September 2013 · Issue 38

Horizons

News and information for the marine industry
A Lloyd's Register magazine

In this issue:

Grand designs

Lloyd's Register supports four exciting and diverse projects

Lloyd's Register
LIFE MATTERS

Issue 38

Horizons is the journal for Lloyd's Register Marine clients and employees, delivering news and analysis on our global activities.

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Horizons is produced by Marine Communications. Care is taken to ensure the information it contains is accurate and up to date. However Lloyd's Register accepts no responsibility for inaccuracies in, or changes to, such information.

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Contents

COMMENT

Nick Brown, Lloyd's Register's Marine Communications Manager

The evolution and expansion of the London cluster

Our Marine business is moving to the Lloyd's Register Global Technology Centre in Southampton, but our proximity to London remains important

With London International Shipping Week taking place as *Horizons* is published, it's a good time to ask: what is Lloyd's Register's position in London and London's role in world shipping, at a time when LR is in the process of relocating its Marine business to a new Global Technology Centre in Southampton?

LR was the first classification society. It emerged from the needs of shipowners and underwriters to understand and manage risk. Now, as the risks we face evolve, so we are now changing too. Our global corporate headquarters remains in London, but there are good reasons to move our Marine business.

When Lloyd's Register was founded over 250 years ago, London was the undoubted centre of world trade, a position the city maintained until the early 20th century. It was the biggest port in the world and London was where modern commercial shipping and its ancillary services were 'invented'. Now, economic growth, the expansion of world trade and globalisation have needed and created multiple shipping centres around the world. Today we can say that there is no one 'centre' of shipping that stands so head and shoulders above the rest as London once did.

So, what of London today, and why is LR's marine business leaving the city? London retains leadership in many of the sectors that originated in the City – shipping law, insurance and shipbroking in particular. These shipping services support an independent shipping culture and, perhaps, a neutrality – enabled by the English language but free of national self-interest – that helps make London a good home for much of the international shipping media, the international shipping trade associations and, of course, for the International Maritime Organization.

Building of LR Marine's new Global Technology Centre (GTC) continues apace. With completion due next year, the GTC will house the 400 members of LR's marine team. It is part of the exciting collaboration between LR and the University of Southampton. Find out more about the GTC at lr.org/marine/GTC

Global Technology Centre

In July 2014 our Marine business will move into a new Global Technology Centre (GTC) on the campus of the University of Southampton. The GTC will be the new headquarters for the Marine business and, with 400 staff, will be the cornerstone of the organisation's global marine research and technology network. It will draw together the engineering excellence of LR, the University and other industrial collaborators to deliver innovation in transport, energy and the environment.

The move is a significant step for the organisation as it continues to evolve in support of shipping. When LR was founded, London was at the heart of world shipping and, with its proximity to the ships in the Pool of London and the docklands emerging in east London, it was where LR's surveyors could see, at one point or another, nearly all the ships their clients operated within a few miles of the City of London.

Today, shipping is a truly globalised industry with no such single centre of trade. Shipping is everywhere. Coal-fired steamships replaced sail. Steam turbines gave way to diesel-fuelled motor engines. When shipbuilding declined in Britain and Europe, it expanded dramatically elsewhere – particularly in Japan in the 1960s, then in Korea and finally in China in the early 21st century. The control of most of the world's ships also widened as new shipowning hubs emerged worldwide, although the City of London has retained leadership in shipping law, insurance and shipbroking.

As the shipping world evolved, so did LR. Our Marine business continued to expand and deepen its capabilities to support a globalised shipping industry. The shipping world has grown more complex and we stand on the brink of a new era – and potentially a new age of technology and innovation to rival the industrialisation of the 18th and 19th centuries.

Against this background of a globalised industry, classification is ready for change, helping the industry manage a new time of technology and innovation.

New approaches

Shipping requires new approaches to meet the requirements of marine stakeholders. This is why we are moving to Southampton. We need to foster technology and innovation in shipping. This is best achieved in collaboration with academia and industry. LR is in a unique position to do this. Few organisations combine technical expertise and experience with the responsibility of applying those skills every day in shipyards and on ships worldwide.

It was agreed that a bold step had to be taken to further develop our technical capabilities at a pace demanded by industry, to support career development and to enable new ways of working. The Marine business needed to relocate to a different, more dynamic and adaptive environment.

To achieve that objective it was necessary to find the right partner and collaboration arrangements.

The decision to choose the University of Southampton was based on the strengths of the University and the sizeable, and growing, cluster of Marine businesses in the Southampton area, as well as the proximity to our roots. Southampton has strong undergraduate and postgraduate academic credentials in engineering and ship science, and a broader maritime offering across law, archaeology, oceanography, history and literature. These non-engineering disciplines provide a broader base to a secondary ambition of both LR and the University: the creation of the Southampton Marine and Maritime Institute (SMMI) with its vision to be a unique internationally recognised centre of excellence. This latter will bring together a research, innovation and education community from universities, research institutes, industry and governments.

Although the move was a big step it was not too far geographically. Lloyd's Register's corporate HQ at London's 71 Fenchurch Street is less than 90 minutes away by train and Heathrow and Gatwick airports are within easy reach.

