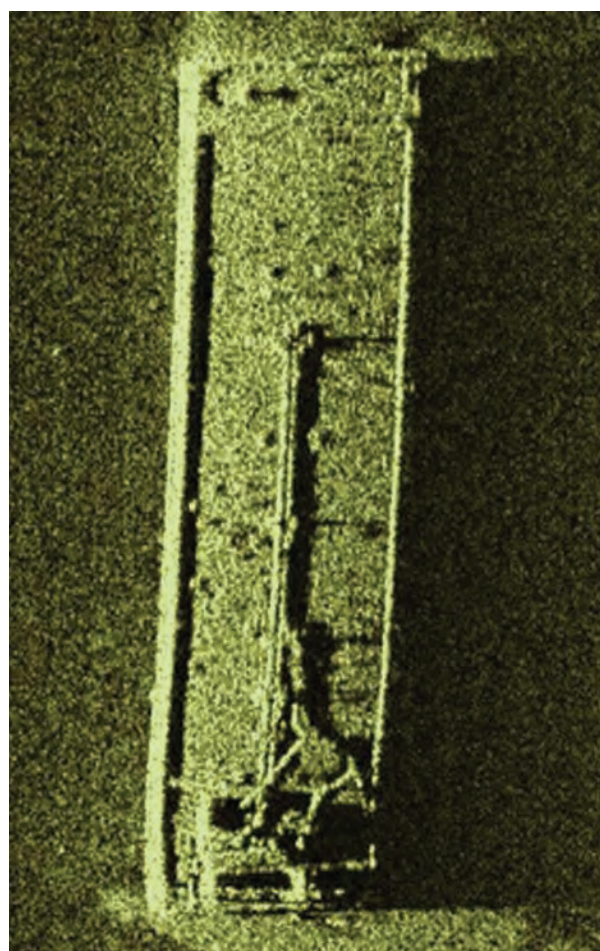
Once the system was designed, Coast Guard approved and constructed, T&T's team of commercial divers hot-tapped each of the Argo's eight cargo tanks twice; once to install a hydraulic submersible pump and once to place a non-return valve on each tank to equalize the internal tank pressure during offload operations. The cargo was then pumped to the surface through a manifold into the receiving tanks. In the end, two of the



eight tanks were determined to contain cargo and approximately 49,000 gallons of product was recovered. Throughout the operation, T&T and Coast Guard safety officers conducted air monitoring for the safety of the top-side crew and the cargo lightering team ensured the proper operation of the inert-gas system and vapor recovery system.

Working in a Unified Command with the Coast Guard, U.S. and Ohio Environmental Protection Agencies and National Oceanic and Atmospheric Administration, T&T successfully achieved all operational objectives – from safely conducting contaminated water diving operations to preventing impacts to the environment by cleaning-up the Great Lakes' top submerged oil threat.

Side scan sonar of ARGO



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“Small Cruise” Market Blossoms

BY KATHY A. SMITH

An impressive 24 million people are expected to take cruise vacations in 2016, according to the Cruise Lines International Association’s (CLIA) 2016 State of the Cruise Industry Outlook. And while ocean-going cruises on the big ships are extremely popular, the smaller cruise market is quietly having a boom of its own.

For the first time in many years, two new expedition cruise ships are being built in the U.S. Lindblad Expeditions Holdings, Inc. recently signed an agreement with Washington-based Nichols Brothers Boat Builders to construct two new U.S.-flagged coastal vessels for the company that works in partnership with National Geographic to produce innovative marine expedition programs and to promote conservation and sustainable tourism around the world.

Not only is this a notable boon for the expedition cruising market and for U.S. cruise ship building but for Lindblad, it

also signifies the 50th anniversary of expedition cruising itself. Lindblad’s first expedition was to Antarctica in 1966, remembered Sven Lindblad, President and CEO, in a recent statement referring to his father Lars-Eric Lindblad who conceived the idea. Lindblad also mentioned a strong growth market in the U.S. as partly being responsible for this expansion.

The interior design for the two vessels; the first scheduled to be delivered in the second quarter of 2017, and the second in the second quarter of 2018, is being headed up by Tomas Tillberg, Managing Partner of U.S.-headquartered Tillberg Design International and his team. Tillberg says the project has come full circle for the company, as it opened the Florida office where he is based, 20 years ago with the expressed purpose of supporting U.S.-built passenger vessels. Tillberg also has a meaningful connection to the Lindblad company – he grew up admiring Lars-Eric, who was practically

a household name in Sweden and was quite famous for his expedition exploits.

The ships will have such advanced features as public spaces designed for maximum viewing, outdoor walkways, a fleet of sea kayaks, a specially-designed landing craft, and a state-of-the-art A/V system for the highest quality presentations.

When it comes to design elements, Tillberg says since these are small ships, every space has to be incredibly well planned with guests in mind. For example, in designing the forward lounge, Tillberg has to take into consideration the multi-uses for the room, like lectures, entertainment, relaxing study areas and workspaces for editing photos taken on the voyage. “It’s absolutely critical in designing such a key space, to first understand all its facets of functionality.”

“This is an exciting and unique project and we’re happy and honored to have been appointed for this job,” he continues. “That Lindblad Expeditions, the original expeditionary cruise ship com-

pany is now building two new ships, is a great example of how this whole segment of the cruise industry is expanding. And that they chose to build in the U.S. is an important statement for our industry.”

It seems there are more people with more disposable income nowadays interested in cruising, despite continued global economic instability. And the expedition-style cruises and river cruising market are moving with the times – delivering product that caters to discerning, experienced travelers. Demographics are changing; typically, North Americans have been the largest group of loyal customers, but now Chinese and Russian patrons are also in the mix. And it’s not just baby boomers, but younger people are also wanting to see the world in a different way.

“I think the Chinese are actually now the second largest group on these cruises,” said Niels-Erik Lund, President and CEO of SunStone Ships Inc., an expedition/luxury ship chartering company that also provides technical and hotel management to shipowners. “The average age is coming down and these cruises are very expensive, so it’s not cruises for families with kids or young couples.”

SunStone represents 10 vessels, managed by Cruise Management International (previously FleetPro Ocean). Tour operators all over the world use the ships to market their cruises. “We are the largest charters providers in this market,” says Lund. “There are about 35 ships in the market and we control nine of them.”

SunStone’s expedition-style ships carry between 100 and 250 passengers. The fleet is a mix of ice class vessels that can cruise to the Arctic and Antarctica and warm water ships that cruise the remote areas of the South Pacific. Zodiacs are used to take passengers ashore or on excursions. Lund says in the market for Arctic and Antarctica cruising, previously many of the expedition ships started out as Russian icebreakers or research vessels that were converted to cruise vessels, however, most vessel which have entered this segment over the past five

Ocean Diamond in Antarctica - QUARK Expeditions.



(Courtesy: SunStone Ships)

years are purpose-built, are more luxurious, have larger cabins and a number of cabins with balconies.

Lund believes one of the reasons this market continues to grow is due to repeat cruisers who have done standard cruise vacations looking for something new. "If you've been to the usual destinations like the Caribbean, Mediterranean and the Baltic, you probably would like to see other areas of the world," he says.

Of particular note in SunStone's charter fleet is the 87-m, 210-passenger MS Saint Laurent, operated by Haimark® Line (and owned by Clipper Cruises Ltd.), which is touted as the first high quality, small ship in the domestic cruise market. The Saint Laurent travels the Great Lakes in the summer and the Caribbean in winter. Starting in 2016, she'll cruise to Cuba, the first ship of its kind to do so from Miami in over 60 years.

Tillberg Design also worked on the refurbishment of the Saint Laurent. All

public areas, including the flooring, furniture, light fixtures and cabins were upgraded to a very sleek, classic American look. "We worked on everything the passenger would experience," says Tillberg. "Our designs start by hand. We do them on paper before putting them into a computer. This gives a more personal style to the design process."

