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MARITIME REPORTER AND ENGINEERING NEWS

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June 2016

World Yearbook

Offshore Energy: Is it Sunrise or Sunset Time?

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Shipbuilding: Japan Prospers, South Korea & China Struggle

Brown Water: The Five Drivers for the Coming Year

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THE WORLD YEARBOOK EDITION

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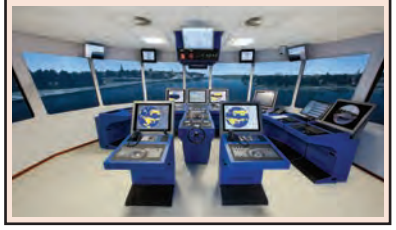

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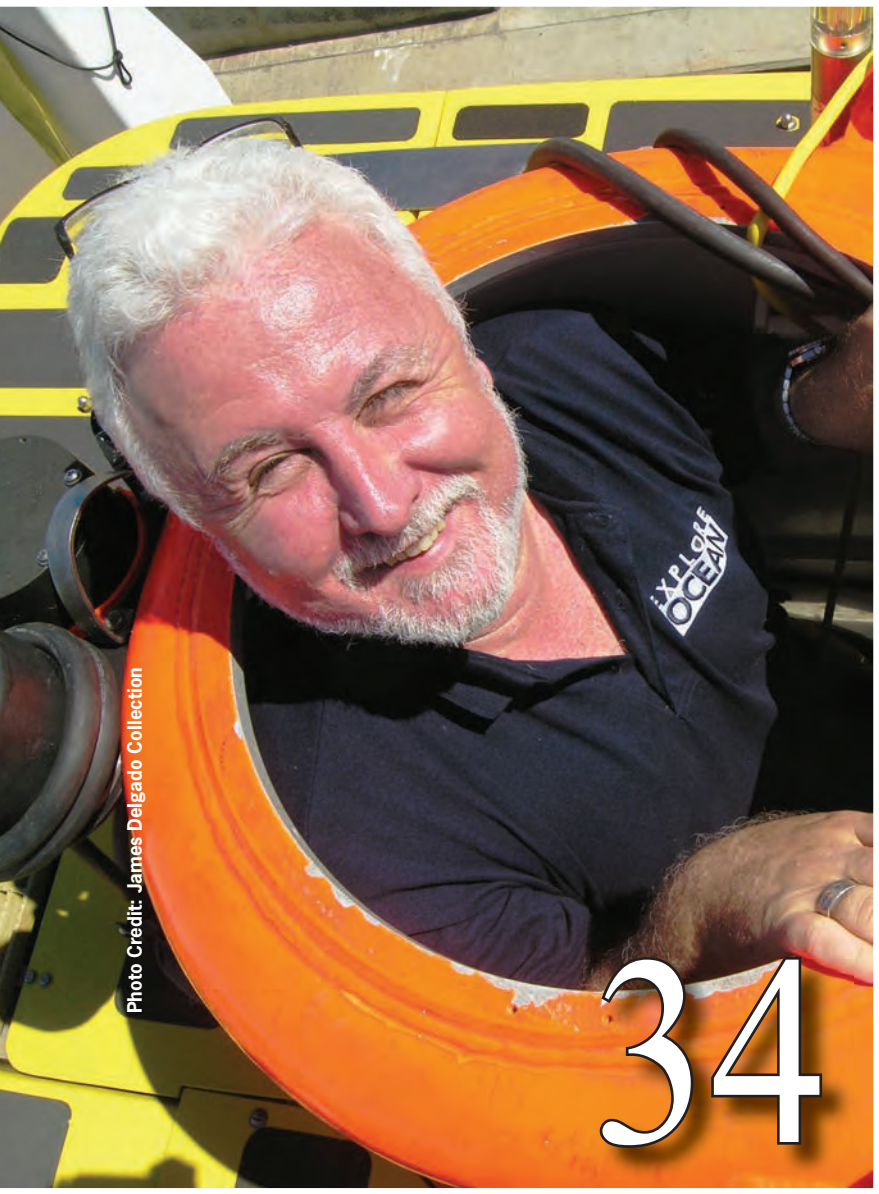
Energy is in the Driver's Seat
Without question energy has been *THE* story of the past 12 months, as the precipitous decline in energy prices has affected nearly every sector of the maritime market.

(Photo: Joaquin Andres Bosqued)



Dr. James Delgado

NOAA's Director of Maritime Heritage discusses the importance of preserving our maritime past and understanding our connection to the sea.

By Kathy A. Smith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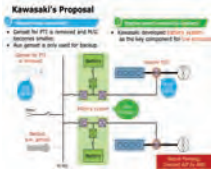

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Future Leader
McGonagle

With intense focus on the 'next-generation,' *MR* sister-publication *Maritime Professional* scouts the academies for promising Future Leaders.


Photo: ABB

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Engineering Project of the Year
The Quest to Save Venice

Rising tides have Venice on the brink of slipping into the sea. ABS Symphony Plus is the 'brains' behind an innovative new flood control system that very well could be the historic city's last chance.

By Kira Coley

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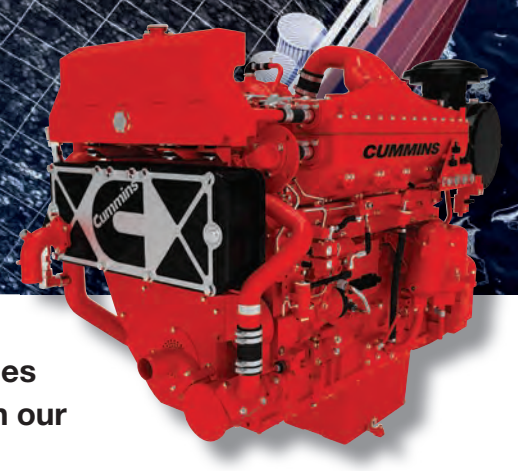

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GREG TRAUTHWEIN, EDITOR & ASSOCIATE PUBLISHER

Last month I had a fascinating discussion with Hege Skryseth, President of the newly formed Kongsberg Digital and Chief Digital Officer at Kongsberg. Skryseth is a software industry veteran, having led Microsoft's efforts in Norway for many years, and is now two and a half years in with Kongsberg, guiding Kongsberg's new digital path in the maritime and offshore markets. The interview was primarily for *MR* sister-publication *Marine Technology Reporter's* June 2016 edition, but something she said stuck with me in the formulation of this, our annual World Yearbook. While everyone seemingly is talking 'Big Data', Skryseth and her team of 500 at Kongsberg Digital engineers are talking 'Smart Data.' To that end, the worst excuse for doing something in a certain way is "because we've always done it that way." While there certainly is merit to tradition, being nimble and adaptive is central to survival and success in today's maritime world. To that end, this year I have decided to dispatch with many of the page after page of numbers and charts that have been a signature of our annual "World Yearbook" for so many years, and instead offer a collection of higher level thought pieces – from some familiar faces and names as well as some newcomers – on select markets that are making headlines in 2016.

- **U.S. Brown Water Market:** Joe Keefe, editor of *MarineNews*, starting on page 10 breaks down the U.S. domestic marine market discussing the five key variables that will drive this sector for the coming 12 months.

- **Shipbuilding:** Industry veteran Robert Kunkel discusses insights on the South Korean shipbuidling collapse (pg. 16), while my interview with Hiroaki Sakashita, Director-General, Maritime Bureau of Japan's MLIT (pg. 12) discusses focus on profits, not capacity, has put Japan in a good position.

- **Offshore O&G:** The offshore market, and energy in general, has been THE story of the last 18 months, and while the price of oil is creeping back up, the casualties are mounting. A pair of articles from Claudio Paschoa (pg. 18) and Peter Lovie (pg. 40) graphically illustrate just how deep this downturn has cut.

- **Navy:** While the U.S. Navy maintains the most lethal and technically advanced arsenal on the planet, there is real need for renewed investment in platforms and people. Edward Lundquist, starting on page 22, give his usual top-to-bottom, inside out overview of this market.

- **Training & Simulation:** Training is more important than ever, as Dennis Bryant's "Not Keeping Watch" (pg. 28) clearly illustrates, while my feature on the creation of Carnival Corporation's amazing new Arison Maritime Center (pg. 30), home of the CSMART Academy, shows the future of corporate committment to running safe ships with qualified crew.

For those of your needing your statistic and chart fix, fear not as the electronic edition of our World Yearbook features many bonus pages of coverage. Look for bonus coverage here:
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Courtesy of the Panama Canal

The enlarged Panama Canal potentially helps inland operators as deep(er) blue water ports attract still larger tonnage that can load more grain and bulk products.

Domestic Drivers

Sectors of the U.S. market are hot, but for how long? Five key variables drive the domestic brown water market

BY JOSEPH KEEFE

The challenging operating climate currently facing blue water, international trades can and sometimes does overshadow what happens on the American side of the big pond. But, as they often say in London, "When America sneezes; the rest of the world catches a cold." Hence, what happens in the U.S. brown water, workboat markets – encompassing more than 39,500 hulls and 98% of our collective domestic merchant fleet – is especially important. Looking ahead, at least five variables will drive those markets in the months to come.

Subchapter M

Regulatory changes are already having a marked impact on the industry, but much of that is still yet to come. The Coast Guard's long-awaited, much anticipated so-called subchapter M towboat rules are finally (almost) here. In the inland sector, more than 1,000 operators and as many as 5,200 vessels will experience at least some changes. For those who haven't yet started to get ready for the soon to be implemented regime, it may actually be too late. And, it won't be cheap. Already, surveyors, consultants and software solution providers are clamoring to help those who don't have the internal wherewithal to do it themselves. Separately, an effort by stakeholders that include the American Waterways Operators (AWO) has pushed forward the Vessel Incidental Discharge Act (VIDA) in an effort to bring the oversight of all vessel discharges under one umbrella. It just might pass muster in Congress, but if not, the confusion over who is in charge of any and all vessel discharges, what those laws stipulate and the geographic boundaries of all of it will continue.

Energy

Energy remains a dominant story in the workboat industry; offshore in the Gulf of Mexico, as well as in the heartland. That's not likely to change very soon. And, although the price of crude oil has rebounded somewhat, the OSV market remains soft with scores of vessels laid up and rig counts lagging. Even when the oil market does come back, the recovery will be slow and will most likely include further consolidation in this sector.

Inland, the war on coal has taken its toll. This, coupled with the reduction in shale production, has reduced the demand for barges in all sectors. Beyond this, a robust barge recapitalization leaves the fleet near record numbers. Aside from a small number of older units, this is a young fleet. Flat and falling freight rates will continue to plague the inland rivers.

Look South

The advent of the enlarged Panama Canal – two years late – potentially helps inland operators as deep(er) blue water ports attract still larger tonnage that can load more grain and bulk products into each and every load. The real impact from that is still yet to be determined. More important to U.S. inland operators is the growing threat from an updated South American inland workboat fleet that is finding ways to move more cheap and plentiful agricultural products to global markets. Without a doubt, South America poses the greatest risk to the health of U.S. inland rivers. How domestic operators respond to this real competition will make all the difference.

But, that's only one part of the equation.

Infrastructure

If competition from South American agricultural interests and a shiny new fleet of built-for-purpose pushboats doesn't frighten the U.S. domestic waterfront, then the age of its inland infrastructure probably should. And, even the favorable markup of the Water Resources Development Act (WRDA) 2016 by the House Transportation & Infrastructure Committee, if eventually passed, won't bring the aging inland waterways, locks and dams up to snuff quickly enough. Although inland stakeholders do a very good job of taking the federal government to task for its failure to disburse funds it has collected over time, the wheels turn slowly inside the beltway. The state of infrastructure and the ability of the nation to maintain rivers ports and waterways to their authorized depths may well be the most important matter facing all stakeholders today.

Shipbuilding

Domestic builders are only now exiting a period of sustained prosperity, marked by robust federal and municipal spending, the successful recapitalization of inland vessels and offshore OSV fleets, and blue water Jones Act building program the likes of which hasn't been seen in four decades. Looking beyond this, those gleaming OSVs rolling off the drydocks all over the Gulf Coast are, more often than not, headed for cold layup. The federal government's spending spree in the workboat market is also arguably just about done, and those municipal operators who are still buying, are doing so in a savvy manner, demanding that each hull be capable of multiple missions.

Youngish inland barge fleet numbers are within reach of their historical highs; in a market that today calls for less demand in many sectors. There is good news for builders. The advent of subchapter M, looming ballast water rules and the increasingly stringent air quality mandates for marine vessels, could come together to create additional opportunities.

Arguably, if all three came into play at once, capacity would once again be at a premium for many areas and competing yards. That hasn't yet happened and there's no guarantee that it will. Still, estimates for average costs for the typical boat to come into subchapter M compliance run as high as $100,000 or more. For brown water hulls big enough to merit ballast water treatment systems, the price tag for those systems could hit $1 million.

The Bottom Line

There is plenty to be concerned about for the domestic workboat and brown water sectors as we head into the dog days of summer. For the boat building and repair sectors, the current ebb in business could very well turn around in the short term.

That turnaround, should it materialize, will come at the expense of operators who can ill afford the additional expense, most of which will be a function of regulatory requirements.

Photo: Maritime Reporter & Engineering News

Japan Powers Ahead

Japanese shipbuilding's focus on profitability, not volume, pays off as its order books are full while others fail

BY GREG TRAUTHWEIN

On a recent visit to Tokyo, Maritime Reporter & Engineering News *had the opportunity to visit with* ***Hiroaki Sakashita****, Director-General, Maritime Bureau, of Japan's Ministry of Land, Infrastructure, Transport and Tourism (MLIT) Mr. Sakashita shared his insights on major trends and drivers today in Japan's shipping, shipbuilding and seafarer sectors.*

For our readers not familiar with yourself and your offices, could you describe to me your position and the overall responsibility of this office?

The Maritime Bureau was established by consolidating three bureaus: the Shipping Bureau; the Ship Bureau, which was in charge of shipbuilding and technology development for ships; and Seafarer's Bureau. As such the Maritime Bureau is in charge of shipping industry, shipbuilding industry and issues involving seafarers, who support maritime industry as human resources. We are responsible for maritime safety and marine environmental protection as well as maritime industry policy making. Other two agencies responsible for maritime issues are Port and Harbor Bureau and Maritime Safety Agency (Japan Coast Guard). Meteorological Agency, which provides marine weather services, is also under the jurisdiction of MLIT, Ministry of Land, Infrastructure, Transport and Tourism. Thus all marine related administrative affairs fall under the jurisdiction of MLIT except for fishery.

I would like to first discuss shipbuilding. Can you provide to me an overview of the shipbuilding business in Japan today? Specifically I'm interested to know the government policy regarding shipbuilding's future.

Japan is one of the major shipping and shipbuilding nations in the world. It is an island nation surrounded by sea, and shipping and shipbuilding industries have played an important role in the development of its economy and the nation's growth. I think Japan is quite unique as a maritime nation, where all the three components necessary for the development of robust maritime industry: shipping, shipbuilding and ship machinery industry that supports them, have been fully developed through the history. In the past, from 1956 to almost 2000, Japan used to have a market share of about half of the global shipbuilding. In the wake of oil crises (of 1973), the global overcapacity forced the shipbuilding industry in Japan to go through a drastic structural adjustment. During periods of increasing demand, South Korea in 1990s and China in 2000s rapidly built up their shipbuilding capacity, while Japanese shipbuilders, learned through hard experience, opted to enhance capacity not by building up physical capacity but through improving productivity.

In other words, having experienced the structural adjustment, Japanese shipbuilders have refrained from quantitative expansion of building capacity and rather focused on increasing profitability. In the light of current world shipbuilding and shipping market condition plagued by oversupply, it has turned out

Japanese shipbuilders have refrained from quantitative expansion of building capacity and rather focused on increasing profitability. **In the light of current world shipbuilding and shipping market condition plagued by oversupply, it has turned out that Japanese shipbuilding industry had made the right choice**

that Japanese shipbuilding industry had made the right choice to adopt such an industrial strategy. In fact, while shipbuilding companies in Korea and China are forced to go through drastic structural adjustment, current orderbook of Japanese shipbuilders guarantees three years of workload. It means that while Korean and Chinese shipbuilding industry are going through structural adjustment, Japanese shipbuilders have enough leeway to wait for market recovery. Japanese government's fiscal policy also worked to their advantage.

How has currency policy affected Japanese shipbuilding?

Abenomics, Prime Minister Abe's economic policies, let the yen fall in value against other major currencies. Three years ago, the exchange rate was about 80 yen to the dollar, now it is 110 yen to the dollar. It is a huge improvement in exchange rate. Unlike Korean and Chinese competitors, Japanese shipbuilders have enough margin of resilience to wait for market recovery. It is essential for Japanese shipbuilders to make an effort to further enhance competitiveness especially during this market downturn.

And in looking at the overall strength of the Japanese shipyards today, what do you see?

One of the strongest attributes of Japanese shipbuilding is its technological competence. Energy saving performance of Japanese built ships and cost competitiveness supported by the high productivity contribute to the competitive edge of Japanese shipbuilders. However, we are well aware that our competitors are always waiting to catch up with our technology. As one of the major themes of this year's Sea Japan, the era of innovation through information technology has finally arrived in maritime industry. I believe it is necessary for Japan to lead the world in taking advantage of information technology to bring innovation to maritime industry, including shipbuilding. It will enable us to further enhance the international competitiveness. Traditional business model of Japanese shipbuilders has been to provide products and maintenance services for the products. However, with the advent of information technology, it is time

Photo: Maritime Reporter & Engineering News

Information Technology

I believe it is necessary for Japan to lead the world in taking advantage of information technology to bring innovation to maritime industry, including shipbuilding. It will enable us to further enhance the international competitiveness.

for us to develop a new business model to provide holistic service to assist ship owners/operators to assure stable operation of their ships without problems. At the threshold of a new era of information technology, Maritime Bureau provides support to the effort of maritime industry to introduce the information technology. This year we started a grant program to assist R&D activities aimed at utilizing information technologies for maritime applications.

Now if we could turn our attention to shipowners. Can you give me an overview of the Japanese shipowners today, again with insights on key government policies intended to ensure a strong maritime future?

As an island nation, it is imperative for the economic security of Japan to ensure Japanese shipping companies support nation's export with a high level of competitiveness. At the same time shipping business is a business carried out in a single global market under free competition. For Japanese shipping industry, which is indispensable to the nation, to maintain a firm presence, it is essential for Japanese government to ensure Japanese shipping companies remain competitive in the global market. Each country has its own maritime policy. Some country subsidizes business operation in order to keep the business afloat. It's not the case with Japan. Instead it is our strategy to maintain our valuable shipping industry by supporting companies' effort to obtain and enhance global competitiveness. Under such circumstances, I believe three of Japan's leading shipping companies, NYK, MOL and K Line are doing an excellent job. Specifically NYK has been aggressively adopting information technology for business application. NYK is a front-runner in this endeavor, and MOL and K Line, are following the lead as well. I think it is desirable that Japanese companies compete with each other to address this challenge.

Maritime Security: Can you give us an overview of Japan's top maritime security challenges as you see them? Specifically, can you discuss government policy to ensure maritime borders remain secure?

We have a bilateral policy dialogue with the U.S. Coast Guard annually, and the last time I met the Mr. (Paul "Chip") Jaenichen, the head of the U.S. Maritime Administration. We discussed cyber security in the maritime industry, important as we are entering a new era of information technology in the maritime sector. (This is an issue taken up by) the International Maritime Organization (IMO), and the U.S. has taken the initiative. We cooperate together on this issue, and we are cooperating to develop and promote certain measures in the maritime sector to strengthen our cyber security. We are very positive to establish the framework to ensure cyber security in this sector.

You touched on it briefly, but if we can expand a bit on the topic of ship equipment supply. Can you provide an overview of government policy in regards to companies that sell product and service to the maritime community?

The ship machinery business in Japan is an indispensible part of the Japanese shipbuilding industry. Almost 90% of the vessel constructed in Japan uses Japanese materials. It means that product provided by the Japanese ship machinery industry is very cost competitive and reliable with a high overall quality. This provides the Japanese shipbuilding industry a competitive edge. Especially in the information technology area, there are many possibilities to introduce this technology into their products and services. As such, it will provide additional competitiveness to the Japanese shipbuilding industry.

The Great East Japan earthquake. Can you describe how this impacted Japan's maritime industry and describe ongoing efforts to help it recover?

From the aspect of the shipping industry in Japan, there are not any adverse affects today. The shipping industry has quickly overcome. Some of the port business is still under re-construction, but for the most part the function of the ports in the northern sector are functioning almost normally.

Maritime Traffic and Maritime Safety: What are Japan's priorities regarding safe and efficient operations in your ports and harbors and your maritime areas of inerest?

Safety is the most fundamental issue for the shipping business. I contend that Japanese shipping companies provide their service safely and environmentally friendly manner. It is the attitude of their business. It is a competitive edge for the Japanese shipping industry. The productivity of the business, the productivity of marine transport is also important. The application of information technology in the shipping business could provide further (efficiency) improvement. Giving ship owning companies to better monitor ship operations all around the world is adding to this efficiency; cooperation between the seafarers and the staff onshore is growing continuously and could drive further improvement.

Photo: Robert Kunkel

S. Korean Shipbuilding Collapse

With losses in the billions and a capacity glut, the shipbuilding goliaths in South Korea are in deep trouble

BY ROBERT KUNKEL

One of the most prominent features of Asia's position in the global economy is the region's role in international shipbuilding. In recent history more than 95 percent of the world's orders for new ships have been placed with Asian yards, more specifically with shipbuilders in China, Japan and South Korea. Japan was the world leader in the1970s and again in the 1990s after rebuilding from the early 80s collapse. Korea quickly emerged as the market leader entering into the new century and boasting the largest shipyard in the world at Hyundai Heavy Industries in Ulsan, South Korea. Whereas the decline of Japanese shipbuilding is well covered throughout more than one collapse, the projected fall of South Korea receives little attention today. Korean shipbuilding has remained strong throughout many of the economic down cycles in Asia. However its day has come.

Global shipping has been suffering with the fall of the dry bulk market. A complete sector of global shipping reduced to freight and charter levels barely covering operating and capital costs. The fall also affected the Chinese shipbuilding industry, as this class of build was dominant for the new yards opening throughout the mainland in the mid 2000 time period. Value levels of tonnage in China have now dropped by over 50% and many abandoned projects deteriorate at the quays. This dry bulk sector is again suffering from substantial overcapacity and considering the age of the fleet after the surge of Chinese newbuilds, the light at the end of the tunnel is dim. The market cycle has been similar to that of the mid 1980s in Japan. Rapid growth of shipyard capacity linked to extreme over capacity and followed by a collapse of shipbuilding orders. However, this current collapse looks to be taking down more than one shipbuilding nation and other freight sectors are looking to fall as a result of it.

Korean mainstream media is reporting the demise of three of the largest shipbuilders in the world. Daewoo Shipbuilding and Marine Engineering, Samsung Heavy Industries and Hyundai Heavy Industries. The report indicates collective losses exceeding $7.5 billion dollars since the start of the 2015 operating year. The country first lost most of STX shipbuilding in 2014 and 2015 with the closing of all but several STX facilities throughput Asia. The latest reports indicate the courts have taken the company and that the STX Jinhae facility will soon close. Their financial advisors estimating another $400 million U.S. dollars needed to keep the facility afloat.

Korea's shipbuilders exist within a wider maritime cluster that provides important upstream and downstream products and services. They are operating as final assembly facilities with upwards of 70% of the services coming from external subcontractors and suppliers. The marine equipment sector is an important part of the maritime cluster in this country, the shipyards are the lifeblood of these small companies and they will also fall with the collapse. The services range from block construction along the country's coasts to major manufacturing of main engines, generator engines and auxiliary systems within its many industrial complexes. If the entire cluster falls, spare parts and consumables needed to repair and maintained delivered vessels may become difficult to procure.

The main Korean concern is concen-

trated in Geoje Island where Daewoo and Samsung call home and control nearly 70% of the large ship market. 20,000 workers have been laid off between the two companies in recent weeks. The two shipyards have reported the lowest forward order book level in 11 years with no shipbuilding interest beyond an early 2017 delivery. The layoffs and the production decline have already affected the local economy. Housing is down by 50% and restaurant and service companies report a 30% downturn this year.

Ulsan, South Korea and home of our Amtech office is also suffering. Hyundai Heavy Industries has laid off 11,000 workers collectively throughout its facilities and its losses continue despite valiant efforts to control costs. Rumors abound of management closing five of its nine drydocks; the first attempt to close and downgrade the production in the remarkable history of the company. There is no longer global interest in the larger ship types moving forward. The markets are not supporting the construction of Post – Panamax containerships, Ultra large Ore carriers, 150,000 cubic meter LNG ships or VLCCs and those ship types were Hyundai's bread and butter.

Why now; what does the future hold?

The mid 80s collapse of the Japanese shipyards dealt with a rapid rise in crude oil prices. The Korean collapse is dealing with a rapid fall. Owners rushed to build under IMO Tier II emission regulations before the 2016 deadline occurred and Tier III requirements raised the cost of construction by a projected $3 million plus U.S. dollars. Contracts of 80 ship and 120 ship orders replaced historical orders of 8 to 10 hulls. The container giants introduced slow steaming to mask an overcapacity in their markets only to be faced with owners building larger containerships, adding to the problem. Where Japan consolidated it shipbuilding industry and opened discussions with the young Korean yards to control their excess capacity, China built shipyards in every city and open field with access to a waterline. Japan provided more than several financial incentives to build and owners took advantage of that financing. Korea is faced with a financial market that has taken its losses and is no longer interested in financing fleets. Overcapacity from China, the uncertainty of crude oil prices and global recession has brought ship orders down to near zero. And Korea estimates this market to last at least another 24 months.

The forces of the market are so strong, and the overcapacity so large, a downscaling of the industry must take place to weather that period. Consolidation of Korea's shipyards will be the first response to the downfall. Small yards will close and we will lose at least one of the giants. China must follow suit and control their capacity. The industry will then have to wait for the single world incident that creates new trade routes, extends a ton-mile voyage, or requires a building of a new nation. Japan had the closing of the Suez Canal and the need for VLCCs. Korea enjoyed the double hull regulations as a result of the Exxon Valdez. China serviced the continued growth of dry bulk with the county's 8% growth and thirst for raw materials. The current market will have a difficult time correcting the supply and demand balance the industry has bought itself into without a world incident of this magnitude.

Having built and worked in this country for over 30 years, employed its engineers and boasted about its ability and respect for our nation, the news is a sad day for us and for shipping.

Photo: EJA

The Arpoador drillship nearing completion at the EJA yard in early 2016.

Sete Brasil Sinks

As Petrobras goes, so too do the fortunes of Sete Brasil, which had set out to build the world's biggest deepwater drilling fleet

BY CLAUDIO PASCHOA

Sete Brasil set out to build the world's biggest deep-water drilling fleet, with a large order book from Brazil's National Operator, Petrobras. That ambitious dream has sunk, along with Petrobras' credibility. The concept behind launching Sete Brasil was put forward in 2010 by a group of Petrobras executives. Sete Brasil was to be a private national company, specialized in building and leasing state-of-the-art, sixth generation, deepwater drillships and semi-submersible drilling units for lease to their only client, Petrobras. This fleet of ships was pegged for deepwater pre-salt drilling operations offshore Brazil. It was widely hoped that these new orders would stimulate local shipbuilding by building specialized ships, which had never been built in Brazil before, while aggregating value through technology transfer from experienced foreign shipbuilding partners, building new shipyards and guaranteeing high local content during construction and through the use of mainly local equipment and service suppliers.

Heavily indebted, with major cash flow problems, facing low oil prices and trying to overcome its largest corruption scandal ever, Petrobras is selling assets, reducing investments and cutting costs. This led the super-major to suspend the leasing contracts for 29 drillships and drilling rigs (23 Drillship and six Semi-Submersibles) originally signed with Sete Brasil in 2010, with a total value of US$25.7 billion. Sete Brasil's 29 rigs would be constructed by five different shipyards and operated by seven different operators. Sete's shareholding structure includes banks and investment funds. Altogether 10 institutions, which have the title of FIP Sondas, own 95% of Sete Brasil's capital. The remaining 5% is owned by Petrobras itself. Petrobras' own pention fund "Petros" is also part of the investment fund which controls FIP Sondas.

Following the cancelation of the original contract, Petrobras then offered to reduce the number of hired drillers to 19, then 15 and finally 10, all with significantly lower day rates than on the original contract. Petrobras and Sete never reached an agreement, leaving Sete Brasil short of funds and with debts exceeding R$19 billion (US$5.52 billion). This in turn forced the Sete Brasil to declare bankruptcy, with its shareholders filing for judicial recovery, to be conducted by the offices of Alvarez & Marsal, which specializes in complex corporate restructuring. Sete claims to only have sufficient funds to maintain operations until the middle of this year and on top of that, company executives and partners to some of the local shipyards contracted to build the deepwater drillers are being investigated as suspects in the ongoing "Carwash" investigation, led by the Brazilian Federal Police. For

over a year now, Sete has been unable to secure new loans, causing many local shipyards to cease building the drillers, due to lack of payments. At least six drillships or semi-subs are over 60% completed, but with construction halted or slowed at the yards, there has been a domino effect on the whole supply chain, which is also not getting paid. All the drillships originally ordered are rated to 3,000 meters with the capability to lay drill pipes to 10,000 meters, with BOPs rated to maximum pressure of 15,000 psi, and DP systems are from GE/Converteam or Kongsberg. All will utilize drilling packages from National Oilwell Varco, except for the drillships built at the EJA yard, which will use an Aker Solutions package.

Ariovaldo Santana da Rocha, President of Sinaval, the National Syndicate of Maritime and Offshore Shipbuilding and Ship Repair, complained about the lack of continuity of projects in Brazil, "The decrease in Petrobras investments, represents less oil fields to be developed, which reduces the demand

Photo: BrasFels

The Urca deepwater semi-sub nearing completion at the BrasFELS shipyardThe Arpoador drillship nearing completion at the EJA yard in early 2016.

Photo: EJA

The Arpoador drillship hull arriving at the EJA shipyard in Brazil.

for production platforms, support vessels and tankers," said Ariovaldo.

Shipyards with Sete Brasil's Orders

Enseada Shipbuilding in the northeast state of Bahia, originally had orders for six deepwater drillships. Construction on the drillers designed by British/Romanian ICE Marine Design, has been suspended since the end of last year. 70% of the Ondina drillship has been built. The Paraguaçu yard, where the drillships are being built, occupies part of an area of 1.6 million square meters in the municipality of Maragojipe in Bahia. The shipyard is capable of processing up to 36,000 tons of steel a year. The company's shareholders include Odebrecht, OAS, UTC, all being investigated in the "Carwash" operation and Kawasaki Heavy Industries, which has effectively taken over the shipbuilders, which owns a smaller yards in Bahia and another in Rio de Janeiro.

The BrasFELS Shipyard in Angra dos Reis on the south coast of Rio de Janeiro originally had firm orders for six KeppelFELS designed DSS 38E DP3 deepwater semi-submersible rigs. The Urca rig is over 90% completed and the Frade rig is at 69%. BrasFELS is a subsidiary of Singapore's KeppelFELS shipbuilding. The shipyard has a total area 1 million square meters and boasts four quays with a combined length of 1,000 meters. It has a steel processing capability of 50,000 tons a year, and is the most established of the five shipyards, being in operation since the year 2000. Keppel Corporation announced that the almost US$170million in provisions for non-payment for six rigs that were to be built for Sete Brasil remains sufficient at present. It is still not clear if they are going to take legal action against Sete Brazil, a move already taken by another Singapore rig builder SembCorp Marine.

The Jurong Aracruz Shipyard (EJA) in the state of Espirito Santo, had a contract for seven drillships designed by Jurong, worth $7 billion, for Sete Brasil on its order books. 90% of the Arpoador drillship is ready, as are 60% of the Guarapari and Camboriú drillers. It's interesting to note that the Jurong shipyard is the newest shipyard to be built in Brazil and is still partially under construction. It is owned by Sembcorp Marine from Singapore. The shipyard has a total area of 825,000 square meters, a 740 meters long quay and steel processing capacity of 48,000 tons a year. It is the newest of the shipyards involved, having begun operations in early 2015 upon arrival of the Arpoador's hull, which was built in Singapore. The shipyard itself is still partially under construction. Sembcorp Marine stated that it has begun arbitration proceedings against Sete Brasil's subsidiaries, not having been paid for orders worth billions since November 2014. With Sete being Sembcorp's biggest client, its bankruptcy is a major setback to the shipbuilder. Wong Weng Sun, Chief Executive Officer for SembCorp Marine said in a statement, that in the last financial year, the company had made provisions of around US$240 million for the Sete contracts, expressing that this is sufficient at the present moment. However he also noted that the situation could become more complex. "In Brazil, the political upheavals remain unabated, with the ongoing process to impeach the Brazilian President. Such development and the deteriorating economy have contributed to the ongoing volatility and uncertainty of the situation in Brazil," said Wong.

Two other shipyards were involved in the original Sete Brasil order. The Rio Grande Shipyard (ERG2), located in the southern state of Rio Grande do Sul, would originally be responsible for the construction of three deepwater drillships designed by Cosco. The yard has an area of 1.08 million square meters (274,000 square meters at ERG2) and a steel processing capability of 100,000 tons per year and Atlântico Sul Shipyard (EAS), located in the northeast state of Pernambuco, which originally had seven drillships under order from Sete Brasil. The yard lies in in an area of 1.62 million square meters with a steel processing capacity of 160,000 tons per year. It was the first shipyard to cancel the Sete Brazil contracts when payments began to be delayed. EAS has also suffered with the decrease in orders for tankers from Petrobras' shipping subsidiary, Transpetro.

Challenges

The main challenge now is to successfully restructure Sete Brasil, in order to conclude the ships and rigs under construction and guarantee order books for the shipyards and financing for Sete Brasil to save the 20 thousand jobs dependent on the outcome of the ship owner's restructuring process. Renegotiating Sete's massive debt will be a major hurdle and there is really no guar-

antee that the debt-restructuring project will be successful. It is understood that Petrobras' new Directors of Exploration and Production would rather see Sete defunct, as there is the option to build abroad at lower costs and just as importantly, on deadline. According to Marcelo Gomes, Executive Director of Alvarez & Marsal, Brazilian shipyards in general will need restructuring. "The maritime sector is passing through a strong moment of restructuring because of the Petrobras crisis and the new level of oil prices. The companies will need to restructure operationally and financially in order to adapt to the reality. There still exit opportunities in the maritime sector," said Marcelo.

Another dark cloud that looms in the horizon is related to ongoing "Carwash" investigations. According to the Brazil's Federal Police and Federal Prosecutors, Sete Brasil was actually conceived, as a new layer of bureaucracy, specifically engendered to facilitate embezzlement and corruption schemes, such as those already uncovered within Petrobras by the "Carwash" investigation. What is special about Sete Brasil, also according to the Federal Police, is that it's corruption funds would only be funneled to Sete Brasil executives and the governing party, the Workers Party or "PT", with PTs former treasurer, João Vaccari being directly involved in this scheme. "Although the discourse utilized for the creation of the company was to stimulate the national market, what was observed, in reality, was the implementation and use of the new business structure in order to expand the corruption scheme structured on Petrobrás," said part of a Federal Prosecution indictment. If these accusations are proven, it may well be that saving Sete Brasil becomes unviable. One thing is certain, even with Petrobras' internal restructuring and decrease in investments, it will still need some of the partially built drillships and rigs in order to pursue its pre-salt ambitions, and the huge loss of jobs resulting from ordering all its drillers from abroad would bring massive political pressure on the National Operator, effectively placing it between a rock and a very hard place.

Image: Icedesign

Artist rendition of the Ondina drillship which is 70% completed at Enseada Shipyard.