Proximity to industrial and academic partners will change the way we work and think – and that is the intention. As we become an organisation that can connect innovation with its application, we will grow our capabilities and those of our stakeholders. We will make careers and be able to better support career development, and a broader base for our technical work, by being exposed to scientific, social science and humanities investigation into the health of the oceans and the development of both the commercial and cultural maritime world. The GTC in Southampton is not a destination so much as an action in meeting our ambitions.

A new future for classification

In Southampton we will be well placed to address the challenges that the industry is facing in moving the world's trade safely, cleanly and efficiently. But we will not be so far from our roots as to lose the undoubted benefits that London still offers.

With effect from 1 September, Nick Brown is Lloyd's Register's Director of Business Development and Innovation. Nick returns from his Shanghai-based role as Area General Manager and Marine Manager, Greater China

Innovation for better shipping

New leadership and organisation is driving LR's ambitions to deliver ever better services and support to the shipping industry by linking clients' performance requirements with global technological development and innovation

Nick Brown became Lloyd's Register's new Director of Business Development and Innovation with effect from 1 September. He returned to the UK from his Shanghai-based role as LR's Area General Manager and Marine Manager, Greater China.

Based in Southampton at Lloyd's Register's new Global Technology Centre and Marine head office, Nick heads Marine's Global Sales, Marketing and Innovation team, including LR Consulting. "One of the principal challenges for us is how we can use our deep technical capability to innovate, developing the capabilities that our customers need," he says. "My job is to make sure we understand our clients' requirements; to work with my colleagues to meet those requirements and to ensure that all industry stakeholders understand the extent to which LR can support their needs." LR does have extremely deep technical expertise. It is no coincidence that when a big series of new ship types are ordered we are most often the lead classification society – demonstrated by a global lead in all 2013 first half ordering with a 23.1% market share.

Not to be confused

There are two Nick Browns at Lloyd's Register. Nick Brown, the Global Marine Communications Manager, is responsible for promoting and protecting the interests of LR's Marine business, with responsibility for media and promotional activities. Both Nicks report to the Marine Director, Tom Boardley.

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NICK BROWN
Global Marine Communications Manager
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We have a proven ability to qualify technology, and our leadership in the gas ship and passenger ship markets are examples of the faith placed in us when classification is required for these sophisticated ships – ships where the highest reliability and safety standards are required.

Now, with ever-increasing safety, environmental, regulatory and operational demands for the whole shipping industry, complex technology solutions and implementation of the latest innovation are not exclusive to the high-end shipping segments, but very much shared by all the commercial shipping sectors – tankers, bulk carriers, container ships and offshore support vessels.

LR SUCCESS:
See containership story on **pages 8-11**. And Singapore bunkering study **page 19**.

One of the challenges for us is for our marketing and selling to be as strong as our technical capability, and we have to explain how we solve our clients' challenges and demonstrate the value that we deliver to the whole shipping industry.

The Business Development and Innovations Team

Hector Sewell, Global Head of Marine Sales

Gwynne Lewis, Global Head of Marine Consulting

Luis Benito, Global Head of Marine Strategic Marketing

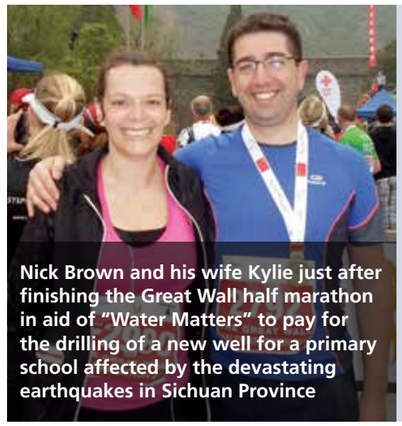
LR's abilities go well beyond traditional class services too, as demand for LR Consulting is rising.

"Our technical consulting skills are highly regarded," explains Brown. "Much of the work we have done in the past has been in identifying and investigating when issues arise, but the skills we have are now increasingly being deployed to improve the commercial or environmental performance of the asset, and understanding what is required to adopt and operate new technologies. Again, we have to make sure that the industry understands all that we can offer. As well as listening to operators' requirements, we are working very hard with designers and innovators to make sure we are at the forefront in understanding what is possible, what is safe and what is practical."

Recent class successes for LR have been allied with consulting support. A sector where LR is seeing significant growth is in containerships – as operators are continuing to look for innovative ways towards better performance and to reduce their fuel bills. In the first half of 2013, LR's share of the classification of new containership orders was very strong. This gives some indication of the impression provided by services such as computational fluid dynamics (CFD); undertaken and validated at full scale, as well as a practical understanding of the realities of future fuels and the optimisation of cargo loading.

"We have to evolve to meet the needs of a fast-moving market. New regulations, market needs and societal expectations are setting the industry substantial challenges. Without compromising safety, we are now focused on helping clients improve their business and asset performance – from surveys to hull form, design and propulsion optimisation. What we are doing in supporting the evolution of alternative propulsion is a good example – whether LNG as fuel, methanol, wind power or battery solutions, we have an unprecedented number of projects underway and in incubation. You need to have many eggs in many baskets because there's not going to be one solution that fits the needs of all," adds Brown.

He concludes: "The shipping world is more complex than ever. Our job is to help shipping manage that complexity to deliver better ships and better performance, with safety paramount."