Haimark® Ltd. (Haimark® Line's sister company) also operates eight river vessels on exotic rivers in the Far East on the Amazon that take passengers to such destinations as India, Myanmar, and Cambodia. The company has a unique arrangement whereby tour operators will book a Haimark® vessel for a period of time and then market the ship under their own brand. "About 75 percent of our business goes through these operators and river cruise companies. The other 25 percent we sell ourselves," said Hans Rood, President of Haimark Travel. "It's an interesting success formula that gives us a lot of momentum."

Rood says demand has been growing rapidly over the past three years, which is why the fleet has expanded from two ships to nine. "It all has to do with the fact that people want a more mind-enriched, high-value vacation. None of our products are for the first-time traveler."

These 5-star river cruising vessels are required to be built locally but all building projects are supervised by Haimark's team of engineers and shipbuilders. "We have two ships on the Ganges built in Calcutta, ships on the Irrawaddy built locally and ships on the Macon River, all built in Ho Chi Minh City, Saigon. The Amazon Discovery delivered in October 2015, was built in Iquitos. Yacht-style cruising is also a popular vacation alternative. In 2015, Windstar Cruises took delivery of the luxury sailing yacht's Star Breeze and Star Legend; both underwent an \$8.5 million renovation each to various public spaces, suites and dining venues. Windstar is planning a \$3 million ad-

New Boats

Blount to Build Chicago Tour Boat

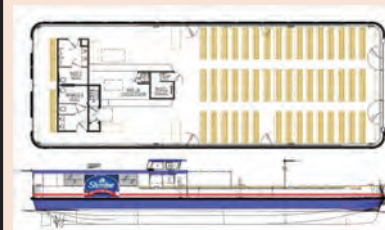


Image: Blount Boats

Blount Boats, Inc. has been contracted to build a 100 x 35-ft. steel passenger ferry boat for Shoreline Sightseeing Co., Chicago, Ill. The proposed 300-plus passenger, Sub-Chapter K vessel was designed by Seacraft Design, LLC, Sturgeon Bay, Wisc. And will operate as an architectural tour boat in partially protected waters. The shipbuilding contract was signed on June 30. The vessel is the second being built by Blount for Shoreline, and delivery is slated for spring 2016. The vessel will be powered by twin Volvo D13 MH, 400hp diesels with twin 65 kW John Deere generators, ZF W325 gearboxes, 2.933:1 ratio and 44-in. diameter, four-blade propellers.

Main Particulars:

Length o.a., molded 100 ft.
 Length, bpp.....97.5 ft.
 Beam, molded 35 ft.
 Depth amidships, molded 7.5 ft.
 Displacement, light ship
Approx. 150 long tons
 Displacement, fully loadedApprox. 200 long tons
 Draft amidships, light ship ...3.66 ft.
 Draft amidships, fully loaded4.25 ft.
 Air draft, min./ max... 14.1/14.75 ft.
 Passenger capacity, main deck (fixed seating)..... 300+
 Fuel Oil capacity 1,800 gallons
 Potable water capacity1,500 gallons
 Holding tank capacity 1,500 gallons
 Engines Two Volvo D13 MH, 400 BHP @ 1,800 RPM
 Gears.....ZF W325 gearboxes, 2.933:1 ratio
 Propeller..... 44-in. diameter 4-blade
 Speed, maximum at full load (approximate)11 knots
 CertificationUSCG Subchapter K Route..... Partially Protected waters/ Limited Coastwise
 Gross tonnage (US Regulatory)< 100

Exquisite Interiors

For two decades Tillberg Design & Associates has envisioned extraordinary interior outfit for passenger vessels large and small. Pictured are interiors of a vessel called Tere Moana with Paul Gauguin Cruises.



(Courtesy: Tillberg Design & Associates)

New Boats

Vigor Wins Fourth WSF 'Olympic' Ferry



(Image: WSF)

The second Olympic class ferry, M/V Samish, undergoing sea trials in April 2015.

Washington State Ferries (WSF) will start 2016 with construction of a new Olympic Class ferry, after signing a Notice to Proceed last week with shipbuilder Vigor Industrial for work on its fourth 144-vehicle ferry. Construction begins in January, with delivery scheduled for mid-2018.

Along with the Tokitae, Samish and Chimacum, the fourth Olympic Class ferry is part of a series built to replace four of the state's oldest ferries built during the 1950s and 1960s.

The new ferry will be built at Vigor Industrial, supporting about 500 jobs at Vigor's Seattle shipyard and contractors around the region. The budget to build the vessel is \$122 million. Funding is provided through the Connecting Washington transportation funding package.

Olympic Class ferries are equipped with the latest emergency-evacuation and fire-suppression systems, two Americans with Disabilities Act-compliant elevators, and wider car-deck lanes that provide more room for passengers to access their vehicles. The vessels' hull design reduces wake and provides better fuel efficiency, while cleaner burning engines reduce emissions.

A public process to determine the fourth ferry's name is being led by the Washington State Transportation Commission.

The first two Olympic Class ferries were delivered on time and under budget. The third vessel, under construction at Vigor, is on schedule, under budget and will be assigned to the Seattle/Bremerton route in early 2017.

SunStone's expedition-style ships carry between 100 and 250 passengers. The fleet is a mix of ice class vessels that can cruise to the Arctic and Antarctica and warm water ships that cruise the remote areas of the South Pacific.

"I think the Chinese are actually now the second largest group on these cruises. The average age is coming down and these cruises are very expensive, so it's not cruises for families with kids or young couples."

Niels-Erik Lund, President and CEO of SunStone Ships Inc.



[Photo by Hans Lagerweij, Quark Expeditions (provided by SunStone Ships)]

ditional renovation each of Star Pride in April 2016, which was moderately updated in 2014. All three vessels are 440 feet long and are equipped with twin propellers and four Bergen marine diesel engines. The company has doubled its fleet from three to six sailing and power yachts.

“The great thing about adding these vessels is not only increasing our capacity but also to introduce new voyages to our guests,” says Hans Birkholz, Windstar Cruises’ CEO. In fact, Windstar expects to begin offering circumnavigation voyages around Iceland in 2016.

One of the advantages, Birkholz says, of small ships is when visiting ports, there are more berthing options and the disembarkation of 140-300 passengers doesn’t disturb the natural rhythm of the local people. Plus there isn’t the typical outlay of cruise tourist activities that occur with large cruise lines.

Windstar’s vessels cruise to 50 nations and 150 ports throughout Europe. “We serve the inquisitive traveler,” says Birkholz. “They want a collection of experiences versus a collection of things,” he adds, referring to the main baby boomer generation who want more than just an onboard experience. “I believe the overall travel market is growing in America. In particular, the upscale travel market. We have a growing economy and demographics also play a big role.”

Interior designs are important on any cruise ship, and in particular, the smaller intimate vessels. “When expedition ships came onto the cruising scene back in the mid-1960s, it was all about destination and the ship interiors had relatively little importance,” explains Tomas Tillberg. “Now passengers expect a better environment and higher quality food and service.” On the river cruising front, Tillberg says the river boat market is much more developed in Europe than in the U.S. where modern replicas of steamboats ply inland rivers but there is still has strong demand for this product in the U.S. In fact, CLIA reports their member cruise lines currently deploy over 170 river cruise ships with 18 new river cruise vessels on order, an increase of 10 percent over 2015.

America’s heartland is where American Cruise Lines (ACL) river boats operate. Built in the U.S., the 150-person capacity American Eagle paddlewheeler was delivered to American Cruise Lines in early 2015, and was renamed the Queen of the Mississippi as she works on the Mississippi River (the previous Queen of the Mississippi is now working



(Courtesy: SunStone Ships)

on the Columbia and Snake Rivers and is named American Pride). The 185-passenger America, followed in the latter part of the year, which introduced features never before seen on a riverboat. America is scheduled to begin navigating the Mississippi River and its tributaries in the spring.

ACL is also anticipating more demand. “We’re doing more marketing and I think other companies are, too,” says Charles Robertson, President and CEO. “River cruising and small ship cruising has got a lot of attention in the press the last few years and all that contributes to it. I think there is a greater awareness in all of the markets that small ship cruising and river boat cruising is very desirable.

It’s close to home and it’s comfortable. The quality of the cruise and the ships are so much better than the ones we were building just 10 or 15 years ago.”