Photo: U.S. Navy

The future guided- missile destroyer USS Zumwalt (DDG 1000) departs the Bath Iron Works shipyard for its second at-sea period to conduct builder's trials,

The U.S. Navy Must Invest

As the world becomes increasingly volatile, the U.S. Navy must invest to address challenges, new & old

BY EDWARD LUNDQUIST

The U.S. Navy remains the world's most powerful fighting force on, under or above the seas. While the need for our Navy has never diminished, there are challenges to its dominance that haven't been seen in more than two decades.

The world's trade is carried at sea. Ships carry 90% of commercial trade, connecting continents. But this commercial traffic is not evenly distributed; it is often forced through narrow choke points, or hugs the coastlines, or concentrates near the busiest ports. So in addition to blue water superiority, expertise and capability is also required to operate and dominate in the crowded littoral regions of the world.

The U.S. is being confronted with a reckless Russia and a emboldened China, with and legally unsupported territorial annexations of Russia in Crimea and China in the South China Sea presented to the world as faits accomplis.

While some may sea Putin's close air encounters with U.S. Navy surface combatants and a show of strength, others view them as unnecessarily provocative and unprofessionalism.

China's land grabs in the South China Sea, which it now claims to own virtually in its entirety, are being challenged in International Court. It is certain to lose, and will likely ignore the verdict and defy any ruling to vacate the islands it has built on top of rocks and reefs. The U.S. Navy "freedom of navigation" excursions have demonstrated to the world that the U.S. will go where it chooses in international waters. Sooner or later, China will feel the need to defend its self-proclaimed sovereign territory.

The sailing of USS Lassen in the vicinity of the Spratly Islands and nearby artificial reefs in the South China Sea last fall was a "visible demonstration" of America's commitment to maintaining freedom of navigation for everyone,. USS Curtis Wilbur conducted a similar freedom of navigation patrol near the disputed Triton Island earlier this year.

Both Russia and China are fielding new weapons designed to counter the Seapower of the carrier strike group. Some assert that these new anti-ship weapons will render the carriers and their air wing and escorts vulnerable and obsolete. That assumption may be premature; the U.S. has some anti-access tricks up its sleeve, too.

Meanwhile, the demand signal by the combatant commanders for naval forces continues to exceed supply. The Navy continues to be forward and present. The Navy is in every ocean, and every continent. But it is spread thin. Deployments are being extended, and coverage is being gapped.

The defense budget continues to support the acquisition of ships, submarines and aircraft. As always, there is the tension of finite resources and rising costs.

Postponing the purchase of new systems means extending the life of existing ones, and that also comes with a heavy price.

And if recapitalizing and modernizing the conventional fleet wasn't a big enough problem, there are huge costs associated with the replacement of the Ohio-class of ballistic missile submarines (SSBNs). Referred to as the ORP (Ohio Replacement Program), its projected cost each year will be greater than the rest of the shipbuilding program combined.

In his 2016 posture statement to the Congress, Secretary of the Navy Ray Mabus called Navy shipbuilding an essential part of our country's larger shipbuilding and repair industry, which he said provides more than 400,000 jobs and contributes more than $37 billion to America's gross domestic product. "Shipbuilding enhances and strengthens economic security as well as national security. The work we have done, and must continue to do, will reinforce the importance of maintaining a partnership with the industrial base, as well as keep our shipbuilding industry strong and ready to support the national security needs of our Navy and our country," Mabus said. "Across our shipbuilding portfolio, we have employed direct, impactful actions including increased competition within and across product lines, using block buys and multi-year procurements when products are mature; ensuring designs are stable before entering into production; pursuing cross-program common-equipment buys; and achieving affordability through hard-but-fair bargaining. This would not have been possible without Congressional approval on items like multi-year procurements."

"Stability and predictability are critical to the health and sustainment of the industrial base that builds our Fleet," Maybus said. "Changes in ship procurement plans are significant because of the long lead time, specialized skills, and extent of integration needed to build military ships. The skills required to build ships are perishable, and, in the past, we have lost talent in this critical industry when plans have changed. Each ship is a significant fraction of not only the Navy's shipbuilding budget but also industry's workload and regional employment."

Ohio Replacement

Secretary of Defense Ash Carter, appearing before the House Armed Services Committee in March 2016, said undersea capability is a critical strength of the United States. "We need to keep that strength, and extend that strength. The biggest issue we are going to face beginning in the '20s is the beginning of the Ohio Class Replacement, and that is the building once again of SSBNs as well as attack submarines SSNs, which we are doing today. And we have been stressing now for several years we are going to need some consideration of the need to recapitalize our undersea nuclear deterrent, because that can't be done at the expense of the rest of our undersea fleet or we will erode our dominance and that is major issue that's looming in the '20s"

The Navy has begun the research and development efforts for the SSBN(X) Ohio Replacement Program (ORP), which will focus on the propulsion plant, common missile compartment, and platform development technologies such as the propulsor, strategic weapons system, and maneuvering/ship control.

The Navy has stated that ORP is the number one shipbuilding priority, and it will be the most expensive, costing between $97 billion and $347 billion, depending on whose estimate you believe. And it can't start the program too soon. The design process has to begin this year to enable construction to begin in 2021 and for the first operational patrol to be conducted in 2031.

The Navy's Submarine Unified Build Strategy, or SUBS, announced on March 28, describes the way ahead for concurrent construction of the Ohio Replacement and the Virginia class attack submarine (SSN). General Dynamics Electric Boat will be the prime contractor for the OR program, while Huntington Ingalls Industries - Newport News Shipbuilding (HII-NNS) will be the major subcontractor to the program. In turn, HII-NNS will receive a greater share of the SSN program.

Design for Affordability

The Virginia class are being built at two different submarine yards on a shared basis. Huntington Ingalls Industries and General Dynamics are America's only submarine construction shipyards, constructing submarines at Newport News Shipbuilding in Virginia and the Electric Boat Company in Connecticut, respectively.

Working with its suppliers, the Navy instituted a "Design for Affordability" process to invest in ways to design and build the newest Block III Virginia class boats for less cost without reduc-

U.S. NAVY BY THE NUMBERS

Virginia Class Milestones

PCU North Dakota (SSN 784) -commissioned 2014

PCU John Warner (SSN 785) commissioned 2015

PCU Illinois (SSN 786) - keel laid Jun 2, 2014
Delivery Yard - General Dynamics Electric Boat
Contract Delivery Date - 31 August 2016
Estimated Delivery Date - Summer 2016

PCU Washington (SSN 787) - keel laid Nov 22, 2014
Delivery Yard - HII- Newport News
Contract Delivery Date - 28 February 2017
Est. Delivery Date -Fall 2016

PCU Colorado (SSN 788) - keel laid Mar 7, 2015
Delivery Yard - General Dynamics Electric Boat
Contract Delivery Date - 31 August 2017
Est. Delivery Date - Winter 2017 (2nd QTR FY17)

PCU Indiana (SSN 789) -keel laid May 16, 2015
Delivery Yard - HII - Newport News
Contract Delivery Date - 28 February 2018
Est. Delivery Date -Summer 2017

PCU South Dakota (SSN 790) -keel laid 4/4/2016
Delivery Yard -General Dynamics Electric Boat
Contract Delivery Date - 31 August 2018
Est. Delivery Date - Winter 2018 (2nd QTR FY18)

PCU Delaware (SSN 791) -keel laid April 30, 2016
Delivery Yard -HII - Newport News
Contract Delivery Date - 28 February 2019
Est. Delivery Date - Fall 2018

PCU Vermont (SSN 792) – Keel Lay TBD
Delivery Yard - General Dynamics Electric Boat
Contract Delivery Date - 30 June 2019

PCU Oregon (SSN 793) – Keel Lay TBD
Delivery Yard - General Dynamics Electric Boat
Contract Delivery Date - 30 November 2019

PCU Montana (SSN 794) – Keel Lay TBD
Delivery Yard – HII – Newport News Shipbuilding
Contract Delivery Date - 31 May 2020

PCU Hyman G. Rickover (SSN 795) – Keel Lay TBD
Delivery Yard - General Dynamics Electric Boat
Contract Delivery Date - 30 September 2020

PCU New Jersey (SSN 796) – Keel Lay TBD
Delivery Yard – HII – Newport News Shipbuilding
Contract Delivery Date - 28 February 2021

PCU Iowa (SSN 797) – Keel Lay TBD
Delivery Yard – General Dynamics Electric Boat
Contract Delivery Date 31 August 2021

PCU Massachusetts (SSN 798) – Keel Lay TBD
Delivery Yard – HII – Newport News Shipbuilding
Contract Delivery Date – 28 February 2022

PCU Idaho (SSN 799) – Keel Lay TBD
Delivery Yard – General Dynamics Electric Boat
Contract Delivery Date – 31 August 2022

SSN 780 – Keel Lay TBD
Delivery Yard – HII – Newport News Shipbuilding
Contract Delivery Date – 28 February 2023

PCU Utah (SSN 801) – Keel Lay TBD
Delivery Yard – General Dynamics Electric Boat
Contract Delivery Date – 31 August 2023

U.S. Navy photo courtesy of the Royal Navy

The fast attack submarine USS Virginia (SSN 774), right, arrives at Her Majesty's Naval Base, Clyde for a scheduled port visit March 22, 2016. Virginia, lead boat of the Virginia-class submarines, is conducting naval ops in the U.S. 6th Fleet area of operations in support of U.S. national security interests in Europe.

ing capability. The Navy and its industry partners reduced the construction span by over two years from an 86-month span down to 62 months. One design change focused on changing the 12 vertical-launch missile tubes to two Virginia Payload Tubes (VPT) with six missiles each in the bow of the ship. The next step in the evolution of the Virginia class will be the addition of the Virginia Payload Modules (VPM), a 70-foot hull insertion that adds four 7-misssile VPT launchers to provide even more capability.

Carriers

The first of the new CVN 78 class of nuclear powered aircraft carriers, USS Gerald Ford, is nearing completing. The crews are conducting "fast cruises" to prepare for getting underway. Commissioning may take in September. Mabus says the Navy has "a steady state Ford Class procurement plan designed to deliver each new ship in close alignment with the Nimitz Class ship it replaces. CVN 78 cost performance has remained stable since 2011 and this lead ship will deliver under the Congressional cost cap."

The Ford class is based on the Nimitz class hull form, but has new propulsion and power distribution systems, sensors, electromagnetic catapults, and many other new features.

Surface Combatants

The Navy continues to procure the Arleigh Burke-class guided missile destroyer. The lead ship was commissioned in 1991, and the ships being procured today have upgraded to integrated air and missile defense as well as ballistic missile defense (BMD) capability. The newest version, called Flight III, will have the new Air and Missile Defense Radar.

The success of the Aegis system for BMD missions has resulted in the establishment of a land-based Aegis Ashore Missile Defense System in Romania, with a second planned for Poland, as part of the European Phased Adaptive Approach to defend Europe from Iranian missiles.

The first Zumwalt class destroyers has conducted sea trials, while the other two continue construction at General Dynamics Bath Iron Works. Although it's called a destroyer, at nearly 16,000 tons it is much larger with more robust offensive capability, than other surface combatants. With a high degree of automation, it is manned with a crew of 142. By comparison, a 9,500 ton Arleigh Burke class DDG has a crew of about 300. The Zumwalts also have considerable power, weight and space margins for new weapons like rail guns and lasers. The future USS Zumwalt (DDG 1000) completed the at-sea portion of acceptance trials, demonstrating her systems for the Navy's Board of Inspection and Survey (INSURV) in April.

While new DDGs are being built, the existing fleet of cruisers and destroyers must be kept combat relevant. The destroyer modernization program includes Hull, Mechanical, and Electrical (HM&E) upgrades as well as combat systems improvements with upgraded AEGIS weapons systems. Advanced Capability Build (ACB) 12 to include open architecture computing environment, BMD capability, installation of the Evolved Sea Sparrow Missile (ESSM), integration of the SM-6 missile, and improved air dominance with processing upgrades and Naval Integrated Fire Control-Counter Air capability.

This renovation reduces total ownership costs and expands mission capability for current and future combat capabilities. 21 Cruiser modernization ensures

U.S. NAVY BY THE NUMBERS

Hull #	Hull Name	Shipyard	Milestone	Milestone Date
AGOR 27	NEIL ARMSTRONG	Dakota Creek	Christening	29-Mar-14
AGOR 28	SALLY RIDE	Dakota Creek	Christening	9-Aug-14
DDG 1000	ZUMWALT	BIW	Christening	12-Apr-14
DDG 1001	MICHAEL MONSOOR	BIW	Keel Laying	23-May-13
DDG 1002	LYNDON B JOHNSON	BIW	Start Fabrication	4-Apr-12
DDG 113	JOHN FINN	HII	Keel Laying	18-Nov-13
DDG 114	RALPH JOHNSON	HII	Keel Laying	12-Sep-14
DDG 115	RAFAEL PERALTA	BIW	Keel Laying	18-Oct-14
DDG 116	THOMAS HUDNER	BIW	Start Fabrication	15-Feb-13
DDG 117	PAUL IGNATIUS	HII	Start Fabrication	30-Sep-14
DDG 118	DANIEL INOUYE	BIW	Start Fabrication	31-Oct-14
JHSV 4	FALL RIVER	Austal	(Delivered)	15-Sep-14
JHSV 5	TRENTON	Austal	(Delivered)	13-Apr-15
JHSV 6	BRUNSWICK	Austal	Launch	19-May-15
JHSV 7	CARSON CITY	Austal	Start Fabrication	9/14
JHSV 8	YUMA	Austal	Start Fabrication	2/15
LHA 7	TRIPOLI	HII	Keel Laying	20-Jun-14
LPD 26	JOHN P MURTHA	HII	Christening	21-Mar-15
LPD 27	PORTLAND	HII	Keel Laying	20-May-13
MLP 3	LEWIS B PULLER	NASSCO	Launch	7-Nov-14
T-AGS 66	MAURY	VT Halter	Christening	27-Mar-13
LCS 7	Detroit	FMM	Acceptance Trials	Jun-16
LCS 8	Montgomery	Austal	Acceptance Trials	May-16
LCS 9	Little Rock	FMM	Builders Trials	Jul-16
LCS 10	Gabrielle Giffords	Austal	Builders Trials	Aug-16
LCS 11	Sioux City	FMM	Builders Trials	Apr-17
LCS 12	Omaha	Austal	Builders Trials	Jan-17
LCS 13	Wichita	FMM	Launch/Christening	Jul-16
LCS 14	Manchester	Austal	Launch/Christening	May-16
LCS 15	Billings	FMM	Launch/Christening	Dec-16
LCS 16	Tulsa	Austal	Launch/Christening	Nov-16
LCS 17	Indianapolis	FMM	Keel Laying	Jun-16
LCS 18	Charleston	Austal	Keel Laying	May-16
LCS 19	St. Louis	FMM	Start Fabrication	Apr-16
LCS 20	Cincinnati	Austal	Keel Laying	Nov-16
LCS 21	Minneapolis/St. Paul	FMM	Start Fabrication	Jul-16
LCS 22	Kansas City	Austal	Start Fabrication	Jul-16
LCS 23	Cooperstown	FMM	Start Fabrication	Dec-16
LCS 24	Oakland	Austal	Start Fabrication	Jan-17
LCS 25	TBD	FMM	Start Fabrication	Dec-17
LCS 26	TBD	Austal	Start Fabrication	Sep-17

Independence-variant of the Littoral Combat Ship.

Photo: U.S. Navy

(U.S. Navy Photo by Bill Mesta/Released)

U.S. Navy Sailors attached to Military Sealift Command's Expeditionary Fast Transport class ship, USNS Spearhead (T-EFP 1), man the rails at Joint Expeditionary Base Little Creek-Fort Story. Spearhead pulled into the joint base signifying the completion of a five month deployment in support of Africa Partnership Station 2016.

long-term capability and capacity for purpose-built Air Defense Commander (ADC) platforms.

"We now have six ships of this class delivered, 18 currently on contract, and two additional ships to award this fiscal year," said Maybus in his 2016 posture statement to Congress. "We are currently upgrading the design, which will significantly increase LCS lethality and survivability, to be introduced no later than FY19, and potentially as early as FY18. Because of these ships' enhanced counter-surface and countersubmarine capabilities, contributing to their role in Battle Group operations, we are redesignating these future ships as Frigates."

LCS average ship construction cost, under the current block buy contracts, has decreased by nearly 50 percent in comparison to LCS hulls contracted prior to 2009, Mabus said.

The Navy plans to solicit bids for detailed design and construction of the first six ships in the T-AO 205s and the LHA 8 amphibious assault ship called LHA-8 that the Navy wants to procure in FY2017, but only opening the competition to the two bidders—Huntington Ingalls Industries' Ingalls Shipbuilding (HII/Ingalls) and General Dynamics' National Steel and Shipbuilding Company (GD/NASSCO) – capable of building either. One of these two shipyards will be awarded the first six TAO-205s; the other shipyard will be awarded LHA-8.

The Navy has announced that the replacement for the 12 Whidbey Island and Harpers Ferry amphibious ships (LSDs) will be 11 ships based on the San Antonio-class LPD. LPDs are generally larger and more capable than LSDs. The new ships, referred to as the LX(R), will be a modified and less costly version of the existing LPD hull design.

Combat Enablers

USNS Lewis B. Puller, the first Expeditionary Mobile Base (ESB), formerly the Afloat Forward Staging Base, will relieve the USS Ponce in the Arabian Gulf. The Navy's two Expeditionary Transport Docks (ESD), formerly known as the Mobile Landing Platform) will support the prepositioning fleet. The first six Expeditionary Fast Transports (EPF), formerly designated the Joint High Speed Vessel) have been delivered, with three more under construction. The total program is for 10 ships, but funding has been authorized for two more. The Navy has embarked on the procurement of a new class of replenishment ships, the John Lewis (T-AO 205) class oiler shipbuilding program, previously known as the T-AO(X) program. The first ship was funded in 2016 and the Navy eventually wants to build 17 of them. A small but important program is getting underway to build five T-ATF(X) fleet ocean tugs.

Great Green Fleet

With the deployment of the USS John C. Stennis Carrier Strike Group in January, Secretary Mabus has been able to see the realization of his "Great Green Fleet," with ships powered by biofuels. Even with todays depressed oil prices, the cost is bound to go back up, and obtaining petroleum products is a logistical challenge. Renewable fuels is one way to diversify the supply of energy. As the availability of "drop in" biofuels is going up, cost is coming down.

While some have called the Great Green Fleet a publicity stunt, Mabus says it's all about warfighting. "Diversifying our energy sources arms us with operational flexibility and strengthens our ability to provide presence, turning the tables on those who would use energy as a weapon against us," Mabus said.

People

But even with the newest ships and aircraft, the navy still relies on the quality of its personnel.

Chief of Naval Operations Admiral Richardson said, "The most important part of our Navy is our Team – Everything we do starts and ends with them. As our platforms and missions become more complex, our need for talented people continues to be a challenge. Admiral Mark Ferguson, commander of U.S. Naval Forces Europe and Africa and Allied Joint Command Naples, agrees, and thinks today's force is the best ever.

"As I look over just my career, my 42 years from the time I entered Annapolis to now, I came in when we transitioned from the draft to the all-volunteer force, and I saw what that force looked like when I was an ensign and I see it now. When the history books are written, they will say that the biggest achievement of this era has been the creation of this professional, all-volunteer force – a force with pride, amazing professionalism, education, and performance levels," Ferguson said. "As I look at all the enlisted ranks, especially the young Sailors, it's the highest quality force we have ever had. And it's having significant, positive impacts on the organization – we can never take it for granted."

U.S. NAVY BY THE NUMBERS

Photo: U.S. Navy

Aircraft Carrier Update

USS Nimitz (CVN 68)
Undergoing scheduled maintenance availability
Home port: Bremerton, WA

USS Dwight D. Eisenhower (CVN 69)
Pre-deployment stand down
Home port: Norfolk, VA

USS Carl Vinson (CVN 70)
Post availability work-ups
Home port: San Diego, CA

USS Theodore Roosevelt (CVN 71)
Local operations, preparations for 6 June availability
Home port: San Diego, CA

USS Abraham Lincoln (CVN 72)
Undergoing RCOH at Huntington Ingalls Industries, Newport News Shipbuilding.
Home port: Newport News, VA

USS George Washington (CVN 73)
local ops, awaiting of RCOH
Home port: Norfolk, VA.

USS John C. Stennis (CVN 74) Pictured Above
deployed
Home port: Bremerton, WA

USS Harry S. Truman (CVN 75)
deployed
Home port: Newport News, VA

USS Ronald Reagan (CVN 76)
undergoing scheduled maintenance availability
Home port: Yokosuka, Japan

USS George H.W. Bush (CVN 77)
undergoing scheduled maintenance Availability
Homeport: Newport News, VA

Under Construction or Proposed

Gerald R. Ford (CVN 78)
Scheduled to be commissioned in Fall 2016.

John F. Kennedy (CVN 79)
Keel laying took place Aug 2015
Phase I scheduled for delivery 2022.

Enterprise (CVN 80)
Scheduled to be commissioned in 2027.

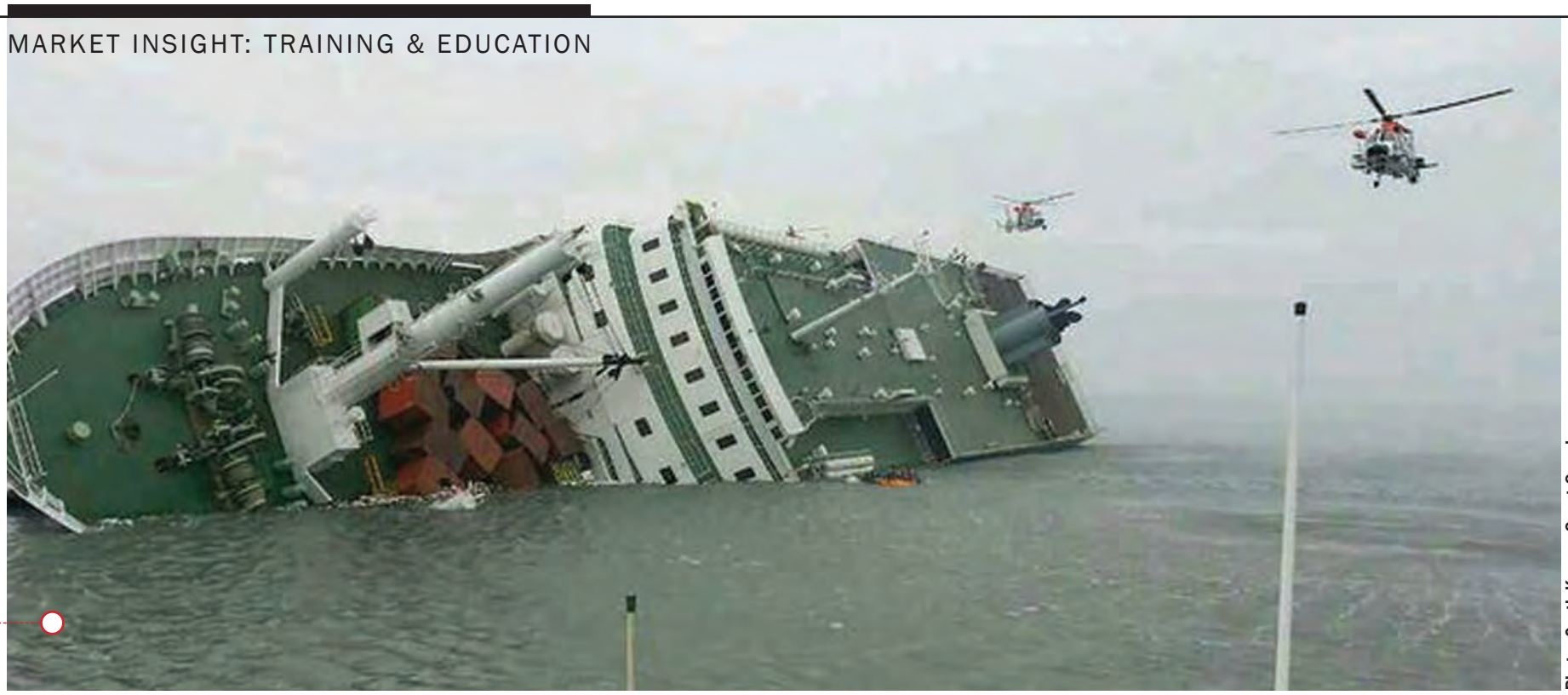


Photo: South Korean Coast Guard

Not Keeping Watch

As seemingly senseless accidents continue to occur, maritime mandates for improved training and education continue in earnest

BY DENNIS BRYANT

Some of the first things that mariners learn are how to keep the watch and the importance of keeping the watch. The rest of the crew trusts their lives to you keeping a proper watch, as does the ship owner and the cargo owner. Other ships in your vicinity trust that you are keeping a proper watch. Owners of the waterfront facilities that you call at or pass along the voyage trust that you are keeping a proper watch. Finally, and perhaps most importantly, the public trusts that you are keeping a proper watch, because your failure to do so has the potential to harm persons, property and the environment.

Lack of Skill

Sometimes, an individual without the necessary skill is assigned to keep the watch. These instances can be more difficult to detect as the individual has the necessary training and knowledge to do the job, but lacks the skill to meaningfully apply that training and knowledge to the task at hand. This can occur, for example, when a highly capable chief mate is promoted to master, but lacks the skill set to handle the new job, a situation sometimes referred to as the Peter Principle. Unfortunately, these situations, while fraught with potential misfortune for all involved, can be difficult to detect. On April 16 2014, the ferry **Sewol** sank en route from Incheon to Jeju, South Korea. Of the 476 passengers and crew on board, only 172 survived. Among the various factors leading to this tragedy, it was revealed that the master, who had the proper training and knowledge, lacked the temperament and skills to perform his duties except under the most routine circumstances.

Lack of Training and Knowledge

There are several variations on how to keep a proper watch, but all involve training, knowledge, skill and attention to detail. On the other hand, there are innumerable ways for not keeping the watch. On rare occasions, an individual without adequate training and knowledge comes into the position of keeping the watch. This can occur when the individual's training and experience records have been falsified or he system has just failed. Fortunately, these situations are generally (but not always) discovered quickly and the individual is removed from the position. On July 23 2008, the towboat **Mel Oliver** was pushing the barge DM932 across the Mississippi River at New Orleans when it collided with the tanker **Tintomara**, resulting in a major oil spill. Investigation revealed that the individual at the helm of the towboat was unlicensed and unskilled. On March 10 2016, the Department of Justice (DOJ) announced the arrest of the master of a dinner cruise vessel in Houston. The individual is accused of stealing the identity of a deceased mariner to obtain, among other things, a merchant mariner credential and a transportation worker identification credential.

Lack of Attention to Detail

The most common circumstance in which an individual fails to keep a proper watch is due to lack of attention to detail. This can occur and has occurred for many reasons and in a plethora of situations. A few examples follow.

Health

On June 23 1995, the passenger ship **Star Princess** grounded on the submerged Poundstone Rock in the Lynn Canal of Alaska's Inside Passage, resulting in no injuries, but significant bottom damage. The probable cause of the casualty was the pilot's poor performance, which may have been exacerbated by chronic fatigue caused by sleep apnea.

Drug Abuse (legal and illegal)

On November 7 2007, the containership **Cosco Busan** allided with the Delta Tower of the San Francisco-Oakland Bay Bridge, spilling 53,500 gallons of fuel oil. The primary cause of the casualty was the failure to safely navigate the vessel in restricted visibility due to, among other things, the degraded cognitive performance of the pilot from his use of numerous impairing prescription medications.

Alcohol abuse

The general cargo ship **Lysblink Seaways** grounded in West Scotland on February 18 2015. The ship grounded at full speed, suffering severe damage, and was later declared a constructive total loss. Investigation revealed that the primary cause of the grounding was that the of-

ficer of the watch and sole watchkeeper had become inattentive shortly before due to the effects of alcohol consumption.

Stress

The tug **Caribbean Sea** and its tow collided with an amphibious passenger vessel in the Delaware River at Philadelphia on July 7 2010. The passenger vessel sank quickly, with a loss of two lives. The primary cause of the casualty was the stress being experienced by the mate on the tug leading to distraction as he almost continually utilized his cellular telephone and laptop computer, dealing with family matters.

Fatigue

On June 23 1989, the tanker **World Prodigy** grounded on Brenton Reef in Rhode Island Sound, spilling several thousand barrels of diesel oil from its cargo tanks. The probable cause of the casualty was the impaired judgment of the master due to acute fatigue. The master had been on the bridge conning the vessel almost continuously for 33 hours.

Distraction

The cruise ship **Costa Concordia** grounded on charted rocks off the Italian island of Giglio on January 13 2012. The master, who was conning the vessel, wanted to pass close to shore as a treat to passengers and a favor to a crew member. He was apparently distracted from his navigational duties by the young Moldovan dancer whom he had invited to dine with him on the bridge.

Complacency

The bulk carrier **Oliva**, carrying 60,000 tonnes of soya beans from Brazil to China, grounded off Nightingale Island in the Tristan da Cunha archipelago in the South Atlantic on March 16 2011. At the time, the vessel was travelling at full sea speed (about 12 knots). Undetected poor passage planning had resulted in a course tracking right through the obscure island. At sea, the vessel was steered primarily by means of autopilot fitted with GPS input. The officer of the watch at the time of the incident saw something ahead on the radar, but thought that it was merely the return from the low-lying storm clouds that he had observed. He did not realize that the clouds were directly over and obscured the large (and hard) island. The grounding ripped open the bottom of the vessel, but the crew was able to evacuate to a passing fishing vessel. The soya beans and the 1,700 metric tons of fuel oil from the Oliva spilled into the sea.

The Bottom Line

While the incidents described can be depressing for mariners to read, it must be acknowledged that the vast, vast majority of watches are kept properly. Proper watchkeeping is so common that it does not attract attention and is seldom recognized. A mariner can keep the watch properly for 20 years, yet one instance of not keeping the watch may end a career. Life at sea, as with many professions entailing great responsibility, is rewarding, but also unforgiving.

Photo: Carnival

The Carnival Way

Just outside of Amsterdam, Carnival is set to open the Arison Maritime Center, an ode to its founders and home of the CSMART Academy

BY GREG TRAUTHWEIN

Next month Carnival Corporation will "cut the ribbon" and officially open its new **CSMART Academy**, the centerpiece of seven-acre Arison Maritime Center located outside Amsterdam, which by name honors longtime board chairman Micky Arison and his father Ted, founder of the company.

While it is difficult to pinpoint with great accuracy an exact number which quantifies the growth in simulation in the maritime sector, with the scheduled July 14, 2016, opening of Carnival Corporation's CSMART Academy just outside of Amsterdam in the town of Almere should provide adequate fodder: An investment of $85 million for the entire Arison Maritime Center, which includes a hotel, comes after the company outgrew its current CSMART Academy, which was opened in the same city only seven years ago.

By the Numbers

As one might expect from the world's leading cruise company – a company which was founded n 1972 with just one -secondhand ship and just enough fuel to make a one-way trip from Miami to San Juan, and has since grown to be the dominate cruise company with 10 brands, 101 ships with 225,000 lower berths in operation, and 15 new ships scheduled for delivery by 2020 – the Arison Maritime Center is large, well-appointed and impressive. The entire facility comes in with a price tag of about $85 million, and the CSMART Academy at the Arison Maritime Center will have approximately 40 permanent instructors and 24 line instructors who divide their time between the CSMART Academy and their work onboard, according to Capt. Hans Hederström, FNI, Managing Director, CSMART. When the new facility opens in July 2016, the company expects to hire up to another 25 employees.

At nearly 110,000 square feet, the center is more than double the size of the current facility, anticipated to train more than 6,500 deck and engineering officers every year. The new five-story CSMART Academy at the Arison Maritime Center will feature a full complement of state-of-the-art simulators from Transas; four full-mission bridge simulators and four full-mission engine room simulators. It will also include 24 part-task engine simulators, eight debriefing rooms and eight part-task bridge simulators. It will also include an advanced medical center and an 11-story, 176-room hotel for Carnival Corporation trainees. While the facility is designed primarily for the use of Carnival Corporation, the company said, space pending, the facility may be available for other cruise companies to train, provided they provide their own instructors, who must first be trained and certified by CSMART Academy instructors.

Simulation: The Machinery

While the seven acre Arison Maritime Center is diverse, the heart and soul of the facility arguably is the Transas Bridge and Engine simulators. Predictably the set up of the bridge and bridge wings mirror the new Carnival Corporation bridge, first used on the new Koningsdam from the company's Holland America Line brand. The full mission engine room simulators are modeled around the following three classes of

"When complete, the Arison Maritime Center and CSMART Academy will be an extraordinary operation dedicated to providing our deck and technical officers **– the heart and soul of ensuring our ships operate as safely as possible – with the most advanced and progressive training, professional development and research in the cruise and maritime industry."**

David Christie,
Senior Vice President of Maritime Quality Assurance for Carnival Corporation

Photo: Carnival

ships: Royal class, Signature class and Hyperion class.

"Transas is extremely proud and honored to be involved in this significant contribution to Carnivals' Arison Maritime Center," said Frank J Coles, Chief Executive Officer, Transas. "Transas supplied four full-mission bridge simulators and four full-mission engine room simulators, 24 part-task engine simulators, eight debriefing rooms and eight part-task bridge simulators. The level of dedication by Carnival to the objective of producing high quality officers and training is matched by the Transas production of technical solutions, realistic environment and training content and capabilities. Together the companies have shown the way for future training."

According to Capt. Hederström, two senior engineering instructors have been working with Transas for 15 months to ensure the simulator model visuals and operational characteristics closely match the modeled vessels. The emphasis has been on providing the real shipboard experience for participants, with the simulator emulating the complex control and automation systems found onboard the ships. Normal operations are fully simulated, including all environmental controls such as exhaust emissions, duel fuel operation, ballast water treatment, membrane sewage systems and oil pollution prevention, said Capt. Hederström. Emergency situations are also modeled, allowing existing ship emergency procedures to be practiced in the simulator.

Keeping abreast of rapidly evolving simulation technology is truly the trick to maximizing the training and education benefits of the facilities, and Capt. Hederström admitted that in the seven short years since the inaugural facility was opened in Almere, simulation technology has changed mightily. "With the rapid evolution of technology and more powerful computers, it is now possible to build high-fidelity simulators that use much less physical hardware but are capable of creating much more realistic simulator scenarios," said Capt. Hederström. "Other advantages include lower power consumption and less downtime thanks to higher redundancy."

While the company dubbed its annual operating budget "proprietary," it did confirm that software is updated at least once a year.

Advances at the new CSMART Academy at Carnival Corporation's Arison Maritime Center include:

- The bridge layout and equipment are the same as onboard Holland America Line's Koningsdam, which just began operating in May 2016 as the newest ship in the Carnival Corporation fleet
- Bridge wings are included on all four bridges, where the visuals are projected in a dome for realistic bridge wing operations
- All bridges have a safety center behind the bridge, just as in the real world
- All bridges and engine control rooms (ECRs) have their own debriefing room with TV-quality video replay.

Photo: Carnival

Ted Arison

founded the company in 1972 with one ship and a goal to making cruising available to people from all walks of life. Referred to by The *New York Times* as "the godfather of the modern cruise industry."

Photo: Carnival

Micky Arison

began his career at Carnival Cruise Line in 1972 and in 1990 was appointed chairman of Carnival Corporation by the company's board of directors.

Photo: Transas

Frank J. Coles

CEO of Transas, supplier of the simulators for the CSMART Center. "Transas is extremely proud and honored to be involved in this significant contribution to Carnivals' Arison Maritime Center."

• Engine Control Rooms are based on actual ship layouts and systems, scaled to size
• Virtual machinery spaces utilizing high-level technologies and avatars
• High voltage and automation workshops allowing interface with actual high and low voltage electrical breakers with virtual breakers to provide training for safe operation, maintenance and isolation procedures

People: The Heart & Soul

While the building and facilities are the visible manifestation of the $85 million investment, the heart and soul of the facility lies in its instructors and processes, particularly the CSMART Academy has played a role in developing and refining a function-based bridge and engine room management system on a large scale.