Nick Brown and his wife Kylie just after finishing the Great Wall half marathon in aid of "Water Matters" to pay for the drilling of a new well for a primary school affected by the devastating earthquakes in Sichuan Province

Nick Brown's biography

Nick Brown is a Chartered Mechanical Engineer and a Member of the Institute of Mechanical Engineers and the Institute of Marine Engineering, Science and Technology.

He joined Lloyd's Register 17 years ago, initially working as a surveyor on existing ship repairs and conversions and new construction projects in Bahrain, Dubai, Finland and Germany.

In 2004, Nick returned to London to develop LR's "Hull Integrity" product, which was launched at Posidonia 2006.

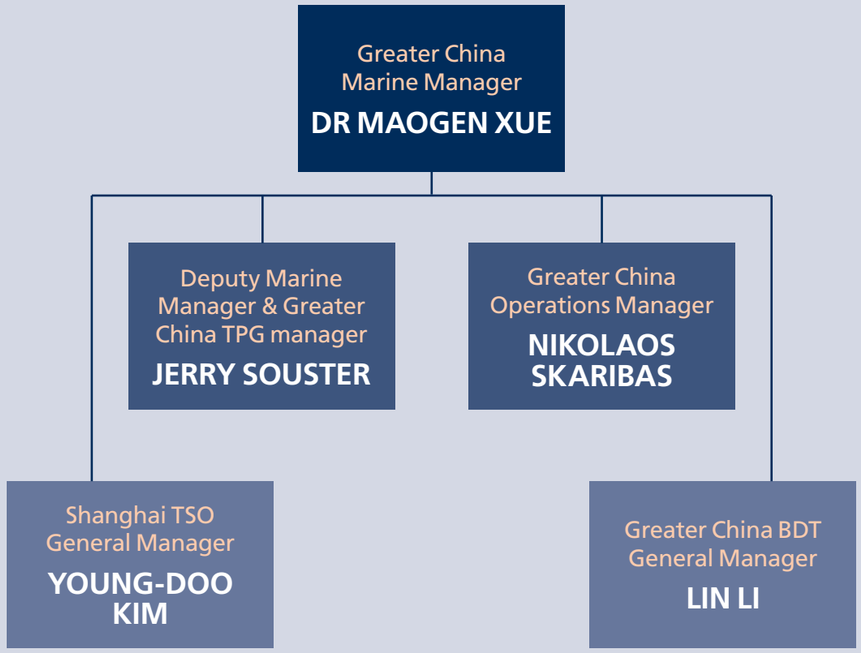
In 2005 Nick assumed responsibility for LR's global oil tanker business at a time when the IACS Common Structural Rules (CSR) for Oil Tankers were being finalised.

Once the CSR rules were adopted in 2006, Nick transferred to China as Country and Marine Manager for PR China, before becoming Area General Manager and Marine Manager for Greater China.

New look LR team in China

Maogen Xue, Marine Manager for Greater China

LR is restructuring its marine management team in China to create a more efficient operating model



Other LR changes

Gary Horrocks
LR's former Marine North China Area Manager is the new UKI Marine Operations Manager, based in Glasgow. Gary, who has spent extensive periods with LR in the Netherlands, Korea and China, will help strengthen the support we provide.

Anil Kumar
Anil w as recently appointed South Asia Area Marine Business Development Team Manager. Anil, who was Marine Operations Manager for East Coast India, will continue to be based in Chennai as we build our marine business development capability in India and South Asia. He will lead and co-ordinate business development activities across the area.

Henk Vanstaalduinen
Henk is the new Marine Operations Manager for Canada based in LR's Toronto office and reporting to Bud Streeter, President of Lloyd's Register, Canada. He joined LR's Rotterdam office as a surveyor 12 years ago, later moving to Shanghai where he served in several different roles, finally as Marine Operations Manager for Greater China (see above).

STEN A. OLSSON

founder of the Stena group, 1916 – 2013

Sten A. Olsson, the Swedish scrap iron and shipping magnate, who died in July at the age of 96, was clearly an exceptional entrepreneurial talent.

The son of a schooner owner and captain, Sten Allan Olsson was born on Donsö, in the archipelago of islands off Gothenburg. He founded his first business there in 1939, trading metal and rubber, later buying his first ship in 1946, a whaler which he converted into a cargo ship and named *Dan*. The shipping activities of Stena were focused in freight until 1963 when a cautious entrance was made into the passenger ship market.

And what a shipping and business empire he built.