Chesapeake Shipbuilding designs and builds ACL vessels. ACL has its own interior designers, and Robertson notes interior design has changed with the evolution of the market. Smaller ships that once had two or three lounges may now have six or seven. The fabrics and colors used are different as are the wall and floor coverings but in general, he says, the design is still traditional. The river boats have a Victorian feel, whereas the coastal and ocean vessels are more country-club theme oriented.

And as the regulatory environment has

changed, vessel designers have had to keep up. ACL’s domestic fleet are built to ABS specifications, which are in line with the U.S. Coast Guard regulations. And for their efforts, Chesapeake Shipbuilding has five naval architects and two engineers to keep on top of these as well as international IMO regulations as required.

Small ship cruising, although specialized, certainly seems to be enjoying its own steady forward momentum. “I think the rate of growth is probably a bit faster for the small ships than the large right now,” says Robertson. “It’s easier than travelling by land or air, checking in and out of hotels and so on. It’s a pretty elegant way to go.”

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APT's Lone Star State is Built LNG Conversion Ready

General Dynamics NASSCO delivered the LNG-conversion-ready ECO Class tanker, Lone Star State, to owner American Petroleum Tankers (APT) in December 2015, marking a milestone on the path toward more environmentally friendly and fuel-efficient shipping in the U.S. Jones Act trade.

The 610-ft., 50,000-dwt Lone Star State is the first in a series of five new 330,000 barrel cargo capacity product tankers for APT to be built at the NASS-

CO shipyard in San Diego. Designed by DSEC, a subsidiary of South Korea's Daewoo Shipbuilding & Marine Engineering (DSME), the ECO Class ships achieve improved fuel efficiency via several features, such as an optimized hull form and a G-series MAN Diesel & Turbo ME slow-speed main engine. Further enhancing the vessels' green status, the tankers are engineered to accommodate the future installation of a LNG fuel-gas system and are equipped with

ballast water treatment systems.

"The delivery of this new vessel symbolizes the future of American shipping: innovative, cost-effective and green," said Fred Harris, president of General Dynamics NASSCO. "The Lone Star State, along with the four others we are currently building for APT, will be among the most fuel-efficient and environmentally-friendly tankers—anywhere in the world. These tankers are 33 percent more fuel-efficient than the pre-

vious five tankers built by NASSCO for APT." Lone Star State's construction began in September 2014, and its keel was laid by San Diego's First Lady and wife of Mayor Faulconer, Katherine Faulconer, in March 2015. The vessel was then christened in October.

The remaining ECO Class vessels are due for delivery to APT, a Kinder Morgan subsidiary, through and mid-2017, and will be operated on long-term time charters.



Courtesy General Dynamics NASSCO



Courtesy General Dynamics NASSCO

Lone Star State Main Particulars

Name	Lone Star State
Type	ECO 50K TDW Product/Chemical Carrier
Shipbuilder	General Dynamics NASSCO
Shipowner	American Petroleum Tankers (KinderMorgan)
Ship Operator	Crowley Maritime Corporation
Ship Designer.....	DSEC - Daewoo Shipbuilding & Marine Engineering
Date of Delivery	12/04/2015
Length, o.a.	186 m
Length b.p.	178 m
Beam	32.2 m
Depth	19.1 m
Design Draft:.....	11.0 m
Scantling Draft:.....	13.3 m
Deadweight Tonnage.....	49,151 MT
Gross Tonnage	29,923 MT
Speed	14.5 Knots
Flag.....	United States
Classification.....	ABS
IMO No.....	9697985
Marine Engines.....	
Make	Doosan Engine Ltd. (MAN Diesel & Turbo licensee)
Model.....	6G50MEB
Bhp or kW.....	7300 kW
Generators	Doosan Engine (x3) (MAN Diesel & Turbo licensee)
Model	7L23/30H
Bhp or kW.....	1053 kW
Propellers	6.8-m Samwoo, Fixed Pitch, 4 blade
Radar.....	JMR-9200
Fuel Consumption (t/d).....	19.5 tons/day
Bunkers	MGO, MDO, and HFO
Ballast Control System	Frank Mohn AS (FRAMO)
BWTS.....	Techcross - Electro-Chlorination

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IMA
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New Fleet

Fast Crew Supplier for P&O Repasa



Damen

P&O Repasa, a new company formed last year by the acquisition of the majority of the shares in Spanish towage firm Repasa by P&O Maritime, has taken delivery of one Damen Fast Crew Supplier 5009. The vessel will be operated from Malabo on Bioko Island, Equatorial Guinea. Red Eagle will ferry personnel and equipment, and supply drinking water and fuel, to offshore rigs and platforms.

Built for stock at Damen's partner Song Thu Shipyard in Vietnam, shortly after the contract was signed the 50-m FCS 5009 was moved to Damen Shipyards Singapore where she was customized to meet P&O Repasa's specific needs. Special features have been added such as FiFi1, a hydraulic crane and reefer plugs. Furthermore, a fast rescue craft has been mounted on a davit for rapid launch and recovery along with transfer pumps for the supply of fuel and drinking water. While the FCS 5009 class can take up to 80 personnel, the Red Eagle has been configured for 50.

Following the works in Singapore, it sailed 7,000 nm nonstop across the Indian Ocean to Damen Shipyards Cape Town on her own hull in 20 days, where she had a short bunker stop and underwent final preparations before sailing the final 2,400 nm to Bioko Island to begin work immediately.

The new P&O Repasa has plans for expansion. The original Repasa focused on towage operations, but in its new form is looking to expand into fast intervention for the offshore industry in areas including the west coast of Africa. To succeed, this strategy requires dependable partners and a modern fleet, and these factors played an important role in winning the contract with Marathon Oil.

Granite Point is Capable and Quiet

Crew Comfort, Noise Control Tops Feature List on Granite Point

Tidewater Transportation and Terminals marked delivery of the second of a series of three towboats, the Granite Point, a boat that will be deployed in Tidewater's Columbia & Snake River Service in January 2016. The vessel was built by Portland's Vigor shipyard and follows towboat Crown Point, which began operations along the Columbia Snake River (CSR) in May 2015. Like the Crown Point, the Granite Point is a custom-built, environmentally-friendly towboat that was specifically designed by CT Marine, Naval Architects and Marine Engineers of Edgecomb, Maine.

"Granite Point performed exactly as we wanted it to during its river trials earlier this month," said Marc Schwartz, Maintenance & Engineering Manager at Tidewater. "We are ready for the Granite Point to team up with Tidewater's current fleet of 16 towboats to provide our customers with the highest quality river transportation."

Named Granite Point for the granite cliff in Washington, about 20 miles southwest of Pullman along the Snake River, the towboat was built to the same specifications as the Crown Point and the forthcoming sister vessel, the Ryan Point. Measuring 102 x 38 ft., with a depth at full load of 11 ft., Granite Point features a hexagonal wheelhouse with floor-to-ceiling windows on all six sides. The hexagonal design continues to the main deck, which consists of a galley with all the comforts of home, a media room and a health and fitness facility. "Tidewater understands the ability of our crewmembers to cope with operational risk factors, like frequent sleep disruptions and heavy workloads,



(Photo: Tidewater Transportation & Terminals)

depends on their level of endurance," said Bruce Reed, Chief Operations Officer and Vice President of Tidewater. "The responsibility for maintaining a high level of crew endurance rests with us. Therefore, all three towboats incorporate a comprehensive sound and vibration control package designed by Noise Control Engineers of Billerica, Mass. The noise levels register at less than 60 decibels in the quarters during vessel operation, which is equivalent to the sound of an air conditioner."

Brian Fletcher, Tidewater Port Captain who piloted the Granite Point through river trials, conveys, "When you are in the wheelhouse, which is three decks above the engines, you would really need to concentrate to hear the engines at all. You couldn't ask for a quieter tug, nor a better tug in tight situations. It turns on a dime."