The function-based system creates what is known as organizational redundancy – giving every member of the bridge and engine room teams a voice and role in safely operating the ship and encouraging officers at all levels to speak up. Officers work under the captain's and chief engineer's direction as a coordinated team to manage bridge and engine rooms based on specific functions, with tasks verbalized, agreed upon and then executed. In keeping with the faculty team's leadership, the Arison Maritime Center will provide the additional space needed to implement the industry's first Proficiency Training and Assessment (PTA) program. The week-long course is based on a specially developed curriculum that annually refreshes and then evaluates each of the corporation's maritime officers.

What is the PTA Program?

"The Proficiency Training and Assessment Program (PTA) is a new concept in the cruise industry – and one we are quite proud of," said Capt. Hederström. "In other safety critical industries such as aviation and nuclear power generation, similar programs have been a permanent feature for some time. What makes the PTA unique to Carnival Corporation and its 10 cruise line brands is the complexity of the program. It combines recurrent training with measurable assurance that our officers have achieved, and are

Rendering of CSMART Hotel & Training Center.

Photo: Carnival

maintaining, the training standards that their considerable responsibilities require." Completing the PTA every year is compulsory as part of the company's Continuous Professional Development matrix. This exceeds regulatory requirements and establishes Carnival Corporation and its 10 brands as maritime industry leaders.

The design is flexible with a fixed component of core competency and a variable component, adjusted to the developing needs.

As a whole it ensures that officers are kept informed of emerging changes to practices, equipment and regulations while they are also assessed on what they can be reasonably expected to know and expect to encounter during the performance of their duties.

It focuses primarily upon responses to abnormal situations, where procedural knowledge and Bridge Resource Management application are tested, said Capt. Hederström. It also looks at technical competencies as well as the knowledge of the International Regulations for the Prevention of Collisions at Sea (COLREG) in accordance with the requirements of the International Standards for Watch-keeping (STCW).

The procedural assessments in the simulator are based on a behavioral marker system, overseen by independent assessors using approved scoring systems. The COLREG element is tested following a refresher lecture using a multiple-choice examination from a large question bank. Should any participant not meet the standards on the first attempt, time is set aside on the last day of PTA for them to retake elements as required. Should participants still not achieve an acceptable standard, they will be returned to their parent cruise line brand with a recommendation for further training, which will include a summary of recommended focus areas for further development. For participants to be eligible, they must first successfully attend at least four of our existing training courses.

The Bottom Line

Carnival Corporation is:

- 10 Cruise Line Brands
- 101 ships
- 255,000 lower berths
- More than 11,000,000 passengers per year
- More than 120,000 employees globally

The Arison Maritime Center is

- An $85 million investment
- A 12-story hotel to accommodate 176
- Home to the CSMART Academy, including
  - o 110,000 sq. ft.
  - o 6500 officers trained per year
  - o Four Full Mission Bridge Simulators
  - o Four Full Mission Engine Room Simulators
  - o 24 Part-Task Engine Simulators
  - o 8 Part-Task Bridge Simulators
  - o 8 debriefing rooms
  - o High Voltage Training
  - o Engine Workshop
  - o CBT Training
  - o Stability Training

(Credit: James Delgado Collection)

Dr. James Delgado

NOAA's Director of Maritime Heritage discusses the importance of preserving our maritime past and understanding our connection to the sea.

BY KATHY A SMITH

Nearly a century ago, Lieutenant Ernest Larkin Jones was lost at sea. For decades, his surviving descendants, and the families of the other 55 seamen aboard the USS Conestoga had no idea what had happened to their loved ones. The ship that had left Mare Island, near San Francisco Bay on March 25, 1921 bound for Pearl Harbor, Hawaii had vanished without a trace.

Fast forward to March 23, 2016. NOAA (National Oceanic Atmospheric Administration) revealed to worldwide media that the wreck had finally been found – almost by accident – in the Greater Farallones National Marine Sanctuary in California. The announcement was made after several family members of the captain and crew had been personally notified – a job Dr. James Delgado, NOAA's director of maritime heritage and his colleagues, take very seriously.

Just a week earlier, arriving at the house of a woman whose grandfather had perished in the tragedy, Delgado prepared himself. He knew the meeting would be very emotional on both sides.

As he and his NOAA colleagues were greeted warmly by Diane Gollnitz, granddaughter of Lieutenant Jones, Delgado's mind flashed back to the moment he knew for sure the elusive wreck's identity – the encrusted barrel of a 3-inch/50-caliber single-fire naval rifle served as the proverbial "smoking gun" that solidified the sunken vessel's place in U.S. naval history.

Jones was the commanding officer of the ill-fated civilian coal-barge-towing

Technology has changed so rapidly in the undersea world that I feel in some ways as if we have catapulted out of one century to another. Whether it's positioning with GPS and better satellite range, or robotic technologies such as remotely operated vehicles and autonomous underwater vehicles, we have the ability to move more quickly and efficiently with less expense.

tug, turned World War I supply transportation and convoy escort. Delgado soon learned from Gollnitz how the loss of Jones had taken a huge emotional toll on her mother.

It was a special career-defining moment for Delgado, who, very early on, had ambitions to become an astronaut. But that all changed when he was introduced to archaeology and history at age 10.

Just four years later, growing up near the Santa Teresa foothills in San Jose, California (now famed as "Silicon Valley"), the 14-year-old with a love of the past, talked his way on to a construction site where bulldozers were unearthing the burials and artifacts of the Ohlone people who had lived in the area thousands of years ago.

The outline of golden-stained ribs and the curve of a skull protruded, fossil-like, from the sidewall of a trench, he remembers, tantalizingly called him to his future path. He rescued more than 100 burials from destruction as well as many artifacts. The skeletal remains were reburied by the Ohlone descendants. Later, beginning in his junior high school years, he began working with local archaeologists, and at age 20, joined the National Park Service. There, he learned to scuba dive while working as an historian and archaeologist for the National Park Service in San Francisco.

Not surprisingly, his career has taken him all over the globe and to several hundred fathoms under the sea. He has been part of some of the world's most famous shipwreck investigations, 150 and counting, that range from wrecks dating from 2,700 years ago to ships of a bygone steamer era like R.J. Walker, the U.S. Coastal Survey sidewheel steamship (NOAA's predecessor organization) and Titanic.

Delgado actually made a trip to the unsinkable passenger liner in 2000 in a Mir submersible. Then in 2010 as chief scientist, he worked with a team of scientists responsible for documenting the wreck; together they created the first-ever 3-D map of her tangled and scattered remains. Preserving Titanic's legacy for future generations is, like all the work he's involved in, ensuring that the stories and the archaeological records live on.

In fact, as part of his personal decree to share his work with others, including scholars and the general public, Delgado has written over 100 articles as well as 36 books and nearly 100 archaeological reports, in addition to giving numerous presentations worldwide. He recalls one of his fondest experiences was when he became the "talking head" and archaeologist on the popular National Geographic documentary TV series The Sea Hunters, which ran from 2001-2006, with a global audience of hundreds of millions.

Now, as he approaches the age of 60, Delgado has been steadily handing the baton to the next generation of historians, archaeologists and shipwreck explorers. The man who has spent more than 43 years immersed in the world of underwater archaeology says his work never gets old.

Always on the move, a late afternoon phone call found him in mid-transit on land, with a few minutes to generously give his views on the field he has poured his life's work into.

When Delgado began diving into the

depths looking for history under the sea, there was no Internet, no cell phones, and mapping a wreck underwater was done by hand, by setting up grids, using tapes and writing notes on plastic slates covered with Mylar.

How have things changed in the world of maritime archaeology?

Technology has changed so rapidly in the undersea world that I feel in some ways as if we have catapulted out of one century to another. Whether it's positioning with GPS and better satellite range, or robotic technologies such as remotely operated vehicles and autonomous underwater vehicles, we have the ability to move more quickly and efficiently with less expense. Additionally, more people have embraced the concept of multi-disciplinary missions. It's more cost-effective and enables people to bring different elements to the table.

You say people no longer have to obtain a PhD to do the work you're doing. Can you explain that?

(Credit: James Delgado Collection)

James Delgado with Jean-Michel Cousteau and Phil Nuytten at the Beneath the Sea Gala in 2015.

Citizen Science recognizes that you don't need a PhD. There is so much that gets done by people who have the passion, who have understanding. I've worked on projects with people who didn't learn anything from a book. They know about historic sailing ships because they sail or they've sailed on replica vessels or they've worked with a certain tool. On a dig, you can learn from the person who has the degree but from others as well. That's the powerful part of it. It's the realization that most of this stuff happens with people who know something and step forward to do it.

What current wreck investigations are you working on?

I'm working with Bob Ballard (naval officer, professor of oceanography at the University of Rhode Island, and the scientist who led the team that found Titanic in 1985) to plan a deep-sea mission off the southern west coast of Canada, where we have an interest, as does the province of British Columbia, in a World War II wreck located in the Strait of Juan de Fuca. Later, I'll also be travelling to San Francisco where we'll be doing deep-sea exploration, including what will be the first time we'll be able to lay eyes on, and do a detailed map of, the wreck of USS Independence aircraft carrier that we did an initial sonar mapping of last year with The Boeing Company.

I've also recently been planning with the State of California's State Parks team and others to better map and understand the maritime cultural landscape north of San Francisco. This area, known as "the Redwood Coast," was part of California's lumber industry after the gold rush in the mid-19th Century. In the absence of a highway and railroad, small steamers would tuck into tiny little coves and load lumber. The ships would anchor at the end of a tower lowered in the water, and they would slide that lumber off the top of the cliffs and down onto the decks of these ships to be loaded. Those dog-hole ports as they're called, remain a powerful feature in the region. Other than archaeological traces, they are gone but not forgotten.Of course, there are a number of things going on all the time with many of my colleagues around the world such as the team at Parks Canada and their ongoing work with HMS Ere-

I think there will always be compelling stories to be told and people will continue to be curious. And as long as that happens and there is support for that, I think exploration will continue to happen. **It's not just lost treasures. It's what it all speaks to in terms of mapping the human heart.**

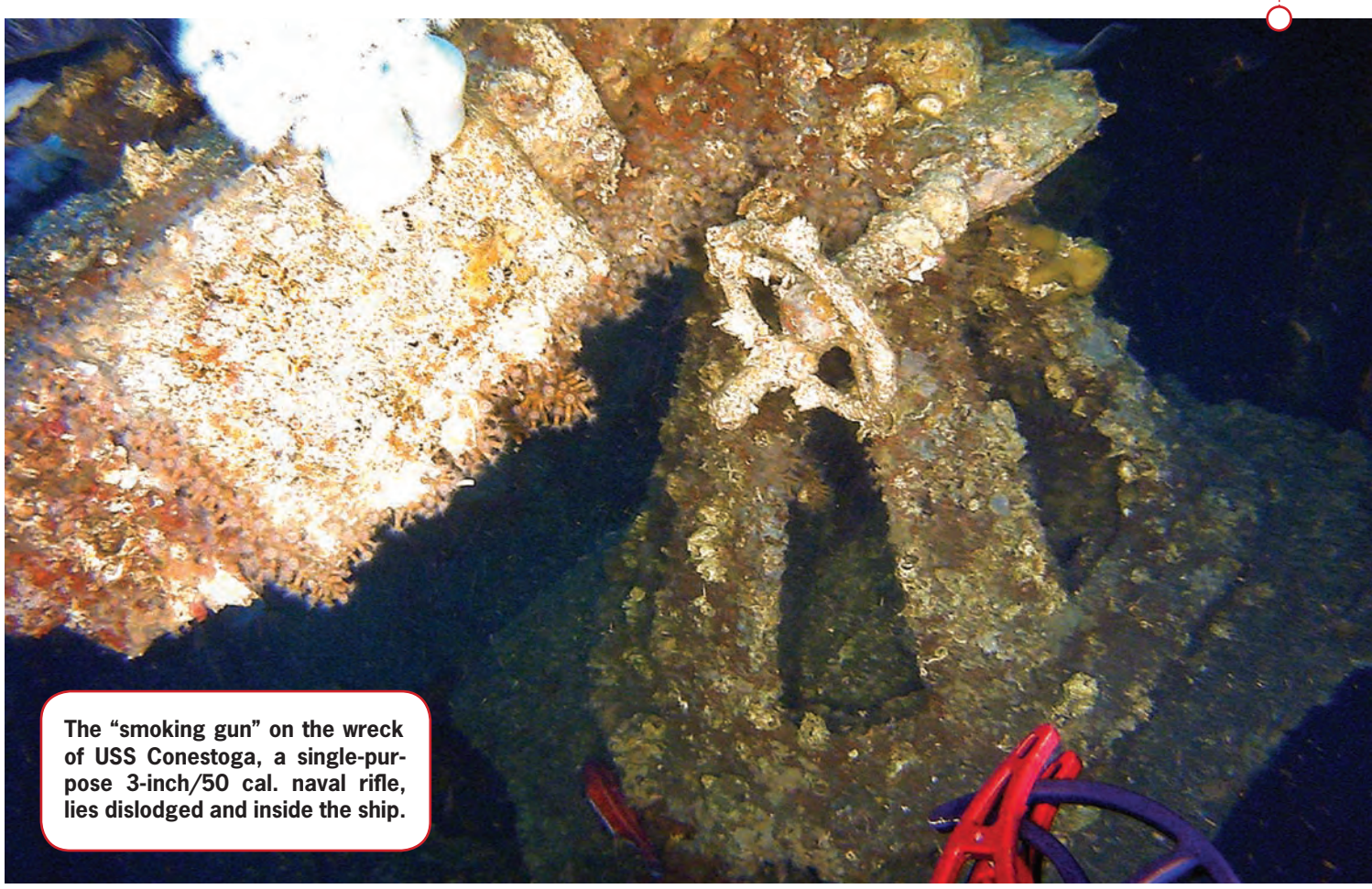
bus (one of two historic ships British explorer Sir John Franklin sailed to find the Norwest Passage in 1845; Franklin and his crew eventually died after the ships became ice-locked) to Hunley (an American Civil War submarine that made history as being the first sub to sink a war ship; her crew and the vessel disappeared shortly afterward). As the rust continues to be cleared away, the sub continues to be revealed as it once looked, telling us even more about this amazingly sophisticated early submarine lost in 1864.

How much more is there we don't know about shipwrecks?

We still don't have the very earliest ships. We still haven't gained a really clear sense of a fair amount of this when you consider that so much of our history is intertwined with the seas, the lakes and the rivers. The Uluburun (late Bronze Age) shipwreck has evidence of 12 different cultures within it, from equatorial Africa to the Baltic, all connected over 3,300 years ago by maritime trade. I think that in time we will understand more of what's in the oceans. I don't think that's going to happen anytime soon. But I think the fact that discoveries are made, sometimes in people's own backyards, is a reminder that not everything is done, that there are achievements yet to be made. And for young people in particular, that they can make a difference, that discovery can happen. I think as well, shipwrecks speak to powerful things in our history but they also connect to us personally.

Any final thoughts?

After meeting the granddaughter of a man who disappeared almost a century ago with the rest of his crew and seeing how that connected to her – it is the universality of our experience as human beings – that we suffer loss, that we prevail and we also experience triumph. I think shipwrecks speak to all of that. I think there will always be compelling stories to be told and people will continue to be curious. And as long as that happens and there is support for that, I think exploration will continue to happen. It's not just lost treasures. It's what it all speaks to in terms of mapping the human heart.



The "smoking gun" on the wreck of USS Conestoga, a single-purpose 3-inch/50 cal. naval rifle, lies dislodged and inside the ship.

Photo: David Rider

Maritime Manpower Shortage by 2025

"The current maritime manpower situation and future outlook indicate that the industry and relevant stakeholders should not expect there to be an abundant supply of qualified and competent seafarers in the future without concerted efforts and measures to address key manpower issues."

"The Manpower Report: The global supply and demand for seafarers in 2015" **in projecting a possible shortage of 147,500 officers by 2025.**

Despite an overall industry downturn which sees many markets operating at reduced levels, the issue of maritime manpower for the coming generation simply will not go away. In Maritime Reporter interviews across the world, across the maritime spectrum, the issue of adequate workforce development and retention is a recurring theme in nearly every executive interview.

"The Manpower Report: The global supply and demand for seafarers in 2015," a report jointly produced by BIMCO and the International Chamber of Shipping (ICS), helps to put shape and form to this issue. Following are some of the more sobering statistics found in the report:

- The global supply of seafarers in 2015 is estimated at 1,647,500, of which 774,000 are officers; 873,500 are ratings.
- Per **Chart 1**, the ranks of officers and ratings have grown substantially since 2005, from a total of 1,187,000 in 2005 to 1647,500 in 2015.
- Per **Chart 2**, China leads the way as the number one supplier for all seafarers.
- For the purposes of the report, the world merchant fleet was defined as 68,723 ship, with the largest category being cargo ships (31%) , followed by bulk carriers (16%) and offshore supply vessels (10%).
- The global demand for seafarers in 2015 is estimated at 1,545,000 (790,500 officers and 754,000 ratings). Based on the previously stated seafarers supply numbers, this equals a SHORTAGE of 16,500 officers, and a SURPLUS of 119,000 ratings.
- Since 2010, the demand for officers has risen 24%; the demand for ratings has risen 1%.
- Per Chart 3, the shortage of supply for officers globally is estimated to grow annually, with an estimated SHORTAGE of 92,000 officers by 2020 and an estimated SHORTAGE of 147,500 officers by 2025.

Buy the Report

The complete Manpower Report 2015 can be purchased from Marisec Publicatoins for $205 including worldwide air postage. Email publications@marisec.org for full details. The full BIMCO/ICS Manpower Report can be purchased from Marisec Publications at

http://bit.ly/27azcQf

Chart 1
Summary of the estimated global supply of seafarers 2005-2015

Rank	2005	2010	2015
Officers	466,000	624,000	774,000
Ratings	721,000	747,000	873,500
Total	1,187,000	1,371,000	1,647,500

Note: the Estimates for 2015 are not directly comparate to previous report due to changes in approaches to data collection and definitions used in the scope fo the report.

Chart 2
Estimated five largest seafarer supply countries

All Seafarers	Officers	Ratings
1. China	China	Philippines
2. Philippines	Philippines	China
3. Indonesia	India	Indonesia
4. Russian Fed.	Indonesia	Russian Fed.
5. Ukraine	Russian Fed.	Ukraine

Source: Country Questionnaire 2015.

Chart 3
Estimated Supply/Demand Balance for Officers

	2015	2020	2025
Supply	774,000	789,500	805,000
Demand	790,500	881,500	952,500
Shortage/Surplus	-16,500	-92,000	-147,500
%	2.1%	11.7%	18.3%

Maritime Reporter & Engineering News *sister-publication* **Maritime Professional** *has started a new editorial series entitled "Future Leaders," profiling select maritime academy students and their quest to make a mark in the maritime industry. This month we 'borrow' the profile of Andrew McGonagle, a veteran and a soon-to-be graduate of Maine Maritime. To view more interviews, visit:*

http://www.maritimeprofessional.com/interviews

Future Leader

Name: Andrew McGonagle
School: Maine Maritime Academy
Major: Marine Engineering Operations
Grad: Class of 2016

Why this school?

Maine Maritime Academy is an investment in the future for my family. The campus is located in downeast Maine, allowing me to chase my dreams and pursue a meaningful career while raising a family in one of the most down-to-earth, family friendly regions that America has to offer. In addition, the school consistently provides graduates with excellent careers offering a high rate of return on investments of both time and money.

What keeps you here?

One of the best things that this country has accomplished recently is passing legislation for the Post 9/11 GI Bill. It allows veterans like me to realistically pursue an education full-time. Without it, attending a four year program would not have been economically feasible. The school also has a VA coordinator on campus that is an unsung hero at expertly navigating the VA system and the challenges that it presents.

What is your major and what career do you intend to pursue?

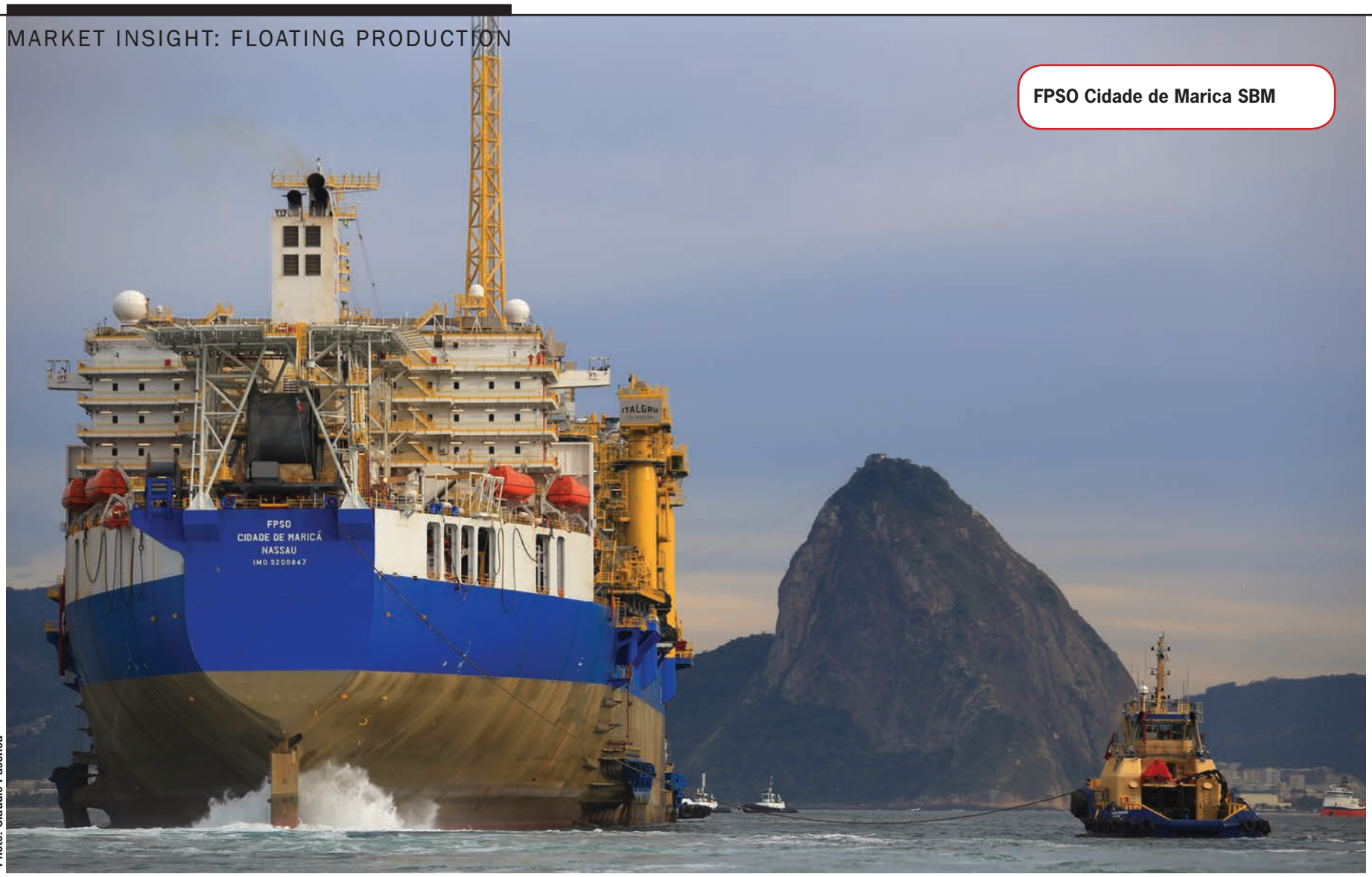
My major is Marine Engineering Operations and I will initially pursue a career at sea as an engineer. I hope to find employment in a fast-paced, technically challenging environment that keeps me growing personally and professionally. Nothing is off limits and I'm excited to begin my job search.

What one thing should prospective employers know about you?

My phone number ... feel free to give it to them! I also maintain an outstanding GPA, have a diverse background that includes military service, small business ownership, and a previous career as a marine technician. My combined skillsets should be valuable to any prospective employer that is looking for someone with technical business experience, strong technical communication skills, and leadership skills from military service.

Tell us about your at sea training or internships – who did you work for or sail with?

Last summer I completed a cadet shipping internship with Hornbeck Offshore Services in the Gulf of Mexico. I worked aboard a 320 class HosMax OSV, supporting Shell Oil's offshore oil and gas production. Most recently, however, I completed a winter cruise aboard the school's training ship, the State of Maine, sailing from Castine, Maine to St. Croix. The experiences were vastly different, but equally valuable. I look forward to sailing again this summer on the T/S State of Maine with the freshman class as we bring her to Europe and points to be determined.



FPSO Cidade de Marica SBM

Photo: Claudio Paschoa

Unprecedented Idle FPSOs

While the oil and gas markets are starting to come to life, nearing the $50 per barrel mark, the future fate of floating production remains a mystery

BY PETER LOVIE

The 20 year four-fold growth pattern in the world's FPSO fleet stalls out in 2016 with a record number of FPSOs idle and available for redeployment – or perhaps to be forced into other uses, lay up or scrap. FPSO redeployments typically are far more complex, costly and risky than for (say) drillships and yet the need for redeploying idle FPSOs is now in the forefront of the industry like never before as FPSO owners also have to face the worst ever down market for their equipment and services.

Redeployments - The Early Days

In 1995 the Uisge Gorm FPSO, designed and built and operated by Bluewater in the Netherlands, entered service at the Fife field in the North Sea under a contract with Amerada Hess who were the operator of that development. Back then Dr. Rex Gaisford was development director for Amerada Hess in London and an enthusiast of FPSOs in their early days. He eloquently spoke of a world where FPSOs would move from producing one field to later producing at another field.

Worldwide the FPSO fleet totaled about 50 FPSOs in 1995.

Subsequent reality did not turn out quite as Dr. Gaisford forecast but the idea of FPSOs being easy to redeploy had taken root. After finishing at one field, the move of an FPSO to the next field often meant working at a seriously different water depth in different sea conditions with production and processing capabilities being required for a different grade of crude oil that usually had quite different ratios of gas and water present and all at different temperatures and pressures from the first field. So the FPSO usually had to be revamped big time.

Time and again it turned out that with realistic project engineering that the changes needed for an FPSO at a subsequent field became many and cost plenty. It was nothing like moving a drill ship from one well location for one operator to another location for another operator in another part of the world.

Redeployment can be hazardous to your financial health

Changes needed for redeployment have frequently turned out to be troublesome: difficult to manage within budget and often ran over on time. After Uisge Gorm, Bluewater built the Glas Dowr FPSO for another development in the North Sea, where it worked for not much more than a year before the two fields it produced from played out unexpectedly early. Still on contract, it stayed at a dock, warm stacked, for some years until finding a subsequent contract offshore South Africa in 2002. It was good equipment but from my own experience as a business developer back then, find-

ing another contract for Glas Dowr was "challenging" to say the least. Street talk signaled that conversion costs for the new assignment ran over by about a 100% over planned budget (figures of $50 million reimbursed by oil company and $195 million total expended give an idea of the magnitude of work).

A few years later a novel kind of FPSO entered the market – ROUND instead of the traditional ship shape. Sevan, the designer and builder, had overcome many challenges in succeeding with this new design in a traditionally very conservative industry. One of their new generation of FPSOs (Voyageur) had to move from one field in 98 meters of water in the North Sea to another location in 90 meters of water in the North Sea which took a number of topsides changes (adding gas compression, gas lift and more water injection). Once again the overrun was approximately 100% (from about $90 to $170 million) but this time the FPSO contractor was still in its early days and financially strained. The end result was a change in the control of the FPSO contractor's FPSO fleet as Teekay took a position in the company in 2011.

Redeployments could thus become seriously hazardous to the financial health of FPSO owners. Redeployment of FPSOs had frequently become far more complex in recent years than had been expected in the early days. Rigorous management discipline in tackling these redeployments became crucial – even more so than in starting from scratch with an FPSO conversion or newbuild.

Industry Learns and the FPSO Fleet Grows

These trends became recognized among the more experienced of the FPSO community as FPSOs were redeployed. It was nothing near as simple as it may have appeared on the surface.

The redeployment business was well set forth in a presentation by SBM at an FPSO conference in Houston in 2012 which showed a number of examples of FPSOs being redeployed for a second or third time with one example (SBM's FPSO II) being redeployed four times over the 20 year period of 1981-2001. 2012 was a relatively stable time in the FPSO market and SBM indicated a total of about 20 FPSOs being redeployed worldwide in the next five years.

Twenty years after the Uisge Gorm FPSO started producing in the North Sea, the world's fleet of FPSOs had grown more than fourfold to something like 218, counting FPSOs that are operational plus these still under construction and these that are idle. In the last 10 years that growth has been more than twice as fast as for other types of Floating Production Systems such as semi-submersibles, Spars and TLPs, as the table below left shows.

The FPSO fleet growth fluctuated from year to year as so often seen in the petroleum industry. The graph shows operator contract awards for the services of FPSOs every year since 2002, including contracts for the small number of redeployments each year in addition to the many conversions and newbuilds for new FPSO projects. (See chart below right)

Reconciling data in the table with the graph of FPSO contract awards, over the 10 year period of 2005-2015 an average of 2.1% of the fleet was retired each year for scrap or other uses. Market signals indicate retirals may become significantly higher in 2016.

The FPSO downturn in 2009 got people's attention in the FPSO contractor community in Houston. I saw it firsthand that year when I flew from Houston to Singapore to chair and speak at the 2009 FPSO Congress. Leaving Houston the mood had been gloomy, while in Singapore the feeling was positive and buoyant. Singapore shipyards, engineering companies and vendors were all happily working through their healthy big backlogs of FPSO business. Fortunately for them 2010 was a great year for FPSO orders, and so the 2009 dip in FPSO contracts made little difference to them as their business levels saw little interruption. Today, seven years later, the FPSO communities in Houston and Singapore are both subdued.

If you look again at the graph of FPSO contracts, you'll detect two downward trends, each fairly steady: in 2005-2009 and again during 2010-2015. It's almost as if this signals a maturing and saturation in the market. But who knows?

As the last few years progressed the prospect of FPSOs becoming idle and

Comparison of Ten Years of Fleet Growth of FPSOs versus Other Types of Floating Production Systems

	Existing & Ordered		Fleet Growth	
The World's Floating Production Systems	Year End 2005	Year End 2015	Change in 10 Years	Average Growth, % p.a.
F P S O s	138	218	80	5.8%
Semisubmersibles + TLPs + Spars	84	105	21	2.5%

Source: Fearnley Offshore

Source: Fearnley Offshore

available for redeployment evolved to no longer be a somewhat unusual "now and again" phenomenon but more of an anticipated process as FPSOs somewhere or another would reach the end of their service at their locations as the fields they served ended economic production. They would be released and be ready to move on, whether owned by an FPSO contractor or owned by an operator (ownership is split about half and half between contractor and operator for the world's FPSO fleet). It was often unclear at any particular point in time just when and how many FPSOs would become available for redeployment – field production economics and operators' plans were often not widely discussed. But in a reasonably stable market – if ever that exists in the oilpatch – FPSOs would become available, some would be redeployed, some retired and a somewhat steady turnover could be expected.

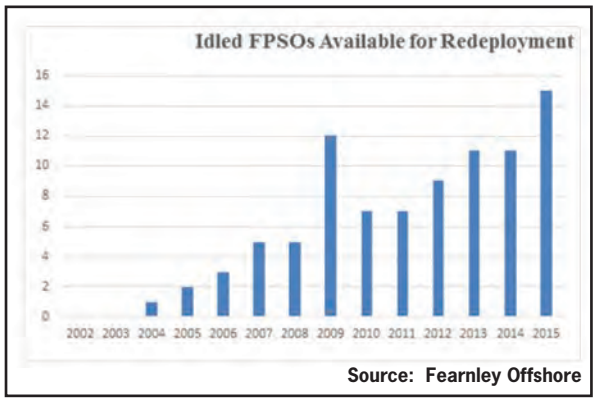
In a few lucky cases an FPSO employed by one operator might be used in a nearby field development operated by that same oil company. But most of the time an idled FPSO faced a lengthy period of being unemployment pending a new job – or retiral. New FPSO employment was traditionally slow and difficult to find – the same predicament that so many engineers and managers have experienced as they were laid off in the 2015-2016 downturn. The graph on "Idled FPSOs Available for Redeployment" gives the history:

Interestingly the last FPSO downturn in 2009 also saw an uptick of FPSOs idled, just like that shown for 2015. Relative to the world fleet of FPSOs, the number of idled FPSOs has fluctuated year to year from a low of 0.8% to about 6.8% in 2009 and in 2015. Many expect that percentage to be seriously higher by year end 2016.

Today's Dire FPSO Market

The pace of FPSO contracts had already slowed in 2015 to three after a total of 63 in the previous five years. The slide in crude oil prices that started in 3Q2014 was followed with a downturn in FPSO orders equally steep and in step with oil prices.

When 2016 arrived the situation was dire for operators who now were engaged in widespread cancellations and deferrals of projects, plus the selling of assets. New FPSO projects (conversions and newbuilds) had come virtually to a stop. Near term, operators talk of very few developments that will go ahead at current oil



Source: Fearnley Offshore

price levels. Added to that the economics of operations at tail end fields become quickly worse and operators think more quickly now about releasing FPSOs. Needless to say, prospects for new FPSOs contracts are at a record low.

As FPSO demand collapsed in 2015-2016, the scramble for redeployments grows

This year in May alone, announcements were made of the release of two FPSOs owned and operated by Bluewater: the Glas Dowr (leaving northwest Australia) and the Aoka Mizu (leaving UK Sector in North Sea), both proven high quality turret moored North Sea FPSOs. Regardless of the terms and settlements for the cancellation of these contracts, it means two more FPSOs on the market for redeployment. It sounds similar to the widespread cancellation of drillships in the offshore drilling business.

No one knows for sure how many more idled FPSOs will hit the market and face a similar limited redeployments possibilities. According to one knowledgeable observer (Fearnley Offshore) there may be a total of 22 FPSOs idled by year end 2016, offset perhaps by scrapping (four?) and possible redeployment (one or two?). In other words, something like 10% of the FPSO fleet may become idle by the end of 2016, representing an overhang in the market to challenge prospects for new FPSO orders.

Not so long ago in 2012 the prospects for redeployment might have been fair and often uncertain on timing, but not so today in 2016. FPSO contractors are sometimes reluctant to say exactly how many FPSOs they expect to have idle and available. It is not quite the open book seen in the offshore drilling industry where idled MODUs are identified and quickly become public knowledge.

The shutting down of new FPSO requirements plus so many existing FPSOs coming available has never happened on this scale before – truly uncharted waters. Talk of redeployments sounds to some as whistling in the dark in the current market, trying to avoid the possible necessities of layups and scrapping idle equipment of the kind that the drillers have already started to address.

On the E part of E&P business, it is easier for an operator to find productive employment for a drill ship than do so for an FPSO when on the P part of E&P, the prospect of finding an FPSO virtually ready right away to work at a new development would be wonderful but reality rarely seems to work that way. The need to get a production facility that does just what is needed leads back to contracting for a new FPSO, whether conversion or newbuild, rather than a redeployment.

The Bottom Line

• All of this is not good news to the FPSO contractor community which hopes they do not have to manage their way through the kind of long term downturn that the drillers faced in 1986. And yet they see the potentially long delays before oil companies can see higher oil prices combined with some sense of stability to justify taking the risk in committing on multi billion dollar field investments that may employ FPSOs, whenever that might be, such is survival.

• Just a few years ago the redeployment situation was a relatively minor issue but in the current downturn it may prompt consideration of write downs on residual values on company balance sheets for both idled and employed FPSOs as a prudent measure in this market.