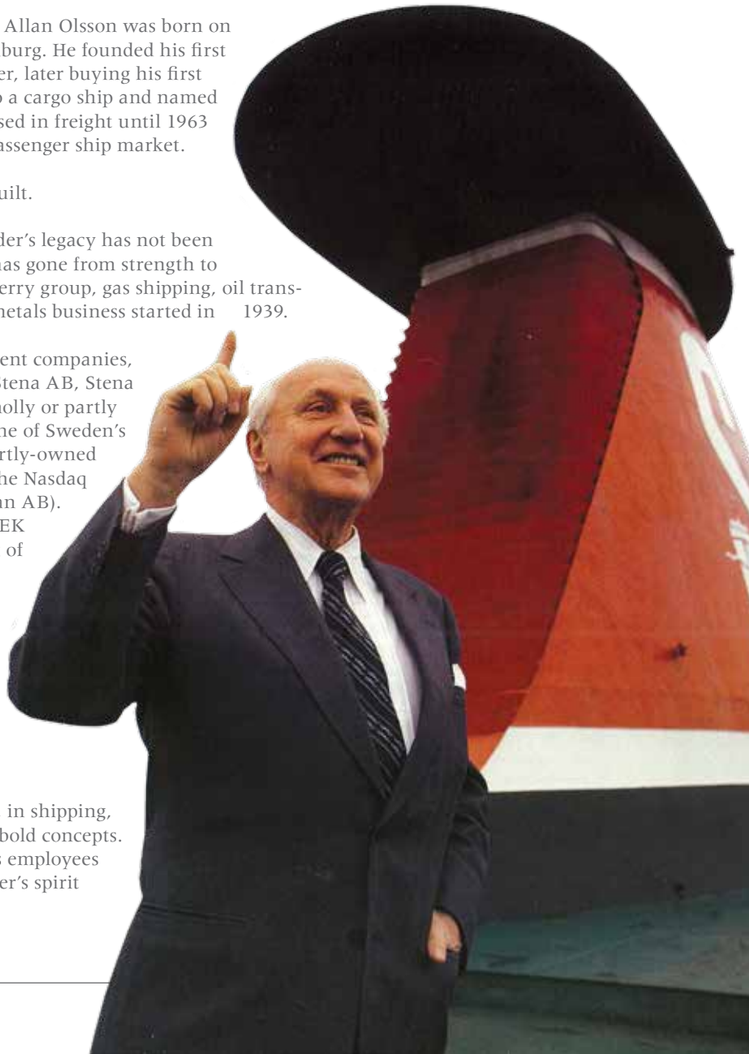
Stena today is a diversified business – the founder's legacy has not been squandered. Still based in Gothenburg, Stena has gone from strength to strength. The group's interests include a large ferry group, gas shipping, oil transportation and offshore drilling, as well as the metals business started in 1939.

The Stena Sphere now consists of the three parent companies, wholly-owned by the Sten A. Olsson family – Stena AB, Stena Sessan AB and Stena Metall AB – and their wholly or partly owned subsidiaries. Together they constitute one of Sweden's largest family-owned corporate groups. The partly-owned company Concordia Maritime AB is listed on the Nasdaq OMX Stockholm (52% is owned by Stena Sessan AB). The Stena Sphere generated total revenues of SEK 68,848 million in 2012 with a result before tax of SEK 1,839 million.

Sten Allan's son, Dan Sten Olsson took over from his father in the 1980s and continues to lead the Stena Sphere of companies today.

Sten Allan served on the Lloyd's Register Nordic Committee until 1985 when Dan Sten joined in his stead.

The Stena Sphere is known for innovation and, in shipping, for building and operating ships incorporating bold concepts. Stena was, and is, a bold organisation where its employees have long talked of the "Stena spirit". Its founder's spirit clearly lives on.



Box efficiency – in safety, economy and stackability

David Tozer, LR's Global Business Manager for Container ships, looks at the ingenuity and technical expertise that keeps LR at the forefront of this important sector

Our clients are looking for improvements in productivity – i.e. cost per container delivered – and we are helping them achieve this.

Lloyd's Register has secured classification contracts for a significant number of new container ships ordered at shipyards in Korea, Taiwan, Japan and China by owners and operators in many parts of the world, including Germany, Chile, Bermuda, Canada, China and Japan.

LR's share of container ship orders in the first half of 2013 was strong. This success seems to reflect the confidence of the market.

So, why is LR being chosen by containership operators?

LR is providing services to the market that link technical requirements with commercial reality. Container ships need to be safe but also need to be designed to maximise profitability. Our expertise in reducing fuel consumption by, for example, hull form, machinery, propeller and trim optimisation, is now well recognised.

Another means to greater efficiency is to maximise the number of containers carried. This can be achieved by utilising every available space on deck, within the constraints of visibility regulations, sometimes by stacking the containers 10 or even more tiers high. Similarly, by enabling the weights of container stacks to be increased, it is possible not to restrict the upper tiers to carrying empty containers, but to use them for carrying (more profitable) loaded boxes.

Further improvements in operational efficiency can be achieved by allowing maximum flexibility for where containers can be located within the stacks. Enabling heavy containers to be carried higher in the container stacks will reduce the number of container moves required in port, by providing the stowage planners more scope for stowage optimisation. As each container lift costs several hundred dollars – and takes time – savings clearly mount up very quickly.

These initiatives to improve operational performance while maintaining current levels of safety, have been the primary focus of the major rule development programme of work which Lloyd's Register has undertaken during the last five years or so. This work is now coming to fruition and was first announced at the end of 2012. Today, we have the most modern rules for container stowage available anywhere in the market, a direct result of our vision for this subject and our long-term investment in supporting our clients' commercial needs and aspirations.

The new rules take account of many features of container ships which affect the motions and accelerations experienced in a seaway. For example, the detailed shape of the stern and the bow – amount of bow flare for example – are important factors in causing rolling and pitching motions and, importantly, they affect the susceptibility of the hull to whipping – when the waves impact the bow and cause the hull to flex – throughout its length. This is a complex phenomenon which can cause vertical accelerations sufficient for the containers to fail, or lashings to break, if not taken properly into account. Our full-scale measurement programme, which has been logging data from a large container ship for a number of years, has provided unique and valuable input to our understanding and evaluation of this important phenomenon.