CT Marine's towboat design on the Granite Point goes beyond the distinc-

tive wheelhouse and mindful accommodations. Due to the unique challenges of maneuvering barges through swift-moving currents, high winds and eight navigation locks along the CSR System, CT Marine designed an enhanced steering system utilizing four main steering and four flanking rudders. Couple the steering system with two Caterpillar 3516C Tier 3 engines, the design team was able to increase the margins of safety and efficiency. "The Granite Point can 'get up and go,'" said Josh Nichols, Assistant Port Captain, "but there is an ease and steadiness to it."

Tidewater and its collaborative partners spent a great deal of time conceiving and engineering the plans used for all three vessels – two years in all. "The up-front work paid off," says Bob Curcio, Tidewater CEO. "The vessels are fuel-efficient, ecologically-responsible, and are giving our captains and crews exactly what they'd asked for."

Bollinger Delivers USCG's 16th FRC

Bollinger Shipyards delivered Fast Response Cutter (FRC) Winslow Griesser for the U.S. Coast Guard (USCG) seventh district in Puerto Rico. USCG took delivery on December 23, 2015 in Key West, Fla., and is scheduled to commission the vessel in Puerto Rico during March, 2016. The 154-ft. patrol craft is the 16th vessel in the USCG's Sentinel-class FRC program. To build the FRC, Bollinger used an in-service parent craft design based on the Damen Stan Patrol Boat 4708. It has a flank speed of 28 knots.



(Photo: Bollinger Shipyards)

ESG Delivers Escort Tug Triton

In early December 2015 Eastern Shipbuilding Group delivered the Escort Tug Triton for Suderman & Young Towing Company. These series of Robert Allan, LTD. (RAL) designed Z-Tech 2400 Class Terminal & Escort Tugs are currently under construction at Eastern's Nelson Street facility. Triton (Hull #235) is the first of a series four Z-Tech Class Terminal & Escort Tugs being constructed for Suderman & Young Towing Company. Eastern is also building another identical series of four tugs for Bay-Houston Towing Company.

G&H Towing Company is the owners' onsite representative and agent during the engineering, construction and delivery for both Suderman & Young and Bay Houston. G&H Towing Company will operate the vessels after delivery. Robert Allan, LTD (RAL) of Vancouver, B.C. provided the Z-Tech 2400 Class Terminal & Escort Tugs design and engineering. G&H Towing's fleet currently consists of eight "Z-Tech" tugs in operation. This "Z-Tech" incorporates the latest technology for escort service and ship assist.



(Photo: ESG)



TRITON Z-Tech Main Particulars

Length, o.a.	80 ft.
Breadth.....	38.25 ft.
Depth.....	15.75 ft.
Total HP	5,150 HP @ 1,600 RPM
Main Engines (2) Cat 3516C (B rating) Tier 3 Main Propulsion	(2) Schottel Model SRP 1215FP
.....	in Nozzles Z-Drives
Main Generators.....(2) John Deere 4045AFM85	Tier 3, 99kW 480V @ 1800 RPM
.....	marine diesel generator sets
Hawser Winch	Markey Machinery
.....	Fairleader 50HP Electric
.....	Model DEPCF-48S, 36" wide Drum
.....	Mid-drum brake holding capacity 300,000 lbs
Classification.....	ABS +A1, Towing Vessel,
.....	AMS and Escort Service ABS Loadline
.....	(SoC), Statement of Compliance
Flag.....	USA

LNG-ready Tanker Delivered to Crowley

Crowley Maritime Corp. has taken delivery of Texas, the second of four new Jones Act product tankers from Philly Shipyard, Inc. (PSINC), the sole operating subsidiary of Philly Shipyard ASA.

The 50,000 dwt, 330,000-barrel-capacity Texas joins sister ship Ohio, which was received by Crowley in October, as the first ever tankers to receive the American Bureau of Shipping's

(ABS) LNG-Ready Level 1 approval, meaning Crowley has the option to convert the tanker to liquefied natural gas (LNG) propulsion in the future. The remaining two product tankers being built by PSINC (formerly known as Aker Philadelphia Shipyard, Inc.) for Crowley are under construction with planned deliveries in 2016.

The new 50,000 dwt product tankers are based on a Hyundai Mipo Dockyards (HMD) design which incorporates numerous fuel efficiency features, flexible cargo capability and the latest regulatory requirements. The vessel is 600 ft. long and is capable of carrying crude oil or refined petroleum products.

Crowley's Seattle-based, naval architecture and marine engineering subsidiary Jensen Maritime is providing construction management services for the product tankers.

www.crowley.com



(Photo: Crowley)

Cement Carrier

LNG-Powered Cement Carrier



Ferus Smit

Dutch shipbuilder Ferus Smit delivered what it is calling the world's first LNG-powered cement tanker, MV Greenland. The delivery was preceded by an extensive program of trials and tests in which the proper working and safety of all systems was verified. On December 23, MV Greenland left the harbor of Delfzijl on its first commercial voyage to Rostock where it was scheduled to receive its first cement load.

M.V. Greenland is a dedicated cement carrier build for the joint venture JT cement, in which Erik Thun AB cooperates with KG Jebsen Cement from Norway.

According to the shipbuilder, the vessel is the first ever dry cargo vessel with an LNG fueled propulsion system and LNG tanks integrated inside the hull. The design incorporates a pressurized LNG tank positioned in the foreship.

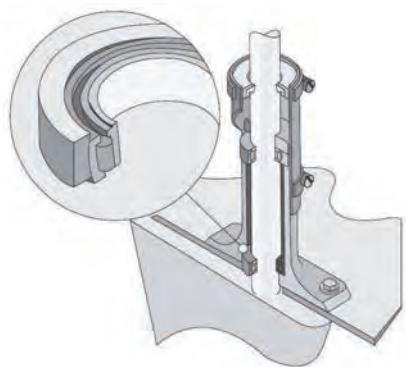
The cement cargo system consists of a fully automated cement loading and unloading system, based on fluidization of cement by means of compressed air. The cement can be loaded and unloaded fully enclosed through pipes, thus dust-free.

Composite Materials for Bearing Bonding to Secure Rudder Integrity

The critical requirement with rudder bearings relates to the bush retention in the housing. Because the bush is manufactured from a different metal to the bearing block, local galvanic corrosion can occur, which causes the housing to become oversized until eventually the bush can no longer be held in the correct alignment. This misalignment can result in the development of annular gaps between the housing and the bearing bush, resulting in excessive and premature bearing wear, a malfunctioning rudder and, consequently, costly repairs and loss of sea time.

Due to a combination of severe vibration, constant fretting and an aerated sea water environment, bearing installation can be a real challenge. The ideal installation would provide a perfect seal between the bush and the housing while offering a complete corrosion protection.

Figure 1: Rudder bearing structure



Picture 1: corroded housing



Traditional Techniques

When replacing rudder bearings on existing boats it is difficult to match the inside and outside dimensions of the old bearing. The three conventional techniques of fitting rudder bearings are press fitting, freeze fitting and heating the housing.

The first technique, press fitting, consists of pressing the bearing into the housing. The ease of fitting will vary

depending on the finish of the housing and the size of the bearing. However, the pressing requires a large force, proportionate with the size of the bearing, and can damage a bearing that is not in line when fitting.

The freeze fitting or shrink fitting technique can be used as an alternative method. The two methods of freezing using liquid nitrogen are full immersion and vapor freezing. In full immersion, the bearing is placed in a container which is then filled with liquid nitrogen until reduction of the bearing to the required diameter. Once the required diameter has been achieved, it can be removed from the nitrogen and will then be held in place in the housing until the bearing returns to its original size. However, this method is very slow and time consuming because it takes a long time to reduce the bearing diameter and to generate enough clearance for fitting. The vapor freezing method can also be used to fit the bearing by vaporising liquid nitrogen directly within the bearing until reduction. It will then be placed in the housing until returns to its original size. This method is more cost effective and safer than the immersion method but the rate of bearing contraction is a lot lower.

Using the same concept, another fitting technique consists in heating the housing in order to expand it. This technique involves hot work and can incur health and safety issues and thus requires an assessment of the risks before carrying out, which can be highly time consuming. While these methods are very effective, there will be limitations in the level of corrosion protection they provide. Indeed, the bush and the housing are made of dissimilar material and they will remain in direct contact, causing the problem of local galvanic corrosion to reoccur. All the processes will require accurate machining of housing and/or bush to ensure clearances are within tolerance for installation.