• As the offshore drillers have learned after more such brutal downturns, tough decisions are on the table about scrapping and lay up of FPSOs in the face of little or no redeployment prospects this year.

About the Author

Peter Lovie's 49 years in engineering and management in the offshore industry have all been in Houston, the first 22 years on offshore drilling related business. Over the last 21 years Peter has become known as something of an industry authority on FPSOs, from his combination of working on both the FPSO contractor and operator sides of the aisle as well as the necessary shuttle tanker side. He is known for his contributions leading to the first FPSO and shuttle tankers to enter service in GoM. He started in the oilfield with Cameron and The Offshore Company (now Transocean), then founded an engineering company (ETA) with its introduction of a new generation of jackup drilling rigs in the 1970s, that were built in France, Singapore and Japan. Currently he is an independent consultant.

Acknowledgement

The author is indebted to Mr. Jens Heim of Fearnley Offshore (j.heim@fearnleys.no) who provided the FPSO fleet data that is used in the table and two graphs here to illustrate FPSO business trends.

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ABB Symphony Plus &

The Engineering Quest to Save Venice

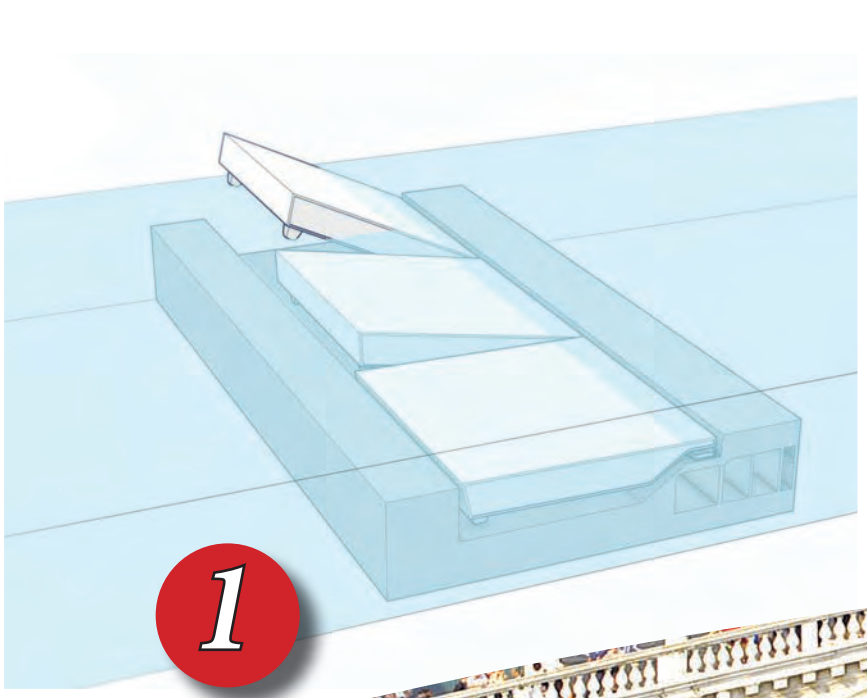
BY KIRA COLEY

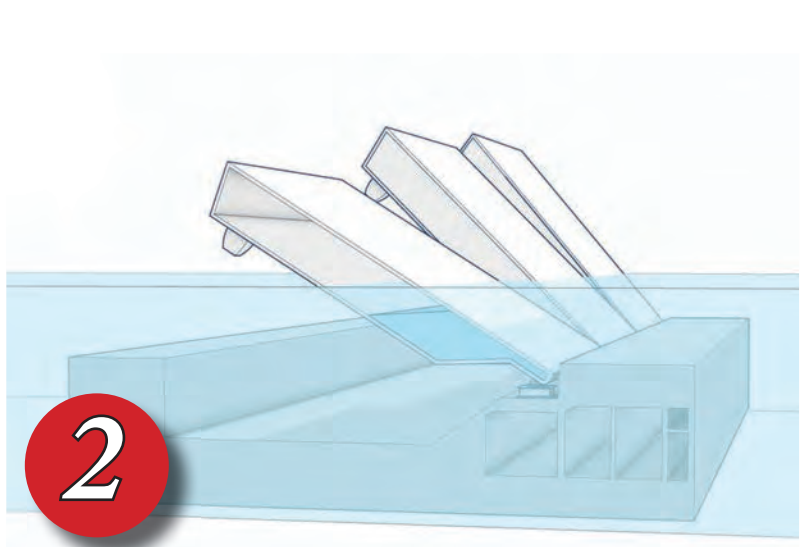
As one of the most important civil engineering projects in recent history, the story of the Venetian Mo.S.E flood barrier has been one of innovation and modernization. Now, in the final stages of the **$6 billion venture** which seeks to save the historic floating city, the 'nervous system' of the project is due to be installed linking the architecture to an intelligent control network. This $38 million order will provide automation and power, connecting 78 independently operated steel gates with signals from more than 50,000 devices. The ABB Symphony Plus automation platform will be the 'brain' of the entire Mo.S.E system, navigating the safe operation of the project's barrier gates and providing the anti-intruder and cyber security systems required in this era of digitalized flood protection. Venice is an amazing engineering endeavor: it has been built on a group of more than 100 little islands as part of a lagoon. This large, enclosed bay is protected by 50 km of sandbank and connected to the sea by three inlets giving passage to the city's maritime traffic, as well as the normal 1-meter tides that flush the city's canals.

While the lagoon is subject to variations in water levels, extreme spring tides are more regularly surging through the city flooding homes, businesses and buildings. Unesco will present a report on the status of Venice to the World Heritage Committee, which will follow with recommendations in July this year. "A range of factors have made the lagoon vulnerable to high water surging through the inlets from the Adriatic Sea. This includes erosion caused by port development, subsiding land and rising sea levels, periodic wind conditions that push waves into the lagoon, as well as the surrounding drainage basin that empties rain and water into the lagoon," said Stefania Mascheroni, ABB. "As a result of global warming, sea levels are expected to rise about 20 cm by 2050. This puts the city of Venice at huge risk to be inundated nearly once a week with tides starting from 80 cm above normal."

The Mo.S.E. Solution

The Mo.S.E. (Italian acronym for Modulo Sperimentale Elettromeccanico) flood barrier system is designed to block the annual high tides and storm surges that enter the Venetian region. Led by the construction consortium Consorzio





(Credit: ABB)

Venezia Nuova, the installation of 78 independently operated steel gates across the three inlets should shield the lagoon from both major and minor floods.

"The Mo.S.E. concept is unique: nowhere else in the world, where the same issue of high waters occurs, a system of barriers like the one in Venice has been implemented. Usually, barriers remain visible as infrastructures above the sea surface. The Mo.S.E. option instead is hidden on the seabed surface and their movement is managed by the injection of compressed air or salt-water," said Mascheroni.

The 20-m-wide gates are between 18.5 – 29.5 m in length and consist of hollow, hinged metal boxes that are fixed to large prefabricated 23,000-ton concrete bases embedded into the sea floor. When the control room is alerted to high tides or storm surges, the water inside the barriers is pumped out with compressed air, and the gates lift into position aided by their own buoyancy. **In just 30 minutes, the entire barrier system can be risen, isolating the lagoon and protecting Venice from tides as high as 3 meters.**

The flexible design allows operators to completely close all inlets simultaneously, or vary the level of closure at each site independently depending on winds, atmospheric pressure and tide level.

There are a variety of critical requirements which will be compulsory for the success of the entire defense. From a structural point of view, the barriers should not interfere with normal maritime traffic flow and host infrastructure to safeguard the area, which demands also vigorous safety from a system point of view through a sophisticated anti-intruder and protection systems to keep out unauthorized entries.

Digital Flood Defense

ABB provides field instrumentation and control and I/O devices that will coordinate operation of the entire flood defense system. This consists of managing the different operational, architectural and safety functionalities for flood barriers, navigation locks and breakwaters, while integrating with ABB's safety system in addition to the Mo.S.E external security system. The signals gathered from more than 50,000 devices provide the data to position and maintain the barrier at the 45-degree angle, with a variance of 1 degree – an amazing endeavor when taking into account the pressure of water on the barrier and the continuous tidal movement.

"For what concerns ABB's scope of supply, the integrated electrical and automation solution is one of our strong suits: our competence in both automation and electrical products and systems is renowned and testified by thousands of references in power and water. The system provided to Mo.S.E. features Symphony Plus latest technology, the control system managing the automation and electrical system enabling the barrier movement. ABB is not new to such peculiar project: they count in fact a number of references in automating many flood barrier projects in The Netherlands," said Mascheroni. "Essential for the reliability of the Mo.S.E. project, to make sure it works when it is most needed, is the availability of the system: an exceptionally redundant design, further reinforced by the geographic separation of redundant components, brings the availability of this system to unprecedented levels."

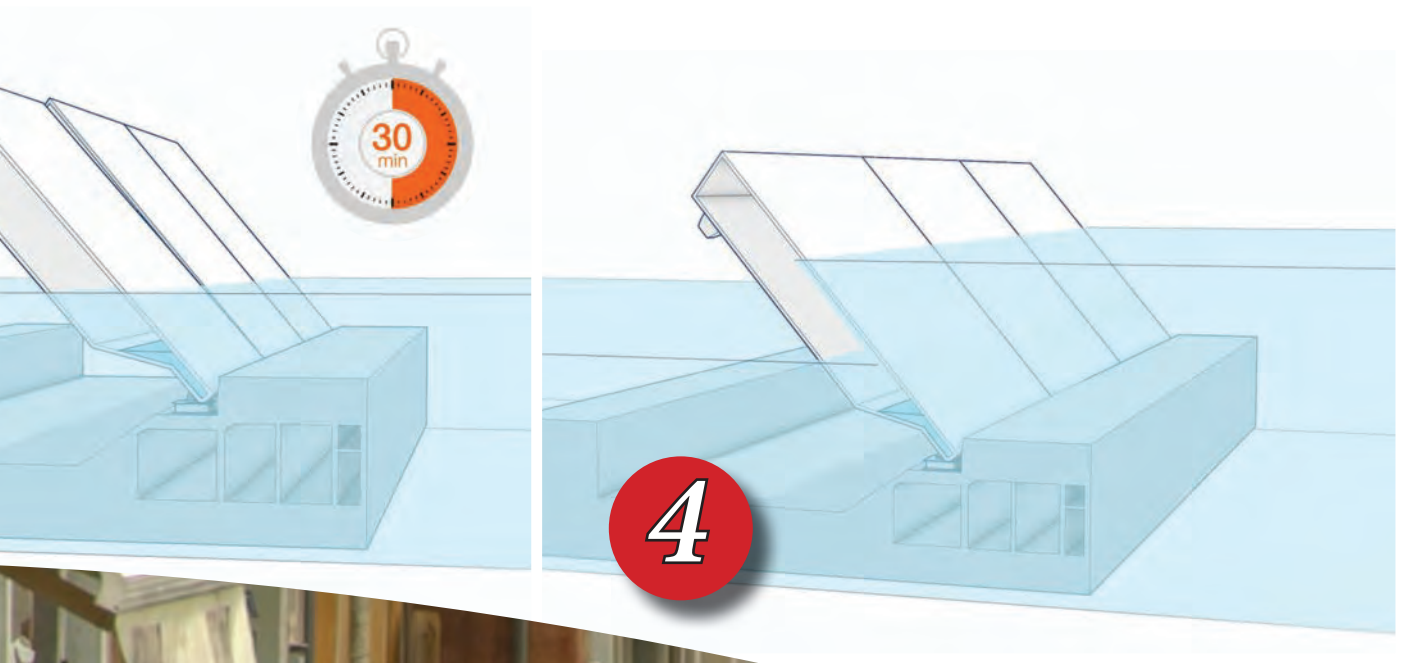
The capacity of ABB's Symphony Plus control system to easily integrate electrical and field equipment is an important differentiator, as is the platform's unique ability to be easily scaled and customized for different sizes and complexities of application. ABB's control system is also easy to maintain, as the main components are redundant (controllers, switches, servers) and most can be quickly replaced.

"The biggest challenge will be to ensure the position of the barriers is always the one needed independently from the varying pressure of water and air into and outside the barriers. The variance of 1 degree might seem nearly indiscernible, but it may affect the system efficiency. With reference to the installation activity, difficulties are mainly related to the actual position of the equipment, underwater in harsh environments," said Mascheroni.

The Mo.S.E. barriers are expected to provide a financial return within 50 years due to the hopeful reduction in costs from damage to the cities structure and contents. But despite the pure return on investment, Venice is a priceless treasure whose safeguard cannot be enumerated.

"Digitalization and Internet of Things (IoT) are the new wave to bring innovation and value added services to a technology portfolio. Although in automation we were already providing 'intranet of things' throughout our DCS systems, the opportunity generated by the digitalization and big data is tremendous in terms of both new services and solutions," said Mascheroni. "ABB is taking an additional step ahead with our concept of the Internet of Things, Services and People (IoTSP), namely by connecting inextricably Services and People to technology. Data collected from super-intelligent devices will drive advanced services that make use of actionable information derived from them, while people will be the ultimate recipient of the advanced analytics for conscious and accurate decision-making."

This Mo.S.E. project with the ABB intelligent systems, showcases a wealth of cutting-edge innovation and technology. As sea levels rise across the world, flood barriers may become more digitalized. Intelligent automated and electrical systems will be required to help control these defenses efficiently, protect from cyber intervention and to maintain consistent reliable defenses for decades to come.



*All images courtesy: ABB

Vittoria Shipyard's Interceptor 43

Technical Specifications

Length, o.a.	14.04 m
Molded, length	13.22 m
Beam, o.a.	2.81 m
Height	1.98 m
Draft	0.91 m
Crew	3 + 3
Maximum speed	60 knots
Cruising speed	40 knots
Range at economic speed (sea force 3)	364 nm (674.128 km)
Fuel tank	2 x 1000 liters
Fresh water tank	1 x 140 liters
Engines	4x Mercury Verado Outboard 4 x 300 hp
Fully-laden displacement	9.93 tons
Displacement in normal working conditions	9.44 tons
Displacement	7.51 tons

Photo: Vittoria Shipyard

Vittoria Shipyard, which specializes in the construction of paramilitary, commercial and passenger vessels of up to 100m recently presented its Interceptor 43-ft boat, a new vessel based on the standards of Customs and Border Protection of the U.S. Department of Homeland Security for maritime rescue operations, and prevention of illegal immigration, smuggling and piracy. Designed for military use, when camouflaged the Interceptor 43 can hide between the waves, and brings together the boat builder's prowess in planning and boatbuilding with high-performance motor engineering from the inclusion of Mercury engines. The prototype, made in vinyl ester resin strengthened with glass fiber, carbon and Kevlar, measures 14.04 x 2.81 m with a height of 1.98 m. It displaces 9.93 tons fully laden. This size allows a crew of six to be housed on board. Research work done in developing the hull and her special "step" structure means the ship can combine high speeds with excellent seaworthiness, all in complete safety. The boat is powered by four outboard MERCURY VERADO engines which can develop a total of 1,200 horsepower. The SmartCraft Digital Throttle Shift (DTS) control system also allows smooth gear changes, with instant response from the accelerator. The Interceptor can reach a top speed of 60 knots and keep up a cruising speed of 40 knots.

AIDAprima Christened in Hamburg

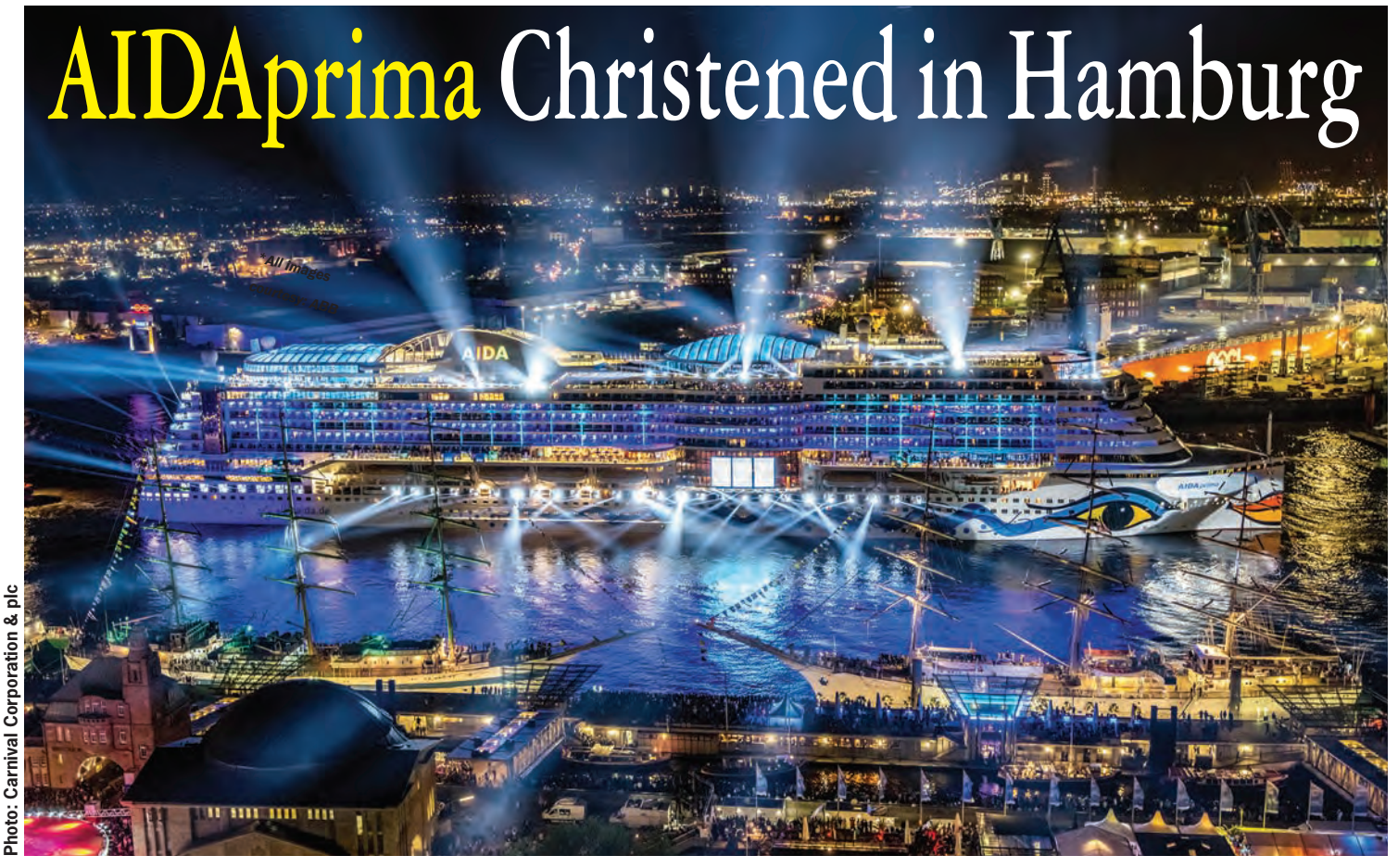


Photo: Carnival Corporation & plc

Carnival Corporation & plc welcomed its newest ship with the christening of AIDAprima, now the flagship vessel for Carnival's German-based brand AIDA Cruises.

AIDAprima made its debut with a light show and naming ceremony witnessed in person by 1.6 million visitors at the 827th Hamburg Port Anniversary. AIDAprima is significant as it is equipped with a dual-fuel engine that can be powered by liquefied natural gas (LNG) while in port and at sea. AIDAprima completed the full test run for its LNG operation, meaning the ship will be able to operate with the fuel while in port – a first for the cruise industry The 124,100-ton AIDAprima, built and delivered by Mitsubishi Heavy Industries, Ltd. (MHI) in Japan, will be able to accommodate 3,300 passengers, and features 12 restaurants, 18 bars and 14 stateroom categories.

Case Study

Floating Pump Station Sauger III

Hamburg Port Authority (HPA) took delivery of the Sauger III, a custom floating pump station from Damen Shipyards Group for supporting dredging operations. Situated 110 km inland on the River Elbe and with a tidal range of 3.6m, the Hamburg Port requires regularly dredging. Measuring 37 x 10 m, the station features a powerful, dual pump installation and comfortable accommodation for the crew.

Sauger III was built to a new design following a tender process that began with 10 shipbuilders. The order was placed in December 2014 and the vessel built in 15 months at Damen Shipyards Hardinxveld The structure is essentially a pontoon fitted with sophisticated pumping equipment capable of managing large volumes of sediment, plus crew accommodation. The core equipment consists of two pumps each connected to an arm on deck. One of these pumps takes the contaminated mud from the barges that come alongside to offload and then pumps it ashore via a floating line. The second pump/arm combination adds sea water to the mud to keep it in a liquefied state. The sediment is cleaned as it passes through the pumping apparatus, allowing to be safely dumped or used for a variety of purposes.

"Damen has delivered a customized dredging tool on time and to good quality," said Jens Bald, Project Manager at HPA. "The crew and HPA technical supervisors are really satisfied with the vessel. We are looking forward to working again with Damen on future projects."

Damen Dredging Equipment built the dredge pump using the same molds as previously used by the Hamburg Port Authority. For the jet pump a standard Damen design was used. The station is moored against piles and so does not have an independent propulsion system. Courtesy of a state-of-the-art control room, the entire operation requires a crew of only two. The unit is powered by electricity supplied via a shore connection with a transformer that converts it to the 690v and 400v necessary for the pumps.

Sauger III is the first vessel that Damen has built for the Hamburg Port Authority. With the dredging equipment and pumps coming from Damen Dredging Equipment, 60% of the components came from Damen.

The vessel has been designed and built to comply with all German regulations and is certified by Germanischer Lloyd. Sauger III was towed from Damen Shipyards Hardinxveld to Hamburg by the Noordstroom, a new Damen Shoalbuster 3512 handed over to its owner Van Wijngaarden Marine Services B.V. by the same yard just a few weeks previously. Sauger III is now undergoing commissioning and trials and will begin operations after the summer.

James Fisher Subsea Excavation Key for FSO Job

James Fisher Subsea Excavation (JFSE) will provide mass flow excavation services to EMAS-AMC ensuring safety of existing infrastructure during vessel replacement. JFSE will play an integral role in the efforts to replace a major floating storage offloading (FSO) vessel off the coast of Libya. JFSE support EMAS-AMC at the Bouri oilfield with post-lay trenching and backfilling services. EMAS-AMC is responsible for the engineering, procurement, installation and commissioning of new offshore facility, FSO Gaza, at the Bouri oilfield. Bouri, considered to be the Mediterranean's largest producing oilfield 120 km from the Libyan shore, is operated by Italian oil company Eni with the National Corporation of Libya as a partner.

Photo: Royal IHC

GDC's New Dredger Launched

Royal IHC launched the 21,028-cu. m. trailing suction hopper dredger Jun Yang 1, for GDC.

The naming and launch ceremony of the trailing suction hopper dredger (TSHD) Jun Yang 1 took place at Royal IHC's shipyard in Kinderdijk, The Netherlands. The dredger is being built for CCCC Guangzhou Dredging Co., Ltd (GDC). The Jun Yang 1 is equipped with two suction tubes, each with a submerged dredge pump. Both suction tubes have a dredging depth of up to 40-60 m, and the starboard suction tube can be extended to a dredging depth of 90 m. Two inboard dredge pumps have been installed for shore discharging and rainbowing. The TSHD has a high level of automation, designed and supplied by IHC. This is the 19th vessel built by IHC for GDC over the last 40 years. In four decades IHC has developed a portfolio of dredging vessels ranging from TSHDs to cutter suction dredgers and wheel dredgers. These dredgers were constructed either on the IHC slipways in The Netherlands, or in partnership with shipyards in the People's Republic of China.

Van Oord's New Dredger Named

A naming ceremony was held at Damen Dredging Equipment in Nijkerk late last year for the second of Van Oord's Damen Cutter Suction Dredgers (CSD) 650, the Mangystau, due to be delivered in the first week of January. The ceremony was attended by members of the Van Oord and Damen families.Damen received the first order for a CSD650 from dredging and marine contractor Van Oord at the end of 2014; the Ural River. With delivery scheduled six weeks from ordering, the on-stock availability of the vessel was a critical factor to support Van Oord's dredging projects in the Caspian Sea. With project time extended, Van Oord required additional equipment to finalize operations. In contrast to the time restrictions for the Ural River, this second order allowed for Van Oord to apply a procurement approach to the sourcing of the dredger. The quality and flexibility to incorporate all of Van Oord's wishes, in addition to the strength of Damen's first delivery, ultimately facilitated securing the tender for the Mangystau.

Photo: Damen

Kawasaki's 'Genset-less' Hybrid Propulsion System for Tugboats

There are a plethora of "hybrid solutions" currently flooding the marine market, as vessel owners of all size and shape search solutions that help achieve new emission mandates and prove cost-effective. The two are not mutually exclusive, but there is no single 'silver bullet' as marine operations vary widely. Enter Kawasaki which is promoting its 'Genset-less' Hybrid Propulsion System for Tugboats, which promises to reduce CAPEX, OPEX and emissions.

By Greg Trauthwein

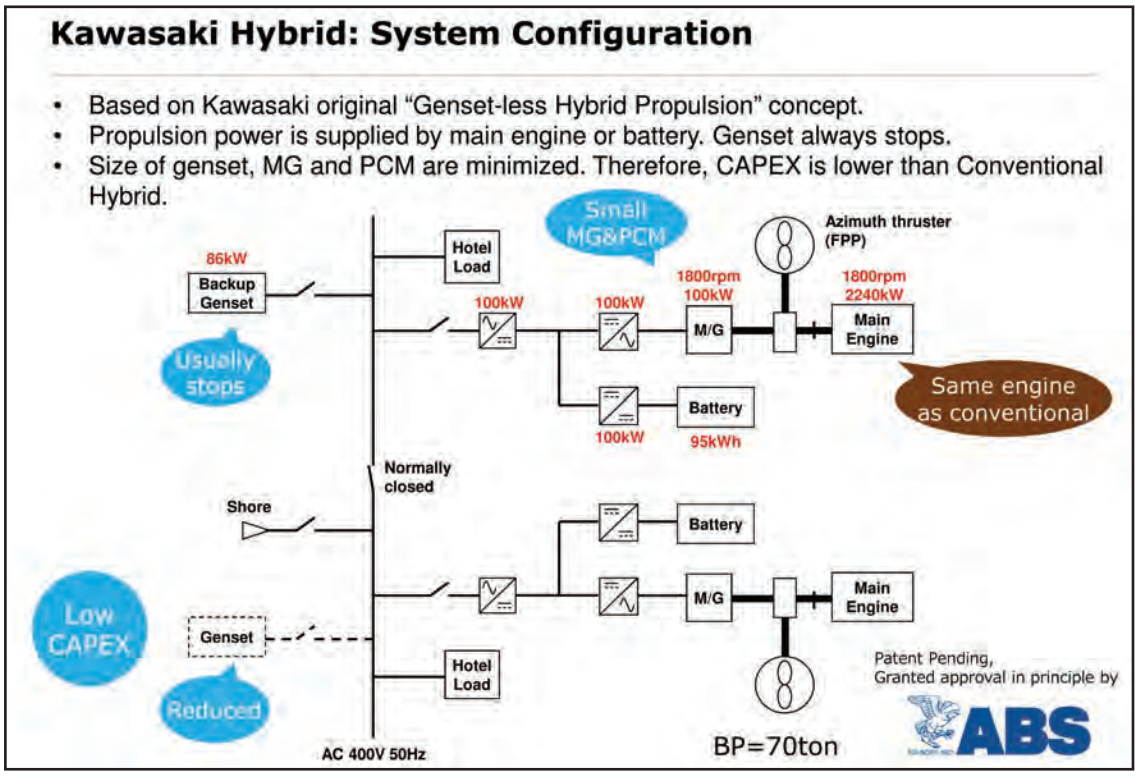
The maritime industry collectively is in a quandary regarding the acquisition of advanced, efficient machinery that helps to reduce emissions: while regulatory mandate is pushing most operators toward lower emission operations, the precise solution is not so clear cut, as cost of acquisition and operation of various systems varies widely. Throw in the fact that current fuel prices are historically low.

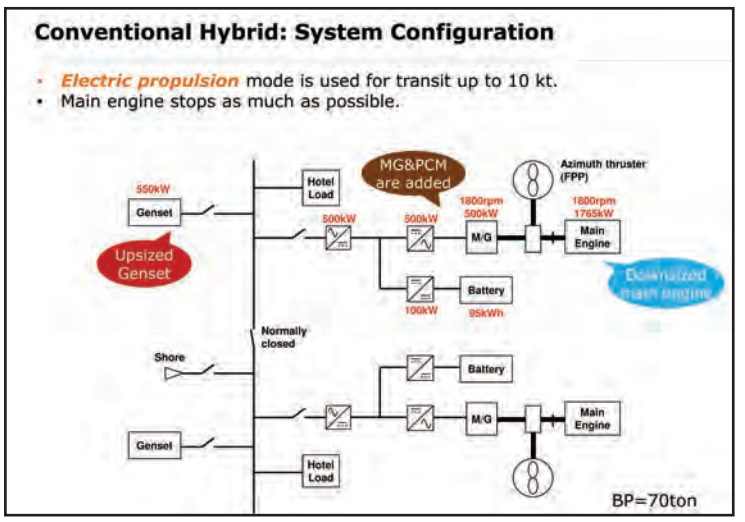
Kawasaki Heavy Industries believes it has the answer courtesy of its 'Genset-less' Hybrid Propulsion solution targeting the tugboat sector. The system, which is patent pending with an Agreement in Principle (AIP) from ABS, effectively cuts out the genset with assist to propulsion power courtesy of a Kawasaki-developed battery power, mitigating the fluctuation of load put on the main engine, and ultimately reducing gas emissions. In a nutshell, the Kawasaki 'Genset-less' Hybrid Propulsion System for Tugboats seeks to deliver the best of both worlds, optimizing the use of both mechanical and electric propulsion in a way that is deems unique in the maritime space.

CAPEX and OPEX

As anyone on the waterfront knows operation profiles vary wildly between individual tugboats and region of operation, making it difficult if not impossible to offer a single solution that best fits every boat and situation. Fluctuation in load put on the engine can significantly increase exhaust gas emissions and dark smoke. The Kawasaki Hybrid solution purports to mitigate this, as it is designed to be flexible to individual operational needs. Cornerstone to the Kawasaki proposed solution is not simply the reduction of emissions, but critically the reduction of capital expenditure (CAPEX) for boat equipment and operating expenses (OPEX). In the 'Genset-Less' operation the genset is removed and the generator become smaller, helping to reduce CAPEX. An auxiliary genset is used only for back-up, and optimal, balanced use of the main engine and battery banks reduces fuel cost, helping to reduce OPEX.

The manufacturer said that efficiencies start to multiply rapidly when the Kawasaki Green Gas Engine for marine operations is included in the system. Kawasaki's Marine L30KG is a pure gas engine for the marine market with an output capacity from 2.6 to 4MW. The L30KG engine is based on an engine already well-established in the power generation market, an engine which the manufacturer claims boasts the world's highest electrical efficiency of 49.5% and NOx emissions below 200 ppm (at 0% O2)





Fuel Cost Case Study: Operation Profile

Annual Operating Hours		3103 hours	
Operational Condition	**% Power**	**% Time**	**Hours/Yr.**
Full Bollard	100%	3%	86
High Power Escort	85%	4%	130
Escort Maneuvers	75%	7%	217
Transit, High Speed	50%	9%	272
Transit, Cruise	11%*	11%	342
Standby	Idle**	66%	2056

* Electric Propulsion is possible for Conventional Hybrid

** Engines of conventional tug are running

Assumptions

Fuel Cost: $.0457 per kWh

Shore Electric Cost: $.1063 per kWh

(August 2015, Japan

Annual Fuel Cost Comparison

	Conv. Tug	Conv. Hybrid (10kt E.P.)	Kawasaki Hybrid (Genset-Less)
Propeller	FPP	FPP	FPP
Main Engine	2240kW x 2	1765kW x 2	2240kW x 2
Genset (backup)	86kW x 2	550kW x 2	86kW x 1
M/G	N/A	500kW x 2	100 kW x 2
Battery	N/A	95kWh x 2	95kWh x 2
Full Bollard	300	314	300
High Power Escort	342	344	341
Escort Maneuvers	529	529	526
Transit High Speed	447	461	444
Transit Cruise	150	174	150
Standby	420	72	72
Total	**2188**	**1893**	**1833**

Source: Kawasaki

The Roxtec Transit Designer

A cable and pipe transit may be a small component in a huge building, onboard a ship or an offshore unit, but it is nevertheless a key to operational reliability. By offering the free, web-based tool Roxtec Transit Designer, cable and pipe seal provider Roxtec is trying to make it easy for designers and engineers to ensure safety.

Sealing solutions for cable and pipe penetrations are important to protect against a variety of risk factors. Roxtec seals offer protection against fire, gas, water, dust and the risk of explosion as well as solutions for bonding, grounding and EMC. The combination of certified protection and flexibility, with regards to new-build or retrofit and to cables and pipes of different sizes, has made Roxtec successful.

In order to help designers select the most suitable solution and to simplify the process of designing, purchasing and installing multi-cable transits, Roxtec created this design tool. Its usefulness is reflected in the number of users:

"We have more than 10,000 registered users in more than 100 countries. The number is increasing as professionals all over the world realize they can design transits in minutes," said Roger Johansson, Executive Vice President at Roxtec.

Roxtec Transit Designer helps to speed up the design process, designing a multi-cable transit in minutes.

Simple Input, Automatic Output

Users enter cable schedule, sealing requirements, installation preferences and preliminary opening sizes to find the solution needed. The tool helps them filter by application, certificate and requirements, and generates approved 3D models and drawings as well as bills of material and installation instructions.

"Making sure that the team gets it all right from the start is a smart way to reduce project risks in all phases," said Mattias Persson, Application Specialist at Roxtec. "There is also a lot of time and money to save by speeding up the entire process."

Designers working with large projects can use the batch import with auto validation to create, update and even validate thousands of cable and pipe transits simultaneously. The cabinet entry design feature, for example, makes it easy to define a surface for one or several cable entries and obtain suggestions for which and how many Roxtec seals to use. "Designers can safely share their work online with project teams anywhere in the world," said Persson. "The tool can also be used offline, as long as the design is finalized online. And we are always available through the chat function."

https://transitdesigner.roxtec.com

Pipe, Pump & Valve

Pipes, pumps and valves are more sophisticated than you may think, and the quality of manufacture and install goes a long way towards ensuring the productivity of commercial boats and ships. Maritime Reporter & Engineering News *examines latest technology developments in the sector.*

Marioff Corporation Oy launched a new HI-FOG Electric Pump Unit (EPU) for the high-pressure water mist fire suppression segment. Incorporating closed loop pressure control, the EPU revolutionizes pumping technology for high-pressure water mist technology. The EPU's advanced control system ensures that the pump unit provides only the required pressure and flow. Pressure optimization is achieved with an advanced software control and a frequency converter. Excess water unloading is no longer needed, which simplifies the mechanical design of the pump skid. The pump unit incorporates many built-in redundancies, including activation and pressure control, to ensure operational reliability. The EPU is equipped with a user-friendly interface that provides a real-time status of the pump unit and the HI-FOG system, alarm and help information, maintenance reminders and event history ensuring efficient and optimized maintenance activities. The EPU consists of a modular pump skid and separate control cabinet. The modular structure together with practical service access enables flexible installation and optimized use of footprint. Different configurations can be put together depending on the system capacity requirements.