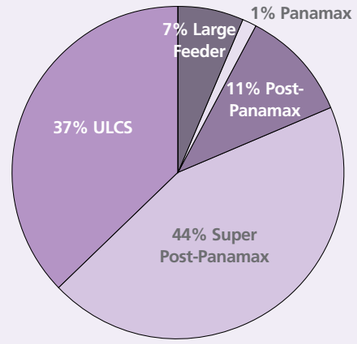
All of this work has provided the basis for the creation of our new rules for container securing which, by taking the fullest account of hull features and complex hydrodynamics, has enabled us to provide a dependable and competitive standard against which container stows can be planned.

Market movements

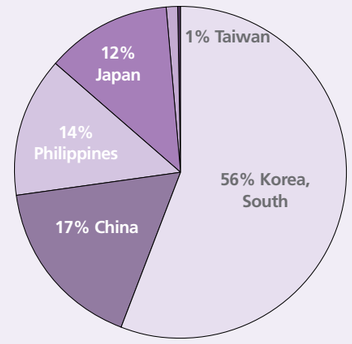
While the focus in recent years has been on super post-Panamax tonnage, especially the very largest vessels for the Asia-Europe trades and the New Panamax (NPX) vessels which are designed to the maximum limits of the new Panama Canal locks, there has been renewed interest in the sub-10,000 teu size ships. For many years the development of the feeder fleet lagged behind post-Panamax vessels. But now interest is returning to this important part of the fleet, and orders have been placed so far this year for 28 vessels of this size. Here, as with all sizes of container ship, there are opportunities for innovation as vessel designs are tuned to the requirements of specific trades, teasing out the maximum profitability for owners and operators, many of whom today have interests in the container terminal facilities which form an essential and integral part of the intermodal container business.

Container ship contracting in 2013

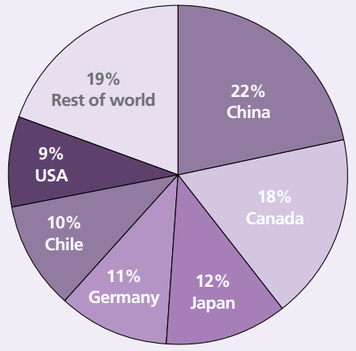
by ship size ranges - TEU



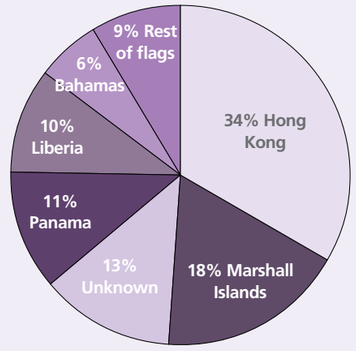
by country of build - TEU



by country of ownership - TEU



by flag registry - TEU



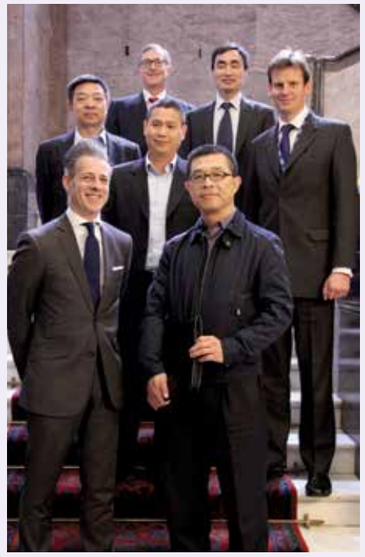
Figures from IHS Fairplay for the year to 30 June 2013

In addition, we encourage owners to install an onboard computer, often as an enhancement to the onboard stability calculation program, in order to apply the rule calculations "live", so the Master can fully assess the stow in conjunction with the ship's draught, GM and the expected weather conditions during the voyage. Such a computer, once verified by LR, can be recognised in the ship's class notation by the new notation **BoxMax**.

There are supplementary characters which recognise that the stowage can be planned to take account of the details of each specific voyage. For instance, why lash for the North Atlantic if your voyage is within the Mediterranean? Similarly, why lash for the winter if the voyage is in the summer? These, together, create the notation **BoxMax (V,W)**.

When an owner requires the **BoxMax (V,W)** capability, Lloyd's Register will produce ship-specific coefficients which are calculated for the various sea areas (100 in total globally) in which the owner wishes the vessel to trade, and for each season. These coefficients, based on calculation of the motions of the ship in each of these areas and seasons, provide factors which are applied, in the stowage program, to roll and pitch motions and to accelerations, including acceleration due to whipping.

Then if a container stack is being shipped in winter from Asia to Europe, or trans-Pacific, do not expect too much benefit. This voyage will be onerous and will benefit little, if at all, from the voyage and seasonal calculation. However, if a particular stack, or bay, is being discharged at an intermediate point, for example at Suez, then there is likely to be a benefit, in terms of fewer lashings or greater stack weight, because it won't have to cope with the rigours of the Bay of Biscay.