Composite Chocking

Composite chocking offers an alternative to traditional press and freeze fitting that ensures not only accurate alignment but also long-term secure location of the bearing. Nowadays, polymeric composites and coatings are widely used in the marine industry for the reseating or installation of new rudder bearings

and pintle liners. Due to their excellent durability, high compressive and adhesive strength, low moisture absorption and electrical insulation characteristics, composite materials are ideal for the stable installation and permanent bonding of rudder bushes. Isolating the bearing into position, Belzona resins and paste grade composites provide a 100% contact between the bush and the housing, ensuring a permanent vibration-free location and eliminating galvanic and crevice corrosion.

Picture 2: Bearing housing installed using composite materials



Application Methods of Composite Materials

Belzona recommends two techniques for bearing installation with composite materials: the slip method and injection method. When installing the bearing, special attention should be given to the method used to align and centralise the bearing bush within the damaged housing. The techniques described below can be used to rebuild, realign and electrically isolate many types of bearing bush housings, including:

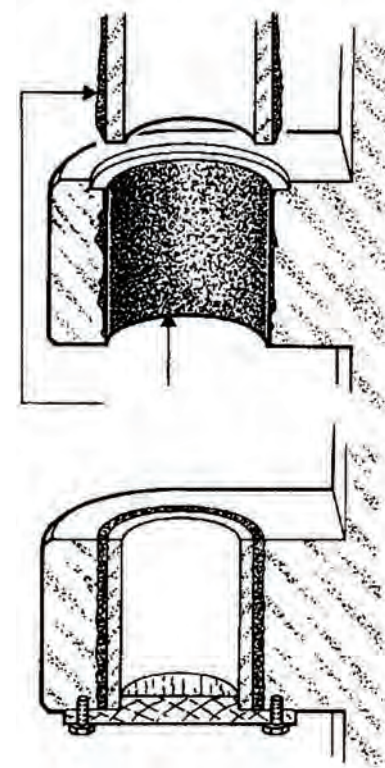
- Rudder bush housings
- Internal stern tube, bush housings
- A-frame bracket bush housings
- Stabilizer in shaft bearing bush housings
- Oversized cutlass bearing housings

a) Slip method

The slip method consists of simply sliding the bearing into the housing. A film of composite material is applied to the prepared inside surface of the housing and also to the outside surface of the bush. Further material is applied in excess to the internal surface of the housing to prevent air entrapment after assembly. The bush is then jacked into position in the housing and correctly aligned. Any excess material extrudes

during assembly will need to be removed immediately.

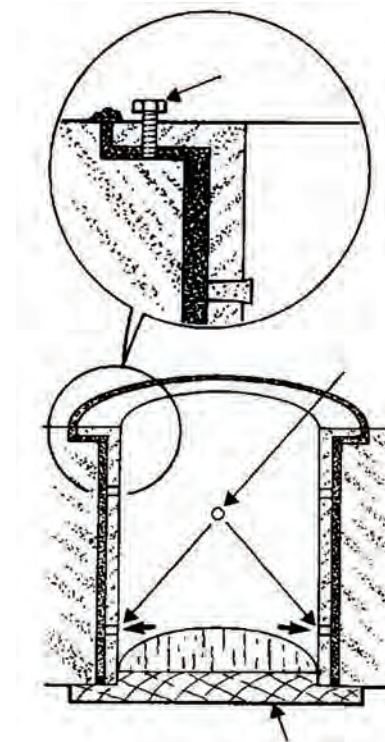
Figure 2: Slip method



b) Injection Method

Bearing bonding can be carried out by injecting the material between the bearing and the housing. The Belzona shim takes up any ovality or housing wear, thus creating a durable barrier with 100% surface contact, electrically isolating the bearing. This method has been

Figure 3: Injection procedure

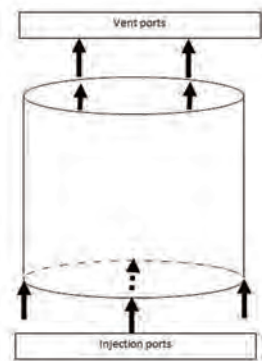


applied to multiple situations including riser bearings and bushes among others. The liner or bush should be aligned in the housing.

The annular space between the bush and the housing is sealed where required to prevent loss of product during the injection process. This may be accomplished by mechanical means or by utilizing a fast curing paste grade product. Injection holes should be carefully positioned together with vent holes to prevent the formation of air traps; ideally, injection points should be spaced no more than 600 mm (24 inches) apart (fig. 3).

The selected material is loaded into disposable injection cartridges and injected using pneumatic equipment. The application progresses from the lowest

Figure 4: Injection procedure with chocking material



to the highest injection point. Material is injected until it is exuded from the next highest injection point, at which time the first hole is sealed with a suitable



BY ALICE JUCQUOIS

Alice Jucquois studied at the University of Lincoln, United Kingdom, and holds an MSc Degree in Marketing. Alice is part of Belzona Polymers Ltd Marketing Department, where she is responsible for the marketing strategy for the French speaking countries and development of brand awareness through PR activities.

bung and injection should begin at the next hole. This process continues until the annular space between the bush and the housing is completely filled with the

chocking material. This is indicated by leakage of material through small vent holes drilled at the highest point available.

Case study

Belzona Bearing Installation in Oversized Bearing Housing

In June 2010, a ship in a Bulgarian dockyard required installation of a new bronze bearing in an oversized bearing housing.

Predominantly, severe corrosion and impact wear had led to the destruction of the old bronze bearing and irregular form of the housing leading to increased annular space between the new manufactured bearing and the housing.

As a result of this, a new bronze bush bearing was manufactured and had to

be resealed in the irregular bearing housing.

Bonding the bush in place with Belzona materials is a proven application in the marine industry.

The use of Belzona composite materials for installation of rudder bearings began in 1977 with collaboration between Belzona and Germanischer Lloyd.

The project investigated the use of Belzona materials to eliminate the

problem of galvanic corrosion between steel housings and rudder bushes, pin-tle cones and liners.

It was proven to be a time and cost saving procedure in comparison with traditional repair, which would have involved welding and boring.

Belzona's injection method was chosen as other alternatives would have incurred longer downtime. The injection of Belzona 1321 (Ceramic S-Metal), a two-part ceramic filled epoxy material

designed to provide erosion and corrosion resistance of metal surfaces, was done through flexible hose placed into the four channels made in the back of the bearing.

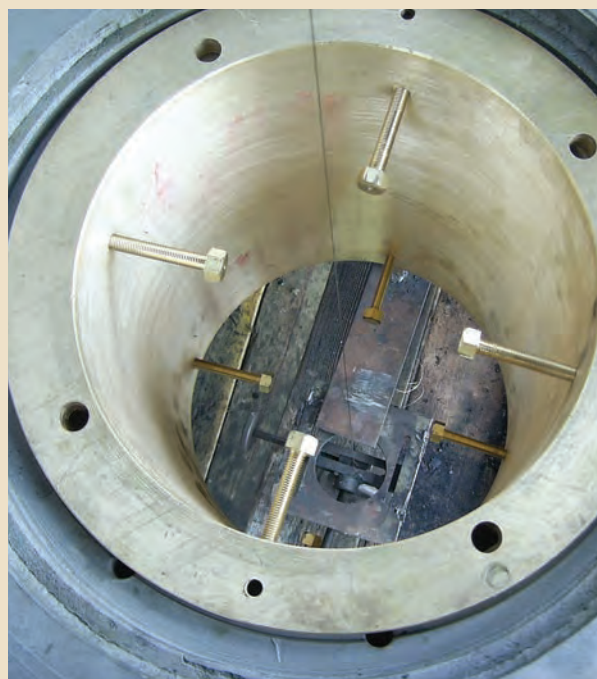
Savings were made using this solution against expensive machining of the housing and supply of larger bronze bush.

This standard repair procedure eliminates galvanic corrosion and provides long term location of the bearing.

Picture 3: Bronze bearing machined and ready to be inserted in to the housing.