The category of air-operated diaphragm (AOD) pumps offer marine operators a solution for de-watering, fuel transfer and bulk liquid transfer. AOD pumps are adaptable, portable, flexible, and easy to set up, maintain and service. In addition, these pumps can be moved to different areas of a ship where excess water needs to be removed or ballast tanks must be filled or emptied. **ARO, a brand of Ingersoll Rand,** offers a line of AOD pumps called the ARO Pro Series that come fully equipped with specific features fluid intelligence experts at ARO recommend to meet the heavy-duty demands of marine operations. ARO's aluminum Pro Series pumps constructed with Hytrel diaphragms meet these needs, and many others. Like all AOD pumps from ARO, the Pro Series line is bolt-constructed to minimize "creep." The bolt construction reduces the tendency of the pump to stretch and expand at the pump's joints due to temperature changes. The ATEX-certified ARO Pro Series pumps easily transfer and re-circulate material ranging from clean, light viscosity fluids to diesel and oils, as well as corrosive, abrasive and hazardous medium viscosity fluids. The pumps can also pass large particles without damage. The Hytrel diaphragm at the heart of the pump is made of super-tough thermoplastic polyester elastomer that resists hydrocarbon, hydrogen sulfide, oils, solvents, and other industrial chemicals, which facilitates material transfer in marine applications. The elastomer-based diaphragm also naturally resists corrosion and rust commonly found in salty, damp marine settings. ARO Pro Series pumps achieve outlet flows up to 237 gallons per minute (897 liters per minute) and will support discharge pressures to 120 PSI (8.3 Bar), depending on the size of the pump. The pumps are available in aluminum, cast iron, and stainless steel and can be configured with ATEX options to enhance safety in combustible and hazardous environments. Six different pump sizes are available, ranging from half-inch to three-inch.

Blackmer, part of PSG, has recently integrated the S Series Screw pumps into its pump offering. 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.

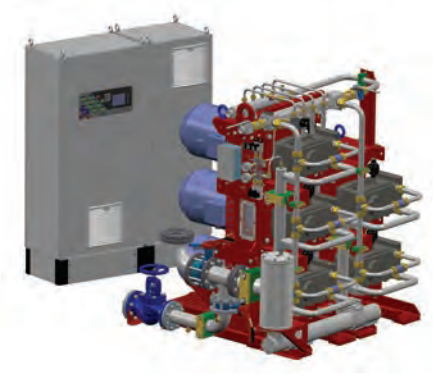
The **Wilden Advanced FIT line of Air-Operated Double-Diaphragm (AODD) Pumps** feature superior flow rates and ease of installation. Advanced FIT AODD pumps precisely "FIT" bolt-to-bolt and pipe-to-pipe in existing fluid-handling piping systems to provide increased performance with no re-piping necessary. They have been engineered to be an easy, cost-effective way to enhance and upgrade existing pump performance with superior bolted product containment. While the Advanced FIT AODD pumps offer an undeniable array of benefits to the end-user when compared to competitive technologies, their performance can be enhanced even further when used in conjunction with other technological innovations that Wilden has recently made in AODD-pump performance.

Chibro press-fit and push-fit piping systems represent the latest production technology in non-welded low pressure fitting design. Purchased in 2013 by Ilta Inox, Europe's largest manufacturer of welded tubing, Chibro's manufacturing process has been key to its growth in the North American Marine industry. All are engineered to meet the design curriculum put forth by the various International Classification Societies, which include ABS, Lloyds, DNV-GL, BV. Specific press-fit systems include Cunipress 90/10, and Pressfitting 316 Stainless steel. Both of these systems come in a variety of pipefitting forms from 15mm through 108mm. Each of these systems allow installation on a variety of marine systems, which include potable hot and cold, machinery fresh water, wet and dry firefighting systems, fire main, seawater, compressed air etc., depending on system material requirements.

Specific Push-fit system includes Steckdrain which is a socket to spigot, sealing ring, gravity and vacuum, sanitary drainage system. Supplied in 316 Stainless Steel from 40mm through 200mm. Steckdrain is the affordable answer to the marine industries drainage requirements.

With **W&O's** recent acquisition of **Engine Monitor, Inc. (EMI),** W&O provides fully automated control and

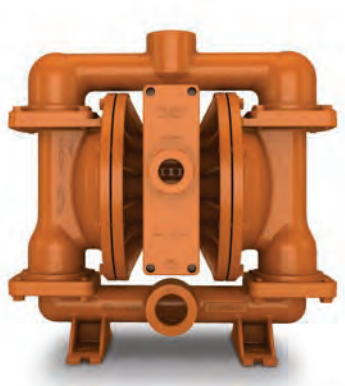
HI-FOG Electric Pump



ARO Diaphram Pump

Blackmer S Series

Wilden



monitoring of piping systems. EMI's in-house engineering, architecture design, and programming allows for tailored solutions for work boats, yachts, ferries and OSVs including steering systems, propulsion controls and control, alarm and monitoring systems (CAMS). The control architecture for these systems is designed around Programmable Logic Controls (PLCs), making them highly configurable and customizable. EMI's CAMS software can accept inputs from other manufacturer's ancillary systems to provide a single user-friendly platform. EMI's steering and control systems now include an HMI (Human Machine Interface) screen located on the Local Control Panels, which aids technicians during system commissioning and diagnostics and reduces onboard service time throughout the vessel's life.

Founded in 1899, the **Viega Group** is a leader in press technology systems for shipbuilding, industrial, commercial and residential industries. Viega LLC, offers more than 3,000 products, including marine-approved piping systems like Viega ProPress for copper and stainless, Viega MegaPress and Viega MegaPressG for black iron and galvanized pipe, SeaPress copper nickel fittings for seawater applications and Viega PEX Press systems in Zero Lead bronze and high-performance polymer.

The pipe repair system is the fastest and easiest way to temporarily repair pipe leaks and bursts. The self-contained design of the **Rapid Repair Clamp** allows for installation in less than 60 seconds by one person, without the use of any tools. The marine-grade stainless steel construction provides an extra-tight seal for water, steam, gas and most types

Wouter Witzel

Rapid Repair Clamp

Viega

of chemicals and petroleum. Available in four widths and a variety of diameters, the product is reusable and can be applied to pressurized pipes up to 20 bar.

Wouter Witzel butterfly valves reduce operational costs, down-time and keep maintenance expenses to an absolute minimum due to their high quality and lasting performance. Wouter Witzel recently announced that it will now assure this high standard of quality with a five-year guarantee. Wouter Witzel's Econaxe Series is the newest range of double eccentric, high performance butterfly valves and excel wherever critical applications demand maximum reliability. With an economical, sustainable and robust design, Econaxe valves are suitable for many marine applications. Their innovatively flexible design provides optimized features specific to individual functionality requirements and allows for exact finishing according to customer specifications. Available as a wafer type and lugged wafer type, Econaxe valves offer an improved life cycle, as well as high productivity and security.

Previously, three process steps were required in order to manufacture bent pipe components: cutting the pipe under consideration of span length and commercial length, the bending process itself, and the final cutting of the component. In order to make this process more efficient and economical, **Schwarze-Robitec** developed a new tool solution: a cutting device integrated into the bending tool. This makes it possible to bend and cut pipe components of commercially available lengths in a single process step. The users' benefit is a reduction of material waste of up to 90% and production times that are reduced.

The combination of bending and cutting tool provides the option to process longer pipe units instead of cut pipe pieces. Schwarze-Robitec has developed a cutting technology that applies a clean cutting edge to all pipe components and allows to continue the processing immediately. In general, the ends of the pipes do not require any finishing process. The cutting tool processes a variety of materials – among others, high-tensile steels.

Schwarze-Robitec

STI Marine Fire Rated Pathways

This cable raceway device consists of a heavy gauge steel shell with self-adjusting intumescent liners to allow cables to pass through fire-rated bulkheads and decks while providing a maintenance free alternative to traditional cable transits in non-water tight divisions. This product provides 100% compliance 100% of the time. These device modules can be installed individually, or ganged to increase cable capacity. Accessory plates allow for easy mounting to bulkheads or decks.

A Shipyards

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A.2 Shipyards

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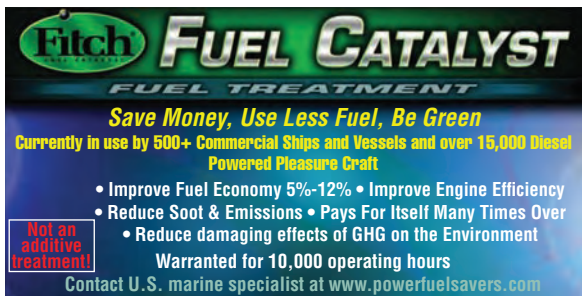
B.8 Control Systems

C Engine Components

C.1 Fuel Treatment



C.2 Leak Prevention Stop Leak

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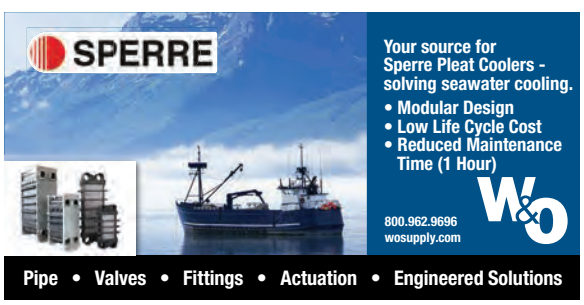

D Measurement and Control Devices

D.1 Tank Level Gauging

Marine Automation & Controls

- Main Boiler Automation & Controls
- Software Development & Testing
- Alarm & Monitoring Systems
- Throttle Control Upgrades
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D.3 Engine Controls

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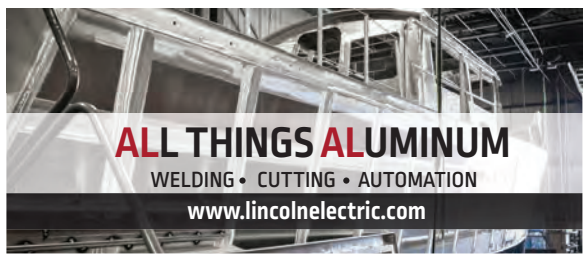
E Ship Equipment

E.1 Welders & Welding Solution



E.2 Helm Chairs

E.3 Marine Insulation

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James Voitel
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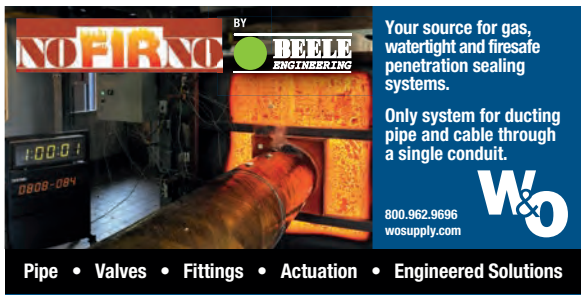
F.5 Flange Covers

G On-Board Power Suppliers

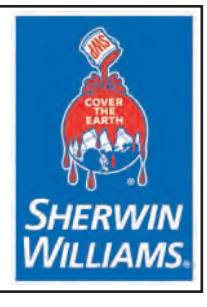
G.1 Cable & Pipe Transits



G.2 Lighting

H Corrosion Protection

H.1 Paints & Coatings



H.2 Surface Preparation

I Navigation and Communication

I.1 Communications & Headsets

I.2 Bridge Equipment

J Deck Machinery

J.1 Cranes

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Full Time, Mid Career
Category: Project Engineering / Project Management
Job Location: 58 South Service Rd. Suite 150 Melville, NY, 11747 USA
Maintenance and Repair Manager
Email: Jshaw@bouchardtransport.com
Work Phone: 631-390-4900
58 South Service Rd. Suite 150 Melville, NY, 11747 USA
Skills:
• Bachelor of Science in Marine Engineering/Marine Transportation
• Minimum three (3) years sailing experience or equivalent shore side experience
• Ability to travel as needed
• Proficiency in MS Office (Word, Excel) and NS5 a plus.
• Detail oriented
Responsibilities:
Assist in managing the daily maintenance and repair activities of the fleet alongside the Manager. He/She is responsible for and maintains NS5 Nautical System.
Job duties to include the following:
• Daily reviews of NS5 maintenance system to ensure all vessels are up to date with maintenance activities.
• As directed by Manager, assigns PO numbers and vendors for repairs requested by Vessel Supervisors.
• Inputs purchase orders assigned into NS5.
• Maintains budget information and provides monthly recaps of actual vs. budget expenditures for annual and shipyard expenditures for the fleet.
• Attends vessels during shipyard periods to review progress of repairs and budget status.
• Functions as a Vessel Supervisor for assigned group of vessels.
• Is trained in emergency response and serves as a member of the oil spill response team.

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Skills:
Few of the skills required for the job are:
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• Carrying out vessel audits for ISM/ISPS/MLC 2006 compliance.
• Supervision of post fixture operations of a fleet of bulk carriers including cargo disputes & claims, liaison with charterers and underwriters.
• Ship Inspections & audits
• Investigation of accidents and incidents on board.
• Arranged several safety seminars for the ships' staff to increase safety and operational awareness.
• Speaker at shipping conferences.
• Knowledge of manning agreements, crew contracts, ITF agreements for the fleet.
• Cruise vessel operation of 1000 Plus passenger capacity and a crew of 300 persons. Job scope included supervision of Deck & F&B department, concessionaires for duty free shops, casino, salon, photo/video departments. Overseeing Sanitation/Hygiene & HAACP compliance on cruise vessels.
• Company security officer for the fleet.
Description:
Position entails as Owner's Representative to manage the vessel from every aspect and in return participate in profit of the company.

Maritime Simulator Operator
San Jacinto College

Full Time
Job Location: Houston, Texas, 77504 United States
Email: none@given.com
TX, USA
Required Qualifications - Must have an associate degree (or higher level degree). - Experience with networking, PC hardware, software, and peripherals in a Windows environment. - Experience with various software installation packages, drivers, and associated files. - Two or more years of experience running, maintaining, troubleshooting, and repairing simulation devices and equipment as part of professional training programs. - Effective verbal and written communication, leadership, and team-building skills. - Ability to work cooperatively with a diverse work force.
Preferred Qualifications - Bachelor degree in a related field. - Five or more years of work experience in the repair of marine electronics (RADAR, ECDIS, Gyro, and VHF/UHF), computers and associated peripherals. - Formal electronics training, license or certification in electronic repair, such as FCC Element 3 or NARTIE certified technician. - Familiarity with simulator systems from such manufacturers as CSC, TRANSAS, MPRI or Kongsberg. - Familiar with marine vessel operations.
Responsibilities - Creating and running exercises/scenarios with any of the College simulator systems.

- Troubleshooting and repairing of College simulator systems hardware and software malfunctions. - Preparing, operating, and securing all simulators and their associated hardware and software. - Creating and updating charts, publications and documentation associated with simulation training. - Working closely with simulation system vendors to ensure optimal operation of all simulation systems. - Overseeing software upgrades and hardware replacements to any simulation system. - Assisting and training other operators, instructors, and faculty in the operation of all simulator systems. - Cleaning and preventative maintenance for all simulator systems and ancillary equipment. - Maintaining readiness and order within all simulation spaces.

REQUEST FOR BIDS

The New York City Department of Transportation, Division of Ferries, cordially invites your company to submit a bid for the following:

Pin # 84116MBSI957 – Detail Design and Construction of the New Staten Island Ollis Class Ferry Boat

Solicitation documents will be available beginning on **May 18, 2016** and can be downloaded free of charge from the City Record Website by visiting https://mspwvw-dcscpfvp.nyc.gov then selecting the Procurement tab and inputting the PIN # referenced above.

A printed copy of the solicitation documents can also be picked up from the *New York City Department of Transportation, Office of the Agency Chief Contracting Officer/Contract Management Unit, 55 Water Street, Ground Floor, New York, NY 10041 between 9:00am – 3:00pm, Monday to Friday (Holidays Excluded).* Prospective bidders may also request a copy via mail by contacting the Contract Management Unit at 212-839-9435. Shipping and handling charges apply.

Company address, telephone and fax numbers are required when requesting solicitation documents.

The DBE Goal for this contract is 2.2%.

Sealed bids must be submitted by 11:00 AM on August 31, 2016 to 55 Water Street, Ground Floor, New York, NY 10041. Entrance is located on the South Side of the Building facing the Vietnam Veterans Memorial. Proper government issued identification is required for entry to the building (driver's license, passport, etc.)

The **Optional Pre-Bid Meeting** will be held on **July 14, 2016** at ***10:00 A.M.*** at **55 Water Street, Ground Floor, New York, NY 10041**.

The deadline to submit questions regarding this procurement is **5:00 P.M. on July 26, 2016.**

Copies of the Buy America Compliance Guidance to Bidders as well as the Construction Management Plan may be downloaded here: http://www.nyc.gov/html/dot/html/about/doing-business.shtml. Bidders should be aware that these documents are not part of the solicitation and are intended for informational purposes only.

For additional information or to submit questions, please contact Shaneza Shinath at (212) 839-9294 or sshinath@dot.nyc.gov.

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13	Louisiana Cat	www.louisianacat.com/marine	(866) 843-7440
36	Malin International	www.malinshiprepair.com	(409) 682-0232
3	MAN DIESEL & TURBO	www.mandieselturbo.com	Please visit our website
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33	Mascoat Products	www.mascoat.com	(800) 549-0043
36	MMC International	www.mmcintl.com	(800) 645-7339
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29	Retlif Testing Laboratories	www.retlif.com	(631) 737-1500
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43	SNAME	www.sname.org/smc	(703) 997-6705
39	Sohre Turbomachinery, Inc.	www.sohreturbo.com	(413) 267-0590
42	Superior-Lidgerwood-Mundy, Corp.	www.lidgerwood.com	(714) 394-4444
27	Tecnico Corp.	www.tecnicocorp.com	(757) 545-4013
31	Transas Technologies Ltd	www.transas.com	Please visit us online
15	US Hoists Corporation	www.ushoists.com	(631) 472-3030
1	Viega	www.viega.us	(800) 976-9819
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United States Flag Privately-Owned Merchant Fleet*

Oceangoing Self-Propelled, Cargo-Carrying Vessels of 1,000 GT and Above (As of May 2, 2016)

IMO #	Vessel Name	Vessel Type	Gross Tonnage	Deadweight	Year Built	Operator	MSP	VISA	VTA	Jones Act Eligible (Y/N)	Militarily Useful (Y/N)*
9316139	AIDA	Ro-Ro	60,942	22,564	2006	American Roll-on Roll-off	Y	N	N	N	Y
9244661	ALASKAN EXPLORER	Tanker	110,693	193,049	2005	Alaska Tanker Co LLC	N	N	N	Y	N
9244659	ALASKAN FRONTIER	Tanker	110,693	193,049	2004	Alaska Tanker Co LLC	N	N	N	Y	N
9271432	ALASKAN LEGEND	Tanker	110,693	193,048	2006	Alaska Tanker Co LLC	N	N	N	Y	N
9244673	ALASKAN NAVIGATOR	Tanker	110,693	193,048	2005	Alaska Tanker Co LLC	N	N	N	Y	N
9303546	ALLIANCE FAIRFAX	Ro-Ro	59,705	19,670	2005	Farrell Lines Inc	Y	Y	N	N	Y
9332547	ALLIANCE NORFOLK	Ro-Ro	57,280	21,500	2007	Farrell Lines Inc	Y	Y	N	N	Y
9285500	ALLIANCE ST. LOUIS	Ro-Ro	57,280	15,880	2005	Farrell Lines Inc	Y	Y	N	N	Y
9564578	AMERICAN PHOENIX	Tanker	30,718	49,035	2012	Seabulk Tankers Inc	N	N	N	Y	Y
9139713	APL AGATE	Containership	65,475	63,693	1997	APL Ltd	Y	Y	N	N	Y
9218686	APL BELGIUM	Containership	65,792	67,500	2002	APL Ltd	Y	Y	N	N	Y
9074389	APL CHINA	Containership	64,502	66,520	1995	APL Ltd	Y	Y	N	N	Y
9139749	APL CORAL	Containership	65,475	64,145	1998	APL Ltd	Y	Y	N	N	Y
9229609	APL GUAM	Containership	13,764	16,400	2001	APL Ltd	Y	N	N	N	Y
9074535	APL KOREA	Containership	64,502	66,520	1995	APL Ltd	Y	Y	N	N	Y
9077276	APL PHILIPPINES	Containership	64,502	65,642	1996	APL Ltd	Y	Y	N	N	Y
9074547	APL SINGAPORE	Containership	64,502	66,520	1995	APL Ltd	Y	Y	N	N	Y
9077123	APL THAILAND	Containership	64,502	66,520	1995	APL Ltd	Y	Y	N	N	Y
8124371	BLACK EAGLE	Containership	31,041	32,709	1983	Sealift Inc	N	Y	N	N	Y
9144926	CALIFORNIA VOYAGER	Tanker	30,770	45,656	1999	Chevron Shipping Co LLC	N	N	N	Y	Y
9123037	CAPT DAVID I LYON	Containership	16,803	22,878	1996	Sealift Inc	N	N	N	N	Y
8109668	CHARLESTON	Tanker	31,452	48,846	1983	USCS Charleston Chartering	N	N	N	Y	Y
9243162	CHARLESTON EXPRESS	Containership	40,146	40,478	2002	Hapag-Lloyd Ag	Y	Y	N	N	Y
6806444	CHEMICAL PIONEER	Tanker	21,760	34,930	1968	USCS Chemical Chartering	N	N	N	Y	Y
9010498	COASTAL NAVIGATOR	General Cargo	1,904	1,500	1991	Coastal Transportation Inc	N	N	N	Y	N
8213249	COASTAL NOMAD	General Cargo	1,920	1,200	1983	Coastal Transportation Inc	N	N	N	Y	N
8855463	COASTAL PROGRESS	General Cargo	1,920	1,200	1988	Coastal Transportation Inc	N	N	N	Y	N
9782493	COASTAL STANDARD	General Cargo	2,451	2,565	2016	Coastal Transportation Inc	N	N	N	Y	Y
5408491	COASTAL TRADER	General Cargo	1,823	1,825	1963	Coastal Transportation Inc	N	N	N	Y	N
7119678	COASTAL VENTURE	General Cargo	1,301	1,383	1971	Stevens Transportation LLC	N	Y	N	Y	N
9198501	DELTA MARINER	Ro-Ro	8,679	3,950	2000	Foss Maritime Co	N	Y	N	Y	Y
9642095	EAGLE BAY	Tanker	62,318	114,762	2015	Seariver Maritime Inc	N	N	N	Y	N
7408081	EAGLE FORD	Tanker	64,329	124,644	1978	Seabulk Tankers Inc	N	N	N	Y	N
7506015	EL YUNQUE	Ro-Ro	28,137	16,144	1976	Sea Star Line LLC	N	Y	N	Y	Y
9408126	EMPIRE STATE	Tanker	29,527	48,632	2010	Crowley Petroleum Service Inc	N	N	N	Y	Y
9121273	ENDURANCE	Ro-Ro	72,708	48,988	1996	American Roll-On Roll-Off	Y	Y	N	N	Y
8026799	ENERGY ENTERPRISE	Dry Bulk	28,250	33,373	1983	International Shipholding Corp	N	N	N	Y	N
8813025	EOT SPAR	Ro-Ro	2,762	3,095	1990	Schuyler Line Navigation Company, LLC	N	Y	N	N	Y
9408138	EVERGREEN STATE	Tanker	29,606	48,641	2010	American Petroleum Tankers LLC	N	N	N	Y	Y
9568469	FLORIDA	Tanker	29,242	45,760	2013	Crowley Petroleum Service Inc	N	N	N	Y	Y
9118630	FLORIDA VOYAGER	Tanker	30,415	46,094	1998	Chevron Shipping Co LLC	N	N	N	Y	Y
9129706	FREEDOM	Ro-Ro	49,821	19,884	1997	American Roll-On Roll-Off	Y	Y	N	N	Y
7710733	GEYSIR	General Cargo	2,266	2,000	1980	TransAtlantic Lines LLC	N	Y	N	Y	Y
9407562	GOLDEN STATE	Tanker	29,527	48,632	2009	Crowley Petroleum Service Inc	N	N	N	Y	Y
9339818	GREEN BAY	Ro-Ro	59,250	18,312	2007	LMS Shipmanagement Inc	Y	Y	N	N	Y
9181560	GREEN COVE	Ro-Ro	57,566	22,747	1999	LMS Shipmanagement Inc	Y	Y	N	N	Y
9158288	GREEN LAKE	Ro-Ro	54,623	22,799	1998	Central Gulf Lines	Y	Y	N	N	Y
9177428	GREEN RIDGE	Ro-Ro	57,449	21,523	1998	Central Gulf Lines	Y	Y	N	N	Y
9126297	HONOR	Ro-Ro	49,814	19,844	1996	American Roll-On Roll-Off	Y	Y	N	N	Y
8419142	HORIZON ANCHORAGE	Containership	20,965	21,282	1987	Horizon Lines LLC	N	Y	N	Y	Y
7224306	HORIZON CONSUMER	Containership	25,644	25,651	1973	Horizon Lines LLC	N	Y	N	Y	Y
7617905	HORIZON ENTERPRISE	Containership	28,219	31,423	1980	Crowley Liner Services Inc	N	Y	N	Y	Y
7617890	HORIZON PACIFIC	Containership	28,219	31,213	1979	Crowley Liner Services Inc	N	Y	N	Y	Y
7729461	HORIZON RELIANCE	Containership	34,077	45,895	1980	Crowley Liner Services Inc	N	Y	N	Y	Y
7729459	HORIZON SPIRIT	Containership	34,077	46,154	1980	Crowley Liner Services Inc	N	Y	N	Y	Y
8419154	HORIZON TACOMA	Containership	20,965	20,668	1987	Horizon Lines LLC	N	Y	N	Y	Y
9331593	HOUSTON	General Cargo	7,002	7,491	2005	Teras BBC Ocean Navigation	N	N	N	N	Y
8220761	HOUSTON	Tanker	21,471	32,689	1985	USS Chartering LLC	N	N	N	Y	Y
9070448	INDEPENDENCE II	Ro-Ro	55,598	15,199	1994	American Roll-On Roll-Off	Y	Y	N	N	Y
8919934	INTEGRITY	Ro-Ro	52,479	29,152	1992	American Roll-On Roll-Off	Y	Y	N	N	Y
9680841	ISLA BELLA	Containership	36,751	33,106	2015	Totem Ocean Trailer Express	N	N	N	Y	Y
9233167	JEAN ANNE	Ro-Ro	37,548	12,561	2005	Pasha Group	N	Y	N	Y	Y
7802718	KAUAI	Containership	25,640	26,350	1980	Matson Navigation Co Inc	N	Y	N	Y	Y
9642083	LIBERTY BAY	Tanker	62,318	115,000	2014	Seariver Maritime Inc	N	N	N	Y	N
9278753	LIBERTY EAGLE	Dry Bulk	28,762	51,812	2004	Liberty Maritime Corp	N	Y	N	N	N
9228136	LIBERTY GLORY	Dry Bulk	28,836	50,601	2001	Liberty Maritime Corp	N	Y	N	N	N
9228148	LIBERTY GRACE	Dry Bulk	28,836	50,601	2001	Liberty Maritime Corp	N	Y	N	N	N
9448114	LIBERTY PRIDE	Ro-Ro	57,030	21,233	2009	Liberty Maritime Corp	Y	Y	N	N	Y
9448425	LIBERTY PROMISE	Ro-Ro	57,030	21,359	2010	Liberty Maritime Corp	Y	Y	N	N	Y
7105471	LIHUE	Containership	30,877	38,656	1971	Matson Navigation Co Inc	N	Y	N	Y	Y
9697985	LONE STAR STATE	Tanker	29,923	53,700	2015	American Petroleum Tankers LLC	N	N	N	Y	Y
9704790	LOUISIANA	Tanker	29,801	49,828	2016	Crowley Petroleum Service Inc	N	N	N	Y	Y
9215660	LTC JOHN U.D. PAGE	Containership	40,085	51,101	2001	Sealift Inc	N	N	N	N	Y
7321087	LURLINE	Ro-Ro	30,506	22,030	1973	Matson Navigation Co Inc	N	N	N	Y	Y
9348649	MAERSK ATLANTA	Containership	74,642	84,676	2006	Maersk Line A/S	Y	Y	N	N	Y
8820195	MAERSK CALIFORNIA	Containership	18,979	25,275	1992	Maersk Line A/S	Y	Y	N	N	Y
9155133	MAERSK CAROLINA	Containership	50,698	62,229	1998	Maersk Line A/S	Y	Y	N	N	Y
9332975	MAERSK CHICAGO	Containership	74,642	84,775	2007	Maersk Line A/S	Y	Y	N	N	Y
9332987	MAERSK COLUMBUS	Containership	74,642	84,704	2007	Maersk Line A/S	Y	Y	N	N	Y
9332999	MAERSK DENVER	Containership	74,642	84,771	2007	Maersk Line A/S	Y	Y	N	N	Y
9333034	MAERSK DETROIT	Containership	74,642	80,000	2008	Maersk Line A/S	Y	Y	N	N	Y
9333008	MAERSK HARTFORD	Containership	74,642	60,375	2007	Maersk Line A/S	Y	Y	N	N	Y
9193264	MAERSK IDAHO	Containership	50,698	61,986	2000	Maersk Line A/S	Y	Y	N	N	Y
9298686	MAERSK IOWA	Containership	50,686	61,454	2006	Maersk Line A/S	Y	Y	N	N	Y
9333010	MAERSK KENSINGTON	Containership	74,642	84,897	2007	Maersk Line A/S	Y	Y	N	N	Y
9193240	MAERSK KENTUCKY	Containership	50,698	61,986	1999	Maersk Line A/S	Y	Y	N	N	Y
9333022	MAERSK KINLOSS	Containership	74,642	84,835	2008	Maersk Line A/S	Y	Y	N	N	Y
9348651	MAERSK MEMPHIS	Containership	74,642	84,868	2007	Maersk Line A/S	Y	Y	N	N	Y
9255244	MAERSK MICHIGAN	Tanker	28,517	47,047	2003	Handytankers K/S	N	N	Y	N	Y
9155121	MAERSK MISSOURI	Containership	50,698	62,226	1998	Maersk Line A/S	Y	Y	N	N	Y
9305312	MAERSK MONTANA	Containership	50,686	61,499	2006	Maersk Line A/S	Y	Y	N	N	Y
9298698	MAERSK OHIO	Containership	50,686	61,454	2006	Maersk Line A/S	Y	Y	N	N	Y
9278492	MAERSK PEARY	Tanker	25,487	38,177	2004	Maersk Line Ltd-USA	N	N	Y	N	Y
9342176	MAERSK PITTSBURGH	Containership	74,642	84,676	2008	Maersk Line A/S	Y	Y	N	N	Y
9193252	MAERSK WISCONSIN	Containership	50,698	62,441	2000	Maersk Line A/S	Y	Y	N	N	Y
7907996	MAHIMAHI	Containership	41,036	30,825	1983	Matson Navigation Co Inc	N	Y	N	Y	Y
8320559	MAJOR BERNARD F. FISHER	Ro-Ro	34,318	24,500	1985	Sealift Inc	N	N	N	N	Y
7907984	MANOA	Containership	41,036	30,825	1982	Matson Navigation Co Inc	N	Y	N	Y	Y
9244130	MANUKAI	Containership	32,575	38,261	2003	Matson Navigation Co Inc	N	Y	N	Y	Y
9273674	MANULANI	Containership	32,575	38,261	2005	Matson Navigation Co Inc	N	Y	N	Y	Y
9619684	MARJORIE C	Ro-Ro	47,279	24,750	2015	Pasha Hawaii Holdings LLC	N	Y	N	Y	Y
9232979	MARSTAN	Containership	6,368	8,627	2000	APL Ltd	N	Y	N	N	Y
8419166	MATSON KODIAK	Containership	20,965	20,668	1987	Horizon Lines LLC	N	Y	N	Y	Y
7116315	MATSON NAVIGATOR	Containership	28,212	31,203	1972	Matson Navigation Co Inc	N	N	N	Y	Y
7366312	MATSON PRODUCER	Containership	25,644	25,651	1974	Matson Navigation Co Inc	N	N	N	Y	Y

United States Flag Privately-Owned Merchant Fleet*

Oceangoing Self-Propelled, Cargo-Carrying Vessels of 1,000 GT and Above (As of May 2, 2016)