(l-r) Mr Gu, COSCO UK's Shanghai Technical Representative, Andrew Craig Bennett, General Manager, COSCO UK, Mr Dinggang, COSCO UK's Crew and Communications Manager, Angus Fairley, LR's UKI & SWE Business Development Manager, Dominic Miller, LR's UKI Client Manager for COSCO UK, Mr Hou, COSCO UK's Engineering Superintendent, Mr Bo, COSCO UK Senior Engineer

Innovation is the key to CSAV boxship order

Lloyd's Register was recently chosen by Chilean operator CSAV to class its new order for seven 9,300 teu container ships at Samsung Heavy Industries. The ships will feature a number of innovations

CSAV answers some key questions about the ships on order:

What is innovative about these ships?
These vessels are designed to be efficient at both slow steaming and high load operation, conditions that can be obtained at any time for the whole range of main engine power as to optimise the propulsion system according to the prevailing operational requirement.

The propulsion system can be adjusted according to operator needs and the always changing operational profiles. This is achieved by means of different main engine ratings and turbochargers' configurations.

The Samsung STAR propeller concept provides high efficiency over a wide range of operating conditions, adding greater flexibility to the propulsion system. The Samsung developed asymmetric rudder bulb increases propulsion efficiency and reduces the negative effects of cavitation on the propeller.

A twin island arrangement has been chosen to provide enhanced hull structure performance and better forward visibility from the bridge which, together with an optimised fuel oil tank arrangement, permits greater nominal capacity on deck and in the holds. Also, having the accommodation situated at a greater distance from the main engine and the vessel's propeller improves crew comfort, due to lower noise and vibration levels within working and living spaces.

How would you expect these ships to perform in service, in terms of energy efficiency and environmental performance?
These vessels will be among the most efficient and eco-friendly ships in both the global and CSAV-owned fleets. They will have an excellent performance across a wide range of operating conditions, but the best results are expected at design draught and at speeds between 15 to 19 knots, reaching an EEDI (Energy Efficiency Design Index) close to 9 [gr CO^2/ton nm], which is about 45% below the current requirement.

LR's ECO Class notation makes the vessels fully compliant with latest and forthcoming Marpol requirements.

What about the technology implemented in these ships? What is making them stand out from the current fleet?
In comparison to CSAV's previous project, which was completed only a few months ago, the company has taken advantage of the very latest technical developments and thus been able to reduce the fuel oil consumption by around 8%, while increasing the deadweight around 4.5% based on same speed and draught.

Among others, state-of-the-art systems such as a super-long stroke main engine, the latest turbocharger technology, variable speed drives, automatic diesel switch (for safe and smooth fuel changeover), fuel oil mass flow meters (for accurate fuel consumption readings), AMP (Alternative Maritime Power from shore while in port – for cold ironing) and compact UV ballast water treatment plant, make these vessels technologically top in their class.

How do these new generation container ships fit with the current market – and how has that fit been achieved?
With these vessels' design, CSAV has not only aimed to comply with current market requirements, but has gone far beyond achieving this with Samsung Heavy Industries' highly efficient and flexible design, which is able to operate in different services and on changing operational profiles. The mentioned flexibility does not only refer to the propulsion system, but also to cargo loading matters such as reefer plugs (1400) distribution on deck and in holds, which allows operators and terminals to reduce planning and cargo operations time.

LR wins COSCO boxship contract

COSCO Maritime (UK) Ltd visited our London office at 71 Fenchurch Street to sign an agreement for the transfer of class (ToC) of seven 5,446 teu container ships.

Led by Dominic Miller, LR's UKI Client Manager for COSCO UK, this opportunity and relationship with the client has been cultivated over the last 18 months, combining the business development efforts of client-facing teams across Lloyd's Register.

Building on recent success with COSCO Hong Kong and COSCO Tianjin, and using the knowledge and support gained by the Shanghai Business Development Team from their ToC negotiations, this significant win clearly demonstrates the benefits and results of our close co-operation with this key client.

CSAV Toconao delivered at Mangalia

The largest container ship ever built in the Mediterranean and Black Sea areas, *CSAV Toconao*, was recently delivered at Daewoo Mangalia Heavy Industries (DMHI), Mangalia, Romania to Zodiac Maritime Agencies Ltd.

Built under the supervision of LR, the 116,700 dwt vessel is the first of four 8,600 teu container ships. The vessel is named after the small Chilean town of Toconao and its charterer is Compania Sud Americana de Vapores (CSAV). It is 300 metres long, 48.4 metres wide and has a scantling draught of 14.5 metres and a maximum speed of 22 knots. It is powered by a MAN B&W engine rated at 47,500 kW.

As well as its spectacular size, the installation of its state-of-the-art equipment was a major challenge for the DMHI team. Two of the other three vessels are scheduled to be delivered in 2013 and the last vessel at the beginning of 2014.

NEWS | *Horizons* looks at all the latest news from the maritime world and rounds up activities from inside and outside of Lloyd's Register

Viking Star – first of a new series of passenger ships

Computer generated image of *Viking Star*

A steel-cutting ceremony for *Viking Star*, the first of a series of new passenger ships to be built for Viking Cruises, was held recently at Fincantieri's Marghera Shipyard in Venice, Italy.