Picture 4: Centralizing of the bearing in progress.



Picture 5: Finished application after injection of Belzona 1321





ABB Services 300 Turbochargers for CSCL

ABB Turbocharging, part of the power and automation technology group, announced has signed its third and largest Operation Performance Package service agreement with China Shipping Container Lines (CSCL), the logistics and containerized transportation company based in Shanghai, China. The contract covers the service and provision of spare parts for 113 turbochargers on 23 vessels, including 51 TPL type and 62 VTR type turbochargers. Added to existing service agreements, ABB now services over 300 turbochargers for CSCL, the largest number covered under contract with any customer. The Operation Performance Package (OPAC) provides customers with a more flexible and cost-effective approach to service, based around turbocharger running hours, according to ABB. It includes proactive service to identify potential future issues. Service is fully delegated to ABB. The service agreement comes with the guarantee that only ABB parts customized to each specific turbocharger will be fitted.

<http://new.abb.com/turbocharging>

Digital Thruster Panel



Twin Disc announced its new Digital Thruster Panel. The unit complements the company's EC300 Power Commander electronic propulsion control and Express Joystick System (EJS). Built of polished stainless steel, the Digital Thruster Panel is engineered rugged for a marine environment, making it ideal for helms, flybridges and docking stations. The ergonomic toggles are sized for easy use. Visually, it perfectly matches Twin Disc's full suite of vessel controls with the company's well-known arced base and modern styling. It is available in dual or single versions.

making it ideal for helms, flybridges and docking stations. The ergonomic toggles are sized for easy use. Visually, it perfectly matches Twin Disc's full suite of vessel controls with the company's well-known arced base and modern styling. It is available in dual or single versions.

www.twindisc.com.

VLT Midi Drive FC 280

VLT Midi Drive FC 280 is the evolution of the VLT 2800 drive. The Drive will be available at the beginning of 2016. With all-pluggable connectors (power up to 7.5 kW), integrated DC-coils, RFI filter, and dual channel STO functional safety, the drive is easy to use and there are no hidden extras.

www.danfoss.com



Cables for Sub-Zero Temps

Rated for operational temperatures as low as -65°C, Cicoil's flexible flat cables have been designed to provide nonstop reliability in punishing weather, polar climates, cryogenic equipment and space applications. The deep freeze resistant Flexx-Sil Rubber Jacket needs no external conduit for protection, retains flexibility and will not deform, crack or wear due to long-term exposure to intense cold temperatures. In addition, the ultra-durable jacketing material is "self-healing."

www.cicoil.com

"Quiet Drive" Solutions

The management teams of CENTA Antriebe Kirschey GmbH and Christie & Grey Limited announce a strategic global sales cooperation between their companies. The agreement allows the two companies to join forces to engineer and strategically supply the industry's premium "quiet drive" solutions - combining soft mounting systems, flexible couplings and intermediate drive shaft systems. As a pioneer in innovation since 1914, Christie & Grey Limited manufactures durable and highly efficient vibration, noise and shock control solutions for worldwide marine, industrial and commercial applications. Christie & Grey has been a leader in designing and building engineered and customized solutions. CENTA Antriebe is a leader in torsional coupling and drive shaft systems..

Compact Genset Muffler



Marine Exhaust Systems offers its its new whisper-quiet Series 4 Thinline Wall Pack Generator Muffler. Currently designed for up to 35 kilowatt gensets, the muffler is 12 inches wide, 17 inches tall and four inches deep. Its compact, low-profile size makes it suitable for any marine application, and it can be mounted on the hull side, a bulkhead or within the recess of a generator body. The Thinline Series 4 Wall Pack Generator Muffler is built of biaxial e-glass with flame-retardant Hetron FR 998 epoxy vinyl ester resin. 316L stainless steel crush-resistant rings are installed at all hose connections.

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www.marine-exhaust.com

Join Schedule 80 Carbon Steel Pipe without Hot Works



Pipe joining solutions manufacturer Victaulic introduced new roll sets for the VE416FSD roll grooving tool that permit roll grooving of 2- to 6-in. Schedule 80 carbon steel pipe. The new capability enables Schedule 80 pipe—commonly used for corrosive services—to be grooved and joined with Victaulic couplings for approved applications, eliminating the need to weld. The VE416FSD roll grooving tool aims to simplify and speed up pipe-end preparation in the field, fabrication shop and shipboard applications. In addition, roll sets are available for standard-wall pipe, light-wall steel pipe and stainless steel pipe.

www.victaulic.com



Blackmer Global Release of S Series Screw Pump

Blackmer announced the global launch of its S Series Screw pumps. Launched for the North American market in July 2015, Blackmer S Series pumps are now available throughout the EMEA and Asian markets. Available with or without external timing gears and bearings, Blackmer S Series pumps are self-priming double-ended positive displacement pumps that offer outstanding performance in the most demanding applications. Blackmer's twin and triple screw designs provide complete axial balancing of the rotating screws and their timing technologies eliminate metal-to-metal contact with the pump. S Series pumps are ATEX-certified for use in explosive or dangerous environments, and have been specifically designed to address the difficult pumping challenges found in the oil and gas, process and marine industries. S Series pumps provide solutions that can meet the toughest application challenges regardless of temperature, viscosity or pressure.

S Series pumps are offered in four distinct lines, each having multiple model configurations and sizes.

www.blackmer.com

WAGO Harsh Environment Modules



WAGO announced new additions to its XTR line of harsh environment (-40 °C to 70 °C extreme temperature and 5g vibration resistance) I/O, providing added functionality, delivering Performance Class

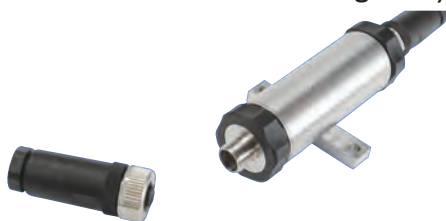
PLCs, Smart Grid technology and energy monitoring. The PFC200 controller is now available in several new harsh environment XTR variants. Featuring modules with varying communication interfaces: Ethernet, RS-232/RS-485, CAN, CANopen, and PROFIBUS-DP-Slave interfaces; as well as DNP3, IEC 61850 and IEC 60870 protocols supporting use as a Smart Grid controller.

www.wago.us

OMEGA Signal Conditioner

The OMEGA IN-UVI in-line signal conditioner is housed in a stainless steel enclosure, which is connected between the transducer and a readout instrument. While providing easy accessibility for transducer field calibrations, especially when space is limited, the IN-UVI provides a great solution for applications where a transducer must be located in a hostile environment or some distance away from the display. The IN-UVI supplies a highly regulated bridge excitation voltage for the transducer or load cell.

www.omega.com/in-uvi



New Power Feed Mag Drill

Hougen Manufacturing released a new model of portable magnetic drill, the power feed HMD927. This new model offers a major performance improvement to the mid-range line of Hougen magnetic drills. The HMD927 has the power to drill holes up to 1-5/8" (41mm) in diameter and offers great power to weight ratio by giving steel fabricators more strength and torque while still maintaining the small lightweight footprint. The newest innovation is the mag drill pilot light. The LED light is built into the base of the magnet and allows the operator to more efficiently and quickly line up the pilot with the holes center location in low light or no light conditions.

www.hougen.com



Container for LNG Hybrid Barge

In 2015 the HUMMEL (bumblebee) LNG Hybrid Barge will enable Becker Marine Systems to supply low-emission power to cruise ships lying at port in Hamburg. The first container with LNG fuel has arrived in the Hanseatic City. The barge works like a floating power plant and uses LNG to supply environmentally-friendly energy to cruise ships. Compared to convent

Lunasea's New 90-W, 180W Extreme Beam Flood Lights



Lunasea Lighting introduced two new flood lights for use on larger yachts and work boats. Both the 90-watt and 180-watt Lunasea Extreme Beam models are designed to maximize useful work area light and deliver reliable, efficient performance.