IMO #	Vessel Name	Vessel Type	Gross Tonnage	Deadweight	Year Built	Operator	MSP	VISA	VTA	Jones Act Eligible (Y/N)	Militarily Useful (Y/N)*
7334204	MATSONIA	Ro-Ro	33,095	22,501	1973	Matson Navigation Co Inc	N	Y	N	Y	Y
7602338	MAUI	Containership	25,630	24,683	1978	Matson Navigation Co Inc	N	Y	N	Y	Y
9273686	MAUNALEI	Containership	25,324	34,027	2006	Matson Navigation Co Inc	N	Y	N	Y	Y
9268538	MAUNAWILI	Containership	32,575	38,261	2004	Matson Navigation Co Inc	N	Y	N	Y	Y
9232278	MIDNIGHT SUN	Ro-Ro	65,314	22,437	2003	Totem Ocean Trailer Express	N	Y	N	Y	Y
7929308	MISSISSIPPI ENTERPRISE	Dry Bulk	22,518	37,244	1980	US United Ocean Services LLC	N	N	N	Y	N
9131369	MISSISSIPPI VOYAGER	Tanker	30,415	46,069	1998	Chevron Shipping Co LLC	N	N	N	Y	Y
9100243	MOHEGAN	Containership	6,158	7,850	1994	Sealift Inc	N	Y	N	N	Y
7908005	MOKIHANA	Ro-Ro	57,379	30,652	1983	Matson Navigation Co Inc	N	Y	N	Y	Y
8302246	NATIONAL GLORY	Containership	11,652	12,418	1988	National Shipping of America	N	Y	N	Y	Y
9418975	NORFOLK	General Cargo	15,549	17,478	2010	Truenorth Transport LLC	Y	Y	N	N	Y
9232280	NORTH STAR	Ro-Ro	65,314	22,437	2003	Totem Ocean Trailer Express	N	Y	N	Y	Y
9258193	OCEAN CRESCENT	General Cargo	7,252	8,097	2002	Intermarine LLC	Y	Y	N	N	Y
9506722	OCEAN FREEDOM	General Cargo	12,810	14,359	2010	Intermarine LLC	Y	Y	N	N	Y
9437335	OCEAN GIANT	General Cargo	15,549	18,389	2012	Intermarine LLC	Y	Y	N	N	Y
9419008	OCEAN GLOBE	General Cargo	15,549	16,576	2010	Intermarine LLC	Y	Y	N	N	Y
9681821	OCEAN GRAND	General Cargo	18,410	19,436	2015	Intermarine LLC	Y	Y	N	N	Y
9457218	OCEAN TRADER	Ro-Ro	29,429	11,325	2011	Military Sealift Command	N	N	N	N	Y
9704776	OHIO	Tanker	29,801	49,828	2015	Crowley Petroleum Service Inc	N	N	N	Y	Y
9144914	OREGON VOYAGER	Tanker	30,770	45,671	1999	Chevron Shipping Co LLC	N	N	N	Y	Y
9353591	OVERSEAS ANACORTES	Tanker	29,242	46,666	2010	Overseas Shipholding Group	N	N	N	Y	Y
9353565	OVERSEAS BOSTON	Tanker	29,242	46,802	2009	OSG Ship Management Inc	N	N	N	Y	Y
9475935	OVERSEAS CASCADE	Tanker	29,234	46,287	2009	OSG Ship Management Inc	N	N	N	Y	Y
9432218	OVERSEAS CHINOOK	Tanker	29,234	46,666	2010	Overseas Shipholding Group	N	N	N	Y	Y
9351062	OVERSEAS HOUSTON	Tanker	29,242	46,814	2007	Overseas Shipholding Group	N	N	N	Y	Y
9353527	OVERSEAS LONG BEACH	Tanker	29,242	46,911	2007	OSG Ship Management Inc	N	N	N	Y	Y
9353539	OVERSEAS LOS ANGELES	Tanker	29,242	46,817	2007	OSG Ship Management Inc	N	N	N	Y	Y
9353589	OVERSEAS MARTINEZ	Tanker	29,242	46,653	2010	OSG Ship Management Inc	N	N	N	Y	Y
9435894	OVERSEAS MYKONOS	Tanker	29,433	51,711	2010	OSG Ship Management Gr Ltd	Y	N	Y	N	Y
9353541	OVERSEAS NEW YORK	Tanker	29,242	46,810	2008	OSG Ship Management Inc	N	N	N	Y	Y
9353577	OVERSEAS NIKISKI	Tanker	29,242	46,666	2009	OSG Ship Management Inc	N	N	N	Y	Y
9435909	OVERSEAS SANTORINI	Tanker	29,433	51,711	2010	OSG Ship Management Gr Ltd	Y	N	Y	N	Y
9353606	OVERSEAS TAMPA	Tanker	29,242	46,666	2011	OSG Ship Management Inc	N	N	N	Y	Y
9353553	OVERSEAS TEXAS CITY	Tanker	29,242	46,817	2008	OSG Ship Management Inc	N	N	N	Y	Y
9408102	PELICAN STATE	Tanker	29,527	48,598	2009	Crowley Petroleum Service Inc	N	N	N	Y	Y
9486958	PENNSYLVANIA	Tanker	29,242	45,760	2012	Crowley Petroleum Service Inc	N	N	N	Y	Y
9680853	PERLA DEL CARIBE	Containership	36,912	45,000	2016	Totem Ocean Trailer Express	N	N	N	Y	Y
9243203	PHILADELPHIA EXPRESS	Containership	40,146	40,478	2003	Hapag-Lloyd Ag	Y	Y	N	N	Y
9244063	POLAR ADVENTURE	Tanker	85,387	141,740	2004	Polar Tankers Inc	N	N	N	Y	N
9206114	POLAR DISCOVERY	Tanker	85,387	141,740	2003	Polar Tankers Inc	N	N	N	Y	N
9193551	POLAR ENDEAVOUR	Tanker	85,387	141,740	2001	Polar Tankers Inc	N	N	N	Y	N
9250660	POLAR ENTERPRISE	Tanker	85,387	141,740	2006	Polar Tankers Inc	N	N	N	Y	N
9193563	POLAR RESOLUTION	Tanker	85,387	141,740	2002	Polar Tankers Inc	N	N	N	Y	N
9002037	R. J. PFEIFFER	Containership	32,664	28,555	1992	Matson Navigation Co Inc	N	Y	N	Y	Y
9080297	RESOLVE	Ro-Ro	49,443	13,548	1994	American Roll-On Roll-Off	Y	Y	N	N	Y
9118628	S/R AMERICAN PROGRESS	Tanker	30,415	46,103	1997	Seariver Maritime Inc	N	N	N	Y	Y
9356074	SAFMARINE NGAMI	Containership	25,904	35,119	2008	Safmarine Container Lines	Y	Y	N	N	Y
7517698	SEA TRADER	General Cargo	3,185	1,496	1976	Trident Seafoods Corp	N	N	N	Y	N
9131371	SEABULK ARCTIC	Tanker	30,415	46,103	1998	Seabulk Tankers Inc	N	N	N	Y	Y
7816551	SEABULK CHALLENGE	Tanker	29,763	49,636	1981	Seabulk Tankers Inc	N	N	N	Y	Y
7816549	SEABULK TRADER	Tanker	29,763	49,990	1981	Seabulk Tankers Inc	N	N	N	Y	Y
7408093	SEAKAY SPIRIT	Tanker	64,329	125,133	1979	Keystone Shipping Co	N	N	N	Y	N
9161168	SEATTLE	General Cargo	13,066	20,406	1997	Truenorth Transport LLC	N	Y	N	N	Y
9222352	SLNC CORSICA	General Cargo	5,548	6,404	2001	Schuyler Line Navigation Co	N	Y	N	N	Y
9448334	SLNC GOODWILL	Tanker	30,241	50,326	2009	Patriot Contract Services	N	N	N	N	Y
9383663	SLNC PAX	Tanker	5,713	7,985	2008	Schuyler Line Navigation Company, LLC	N	N	N	N	Y
9243186	ST LOUIS EXPRESS	Containership	40,146	40,478	2002	Hapag-Lloyd Ag	Y	Y	N	N	Y
9077044	SULPHUR ENTERPRISE	Tanker	16,771	21,649	1994	ISC-Sulphur Holding Inc	N	N	N	Y	Y
9408114	SUNSHINE STATE	Tanker	29,527	48,633	2009	Crowley Petroleum Service Inc	N	N	N	Y	Y
9704788	TEXAS	Tanker	29,801	49,990	2015	Crowley Petroleum Service Inc	N	N	N	Y	Y
7821154	TEXAS ENTERPRISE	Dry Bulk	21,734	36,414	1981	US United Ocean Services LLC	N	N	N	Y	N
9148520	TRANSATLANTIC	General Cargo	4,276	5,055	1997	Transatlantic Lines LLC	N	Y	N	N	Y
9243198	WASHINGTON EXPRESS	Containership	40,146	40,478	2003	Hapag-Lloyd Ag	Y	Y	N	N	Y
9243174	YORKTOWN EXPRESS	Containership	40,146	40,478	2002	Hapag-Lloyd Ag	Y	Y	N	N	Y

United State Flag Fleet @ a Glance:

Total Ships

169

Jones Act

92

Non-Jones Act

77

To provide any updates for this list, please e-mail DATA.MARAD@DOT.GOV

Coverage

This report contains a listing of oceangoing, self-propelled, privately-owned, cargo-carrying vessels of 1,000 gross tons or greater

Vessel Types

The vessel categories used for this report include the following types of vessels:
Tankers: Petoleum Tankers, Chemical Carriers, LNG Carriers, LNG/LPG Carriers, LPG Carriers.
Container: Fully Cellular Containerships
Dry Bulk: Bulk Vessls, Bulk Containerships, Cement Carriers, Wood Chip Carriers, Ore/Bulk/Oil Carriers, and Bulk/Oil Carriers.
Ro-Ro: Ro-Ro Vessels, Ro-Ro/Containerships, Vehicle Carriers.
General Cargo: General Cargo Carriers, Partial Containerships, Refrigerated Ships.

Capacities

Vessel capacities are expressed in gross tons (GT) and deadweight tons (DWT). Gross Tonnage is volume of all ship's enclosed spaces (from keel to funnel) measured to the outside of the hull framing. 1 GT = 100 cubic feet.
Deadweight is the total weight (metric tons) of: Cargo, fuel, fresh water, stores and crew which a ship can carry when immersed to its load line.

Operator - The company responsible for the commercial decisions concerning the employment of a ship and therefore who decides how and where that asset is employed. The direct beneficiary of the profits from the operations of the ship, this company may also be responsible for purchasing decisions on bunkers and port services. A medium to long-term time or bareboat charterer is considered to be the operator of the ship. Companies heading operator pools are Operators of the ships in the pool.
MSP - Maritime Security Program
VISA - Voluntary Intermodal Sealift Agreement
VTA - Voluntary Tanker Agreement

Jones Act Eligible - Vessels that are eligible to participate in domestic trade . Jones Act eligible vessels are built in the United States, owned by United States citizens and crewed by U.S. Mariners.

Militarily Useful Sealift Vessels
The following definition is based on the Joint Publication 4-01.2, Sealift Support to Joint Operations, Chairman of the Joint Chiefs of Staff, 22 June 2012.

Sources: U.S. Maritime Administration, (IHS Maritime, Sea-Web. www.sea-web.com)

United States Flag Privately-Owned Merchant Fleet*

Articulated and Integrated Tug-Barge Units (As of October 2, 2015)

Operator	Vessel IMO or CG Number	Tugboat Name	Barge CG Number or IMO Number	Barge Name	Type of Barge	Barrel Capacity*
Bouchard Transportation	9053141	BARBARA E. BOUCHARD	998038	B. NO. 240	Tank Barge	141,082
Bouchard Transportation	8835102	BOUCHARD GIRLS	955449	B. NO. 295	Tank Barge	158,822
Bouchard Transportation	9219501	BRENDAN J. BOUCHARD	1064767	B. NO. 215	Tank Barge	118,538
Bouchard Transportation	7814591	BUSTER BOUCHARD	603622	B. NO. 255	Tank Barge	157,905
Bouchard Transportation	8115825	CAPT. FRED BOUCHARD	640436	B. NO. 275	Tank Barge	159,088
Bouchard Transportation	9170688	DANIELLE M. BOUCHARD	1050073	B. NO. 245	Tank Barge	256,850
Bouchard Transportation	9730359	DENISE A. BOUCHARD	1216341	B. NO. 284	Tank Barge	86,976
Bouchard Transportation	8117952	ELLEN S. BOUCHARD	1204610	B. NO. 282	Tank Barge	86,966
Bouchard Transportation	9629768	EVENING STAR	1235496	B. NO. 250	Tank Barge	58,983
Bouchard Transportation	9137325	J. GEORGE BETZ	1031170	B. NO. 235	Tank Barge	141,082
Bouchard Transportation	9269702	JANE A. BOUCHARD	1139764	B. NO. 225	Tank Barge	119,678
Bouchard Transportation	9405394	LINDA LEE BOUCHARD	1191747	B. NO. 205	Tank Barge	119,678
Bouchard Transportation	7901978	MARION C. BOUCHARD	614652	B. NO. 265	Tank Barge	158,178
Bouchard Transportation	9269740	MORTON S. BOUCHARD IV	1154327	B. NO. 242	Tank Barge	141,207
Bouchard Transportation	8809983	RALPH E. BOUCHARD	991746	B. NO. 230	Tank Barge	138,802
Bouchard Transportation	8117964	RHEA I. BOUCHARD	1181626	B. NO. 280	Tank Barge	86,966
Bouchard Transportation	9085821	ROBERT J. BOUCHARD	923249	B. NO. 285	Tank Barge	159,402
Bouchard Transportation	9753179	KIM M. BOUCHARD	1257373	B. NO. 270	Tank Barge	260,000
Brice Incorporated	CG1245036	ALULAQ	1245030	DRIFT RIVER	Freight Barge	-
Brice Incorporated	CG1194639	SAM B	1194640	LA B	Freight Barge	-
Coastal Carriers, Inc.*	7532741	COASTAL 202	587045	FLORIDA ENTERPRISE	Freight Barge	-
Coastal Carriers, Inc.*	7236024	COASTAL 101	667454	LOUISIANA ENTERPRISE	Freight Barge	-
Coastal Carriers, Inc.*	8875310	NAIDA RAMIL	641530	PEGGY PALMER	Freight Barge	-
Coastal Carriers, Inc.*	7303853	COASTAL 303	691889	ALABAMA ENTEPRISE	Freight Barge	-
Crowley	9542568	ACHIEVEMENT	1214913	650-8	Tank Barge	178,000
Crowley	9271119	COASTAL RELIANCE	1134952	550-4	Tank Barge	155,000
Crowley	9369411	COMMITMENT	1197649	650-6	Tank Barge	178,000
Crowley	9369409	COURAGE	1197648	650-5	Tank Barge	178,000
Crowley	9398474	GULF RELIANCE	1182054	650-2	Tank Barge	178,000
Crowley	9542594	INNOVATION	1214914	650-9	Tank Barge	178,000
Crowley	9369394	INTEGRITY	1197647	650-4	Tank Barge	178,000
Crowley	9583249	LEGACY	1223284	750-1	Tank Barge	327,000
Crowley	9601792	LEGEND	1223285	750-2	Tank Barge	327,000
Crowley	9601821	LIBERTY	1223286	750-3	Tank Barge	327,000
Crowley	9275438	OCEAN RELIANCE	1132685	550-3	Tank Barge	155,000
Crowley	9386548	PACIFIC RELIANCE	1182053	650-1	Tank Barge	178,000
Crowley	9369423	PRIDE	1214912	650-7	Tank Barge	178,000
Crowley	9369382	RESOLVE	1197646	650-3	Tank Barge	178,000
Crowley	9275878	SEA RELIANCE	1123079	550-1	Tank Barge	155,000
Crowley	9277369	SOUND RELIANCE	1123080	550-2	Tank Barge	155,000
Crowley	9542609	VISION	1214915	650-10	Tank Barge	178,000
Express Marine	8830932	BALTIMORE	947469	EMI 1850	Freight Barge	-
Express Marine	9584176	FREEDOM	1225098	EMI 2400	Freight Barge	-
Foss International, Inc.	7634331	STRONG	678752	MARINER	Freight Barge	-
Foss International, Inc.	8846151	THUNDER	973127	LIGHTNING	Freight Barge	-
Harley Marine Services	9767924	EMERY ZIDELL	1255909	DR. ROBERT J. BEALL	Tank Barge	80,000
Kirby Offshore Marine	7716969	ADRIATIC SEA	1209866	DBL 77	Tank Barge	77,000
Kirby Offshore Marine	7206902	BEAUFORT SEA	1212984	DBL 76	Tank Barge	77,000
Kirby Offshore Marine	7512052	BISMARCK SEA	1219893	DBL 106	Tank Barge	107,041
Kirby Offshore Marine	9565596	BLUEFIN	1226850	PENN 80	Tank Barge	77,000
Kirby Offshore Marine	9329320	CAPT. HAGEN	1162823	KEY WEST	Tank Barge	140,000
Kirby Offshore Marine	9645607	CAPTAIN DONALD LOWE SR	1243311	MARGO DALE	Freight Barge	
Kirby Offshore Marine	9536662	COHO	1215272	PENN 92	Tank Barge	88,000
Kirby Offshore Marine	9492684	DUBLIN SEA	1220015	DBL 185	Tank Barge	193,104
Kirby Offshore Marine	8899550	ELIZA	1027618	ATLANTIC	Tank Barge	115,000
Kirby Offshore Marine	9032783	GREENLAND SEA	1137538	DBL 82	Tank Barge	85,834
Kirby Offshore Marine	7038393	IRISH SEA	1119760	DBL 101	Tank Barge	107,284
Kirby Offshore Marine	9645592	JASON E. DUTTINGER	1243312	WINNA WILSON	Freight Barge	
Kirby Offshore Marine	8023876	JAVA SEA	1132231	DBL 81	Tank Barge	85,818
Kirby Offshore Marine	7743596	JULIE	1055441	YUCATAN	Tank Barge	138,500
Kirby Offshore Marine	9219006	LINCOLN SEA	1090503	DBL 140	Tank Barge	140,000
Kirby Offshore Marine	8899562	LUCIA	1027617	CARIBBEAN	Tank Barge	115,000
Kirby Offshore Marine	9579896	MAKO	1231560	PENN 81	Tank Barge	77,000
Kirby Offshore Marine	8116001	MCKINLEY SEA	699977	DBL 134	Tank Barge	136,766
Kirby Offshore Marine	7367213	NAKOLO	1209866	DBL 77	Tank Barge	80,000
Kirby Offshore Marine	8968210	NATHAN E. STEWART	1229343	DBL 55	Tank Barge	52,000
Kirby Offshore Marine	7523659	NORWEGIAN SEA	1170633	DBL 103	Tank Barge	101,129
Kirby Offshore Marine	8109773	OSPREY	8645026	ATC 25	Tank Barge	152,000
Kirby Offshore Marine	7647223	PACIFIC AVENGER	1212984	DBL 76	Tank Barge	82,000
Kirby Offshore Marine	7404047	PACIFIC WOLF	1221438	DBL 54	Tank Barge	52,000
Kirby Offshore Marine	7802627	PARAGON	1209849	DBL 79	Tank Barge	80,000
Kirby Offshore Marine	7367134	PENN NO. 4	1146491	DBL 102	Tank Barge	100,000
Kirby Offshore Marine	8856326	REBEL	556673	DBL 155	Tank Barge	150,000
Kirby Offshore Marine	9219915	SEA EAGLE	1038792	TMI 17	Tank Barge	85,000
Kirby Offshore Marine	9256846	SEA HAWK (ALLIED)	1123631	ATC 21	Tank Barge	126,000
Kirby Offshore Marine	7806506	SEA RAVEN	1523786	ATC 23	Tank Barge	164,000
Kirby Offshore Marine	9503847	SKIPJACK	1208556	PENN 91	Tank Barge	88,000
Kirby Offshore Marine	7390923	TARPON	569269	POTOMAC	Tank Barge	78,000
Kirby Offshore Marine	7026900	TASMAN SEA	1193787	DBL 104	Tank Barge	101,129
Kirby Offshore Marine	9175016	TERESA	1049252	ACADIA	Tank Barge	136,000
Kirby Offshore Marine	7005841	VALIANT	630287	EVERGLADES	Tank Barge	175,000
Kirby Offshore Marine	7309780	VIKING	1146491	DBL 102	Tank Barge	107,284

United States Flag Privately-Owned Merchant Fleet*

Articulated and Integrated Tug-Barge Units (As of October 2, 2015)

Operator	Vessel IMO or CG Number	Tugboat Name	Barge CG Number or IMO Number	Barge Name	Type of Barge	Barrel Capacity*
Kirby Offshore Marine	8202991	VOLUNTEER	653463	DBL 105	Tank Barge	113,335
Kirby Offshore Marine	9565584	YELLOWFIN	1220985	PENN 110	Tank Barge	10,500
Kirby Offshore Marine	7512064	BERING SEA		No assigned barge		
Kirby Offshore Marine	8989941	DAVIS SEA		No assigned barge		
Kirby Offshore Marine	5107918	MARYLAND		No assigned barge		
Kirby Offshore Marine	9265718	LABRADOR SEA	1205954	DBL 24	Tank Barge	27,000
Kirby Offshore Marine		No assigned tug	1184523	DBL 26	Tank Barge	27,000
Kirby Offshore Marine		No assigned tug	1180995	DBL 29	Tank Barge	27,000
Martin Midstream	7326312	LAFORCE	1215084	M6000	Tank Barge	Unknown
Martin Midstream	9160853	MARTIN EXPLORER	1037624	MARGARET SUE	Tank Barge	Unknown
Martin Midstream	5391260	ORION	552864	POSEIDON	Tank Barge	Unknown
Martin Midstream	7722073	TEXAN	536811	PONCIANA	Tank Barge	Unknown
Martin Midstream		UNKNOWN	523487	MARTIN ENDEAVOR	Tank Barge	Unknown
Matson Navigation Company	7932202	MOKU PAHU	644915	HSTC 1	Freight Barge	-
Moran Towing Corporation	9132105	BARNEY TURECAMO	1161559	GEORGIA	Tank Barge	118,000
Moran Towing Corporation	9398565	LINDA MORAN	1205750	HOUSTON	Tank Barge	118,000
Moran Towing Corporation	9415777	LOIS ANN L. MORAN	1215132	PHILADELPHIA	Tank Barge	118,000
Moran Towing Corporation	9560534	MARY ANN MORAN	651023	VIRGINIA	Freight Barge	-
Moran Towing Corporation	9398553	PATI R. MORAN	1197244	CHARLESTON	Tank Barge	118,000
Moran Towing Corporation	7390777	PAUL T MORAN	643069	MASSACHUSETTS	Tank Barge	137,000
Moran Towing Corporation	9203356	SCOTT TURECAMO	1161563	NEW HAMPSHIRE	Tank Barge	118,000
OSG Ship Management	8024727	OSG COLUMBIA	636104	OSG 242	Tank Barge	239,656
OSG Ship Management	9395707	OSG COURAGEOUS	532585	OSG 244	Tank Barge	240,862
OSG Ship Management	9441477	OSG ENDURANCE	614210	OSG 192	Tank Barge	175,305
OSG Ship Management	7717028	OSG ENTERPRISE	565314	OSG 214	Tank Barge	188,017
OSG Ship Management	7400455	OSG HONOUR	624039	OSG 209	Tank Barge	210,496
OSG Ship Management	9436549	OSG HORIZON	1229615	OSG 351	Tank Barge	353,048
OSG Ship Management	7906849	OSG INDEPENDENCE	646669	OSG 243	Tank Barge	239,691
OSG Ship Management	7028336	OSG INTREPID	529918	OSG 254	Tank Barge	254,521
OSG Ship Management	7208065	OSG NAVIGATOR	537129	OSG 252	Tank Barge	255,037
OSG Ship Management	9436537	OSG VISION	1223554	OSG 350	Tank Barge	353,047
Reinauer Transportation	7729514	AUSTIN REINAUER	1170443	RTC 100	Tank Barge	100,000
Reinauer Transportation	9653238	B FRANKLIN REINAUER	1200042	RTC 81	Tank Barge	80,000
Reinauer Transportation	9263289	CHRISTIAN REINAUER	1120514	RTC 145	Tank Barge	140,000
Reinauer Transportation	7517686	CRAIG ERIC REINAUER	1214893	RTC 103	Tank Barge	100,000
Reinauer Transportation	9653240	CURTIS REINAUER	1205655	RTC 82	Tank Barge	80,000
Reinauer Transportation	8993368	DACE REINAUER	1228916	RTC 61	Tank Barge	60,000
Reinauer Transportation	9653264	DEAN REINAUER	1244835	RTC 106	Tank Barge	100,000
Reinauer Transportation	9653252	HAGGERTY GIRLS	1252825	RTC 107	Tank Barge	100,000
Reinauer Transportation	7050896	JO ANNE REINAUER III	1231310	RTC 62	Tank Barge	60,000
Reinauer Transportation	9575876	LAURIE ANN REINAUER	1224930	RTC 85	Tank Barge	80,000
Reinauer Transportation	7304003	LUCY REINAUER	1209445	RTC 83	Tank Barge	80,000
Reinauer Transportation	9269037	MEREDITH C. REINAUER	1139735	RTC 150	Tank Barge	140,000
Reinauer Transportation	8101733	MORGAN REINAUER	1178588	RTC 101	Tank Barge	100,000
Reinauer Transportation	9207625	NICOLE LEIGH REINAUER	1089422	RTC 135	Tank Barge	135,000
Reinauer Transportation	9592965	REINAUER TWINS	1234439	RTC 104	Tank Barge	100,000
Reinauer Transportation	9559779	RUTH M REINAUER	1214663	RTC 102	Tank Barge	100,000
Reinauer Transportation	7046170	STEPHEN REINAUER	1196517	RTC 80	Tank Barge	80,000
Reinauer Transportation	7902049	TIMOTHY L. REINAUER	1223055	RTC 84	Tank Barge	80,000
Reinauer Transportation		NO ASSIGNED TUG	1226399	Tank Barge	Tank Barge	60,000
The Vane Brothers	9378761	BRANDYWINE	1187192	DOUBLE SKIN-141	Tank Barge	137,500
The Vane Brothers	9383273	CHRISTIANA	1202002	DOUBLE SKIN-143	Tank Barge	137,500
U.S. Shipping Corp	9385738	BROWNSVILLE	1211796	PETROCHEM TRADER	Tank Barge	156,346
U.S. Shipping Corp	9385740	CORPUS CHRISTI	1211793	PETROCHEM SUPPLIER	Tank Barge	156,346
U.S. Shipping Corp	9447249	FREEPORT	514028	CHEMICAL TRANSPORTER	Tank Barge	142,460
U.S. Shipping Corp	9503160	GALVESTON	1208463	PETROCHEM PRODUCER	Tank Barge	156,346
Vitus Energy	CG1231665	CAVEK	1231656	AVEC 208	Tank & Freight Barge	10,000
Vitus Energy	CG1231666	NANIQ	1231653	AVEC 183	Tank & Freight Barge	8,000

*A subsidiary of International Shipholding Corporation (revision 1/6/2015)

Barrel Capacity

15,802,105

Total Unit Count

137

Big Ship Casualties

Long-term decline in shipping losses continues but economic pressures, cyber risk and superstorms challenge safety progress

Shipping losses continued their long-term downward trend with 85 total losses reported worldwide in 2015, according to Allianz Global Corporate & Specialty SE's (AGCS) fourth annual Safety and Shipping Review 2016, which analyzes reported shipping losses of over 100 gross tons.

Although the number of losses remained stable year-on-year, declining by just 3% compared with the previous year (88), **2015 was the safest year in shipping for a decade. Losses have declined by 45% since 2006,** driven by an increasingly robust safety environment and self-regulation. However, disparities by region and vessel-type remain.

More than a quarter of all losses occurred in the South China, Indochina, Indonesia and Philippines region (22 ships), which has been the top loss hotspot for the past decade. Losses increased year-on-year, unlike other major regions.

Cargo and fishing vessels accounted **for more than 60% of ships lost globally,** with cargo losses up for the first time in three years. The most common cause of total losses is foundering (sinking), accounting for almost 75% of losses, up 25%, and often driven by bad weather.

There were 2,687 reported shipping incidents (casualties including total losses) globally during 2015, down 4%. Activity is spread across all days of the week, although **Thursday sees the most incidents and Saturday the fewest.** The East Mediterranean and Black Sea (484) remains the top incident hotspot. Three vessels share the accolade of being the most incident-prone - a ro-ro in the Great Lakes region, a hydrofoil in the East Mediterranean & Black Sea and a ferry in the British Isles – with 19 incidents over the past decade.

Trends in Brief

85 large ships lost worldwide in 2015, down by 45% over a decade making it the safest shipping year in 10 years.

Cyber Exposure, driven by IoT, e-navigation and piracy; "mega ship" salvage issues; superstorms; and increasing Arctic casualties heighten risk environment.

25%+ More than a quarter of all losses occurred in – South China and South East Asian waters making it the top loss hotspot for the past decade.

Economic & market conditions are pressurizing costs, raising safety concerns

Economic pressures challenge safety advances

While the long-term downward trend in shipping losses is encouraging, the continuing weak economic and market conditions, depressed commodity prices and an excess of ships are pressurizing costs, raising safety concerns. AGCS has seen an increase in frequency losses over the past year which can likely be attributed to some extent to this environment.

"The economic downturn – and its impact on the shipping sector - is likely to have a negative impact on safety," says Captain Rahul Khanna, Global Head of Marine Risk Consulting, AGCS. It is critical that economic pressures do not allow a "put it off until later" safety mentality to develop, AGCS experts warn. Some shipowners are already stretching maintenance to longest possible intervals while others are laying-up vessels. The oversupply of the tonnage, influx of vessels ordered after 2010 which are still not up to the speed with technological evolution, existing aging tonnage are major caveats which have created a large number of players chasing a relatively small quantity of cargo and this has led to increased number of lay-ups. "Reactivation of these vessels to a market that has moved on technologically may result in a painful exercise. There is a need for standardized lay-up procedures," says Captain Jarek Klimczak, Senior Marine Risk Consultant, AGCS.

As well as impacting investment in vessel maintenance, cost pressures can impair crewing conditions, passenger ship safety and salvage and rescue. AGCS has seen an increase in fatigue-related insurance claims over the past decade. With crew numbers already often at their lowest possible level, and a future staffing shortage anticipated, longer shift patterns could exacerbate this issue. Meanwhile, training remains below par in some areas, such as electronic navigation, which should not be seen as panacea but as a complementary tool.

"Mega ship" salvage issues

The appetite for ever-larger container ships has seen cargo-carrying capacity of the largest vessels increase by **70% over 10 years to 19,000+ containers.** Two "mega ships", the CSCL Indian Ocean and APL Vanda were grounded in February 2016, raising questions about a more serious incident. There are concerns commercial pressures in the salvage business have reduced easy access to the salvors required for recovery work on this scale. The industry may need to prepare for a $1bn+ total loss scenario.

The report also notes that exceptional weather events are becoming more commonplace, bringing additional risks and disruption to supply chains. This year, the effect of a "super" El Niño is expected to lead to more extreme weather conditions.

Cyber risk evolves

The shipping industry's reliance on interconnected technology also poses risks. Cyber risk exposure is growing beyond data loss. There have already been a number of notable cyber incidents and technological advances including the "Internet of Things" (IoT) and electronic navigation means the industry may only have a few years to prepare for the risk of a vessel loss. "Pirates are already abusing holes in cyber security to target the theft of specific cargoes," says Captain Andrew Kinsey, Senior Marine Risk Consultant, AGCS. "The cyber impact cannot be overstated. The simple fact is you can't hack a sextant."

For the first time in five years piracy attacks failed to decline in 2015[1]. South East Asian attacks rose, accounting for 60% of all incidents. Attacks in Vietnam surged year-on-year where the main cause was low-level theft against vessels anchored in Vietnam. Other risks identified in the report include:

Lower emissions safety threat: There have been unexpected safety implications from the shipping industry's drive to reduce emissions, resulting in power issues related to rising use of ultra-low sulfur fuel. AGCS has seen an increase in machinery claims related to fuel.

Arctic casualties rising: There were over 70 reported shipping incidents in Arctic Circle waters during 2015 - up almost 30% year-on-year, the highest in a decade. The incoming Polar Code is welcomed, but safety questions remain about best practices and clean-up.

www.agcs.allianz.com/assets/PDFs/Reports/AGCS_Safety_Shipping_Review_2016.pdf

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The Market Drives Training & Employment Numbers

Yesterday's red hot maritime markets were fueled by a super-charged combination of domestic energy production, an increase in the number of hulls being turned out by the nation's shipyards, and robust salary structures. Those variables also drove an insatiable thirst for qualified licensed mariners, in particular. America's maritime academies are experiencing similar boom times, with record enrollments reflecting yesterday's euphoria, and – *something you won't necessarily see in the graph on page 10* – a marked increase in the number of students migrating ***back*** to the license track curricula. The most telling statistic, perhaps, is the 1,717 graduates who stepped out into the work place from the class of 2014. That number is up 431 students from just seven years ago, or a whopping 33 percent. It also represents a headcount leap of 246, or 17 percent, more than the seven year average. That's only half the story.

But, what do slowing employment numbers, stacked offshore supply vessels and sub-$40 oil mean for the graduates of these seven schools? At the Massachusetts Maritime Academy, today's enrolled four classes are not only larger than ever before, but both are also much more heavily weighted towards the license-track program. Almost 55 percent of these students are choosing the license track versus a seven year average of just 43 percent at the academy. Those numbers, although a far cry from the school's almost 100 percent license track numbers from the 1980s, reflect yesterday's demand for mariners everywhere. Most of these credentialed mariners will likely end up in the protected Jones Act trade, where the fleet has stabilized at its now anemic blue water numbers. A vibrant domestic, deep draft building program is still underway, but eventually, that cycle will also end. There are a limited number of ships to replace, after all.

Also not reflected in the table is Mass. Maritime's total regiment numbers for the coming school year – and the three that follow. With total enrollment topping out at 1,536 students, the numbers produce an average class size of 384, of which 210 graduates annually will potentially walk up a gangway just weeks after graduation. In fact, all of the seven schools recorded high water graduation marks within the last two years. For Mass. Maritime, 2016 promises to be its largest production of merchant officers ever – 223.

The positive trending brings with it another sea bag full of problems. The state maritime academies in particular are bursting at the seams, but also struggling to keep up with the unrelenting introduction of still more in the way of STCW training requirements that heap as much as an additional semester of requirements on the backs of cadets, all of which is being crammed into a traditional four-year academic calendar. Still, that's good value in today's spiraling education costs where a $100,000 MMA education immediately translates into a $70,000 job for 97 percent of its graduates. At MMA, as much as 25 percent of each graduating class is typically offered employment through the Military Sealift Command. *And the other schools?* They boast similar metrics. The license programs are becoming so popular that Mass. Maritime placed a "cap" to the number of students it can accommodate, and at least one other academy has already done the same. Good times indeed, for schools, some of which, that just 15 years ago were teetering on the brink of extinction as the U.S. merchant marine looked to be dying a slow and lingering death in an increasing global world.

All challenges aside, we asked Dean Lima for his assessment of the current situation and an estimate of how long the 'boom' time could last – at least at the academies themselves. For his part, Lima insists, "For the next half dozen years, the prospects look very good." He cited attrition from a graying workforce and the uncertainty represented by far more stringent U.S. Coast Guard medical standards that are now being applied at two year intervals, instead of the traditional five. The market changed, demanded products, and the academies delivered. And, looking at the price of Brent Crude oil, it seems like another change is coming. Can the market absorb as much as a 40 percent increase in licensed officers under market conditions that see scores of offshore supply vessels stacked in layup on the Gulf Coast? *Stay tuned for what comes next.*

		CMA	Maine	Mass.	Michigan	SUNY	Texas	USMMA	All	PCT. Lic.
2008	Graduates	131	169	214	30	268	263	211	1286	
	Licensed	97	86	112	30	137	42	211	715	56
	Non-Lic.	34	83	102	0	131	221	0	571	
2009	Graduates	159	152	257	19	306	250	196	1339	
	Licensed	102	102	122	19	172	40	196	753	56
	Non-Lic.	57	50	135	0	134	210	0	586	
2010	Graduates	157	182	252	21	266	274	201	1353	
	Licensed	101	125	122	21	144	55	201	769	57
	Non-Lic.	56	57	130	0	122	219	0	584	
2011	Graduates	169	210	267	30	300	261	205	1442	
	Licensed	119	136	108	29	165	65	205	827	57
	Non-Lic.	50	74	159	1	135	196	0	615	
2012	Graduates	171	156	292	27	390	328	219	1583	
	Licensed	113	93	126	25	229	56	219	861	54
	Non-Lic.	58	63	166	2	161	272	0	722	
2013	Graduates	161	132	325	41	396	337	201	1593	
	Licensed	113	73	125	41	243	63	201	859	54
	Non-Lic.	48	59	200	0	153	274	0	734	
2014	Graduates	195	188	338	42	384	353	217	1717	
	Licensed	134	117	121	42	241	79	217	951	55
	Non-Lic.	61	71	217	0	143	274	0	766	
Totals	Graduates	1143	1189	1945	210	2310	2066	1436	10,299	
	Licensed	779	732	836	207	1331	400	1436	5,721	56
	Non-Lic.	364	457	1109	3	979	1666	0	4,578	
	PCT Lic.	68	62	43	99	58	19	100	56	
AVG	Graduates	163	170	278	30	330	295	205	1,471	
High #	Grads. (yr)	195 ('14)	210 ('11)	338 ('14)	42 ('14)	396 ('13)	353 ('14)	219 ('12)	951 ('14)	

(*) entries marked in RED show high water marks for those categories; total enrollment, average enrollment, numbers of licensed graduates, etc. CMA (California Maritime Academy). 2015 numbers not yet finalized. Source: Marad.

The U.S. Waterway System – *and Dredging*

In the fascinating, yet somewhat obscure world of dredging, there are two "go to" sources for data related to this marine discipline. In the United States, the U.S. Army Corps of Engineers (USACE) maintain a commendable list of statistics related to domestic markets. For international numbers, the clear choice for information comes from the International Association of Dredging companies' (IADC) annual report, entitled, *"Dredging in Figures."* Although the latter source focuses on the global dredging and maritime construction industry in the previous calendar year (both USACE and IADC figure typically lag at least one year), the perspective of what goes on across the pond can be useful here at home, as well. Interestingly, while IADC is a treasure trove of data, it also espouses four sacred tenets of the dredging; namely *Corporate Social Responsibility, Sustainability, Emissions Control and Safety*. These efforts extend to such things as dredging company attention to in-house safety programs, employee education, the use of biodegradable lubricants, reducing carbon emissions and recycling policies for controlled and monitored ship dismantling – just to name a few. IADC also asks: **What Drives Dredging?** In fact, there are six drivers that account for the vast majority of global dredging:

world trade	coastal protection	water-related tourism
population growth	growing demands for energy	the environment

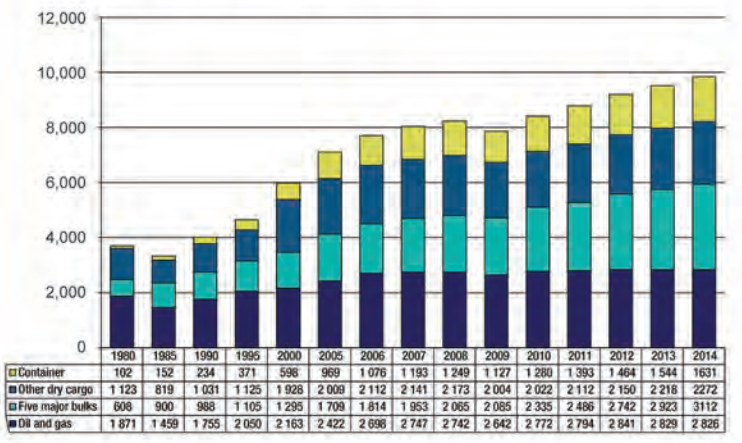
IADC says that seaborne trade accounts for the bulk of world trade, hence the expansion and building of new ports cannot be underestimated. The Panama Canal Expansion will double the waterway's capacity. Existing locks allow passage of 5,000 twenty-foot equivalent unit (TEU) vessels. After the expansion, vessels will be able to transit the Canal with up to 13,000 TEUs. Separately, Containerships are also getting larger. In 2014, boxships with over 19,000 TEU capacities were added to global fleets. All of this requires dredging, which in 2014 produced a global total turnover of dredging contractors, private and state- or port-owned companies in open markets of €6.415 billion, an increase of 0.7% compared to 2013 turnover. IADC notes that the share of markets closed to international players is substantial, with China leading followed by the US. Only a few Chinese projects are open for international tenders. The US market remains closed to foreign competition by the Jones Act.