Viking Star, which is expected to be delivered in early 2015, is to be classed by LR and we have already signed a contract with the yard for another vessel as well. The ships will be 47,800 gt in capacity and will be part of the small size ship unit market sector. They will have 465 cabins and a passenger capacity of 930.

The building contract for *Viking Star*, which was signed last year, includes the construction of a second vessel scheduled to be delivered in 2016. Viking Cruises has the option to add further Fincantieri-built cruise ships to its fleet after the delivery of the first two.

A royal duchess meets *The Royal Princess* in Southampton

***The Royal Princess*, the largest cruise ship to be built in Italy, was christened by the UK's Duchess of Cambridge in a naming ceremony at the Port of Southampton recently.**

The vessel, which is the first of two new cruise ships being built at Fincantieri's Monfalcone Shipyard in Italy, is the first cruise vessel in the LR fleet to meet the IMO's "Safe Return to Port" regulation. She will be joined by her sister, *The Regal Princess*, in May 2014.

The 142,229 gt ship, which is registered in Bermuda, includes such innovations as a Seawalk: a glass-floored corridor extending beyond the hull with sea views 39 metres below.

The *Royal Princess* sets sail

Revised LAME Code reflects a changing industry

LR has produced a new, updated version of its Code for lifting appliances to meet new regulations, rules and designs, reports LR's Business Improvement Consultant, Robert Dows-Miller

Contrary to its title, the LAME Code is anything but lame. The four letters in the title literally mean Lifting Appliances in a Marine Environment and the Code itself is a standard for the maritime industry, against which a level of design, manufacture, survey and testing can be measured.

Lifting devices are a key area of our expertise and the headline news is that we have just produced a revised version of the Code. In it we have made some significant changes.

All the chapters have been comprehensively rewritten to reflect advances and developments in the maritime industry. Several new chapters have also been added to show changing regulatory requirements, as well as technical and operational practice.

It is a requirement of most national safety authorities that lifting appliances are approved, examined, tested and certified by a competent person or organisation before being taken into use, and periodically surveyed thereafter to maintain the validity of the certification. LR certification is internationally accepted. Where requested, LR will undertake the necessary certification of lifting appliances (LA) and subsequent surveys to ensure compliance with the statutory regulations and/or LR's LAME Code.

In certain cases, a national authority requires its own certification to be used. Where authorised, LR is also able to arrange the issue of these certificates, which may be in addition to the LR certification, if so desired by the owner.

Lifting appliances are commonly utilised in marine and energy applications where plan approval of proposed appliances is critical, as LAs pose a particular risk given the severity of the impact of operational failures.

A container ship lifting appliance in the Port of Bremerhaven, Germany

> "Lifting appliances pose a particular risk given the severity of the impact of operational failures"

The key areas where the LAME Code applies cover the technical advice, plan approval and in-service activities of the following:

- Ship mounted deck cranes, engine room cranes, stores cranes and general lifting equipment;
- Offshore lifting equipment;
- Ship mounted heavy lift and special equipment;
- Ship mounted pipe laying equipment;
- Ship mounted crew and passenger lifts;
- Ship mounted vehicles' lifts and ramps;
- Ship mounted lifesaving appliance davit systems;
- Loose gear for lifting appliances;
- General industrial cranes;
- Specialised industrial heavy lift equipment.

The LAME Code was originally published in 1987 and extensively reviewed in 2007. The new updated version seeks to make the potentially hazardous lifting appliance industry safer, in line with its stated mission to "enhance safety of life and property at sea, on land and in the air". It is part of a broader programme of activities that aims to enhance LR's capability and emphasise our professional specialism within the field of LA.

The revised code will contribute to an improved customer experience, which should lead to increased internet promotion and, subsequently, an increase in LA business from customers.

The Code can be downloaded now on www.lr.org/lame but will not be effective until 1 February 2014.

Steel cutting ceremony for 130 metre dual-fuel ferry

Italian shipbuilder Fincantieri recently held a steel cutting ceremony on an innovative dual-fuel ferry, which is being built to Lloyd's Register class for Société des Traversiers du Québec (STQ) of Canada.

Scheduled to be delivered in 2014, the vessel will be 130 metres long and capable of transporting 800 passengers and 180 cars. It will feature a complex and extensive system of fore and aft ramps and doors which will allow the vessel to load and unload very rapidly.

The vessel will feature new energy saving systems to reduce its environmental impact and will be equipped with two azimuth thrusters. Each of them will be fitted with two contra-rotating propellers, powered by four diesel power generators capable of running on liquid natural gas (LNG) or marine diesel, which together with transverse propellers, will give the ferry exceptional manoeuvrability.

The ferry is intended to be an amalgam of technology and innovation, adopting the most advanced solutions in terms of energy saving and low environmental impact. In fact, the ship will be certified in Ice Class 1A and Propulsion Class 1AS, the highest level awarded by the classification registries.

Throughout the development of the design the builders have been working with LR Trieste. This has been in co-operation with specialists dealing with novel technologies and specific local regulatory requirements from both LR's London and Toronto offices. Rigorous pre-concept design discussions took place with all parties to make this project a reality.

Signing ceremony: Hudong Zhonghua Shipbuilding and LR representatives at the LNG carrier signing

LR China supports first dual fuel LNG carriers to be built in China

LR recently signed a classification contract for six 174,000 m3 LNG tankers to be built by Hudong Zhonghua Shipbuilding (Group) Co. Ltd.