Ideal for commercial marine and industrial applications, Lunasea's Extreme Beam Flood Lights are built to effectively illuminate large onboard areas while standing up to anything the punishing marine environment can dish out. Lunasea's ultra-powerful LED lights boast rugged exterior housings machined out of solid marine-grade billet aluminum and hard anodized for scratch and corrosion resistance. The included stainless steel brackets and mounting hardware are equally tough and non-corrosive. Lunasea's new 90-watt and 180-watt Extreme Beam Flood Lights are compact in size, yet they provide intensely bright light where you need it the most. The 90-Watt model features a 100-degree beam angle and produces 11,500 lumens, while the 180-Watt unit (70-degree beam angle) doubles that output for an impressive 24,000 lumens.

www.lunasealighting.com



Ulstein

Kristensen



Odfjell

Nyborg



Alfa Laval

Glendinning



Bollinger

Blackburn



Gulf Navigation

Jain



BMT

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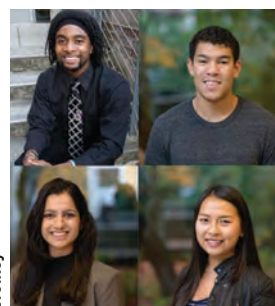
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Rodgers



Crowley

USMMA Cadets Win Crowley Scholarship



Crowley

Clockwise: Bell, Banks, Liao and Grewal



UK MCA

Barham



ZF

Industrial gear & wind turbine gearbox.

Kristensen to Head Ulstein D&S

Eva Kristensen will take the helm as the new managing director at Ulstein Design and Solutions AS starting in January 2016. Kristensen joins Ulstein from GE Oil & Gas Nordics, where she was managing director for five years.

Atlas Elektronik Management Shuffle

Dr. Rolf Wirtz is CEO of the naval electronics systems provider Atlas Elektronik GmbH effective January 1, 2016.

Odfjell Elects Nyborg

Klaus Nyborg was elected as the new director of the Board of Odfjell SE. Nyborg was recently Interim CEO of DS Norden AS from 2014-2015, where he has also been on the board since 2012, and chairman since 2015.

Glendinning Named SVP, Alfa Laval

Ross Glendinning was appointed SVP, Service Division of Alfa Laval Inc. in January 2016, charged with driving consistent profitable growth, and developing new sales opportunities for the service business of Alfa Laval in the U.S.

Bollinger Promotes Blackburn

Bollinger Shipyards promoted Brent Blackburn as Director of Engineering.

Gulf Navigation Names Jain CEO

Gulf Navigation Holding PJSC appointed Parag Jain as the company's new Chief Executive Officer (CEO).

BMT Group Reorganizes

BMT Group (BMT) announced an internal reorganization. Jan van Smirren, who will lead the Energy Partnership, will join BMT in its Houston office, hav-

ing worked for the past 25 years for Fugro Inc. and Fugro GEOS.

Jeremy Berwick will take the lead for the Defence Partnership and be based in BMT's Bath office. Dr. Paul Wilkinson has over 18 years' experience in water and environmental consultancy across Australia, Southeast Asia and the U.K.

Denis Welch has been Chairman of One World Maritime for the past six years.

David Bright, currently BMT's Sector Director Defense will lead the Surveys, Ship Design & Vessel Performance Partnership.

Rodgers Named CMA 'Commodore'

Paddy Rodgers, CEO of Euronav NV has been named as the Connecticut Maritime Association (CMA) Commodore for the year 2016.

Crowley Scholarships to Cadets

Crowley Maritime Corporation awarded three United States Merchant Marine Academy (USMMA) cadets with Thomas B. Crowley Sr. Memorial scholarships at the Containerization and Intermodal Institute's Connie Awards luncheon yesterday in Newark, N.J. Crowley's Jenny Terpenning, supervisor, marine recruiting, presented the scholarships. Recipients include William Murray, Peter Tolles and Robert Tirrito.

Crowley Aids Four UW Students

Crowley Maritime recently awarded Thomas B. Crowley Sr. Memorial Scholarships to four seniors studying at the University of Washington's (UW) Michael G. Foster School of Business. The students, Joshua Banks, Kainen Bell, Maninder Grewal and Xuan Liao,

were each chosen to receive a \$2,500 scholarship for the 2015-2016 academic year based on their demonstrated financial need, community involvement and leadership skills.

Barham: UK Ship Register Director

Simon Barham has been appointed as the first U.K. Ship Register Director at the Maritime and Coastguard Agency, scheduled to start his role in Feb. 2016.

Seaspan Appoints Brennan

Seaspan announced that Ian Brennan has joined Seaspan's Vancouver Shipyards (VSY) as Vice President, Supply Chain Management & Contracts.

Four New Cruise Ships for Carnival

Fincantieri signed a memorandum of agreement with Carnival Corporation & plc for the construction of four new cruise ships of an overall value of about \$2.5 billion.

W&O Acquires Engine Monitor, Inc.

W&O bought Engine Monitor Inc. (EMI), based in St. Rose, La. EMI provides engineering and manufacturing as a marine integrator of critical vessel monitoring and control systems.

ZF Acquires Bosch Rexroth Industrial Gears Arm

ZF acquires industrial gears and wind turbine gearbox segment from Bosch Rexroth. Following the go-ahead from antitrust authorities, on December 1, 2015, ZF has officially taken over the industrial gears and wind turbine gearbox business from Bosch Rexroth AG. With this, some 1,200 employees altogether at the Witten, Beijing and Lake Zurich

(U.S.) locations will thus join the technology company.

Liberty Chooses Ecochlor BWTS

The Ecochlor Ballast Water Treatment System has been selected for installation on board Liberty Maritime Corporation's fleet of nine U.S. and foreign flagged ro/ro and bulk carrier vessels.

AAA Wins 5-Year NOAA Deal

Art Anderson Associates won a five year Blanket Purchase Agreement (BPA) for program and project management as well as other services supporting the Marine Engineering Branch for oceanographic and fisheries research ships and small vessels operated by the National Oceanic and Atmospheric Administration's (NOAA) Office of Marine Operations (OMAO).

Kongsberg Maritime Acquires SMSC

Kongsberg Maritime signed a contract to buy the Trondheim-based ship simulation and consultancy company, Ship Modeling & Simulation Center AS.

Boskalis, KOTUG JF Formalized

Royal Boskalis Westminster N.V. and KOTUG International B.V. have reached a formal agreement to merge their European harbor towage operations following on a Memorandum of Understanding signed by the parties in late 2014.

Alphatron Secures Van Oord Deal

Alphatron Marine has signed a three-year global maintenance agreement with Van Oord to maintain and support all navigation and communication equipment on its entire fleet of more than 80 vessels.

JANUARY

Ad Close: Dec. 21

Ship Repair & Conversion Edition

Market: Passenger Vessel Operation Optimization
 Technical: Marine Salvage & Recovery
 Product: Maritime Propulsion: Gears, Thrusters, Waterjets & Propellers
 Country Reports: Spain & Portugal

PVA Maritrends

Jan. 22-26 Washington DC

FEBRUARY

Ad Close: Jan. 21

Cruise Ship Technology Edition

Market: U.S. Navy Technology
 Technical: BIG DATA: Satellite, Data, Tracking & Communications
 Product: Marine Coatings & Corrosion Control
 Country Report: Italy

Cruise Shipping Miami March 14-17, Miami, FL

Asia Pacific Maritime March 16-18, Singapore

ASNE DAY March 2-3, Arlington, VA

NACE Corrosion March 6-10, Vancouver

PSOCE 2016 Florida March 17-19, Tampa, FL

MARCH

Ad Close: Feb. 22

Green Marine Technology

Market: Training & Education: Maritime Simulation Centers & Technology
 Technical: Workboat Fleet Maintenance & Repair
 Product: Green Marine Fuels & Lubricants and Emission Technologies
 Country Report: Japan

CMA Shipping

Mar 21 -23 Stamford, CT

Workboat Maintenance

April 12-14, New Orleans, LA

Sea Japan April 13-15, Tokyo

APRIL

Ad Close: Mar. 21

The Offshore Annual

Market: Port & Ship: Loading and Unloading Technology & Equipment
 Technical: Satellite Communication
 Product: Deck Machinery, Winches and Ropes
 Region Reports: Scandinavia: Denmark, Finland, Norway & Sweden