Closer to home, the U.S. inland system of waterways depends on the USACE to not only dredge, but also to maintain a vast labyrinth of locks, chambers and dams. Waterways are operated by the Corps as multi-purpose, multi-objective projects. They not only serve commercial navigation, but in many cases also provide hydropower, flood protection, municipal water supply, agricultural irrigation, recreation, and regional development.

Annual Domestic Waterborne Traffic Distribution at a glance ... (source: USACE)

Domestic Traffic	Coastal	Great Lakes	Inland	Total
Short tons (millions)	172.0	87.9	599.4	937.1
Ton-miles (billions)	172.5	49.5	281.3	504.6
Average Haul (miles)	1,002.9	563.3	469.3	538.4

INTERNATIONAL SEABORNE TRADE, SELECTED YEARS (MILLIONS OF TONS LOADED)



	1980	1985	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Container	102	152	234	371	598	969	1 076	1 193	1 249	1 127	1 280	1 393	1 464	1 544	1631
Other dry cargo	1 123	819	1 031	1 125	1 928	2 009	2 112	2 141	2 173	2 004	2 022	2 112	2 150	2 218	2272
Five major bulks	608	900	988	1 105	1 295	1 709	1 814	1 953	2 065	2 085	2 335	2 486	2 742	2 923	3112
Oil and gas	1 871	1 459	1 755	2 050	2 163	2 422	2 698	2 747	2 742	2 642	2 772	2 794	2 841	2 829	2 826

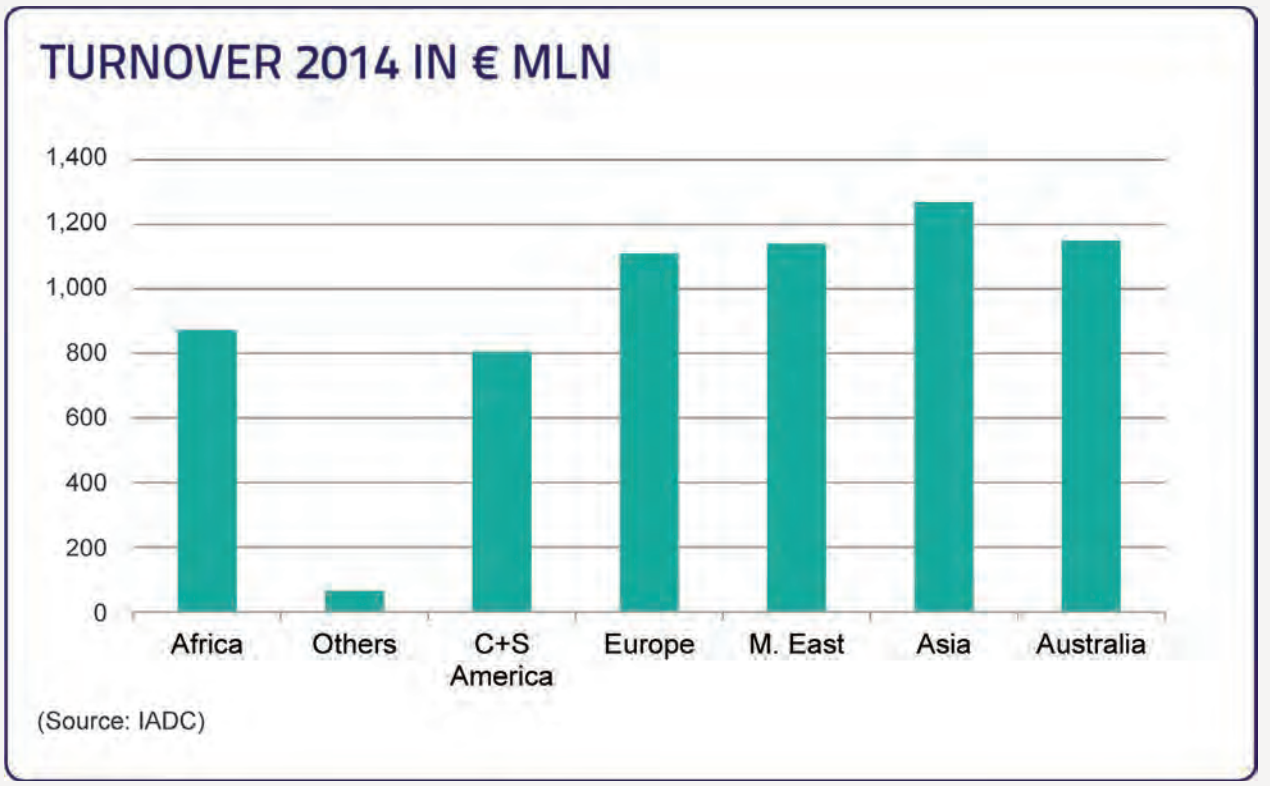
(Source: *UNCTAD, Review of Maritime Transport*, various issues. For 2006–2014, the breakdown by type of cargo is based on Clarksons Research, *Shipping Review and Outlook*, various issues.)

By any yardstick the USACE does an admirable job; especially considering the paucity of resources and funds allotted to their mission. The dredging statistics, supported by trust fund facts and other fun facts, add up to a daunting responsibility. Doing more, usually with less (much like their cousins in the U.S. Coast Guard), and *By the Numbers*, it looks something like this:

The Latest USACE Waterborne Commerce Facts at a glance ...

5.33: avg. cost ($)/cy of maintenance dredging	**5**: Top '14 U.S. traffic ports (LA, NY/NJ, Long Beach, Houston, Savannah)
11: age of youngest lock (Montgomery Pt)	**8.68**: value of the Harbor Maintenance Trust Fund in FY 15 in billions ($)
39: number of multi-chambered locks	**34.1**: million cubic yds of dredging contacts awards (New Orleans Dist.)
40.89: average cost ($)/cy for new dredging	**40.6**: millions short tons of coal exported from Hampton Roads (-15.7%)
46: lock-associated dams producing hydropower	**55**: Number private dredging firms receiving dredging awards, FY14
113: highest lift (feet) (John Day, Columbia River)	**68.5**: millions of dollars disbursed by IWTF projects in FY 15
126.1: Millions of tons on GIWW in 2014	**83**: Pct. of material dredged (154.5 mcy) by private contractors in FY14
193: total number of (lock/chamber/dam) sites	**97.89**: millions of dollars paid into IWTF by inland towing in FY 15
239: total number of lock chambers	**97.9**: millions of dollars earned by Inland Waterways Trust Fund in FY 15
1873: the year Willamette Falls locks (oldest) built	**185.9**: (mcy) Corps & contractor dredges handled in FY14
3,772: number DH tank barges (+ 244 from 2013)	**266.1**: millions of dollars in dredging contracts awarded by Phila. District
6,791: combined lift (in feet) of all Corps locks	**267.4**: million tons cargo through Port of South Louisiana (+12.1%)
12,000: miles, US inland & intracoastal waterways	**461**: number of deep draft dry cargo barges (up from 448) in 2014
71,000: number barges through OH River Lock 52	**18,624**: number vessels passing through youngest lock (11 yrs)
84,000,000: tons shipped on those 71,000 barges	**30,764**: number US flag boats in Miss. River &Gulf Intracoastal Waters
91,192,537: tons through youngest lock (11 yrs)	**40,082**: Number US flag passenger and cargo vessels on 12/31/14

Source: USACE / mcy = millions of cubic yards



Want more data?

www.navigationdatacenter.us/index.htm
www.navigationdatacenter.us/lpms/lpms.htm
www.navigationdatacenter.us/wcsc/wcsc.htm

US Army Corps of Engineers®

Freight Facts & Figures 2015:
The Bureau of Transportation Statistics (BTS) Weighs in.

The 11th edition of the BTS Freight Facts and Figures is an in-depth 111-page report touches upon on the volume and value of U.S. freight; condition and performance of transport infrastructure; economic conditions, and the safety, energy, and environmental implications of freight. That's a mouthful. The document, intended to help decision makers and planners understand the importance of transportation metrics, discusses all modes of transport. At *MarineNews*, we'll focus on the waterfront.

We'll start with Energy: Texas was the largest oil producing state in 2014, while North Dakota is the fastest growing oil producer. North Dakota produced 397 million barrels, or 12.5 percent of total U.S. production. Expanded U.S. oil production and changes in where oil is produced have increased the use of rail and barges to move oil to refineries and terminals for distribution to consumers. Although pipelines continue to be the predominant transport mode, tankers and barges move crude oil on U.S. inland waterways, from port to port and on the Great Lakes. The use of tankers and barges for oil transport has risen from 2.1 percent in the first 6 months of 2010 to 3.2 percent in the first 6 months of 2015. … *Still – we could be using our waterways more often, and more efficiently.*

Vessels: The age of the domestic fleet has decreased measurably since 2000. That's the good news. Inland barges accounted for the largest share (78%) of U.S. vessels. Towboats are the oldest vessels with 69 percent older than 25 years. As the subchapter M towboat rules loom just around the corner, the age of that fleet might make shipyards happy as they look forward to more repair/newbuild work, but probably gives operators heartburn as they ponder what to do in a challenging market and a tightening regulatory noose. On the other hand, barges are among the youngest vessels due to a combination of retirement and replacement of older dry cargo barges and acquisition of new tank barges. *And, the inland waterways continue to account for more than 98 percent of all U.S. flag vessels.*

Locks make it easier for vessels to navigate U.S. Rivers, but increasing traffic and aging locks create massive delays while locks are shut down for maintenance/repair. The average age of all locks in 2014 was a whopping 59 years. Between 2000 and 2014, average delay per lockage nearly doubled from 64 minutes to 121 minutes. In 2014, the highest average lockage delay was on the Tennessee River at 277 minutes, while the Gulf Intracoastal Waterway had the highest percent of vessels delayed at 90. *Time is money.*

The top 25 water ports by tonnage handled 68.5 percent of the weight of all domestic and foreign goods moved by water. Notably, from 2006 to 2011, the number of calls by containership with capacities of 5,000 TEUs or more increased by 78 percent. These boxships accounted for 27 percent of total containership calls at U.S. ports in 2011, up from 17 percent in 2006. Beyond this, the average vessel size per call at U.S. ports increased from 50,653 DWT tons in 2006 to 53,832 DWT in 2011, or about 6 percent. The average size of containerships increased by 13 percent (TEU's) and (9.9 percent (DWT). As the Panama Canal nears completion of its historic expansion, the above metrics will only widen. *That's good news for domestic dredgers.*

Shortsea Shipping: Assuming no change in network capacity, the number of miles with recurring congestion and the number of large trucks is forecast to increase significantly between 2011 and 2040. On highways carrying more than 8,500 trucks per day, recurring congestion will slow traffic on close to 7,400 miles and create stop-and-go conditions on an additional 22,000 miles. *Opportunities abound for shortsea entrepreneurs.*

Number of Domestic Vessels: 1990 – 2013 ...

	1990	2000	2010	2011	2012	2013
All Water	39,445	41,354	40,512	40,521	40,530	39,999
Non-Self Propelled	31,209	33,152	31,412	31,498	31,550	31,081
Self Propelled	8,236	8,202	9,100	9,023	8,980	8,918

Avg. Hourly Wages on the Waterfront: ($)

Occupation	2000	2010	2013	2014
Sailors and marine oilers	13.94	18.28	19.56	19.70
Captains, mates, pilots of vessels	23.30	33.89	36.34	38.07
Ship Engineers	23.12	34.09	36.37	35.87
Dredge Operators	14.32	17.59	21.91	21.94
Transportation Inspectors	21.25	30.31	32.83	34.05
Tank car, truck, & ship loaders	15.62	21.40	21.80	21.41

Employment in the transport sectors has grown since 2000, with only air transport experiencing a decline in employee numbers. Between 2000 and 2014, air transport declined by 28.2 percent. **Average hourly wages** for different freight-related occupations vary widely. In 2014, ship engineers and captains and pilots of water vessels were among the highest paid freight transportation occupations. The highest wage occupations employ relatively few workers, while lower-wage occupations account for millions of workers. *The waterfront remains a pretty good place to make a living.*

The Environment: Trucking accounts for 77 percent of freight emissions with rail a distant second. It shouldn't be surprising that the mode that emits the cleanest environmental signature per ton-mile is the marine industry. Regulatory pressures during this time have cleaned up that signature even more. Water Quality is affected by oil spills from vessels and facilities. In 2014, vessel related spills accounted for 40.9 percent of total gallons spilled. But, while the amount of oil spilled annually varies considerably, data shows a marked decrease in spills since 1990. *The marine industry has much to be proud of in this way.*

Table 3-7 U.S. Flag Vessels by Type and Age: 2000, 2010, and 2013

(percent)

	Vessel type							
Age[1]	Dry cargo	Tanker	Towboat	Passenger	Crewboat	Dry barge	Liquid barge	Total
2000, total vessels	**737**	**135**	**4,995**	**918**	**1,414**	**29,141**	**4,011**	**41,354**
Age (%): <6	9.0	8.1	6.5	14.6	17.4	23.1	14.5	19.6
6–10	6.8	3.0	2.9	12.9	7.5	10.5	8.2	9.2
11–15	15.3	5.9	2.8	19.4	4.1	5.4	1.2	5.1
16–20	18.5	25.2	18.6	13.5	32.1	20.1	15.0	19.6
21–25	14.2	22.2	19.1	9.8	23.5	18.4	17.8	18.3
>25	35.7	35.6	50.0	29.5	15.1	22.2	42.7	27.7
2010, total vessels	**875**	**77**	**5,466**	**843**	**1,817**	**26,848**	**4,564**	**40,512**
Age (%): <6	7.0	22.1	10.5	3.2	14.9	20.1	25.6	18.5
6–10	12.6	9.1	5.5	7.0	11.7	12.7	12.0	11.5
11–15	12.7	11.7	6.0	10.9	12.7	20.8	11.2	17.0
16–20	7.2	3.9	2.7	13.5	5.6	10.3	7.2	8.7
21–25	12.5	3.9	2.7	18.4	2.8	4.5	0.8	4.2
>25	48.1	49.4	72.5	46.9	52.2	30.5	43.1	39.3
2013, total vessels	**844**	**65**	**5,473**	**833**	**1,645**	**26,387**	**4,694**	**39,999**
Age (%): <6	6.9	25.4	11.3	4.1	13.2	20.4	30.3	19.4
6–10	10.7	22.2	6.4	5.9	12.3	12.9	15.7	12.2
11–15	12.6	12.7	6.6	7.8	14.8	17.0	10.4	14.4
16–20	10.2	3.2	4.0	11.3	6.7	17.3	8.2	13.6
21–25	8.9	3.2	2.8	17.2	4.7	9.1	5.2	7.7
>25	50.7	33.3	68.9	53.7	48.3	23.3	30.2	32.7
>25 Change from 2000	15.0	-2.2	18.9	24.2	33.1	1.1	-12.6	5.0
Median age range, years								
2000	16-20	21-25	21-25	16-20	16-20	16-20	21-25	16-20
2010	21-25	21-25	>25	21-25	>25	11-15	16-20	16-20
2013	21-25	11-15	>25	>25	21-25	11-15	11-15	16-20

[1] Age is based on the year the vessel was built or rebuilt.

NOTES: Figures include vessels available for operation. Totals may be greater than sum because of unclassified vessels and vessels of unknown age, hence percentages may not add to 100, and also due to rounding.

SOURCE: U.S. Army Corps of Engineers, *Waterborne Transportation Lines of the United States, Volume 1: National Summaries* (Washington, D.C.: 2014), available at www.navigationdatacenter.us/veslchar/veslchar.htm as of July 2015.

See the full version of the Report at:

www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/FF%26F_complete.pdf

U.S. Department of Transportation
Bureau of Transportation Statistics

Enhancing Sleep Efficiency on Vessels in the Tug/Towboat/Barge Industry

Human error related to operator fatigue is a major concern in all freight operations. Beyond this, 7 to 8 hours of sleep per 24-hour day is required to maintain acceptable levels of alertness and minimize fatigue. A new report, overseen by the Transportation Research Board and approved by the National Academies of Sciences, Engineering, and Medicine (Enhancing Sleep Efficiency on Vessels in the Tug/Towboat/Barge Industry) provides best practices, including the use of anchor-sleep/nap-sleep strategies, to improve sleep and reduce fatigue on U.S. inland waterways. The 180-page report examines watch shifts employing a schedule of "6 hours on/6 hours off," and whether or not changes to this system are warranted.

While there are no hours-of-service regulations beyond the 15-hours-on-duty limit, 46 United States Code (U.S.C.) 8904(c) gives the U.S. Coast Guard authority to establish them. The (Federal Register/Vol. 76, No. 155, August 11, 2011/Proposed Rules) stated that it was considering, "requirements to increase uninterrupted sleep duration to a threshold of at least 7 consecutive hours in one of the two available off periods..."

Strict adherence to such requirements would ban the most common work schedules in the tug/towboat/barge industry. All of that said; the report concludes that ***"there is currently no scientific data to support such a change in hours of service."*** A long-standing and preferred practice of crews in the U.S. tug/towboat/barge inland waterway industry is to work/rest in alternating 6-hour shifts, commonly referred to as a square watch system. Recent laboratory data suggests, says the report, that sleep can be obtained in more than one sleep period, referred to as anchor-sleep/nap-sleep, and that as long as the total duration is 7 to 8 hours, performance is comparable between a single sleep period and two separate sleep periods.

Not everyone agrees with report. For example, International Organization of Masters, Mates & Pilots (MM&P) VP George Quick said there is "a serious credibility issue" with the paper, calling it "essentially an advocacy position paper for the American Waterways Operators." Nevertheless, AWO EVP & COO Jennifer Carpenter hailed the report, saying, "The TRB study is the latest contribution to a growing body of scientific research in multiple transportation modes that demonstrates that splitting sleep into two periods can be a safe and effective way to manage fatigue in 24/7 operating environments like the tugboat, towboat and barge industry."

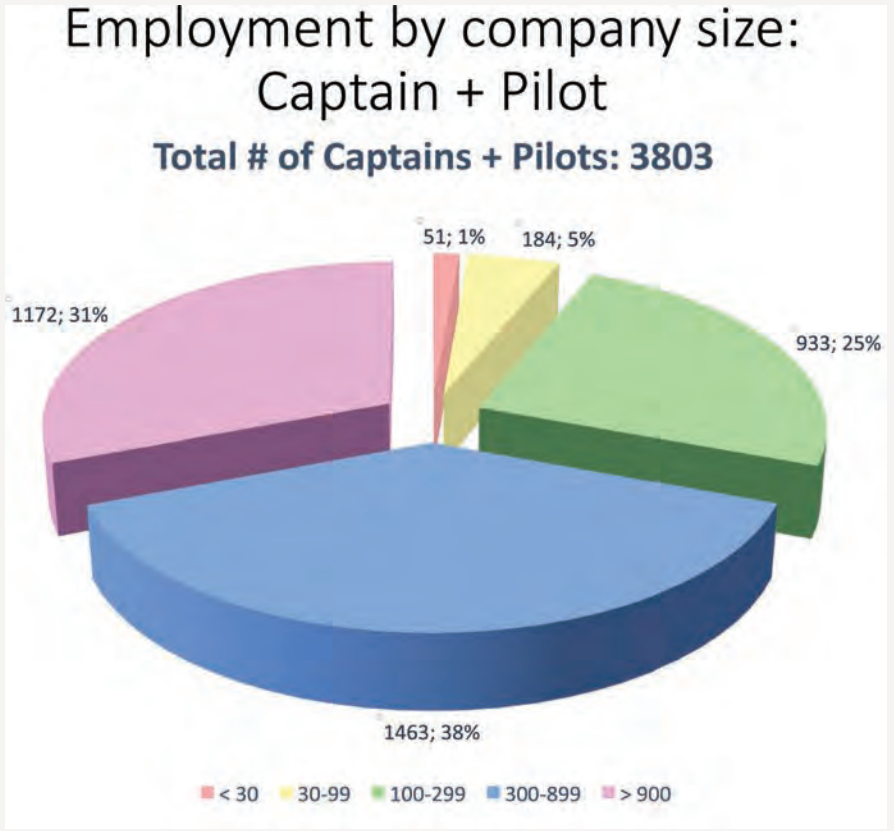
A major goal of this research was to understand and implement best practices that will allow tug/towboat/barge crews to obtain 7 to 8 hours of sleep split into two sleep periods while on a 6:6:6:6 square watch. The results of these studies allowed the development of strategies for obtaining sufficient sleep on board these vessels that can now be implemented and communicated to other stakeholders, including the USCG and NTSB. It is expected that the development of best practices strategies and educational materials will increase sleep and reduce human errors due to fatigue not only for crews on tugs/towboats/barges, but also in other industries that require the use of an anchorsleep/nap-sleep strategy to maintain alertness and minimize fatigue during on-duty operations for individuals in 24/7 work environments.

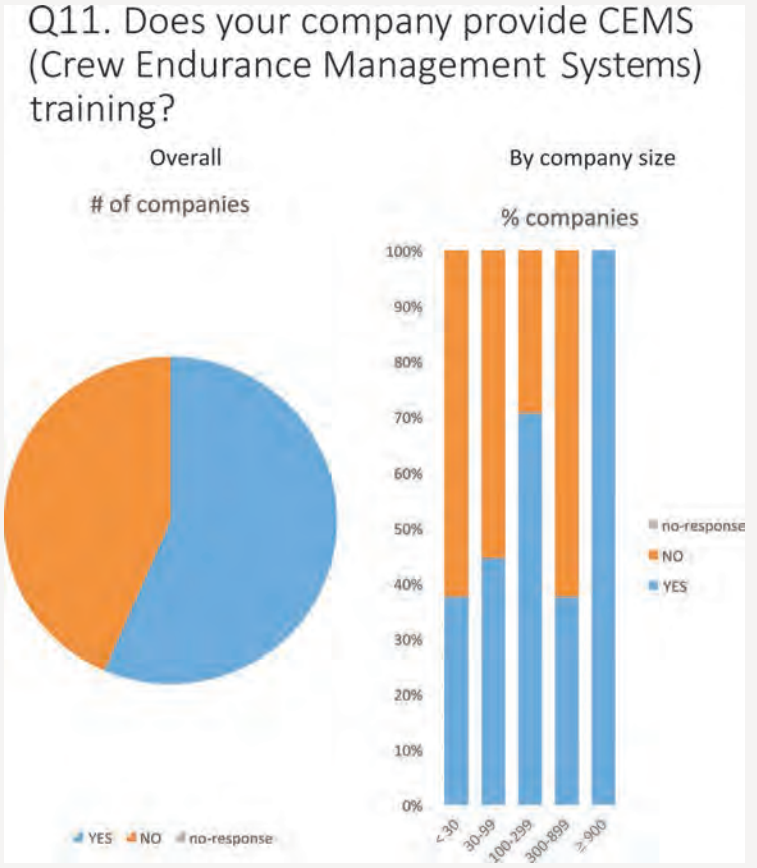
A major challenge is the diversity of operations (harbor, line, seasonal) and company size (3 to 2,000 employees). Similar challenges face other transportation related industries, such as trucking and aviation. As such, a one-size-fits-all Fatigue risk Management System (FRMS) was not proposed.

Indeed, and according to the report, many of the best practices suggested have already been implemented by a number of companies in the tug/towboat/barge industry. While assessments focused on key areas in the evaluation of current practices related to sleep efficiency, open-ended questions were also asked to elicit discussion about related practices that may be unique to a particular individual, company, or region within the U.S. tug/towboat/barge industry. This report provides a compendium of 16 best practices to improve sleep and reduce fatigue.

Key areas of consideration included:

Noise abatement	Sleep Disorder Screening	Exercise
Sleeping quarters	Wellness programs	Medical condition
Training/education	Diet/nutrition	Medications





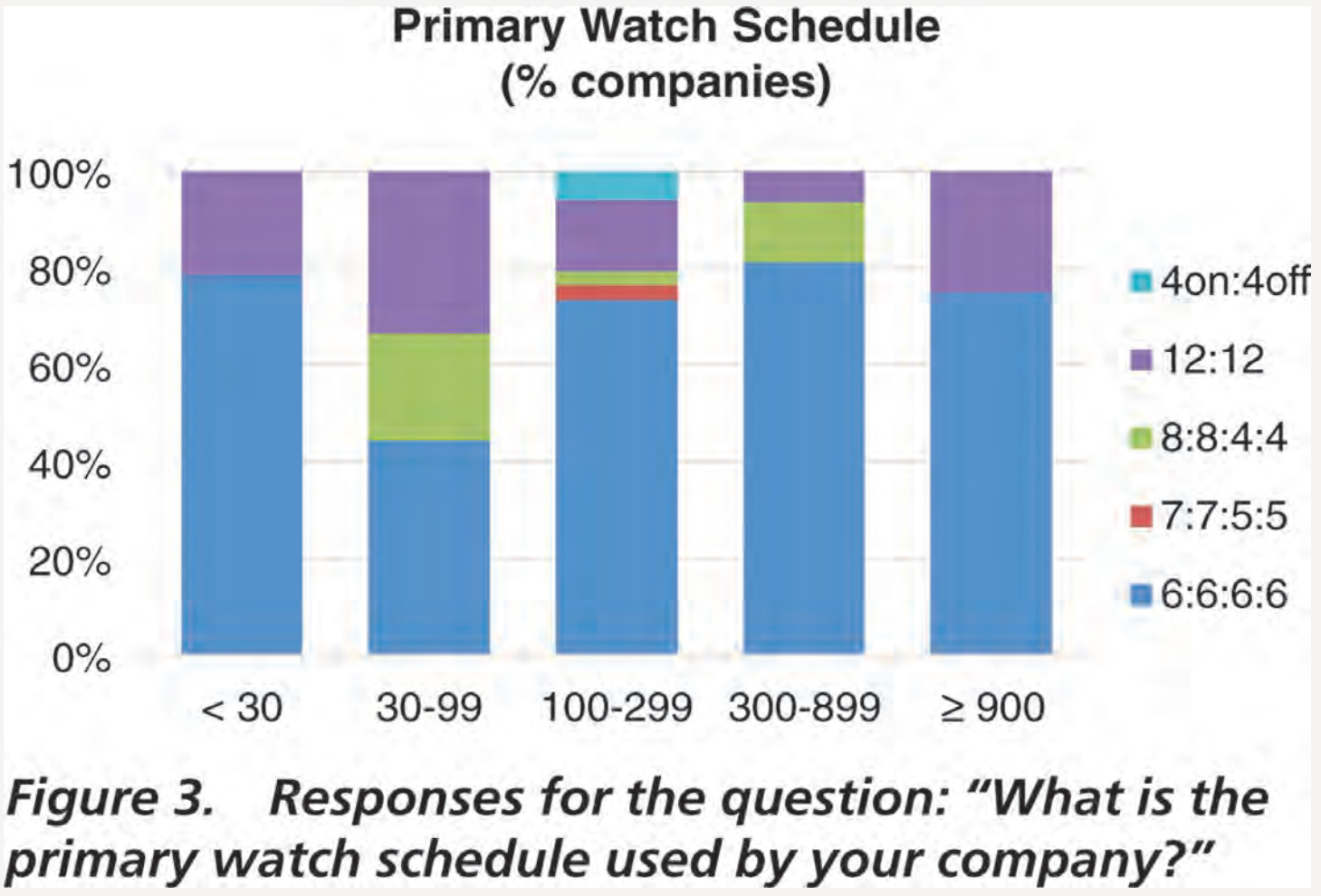


Figure 3. Responses for the question: "What is the primary watch schedule used by your company?"

Read the full report here: http://onlinepubs.trb.org/onlinepubs/ncfrp/ncfrp_rpt_036.pdf

Green Waterways and the Bureau of Transportation Statistics

The American Waterways Operators (AWO) and Waterways Council (WCI) released a fact sheet highlighting the efficiencies of the nation's waterways. At the same time, the Bureau of Transportation Statistics (BTS) released the 11th edition of *Freight Facts and Figures.* Hence, it is a good time to see if the AWO/WCI numbers stack up.

• **CAPACITY COUNTS:** According to the AWO/WCI, in 2014, 604 million tons of cargo valued at $232 billion moved on the inland waterways system. Unfortunately, that 604 million tons represents but 4 percent of the totals moved domestically, with trucking moving the lion's share of that freight, followed in distant second place by rail, according to the BTS. Hence, despite the fact that one 15-barge tow carries as much cargo as 1,050 semi-trucks, or six locomotives pulling 216 rail cars, shortsea shipping has failed to gain the attention of the federal government. If all cargo moved by inland barge were put in tractor trailers across our nation's interstate highway system, truck traffic would increase by 83%. Moving that cargo by rail would increase the nation's rail tonnage by 25%.

• **SAFETY:** Regional oil shipments by rail increased from less than one percent in the first six months of 2010 to 22.6 percent in the first six months of 2015. Tankers and barges move crude oil on U.S. inland waterways, from port to port along the coast, or on the Great Lakes. *The use of tankers and barges for oil transport has risen as well, from 2.1 percent in the first 6 months of 2010, but only to 3.2 percent in the first 6 months of 2015.* Despite the proven safety advantage of barges over rail, shippers continue to favor railways, even when waterways are close.

• **CLEAN AIR:** No other mode of transportation compares to barges in minimizing carbon dioxide emissions. Based on emissions of CO2 per-million-ton-miles of cargo moved, trucks emit 171.83 tons, rail emits 21.35 tons, while barges produce only 16.41 tons. Barge transportation minimizes noise as vessels glide silently through the water, away from shorelines and population centers.

• **CLEAN WATER:** Without a doubt, the environmental footprint of the marine industry, especially in terms of oil pollution, has been improving dramatically and measurably over time. That said, and looking at BTS Table 6-17, *2014 (the latest year for which statistics exist) wasn't the best year for America's tank barges,* with almost 200,000 gallons of oil spilled into the water, a marked increase from the previous year, but also just 20 percent of what was spilled in 1990. So, there is room for improvement still. Fortunately, the subchapter M towboat rules are right around the corner.

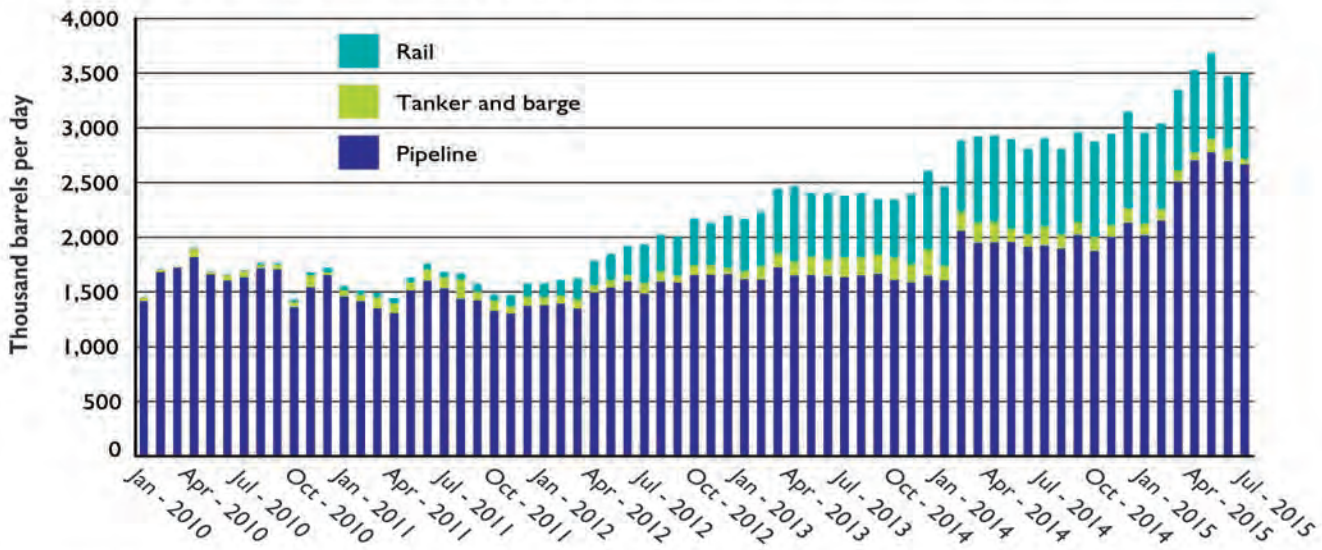
• **FLEET COMPOSITION:** The average age of the U.S. flag fleet decreased over the 2000 to 2013 period: vessels age 15 years and younger decreased from 46 to 33.9 percent. And says BTS, inland waterway barges accounted for the largest share (77.7 percent) of U.S. vessels. *Unfortunately, towboats are the oldest vessels in the fleet with 68.9 percent older than 25 years.* No doubt the new EPA Tier emission rules, subchapter M requirements and other factors will result in a fair amount of this fleet being renewed in the short term. *Certainly, the nation's shipyards could use the business.* In contrast, barges are among the youngest vessels due to a combination of retirement and replacement of older dry cargo barges and acquisition of new tank barges. Although the total number of domestic vessels has decreased, inland numbers are on the rise.

• **EFFICIENCY:** Trucks can move a ton of cargo 150 miles for each gallon of fuel burned. Newer railroad locomotives can move that cargo 478 ton-miles per gallon, but barges pushed by towboats can move it 616 ton-miles per gallon. Advantage: inland waterways! Unfortunately, says BTS, and although river locks make it easier for vessels to navigate the uneven water levels of U.S. rivers, the U.S. Army Corps of Engineers reports that the average age of all locks in 2014 was 59 years. *Between 2000 and 2014, average delay per lockage nearly doubled from 64 minutes to 121 minutes.* Meanwhile, trucks on congested highways substantially impede interstate commerce. Recurring congestion slows traffic on 5,800 miles and creates stop-and-go conditions on 4,500 miles of the National Highway System, which carries more than 8,500 trucks per day. Beyond this, assuming no change in network capacity, the number of NHS miles with recurring congestion and the number of large trucks is forecast to increase significantly between 2011 and 2040. It really is time to move that cargo onto the river, but not if we can't upgrades our locks and infrastructure. Read the full report at **www.rita.gov**

U.S. Flag Vessels by Type, Number and Age: 2000, 2010, and 2013 (BTS)

Type (#)	Dry Cargo	Tanker	Towboat	Passenger	Crewboat	Dry Barge	Tank Barge	TOTAL
2000	737	135	4,995	918	1,414	29,141	4,011	41,354
2010	875	77	5,466	843	1,817	26,848	4,564	40,512
2013	844	65	5,473	833	1,645	**26,387**	4,694	**39,999**
Age (Yrs)								***
2000	16-20	21-25	21-25	16-20	16-20	16-20	21-25	16-20
2010	21-25	21-25	>25	21-25	>25	11-15	16-20	16-20
2013	21-25	11-15	**>25**	**>25**	21-25	11-15	11-15	16-20

Figure 2-3 Shipments of Crude Oil Moved by Pipeline, Tanker and Barge, and Rail: January 2010–July 2015



SOURCE: U.S. Energy Information Administration based on data from the Surface Transportation Board and other information, October 2015.