OTC May 2-5, Houston, TX

Inland Marine Expo May 10-12, St. Louis

Portsecure 2016 May 18-20, Toronto

MAY

Ad Close: Apr. 21

The Marine Propulsion Edition

Market: RIB & Patrol Boat Report
 Technical: Workboat Design & Construction
 Product: Marine Electronics: Navigation Radar & ECDIS
 Country Reports: Greece & Turkey
 Special Report: U.S. Coast Guard Annual

Posidonia June 6-10, Athens

Sea-Air-Space May 16-18, National Harbor, MD

SeaWork June 14-16 Southampton, UK

CIMAC CONGRESS June 6-10, Helsinki

JUNE

Ad Close: May. 20

Annual World Yearbook

Market: Maritime Simulation & Training Centers
 Technical: Dredging Vessel Technology
 Product: Pumps, Valves, Pipes & Insulation
 Country Reports: U.K. & Ireland

Marine Money Week

June 21-23,

New York, NY

JULY

Ad Close: Jun. 21

Marine Communications Edition

Market: Tugboat, Towboat & Barge
 Technical: Oil Spill Response & Recovery
 Product: Marine Electronics Equipment & Supplier Guide
 Country Report: Singapore

**JULY SPECIAL CONTENT
ELECTRONIC EDITION**
www.whitepapers.marinelink.com

AUGUST

Ad Close: Jul. 21

The Shipyard Edition

Market: Offshore Deepwater: Structures and Systems
 Technical: Heavy Lifting Solutions: Maritime Cranes, Winches, Windlasses & Capstan
 Product: Ballast Water Technologies
 Country Report: The German Maritime Cluster

SMM HAMBURG

September 6-9,

Hamburg, Germany

SEPTEMBER

Ad Close: Aug. 22

Maritime & Ship Security

Market: Caring for the Mariner: Onboard Amenities
 Technical: Maritime Propulsion: The Hybrid Drive Solution
 Product: Clean Water Technologies
 Region Report: U.S. West Coast Maritime

Shipping Insight

October, Stamford, CT

OCTOBER

Ad Close: Sep. 21

Marine Design Annual

Market: Ship Classification Societies
 Technical: Marine Firefighting, Safety & Salvage
 Product: CAD/CAM
 Country Report: The Netherlands

SNAME

November 2-4, Bellevue, WA

Arctic Technology Conference

October 24-26, St. John's

NOVEMBER

Ad Close: Oct. 21

Workboat Edition

Market: The 'LNG-as-Fuel' Revolution
 Technical: Deck Machinery, Winches & Ropes
 Product: Marine Coatings
 Special Report: Gulf of Mexico Builder and Supplier Guidebook

**NOV. SPECIAL CONTENT
ELECTRONIC EDITION**
www.whitepapers.marinelink.com

Workboat Show

Nov. 30-Dec. 2, New Orleans, LA

DECEMBER

Ad Close: Nov. 23

Great Ships of 2016

Market Report: The Autonomous Ship: Command & Control
 Technical: Shipyard Automation: Welding & Cutting Equipment
 Product: Marine Engine Guide
 Country Reports: China & Korea

Surface Navy Association 2017

Crystal City, VA

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Contact

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Job Responsibilities and Duties include, but are not limited to the following:

- Provide support in reviewing, researching, writing and submitting project bids and proposals
- Review plans and other technical documents
- Assist in the development of cost estimates or tentative schedules
- Conduct new project research
- Assist with materials research, purchasing and project support needs
- Review, check and compile information and verify

- data for accuracy, completeness and compliance according to project specifications
- Assist with project mobilization
- Conduct client communications and updates on an as requested and needed basis
- Clerical Skills to maintain accurate records, reports, orders, etc.

Skills Required:

- Able to read, speak, write, and understand English in person and over the telephone
- Excellent interpersonal, verbal and written communication skills are essential in this collaborative work environment
- Ability to work independently, as well as follow directions and perform tasks
- Capable of working efficiently in an environment of constant change
- Possess time management and scheduling skills
- Strong attention to detail
- Ability to read/understand bid documents and specifications
- Proficient Computer Skills: Microsoft Word, Excel, PowerPoint, and PDF editing programs

Physical Requirements:


- Work is performed while standing, sitting and/or walking
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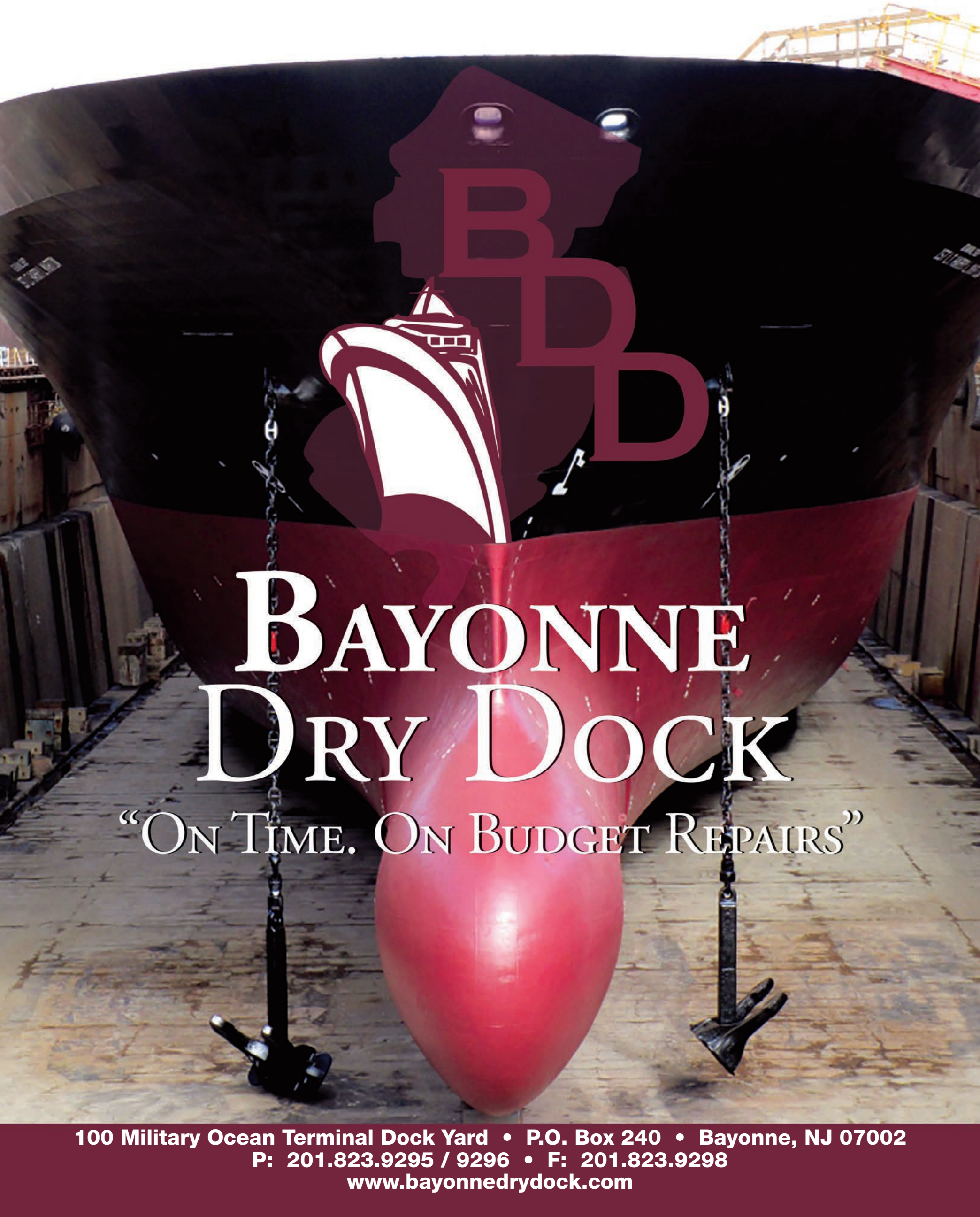
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