Table 6-17 Number and Volume of Oil Spills In and Around U.S. Waterways: 1990, 2000, and 2012–2014

	1990		2000		2012		2013		2014	
Source	Incidents	Gallons spilled	Incidents	Gallons spilled	Incidents	Gallons spilled	Incidents	Gallons spilled	Incidents	Gallons spilled
Total, all spills	**8,177**	**7,915,007**	**8,354**	**1,431,370**	**3,266**	**196,183**	**3,223**	**497,710**	**3,077**	**668,363**
Vessel sources, total	**2,485**	**6,387,158**	**5,560**	**1,033,643**	**1,824**	**131,986**	**1,721**	**207,106**	**1,716**	**273,432**
Tankship	249	4,977,251	111	608,176	27	3,864	20	711	18	146
Tank barge	457	992,025	229	133,540	93	33,268	100	19,568	89	199,667
Other vessels[1]	1,779	417,882	5,220	291,927	1,704	94,854	1,601	186,827	1,609	73,619
Nonvessel sources, total	**2,584**	**1,408,472**	**1,645**	**373,761**	**1,048**	**51,040**	**1,048**	**284,513**	**963**	**386,350**
Facilities[2]	73	46,228	4	17	16	251	35	6,028	41	5,267
Pipelines	76	270,700	21	17,004	0	0	0	0	0	0
All other non-vessels[3]	2,435	1,091,544	1,620	356,740	1,032	50,789	1,013	278,485	922	381,083
Mystery	**3,108**	**119,377**	**1,149**	**23,966**	**394**	**13,157**	**454**	**6,091**	**398**	**8,581**

[1]Other vessels include commercial vessels, fishing boats, freight barges, freight ships, industrial vessels, oil recovery vessels, passenger vessels, unclassified public vessels, recreational boats, research vessels, school ships, tow and tug boats, mobile offshore drilling units, offshore supply vessels, publicly owned tank and freight ships, as well as vessels not fitting any particular class (unclassified).

[2]Facilities include mobile offshore drilling units, offshore supply vessels, offshore platforms, designated waterfront facilities, fixed platforms, mobile facilities, and municipal facilities.

[3]All other non-vessels include aircraft, land vehicles, railroad equipment, bridges, factories, fleeting areas, industrial facilities, marinas, common carriers, sewer drainage, shipyard/repair facilities, and shorelines.

SOURCES: **1990 and 2000**: U.S. Coast Guard, *Polluting Incidents In and Around U.S. Waters, A Spill/Release Compendium: 1969-2011* (Washington, DC: January 2013), tables *Number of Spills by Source, Volume of Spills by Source (Gallons) and Oil Spills In U.S. Waters Calendar Year*, available at http://homeport.uscg.mil/ as of August 2015. **2012-2014**: derived from Pollution Incident Investigation records from the Marine Information for Safety and Law Enforcement System (MISLE) as of August 2015. The Polluting Incidents In and Around U.S. Waters, A Spill/Release Compendium is not currently being published. U.S. Coast Guard, Office of Investigations and Analysis, CG-INV JGLaw.

NOAA's Report on the U.S. Ocean and Great Lakes Economy

Issued in 2015, the report entitled "NOAA Report on the U.S. Ocean and Great Lakes Economy" is based upon 2012 NOAA data produced by NOAA's Office for Coastal Management, as well as employment and gross domestic product statistics are derived from the Bureau of Labor and the Bureau of Economic Analysis. The report's authors remind us that the oceans and Great Lakes support the lives, lifestyles, and livelihoods of all Americans. We fish from their waters, vacation on their edges, ship cargo on their surface, and extract oil, gas, sand, and gravel from their seafloors. The ocean economy, as represented in the data, includes six economic sectors that depend in various ways on the oceans, rivers and Great Lakes. These include:

living resources	marine transportation	ship and boat building
marine construction	offshore mineral extraction	tourism and recreation

As with almost all government data and reports, the final tallies typically lag a year or two behind, and these numbers are no different. Still they provide a stark and well formatted summary of just how important the maritime sector is to the greater economy. For example, and according to the report, coastal economic facts (2012) include, ***by-the-numbers:***

New jobs created (2011-to-2012): 108,000	3.8 percent growth in employment (2x national rate)
National Avg. Wages: $49	Average wage (ocean industries): $63,000 to $143,000
$113 billion in annual wages	Goods & Services Produced: $343 billion
147,000 total business establishments	2.2 percent of the nation's employment
Employed: ~ 3 million people	2.1 percent of its gross domestic product

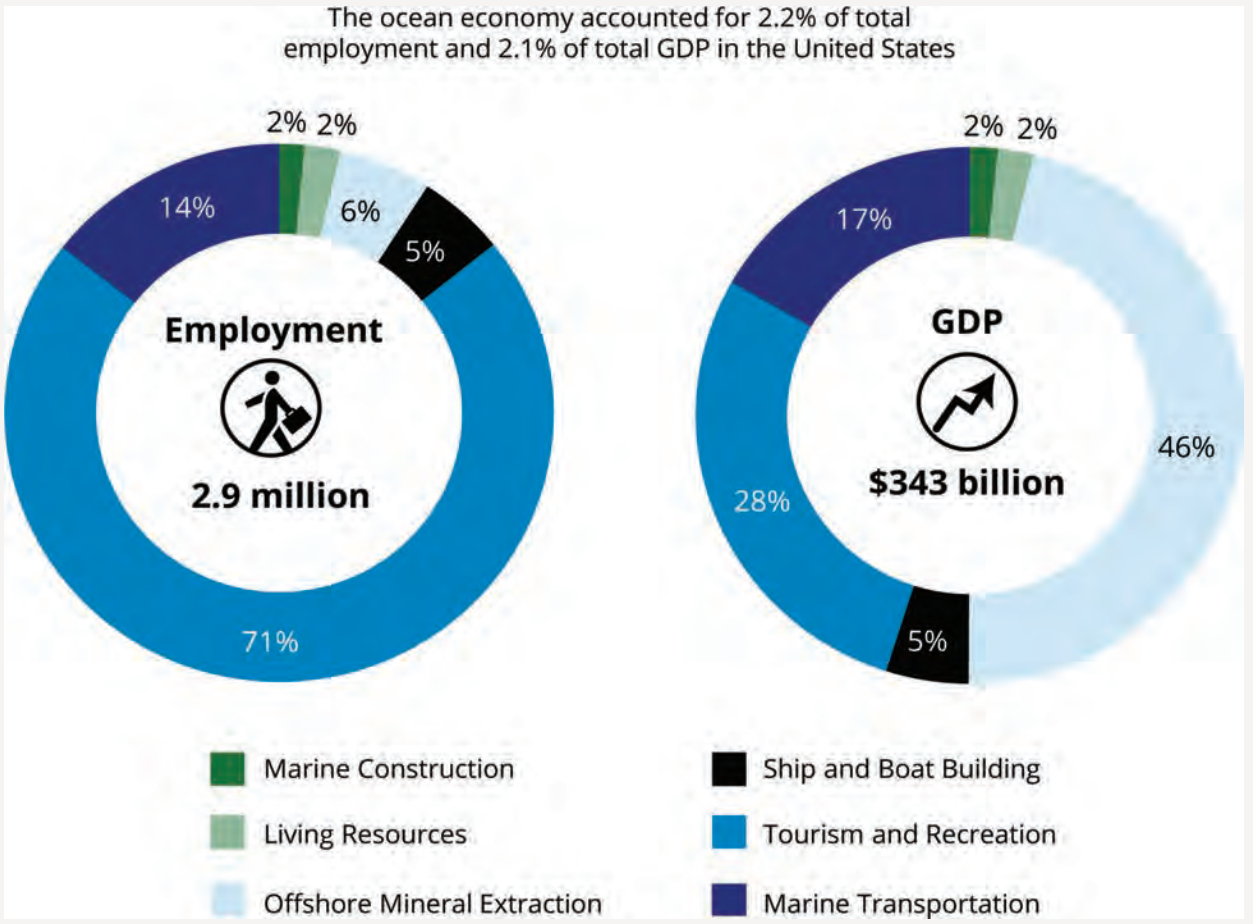
In 2012, the ocean economy's contribution to gross domestic product grew by 10.5 percent – or more than four times as fast as the U.S. economy as a whole. And, in 2012, employment in the ocean economy was 2.4 percent higher than in 2007, while employment of the U.S. economy as a whole decreased about 2.7 percent during the same period. Sure, the economy has dipped more than a little bit in the intervening years, and the price of oil is taking its toll as well, but the ocean economy shows remarkable resilience. Take, for example that in 2012, inflation-adjusted gross domestic product in the ocean economy was 15.7 percent higher than in 2007, contrasted with a 2.8 percent increase in the U.S. economy as a whole over the same period. In just one year, from 2011 to 2012, the ocean economy's Inflation-adjusted gross domestic product grew by 10.5 percent—more than four times the rate of growth experienced in the nation as a whole (2.5 percent).

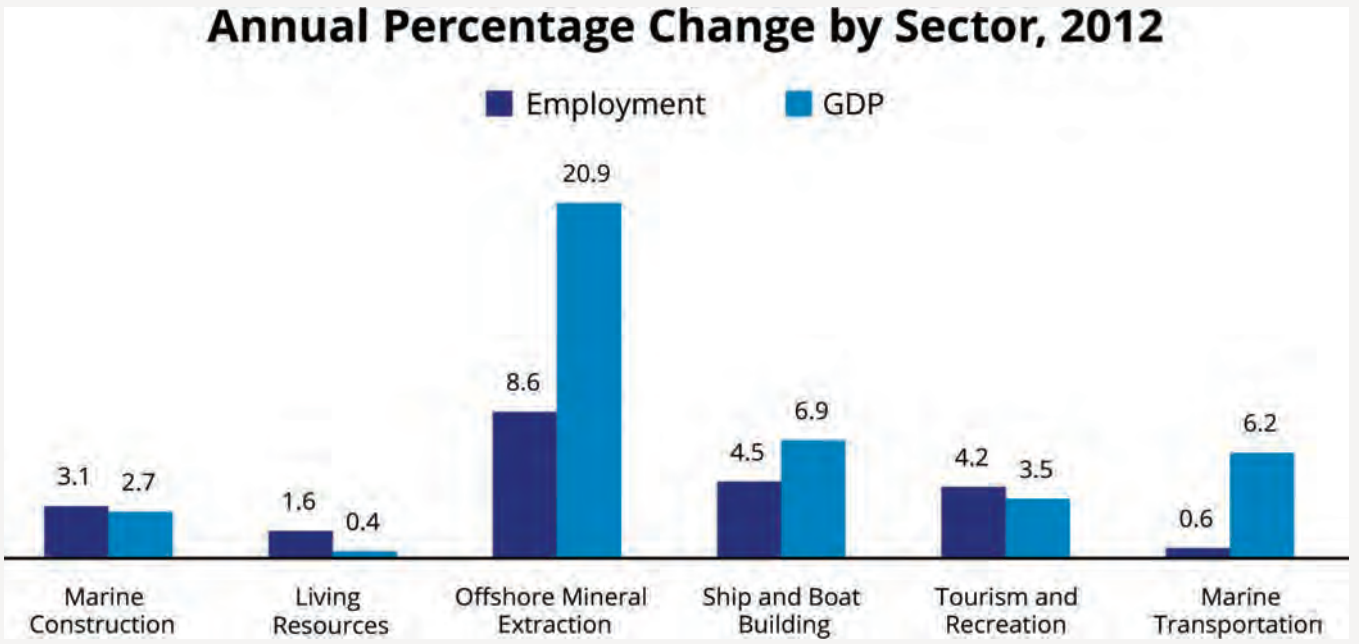
In fact, gross domestic product in all six ocean sectors increased in 2012, with all but the living resources sector growing faster than the U.S. economy as a whole. ***Marine construction*** represents but a small percentage of the ocean economy, but it is an integral component, paying one of the highest average wages per employee of $67,000, much higher than the national average of $49,000. Marine construction activities occur in most states but it is highly concentrated in Texas, Florida, and Louisiana, which in 2012 accounted for about 47.1 percent of employment and 43.7 percent of the gross domestic product in this sector. On the other hand, ***Offshore Mineral Extraction*** – which includes oil and gas exploration and production, as well as limestone, sand, and gravel mining – is largely concentrated in the Gulf of Mexico. Interestingly, offshore mineral extraction accounted for only 5.5 percent of the total employment, but contributed 46.3 percent of its gross domestic product. Average wages per employee of more than $143,000 per year were more than twice the national average. The national center of the oil and gas industry is Houston, Texas. Texas alone accounted for two thirds of the employment in offshore mineral extraction sector and 71.5 percent of its 2012 gross domestic product.

The ***Ship and Boat Building*** sector includes the construction, maintenance, and repair of ships, recreational boats, commercial fishing vessels, ferries, and other marine vessels. An important attribute of this sector is the concentration of large shipyards in a few locations around the country. However, boatbuilding and repair activity is spread more evenly around the country, with concentrations in areas engaged in commercial fishing and recreational boating. In 2012, the ship and boat building sector accounted for 5.2 percent of the employment and 4.9 percent of the gross domestic product in the U.S. Ocean and Great Lakes economy. Average wages per employee, of $63,000, were significantly higher than the national av-

erage of $49,000. The ship building, maintenance, and repair component of this sector accounted for more than 85 percent of the employment and gross domestic product. At the time, the ship and boat building sector grew at a rate of 6.9 percent in gross domestic product from 2011 to 2012 – a significant rebound from its decline of 7.7 percent in 2011. From there, of course, the industry ramped up only to arrive at the oil-induced dip that we are currently experiencing. Virginia contributed most to the jobs in this sector, accounting for 23.7 percent of the employment. Washington – where Vigor Industries is concentrated – contributed most to values in this sector, accounting for 20.5 percent of the gross domestic product.

Marine Transportation includes businesses engaged in the traffic of deep-sea freight, marine passenger services, pipeline transportation, marine transportation services, warehousing, and the manufacture of navigation equipment. It accounted for 14.5 percent of the employment and 16.7 percent of the gross domestic product in the U.S. Ocean and Great Lakes. While the sector represents a smaller percentage of the ocean economy than tourism and recreation or offshore mineral extraction, it is an integral component of the ocean economy, paying one of the highest average wages per employee of $70,000 in 2012.

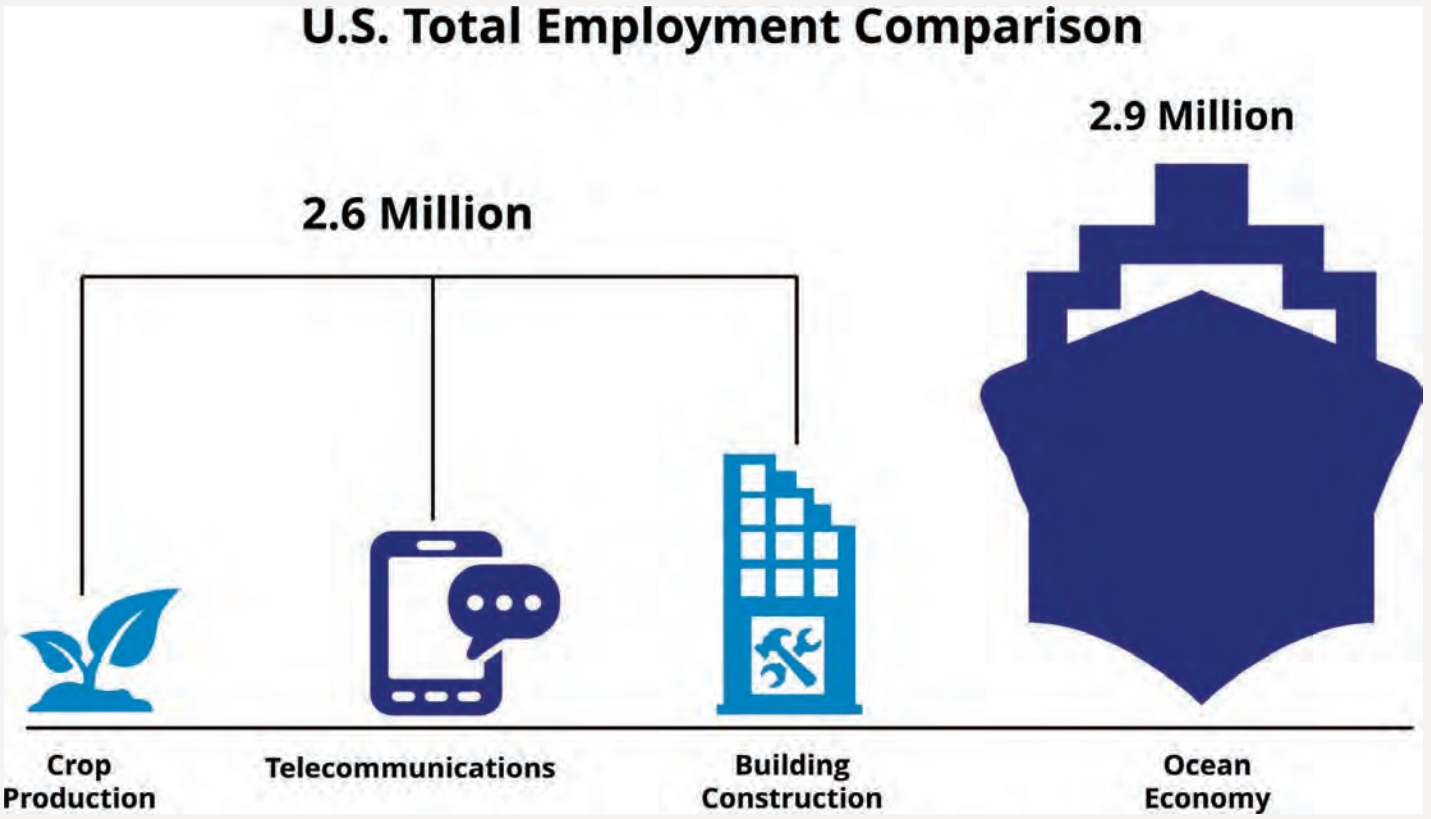


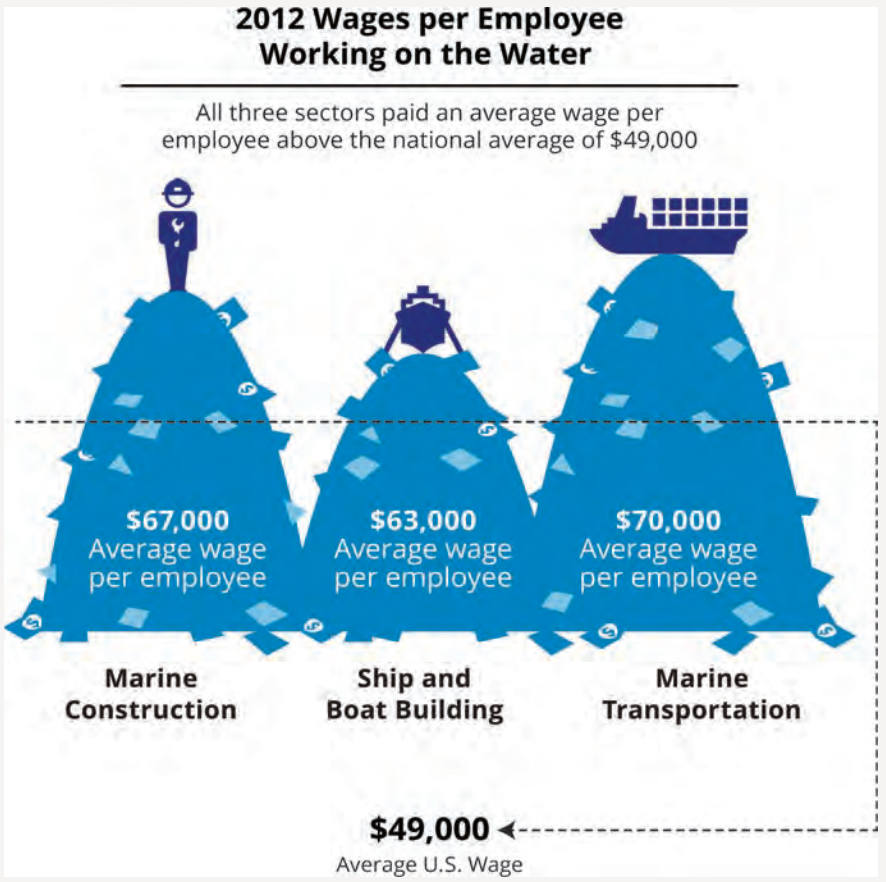


The U.S. ocean and Great Lakes economy accounted for

147,000	2.9 million	$113 billion	$343 billion
Establishments	Employees	Wages	Goods and Services

in the U.S. ocean and Great Lakes economy in 2012





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Safety and the Environment – as defined by IMCA

The International Marine Contractors Association (IMCA) is the international trade association representing companies and organizations engaged in delivering offshore, marine and underwater solutions. IMCA operates with a global focus via a structure of technical committees made up of experts elected from member companies. A respected voice around the world promoting good practice, particularly in the areas of health, safety and environment, 1,000+ member companies derive countless benefits from IMCA. With a core purpose of improving performance in the marine contracting industry by championing better regulation and enhancing operational integrity, IMCA's online library holds over 200 guidance documents. IMCA further underscores that role by publishing an annual report entitled *Safety and Environmental Statistics for IMCA Members*. This month, ***MarineNews*** presents, By the Numbers, a snapshot of those findings which cover fatalities, injuries and environmental indicators.

The statistics record the safety and environment performance of IMCA contractor members each year and enable respondents to benchmark performance. It is important to note that safety statistics recorded by IMCA members are consistent with those of other main industry trade associations, International Association of Oil & Gas Producers (IOGP) and International Association of Drilling Contractors (IADC).

Statistics were provided by 264 companies representing 60% of the contractor membership(excluding drilling contractors who report as part of a greater group), based upon 798 million man-hours of work overall (558 million man-hours offshore). Environmental data of one form or another was provided by 59% of members. This year, IMCA contractor members' lagging safety indicators have worsened very slightly, though the "flatline" tendency has continued in the longer term. There were fewer fatalities (6) this year than last year (9).

Although IMCA encourages all contractor members to take part in this safety statistics exercise, doing so is not mandatory, and statistics are submitted on a voluntary basis on the understanding of complete anonymity. As in previous years, data are separated into offshore and onshore activity to improve consistency in the data collected. The offshore statistics cover offshore work only, whereas the inclusion of onshore work covers such areas

	2014	2013 (revised)	2013 (original)
Overall Lost Time Injury Frequency Rate (overall LTIFR)	**0.54**	0.54	0.37
Overall number of Lost Time Injuries	**424**		474
Overall Total Recordable Injury Rate (TRIR)	**2.18**	2.12	1.47
Overall Fatal Accident Rate (FAR)	**0.75**	1.00	0.69
Offshore Lost Time Injury Frequency Rate (offshore LTIFR)	**0.65**	0.57	0.35
Offshore Total Recordable Injury Rate (TRIR)	**2.60**	2.27	1.37
Offshore Fatal Accident Rate (FAR)	**0.72**	1.15	0.69
Onshore Lost Time Injury Frequency Rate (onshore LTIFR)	**0.28**	0.46	0.46
Onshore total recordable injury rate (TRIR)	**1.18**	1.81	1.81

Table 1: Summary of IMCA safety statistics for 2014 (last year's figures in brackets)

as fabrication yards and office work. For the purposes of these safety statistics, "inshore" work (for example in the renewables sector) is considered to be offshore rather than onshore.

Environmental Indicators: This is the third year that IMCA has collected information from contractor members on their environmental performance and IMCA collected data as follows:

- *Number of oil spills per million man-hours worked;*
- *Liters of oil spilt per million man-hours worked;*
- *Bunkers used (either in tonnes or in cubic metres) per million offshore man-hours worked;*
- *Megawatt-hours (not kilowatt-hours) electricity used per million onshore man-hours worked;*
- *Tonnes of non-hazardous waste per million overall (offshore and onshore) man-hours worked;*
- *Tonnes of hazardous waste per million overall (offshore and onshore) man-hours worked.*

88 contractors (78 last year) reported having spilled oil, and 77 (73 last year) reported the quantity spilled. IMCA members reported a total of 674 oil spills (682 last year). "Oil" is not at this stage more closely defined – hydraulic oil, engine oil, any non-aqueous petroleum-based fluid. Amount of bunkers used was reported by 160 contractors (155 last year), of whom 12 reported by both weight and volume. Some of the data was reported in different units to that required, leading to indications that bunkers used were one, two or even three orders of magnitude (1000x) greater than what was likely given the number of offshore man-hours involved and the possible number of vessels involved. On this basis, data from 9 contractors were omitted from the calculations used to derive an IMCA indicator.

This year, IMCA will publish a short summary leaflet or downloadable report summarizing the 2014 statistics, while continuing to publish this detailed statistical analysis of the safety data in this separate information note.

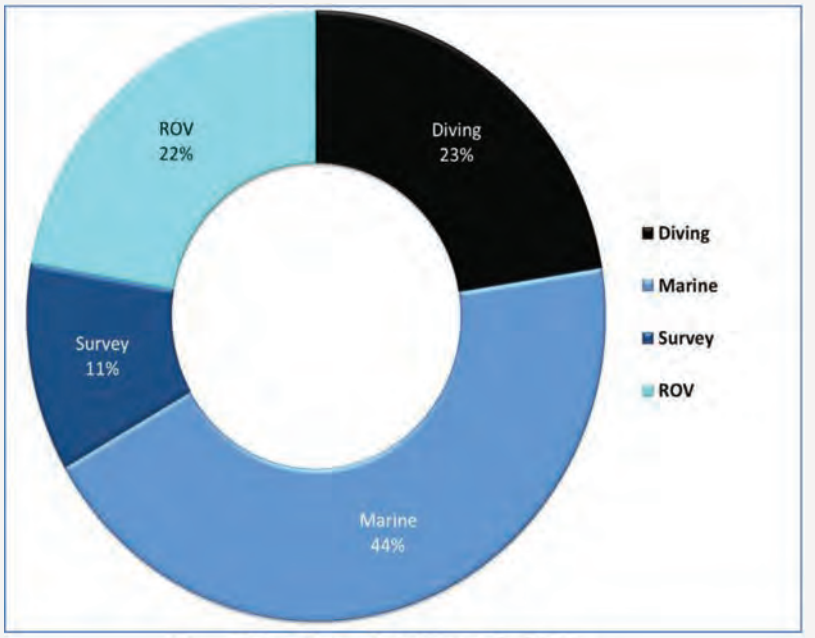

Figure 4: Contributors by IMCA technical division

Comparison of Overall Total Recordable Injury Frequency Rates (TRIR) between Trade Associations										
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
IMCA	5.41	4.14	4.38	2.50	2.54	2.74	2.40	1.93	2.12	2.18
IOGP	3.05	2.92	2.68	2.08	1.75	1.68	1.76	1.74	1.60	1.54
IADC	11.71	10.85	10.24	9.11	6.12	6.55	4.17	4.41	4.03	3.76*

Table 2: Comparison of trade association TRIR **Q4 results only*

	Spills	Amount spilt	Bunkers (volume)	Bunkers (weight)	Electricity (MWh)	Non-hazardous waste	Hazardous waste
No. of contributors	88	77	96	74	129	155	106
Minimum	0.00	0.000	3.04	2.98	0.67	0.16	0.01
Maximum	90.22	4728.5	558523	558523	63274	7670	2070
Average	7.03	239.7	25435.0	27958.5	2824.6	515.4	128.5
IMCA	**0.76**	**218.6**	**358563.6**	**19978.1**	**12960.8**	**894.7**	**106.5**

Table 6: Environmental indicators, 2014

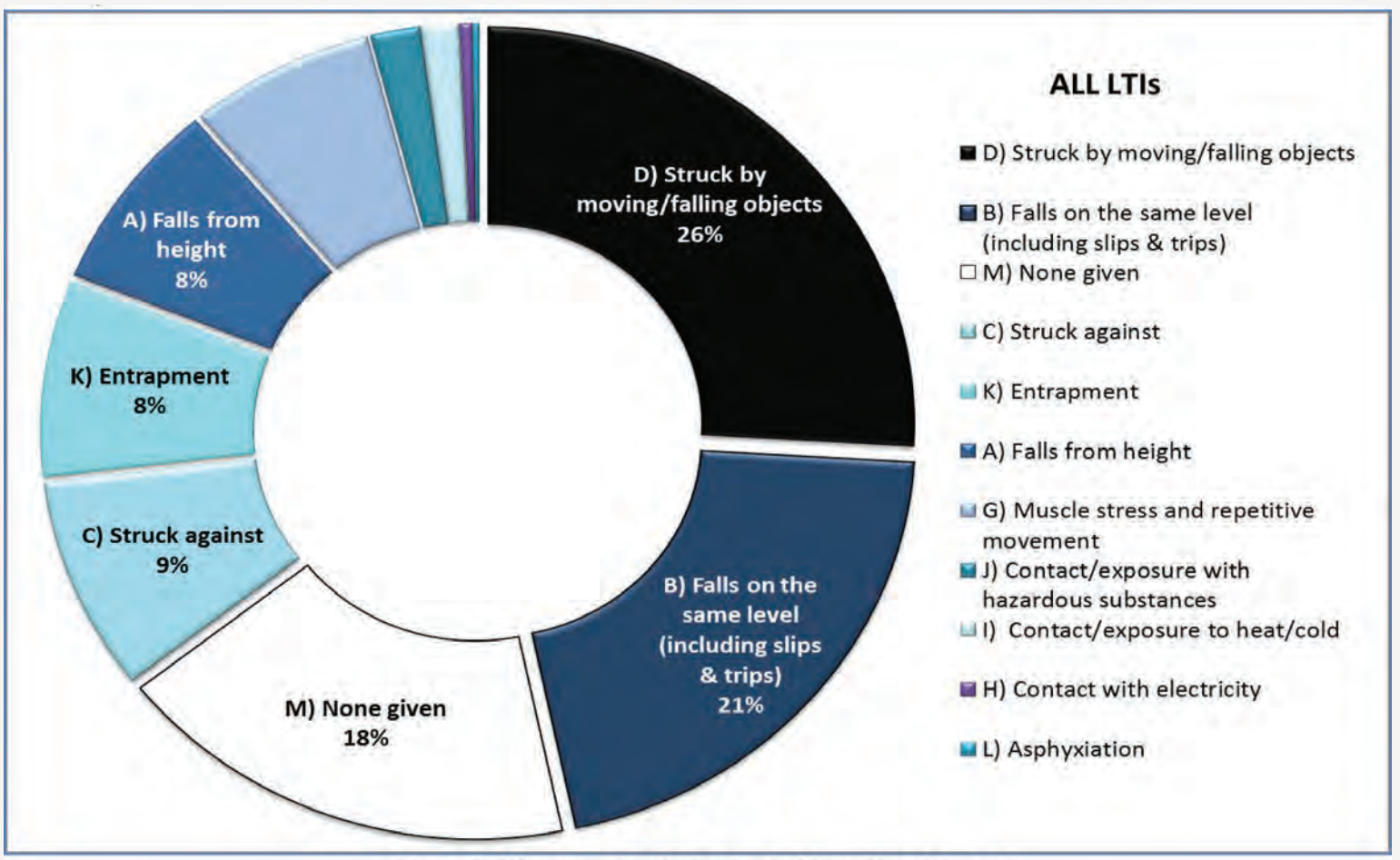

Figure 9: Direct causes of all reported Lost Time Injuries

	Overall								Offshore						Onshore			
	Contractors	Million hours worked	LTIs	LTIFR	Fatalities	Fatal Accident Rate	Recordable injuries	TRIR	Million hours worked	LTIs	LTIFR	Fatal Accident Rate	Recordable injuries	TRIR	Million hours worked	LTIFR	Fatal Accident Rate	TRIR
1997	23	47.6	236	4.96	3	6.3												
1998	32	52.9	257	4.86	2	3.8												
1999	28	52.8	196	3.72	4	7.6												
2000	31	65.6	227	3.46	5	7.6					4.25	10.1				1.05		
2001	32	54.5	162	2.97	4	7.3					3.77	10.1				0.86		
2002	32	197	244	1.24	3	1.52			62		2.96	4.83			135	0.44	0	
2003	31	200	198	0.99	5	2.49			66	133	2	6.03			134	0.49	0.75	
2004	36	145	164	1.13	3	2.06	645		72	120	1.65	2.75		8.87	72	0.61	1.39	
2005	51	160	189	1.18	6	3.13	864	5.42	102	172	1.69	3.93	742	7.29	58	0.29	1.73	2.1
2006	74	221	226	1.02	6	2.72	914	4.14	186	196	1.06	3.23	807	4.35	35	0.86	0	3.05
2007	100	310	339	1.09	6	1.94	1356	4.38	252	315	1.25	2.38	1180	4.68	58	0.42	0	3.05
2008	129	612	433	0.72	7	1.14	1531	2.5	465	341	0.74	1.08	1176	2.53	148	0.64	1.35	2.4
2009	152	602	395	0.67	6	1.00	1530	2.54	474	340	0.73	1.27	1291	2.72	127	0.43	0	1.88
2010	172	547	393	0.73	7	1.28	1499	2.74	389	328	0.86	1.29	1240	3.19	158	0.43	1.27	1.64
2011	195	583	370	0.64	3	0.51	1400	2.40	431	303	0.71	0.70	1133	2.63	152	0.44	0.00	1.76
2012	227	945	467	0.51	14	1.69	1825	1.93	655	357	0.57	2.14	1274	1.95	291	0.39	0.69	1.90
2013	245	901	474	0.54	9	1.00	1837	2.12	607	341	0.57	1.15	1378	2.27	293	0.46	0.68	1.81
2014	**264**	**798**	**423**	**0.54**	**6**	**0.75**	**1736**	**2.18**	**558**	**358**	**0.65**	**0.72**	**1453**	**2.60**	**239**	**0.28**	**0.84**	**1.18**

Table 3: Summary of IMCA safety statistics 1997-2014

Access the full report at the following link:
www.imca-int.com

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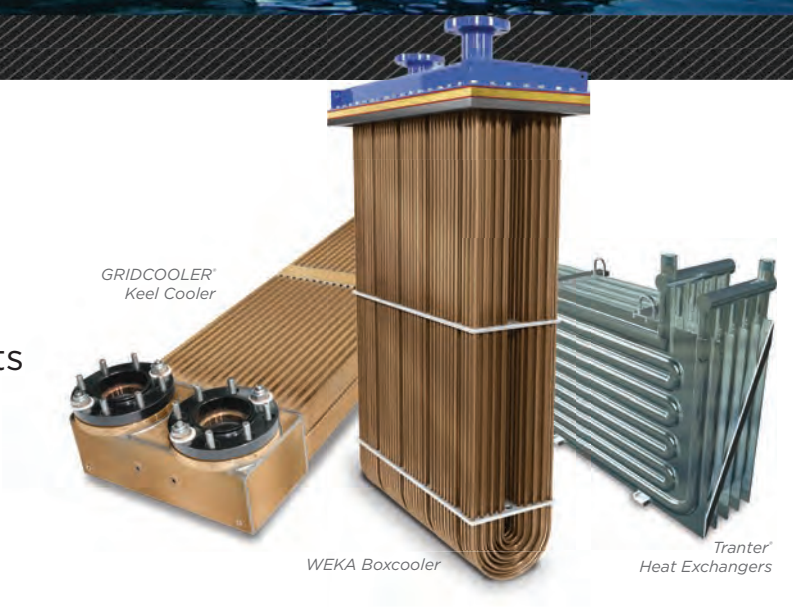

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