The project is a key milestone in Chinese shipbuilding and a key indicator in the development of China's LNG ambitions. When delivered, the ships will load LNG in Gladstone, Australia for a number of Chinese import terminals: Qingdao, Beihai, Tianjin, Lianyungang and Wenzhou.

Steel cutting on the first ship will take place in January 2014. The final and sixth ship will be delivered in the fourth quarter of 2017.

The ships will be fitted with medium speed MAN B&W dual fuel diesel engine (DFDE) systems, which will enable them to burn both gas and fuel oil, supplying power to twin electric motors and twin shafts. The intention would be to primarily burn gas. The LNG containment systems will be the NO96 type.

Construction will take place near Shanghai at the Jiangnan Changxing Production Line No 1, now the responsibility of Hudong, following parent group China State Shipbuilding Corporation's (CSSC) re-organisation of production facilities.

Jin Yanzi, Hudong's Vice General Manager, commented: "We have been co-operating with LR since 1979 on a wide variety of projects, including naval corvettes, 87,000 dwt bulk carriers and 17,300 dwt multi-purpose vessels (MPVs). Hudong is experienced in LNG carrier construction and, as we all know, LR is the leading class society for LNG carriers and has the largest market share of the world fleet of LNG carriers. I am sure it will be a win-win co-operation for us and LR."

On delivery, the new LNG carrier orders will be dual classed by both LR and China Classification Society (CCS) and will sail under the Hong Kong flag.

LR takes on advisory role after *MOL Comfort* sinking

LR is acting as a technical consultant to Mitsui O.S.K. Lines (MOL) after the post-Panamax container ship, *MOL Comfort*, chartered by MOL, broke in two in poor weather conditions off the coast of Yemen in June.

The ship suffered a complete structural hull failure. Although not classed by LR, we have been asked to help determine the cause of the failure and to help reinforce the safety of the container ship's sister vessels. The *MOL Comfort*'s aft section later sank, shortly followed by its bow section, which had been partially destroyed by an onboard fire.

The 8,100 teu container ship, which was built in 2008, was flagged by the Bahamas registry.

BoxMax helps operators combat storms at sea

Operators will be able to stow and lash their cargoes more effectively to help combat bad weather and stormy sea conditions, thanks to BoxMax – a new service pioneered by LR.

The service helps operators load greater volumes of cargo more flexibly and, at the same time, increase and optimise container stack weights.

"BoxMax is a smart solution to the needs of operators and no investment is required," said Luis Benito, LR's Global Marine Marketing Manager. "Forces in a stack vary widely and vary between stacks at different locations in a ship. Our rules provide the greatest stowage planning flexibility in the market, enabling operators to achieve the most cost-effective container transportation." LR is the first society to address the interaction between the complex motions experienced by a container ship and the load paths through containers stacks and their support arrangements. (See *Horizons* container ships article pages 10-13)

Lloyd's Register, Nor-Shipping and the Technology Tree

One of the highlights of our participation at Nor-Shipping this year was a Technology Tree showing how we have developed from our origins as a traditional classification society to our role today as a leading maritime innovator.

The tree demonstrates how we help our clients understand and adopt the right technologies so that their ships and businesses can perform better. Find out more at www.lr.org/technologytree.

Our stand was more energy efficient and sustainable than in previous years. It was made of engineered aluminium, which is

LR's Technology Tree

100% recyclable and will last for years. Because it is lightweight we have reduced transportation volumes and costs too, as well as the need for teams of skilled operatives to install it.

LR Marine Consulting – better ships, better performance showcased just a few of the ways in which we are helping the industry perform better. We also demonstrated how our technical expertise is meeting the demand for ships that are designed and operated to perform better in every way, from the fuel they consume to the technologies and procedures they employ.

Watch this video to find out more: http://www.youtube.com/user/LloydsRegisterMarine. For pictures of the event visit: http://flic.kr/s/aHsjFPvWLo

Dynagas takes delivery of two ice-class LNG carriers at HHI

Dynagas, the liquefied natural gas (LNG) shipping arm of the George Prokopiou shipping enterprises, recently took delivery of *Arctic Aurora* and *Yenisei River,* two ice-class membrane LNG tankers, at Hyundai Heavy Industries (HHI) Ulsan shipyard, Korea.

The 155,000 m³ ships are fitted with GTT Mk III containment systems. Propulsion for the ships is provided by a duel fuel diesel generator engine system. Four Wartsila-Hyundai diesel engines in each ship, fuelled either by gas or fuel oil, will power two propulsion motors driving a single fixed pitch propeller. Registered in the Marshall Islands, the ships will operate on charter to Gazprom and Statoil.

With a market leading share in gas ship classification, LR is focusing on continuing to support innovation in gas technology. Jose Navarro, Gas Technology Principal Specialist at LR, said: "It is a great honour

Ulsan delivery: *Arctic Aurora*

to have been chosen to class the lead ships in this project – a continuation of our strong relationship with Dynagas and a milestone for Hyundai Heavy Industries. We have worked closely with HHI in supporting and helping enable the technological development required in these ships.

"A key achievement was implementing a fully automated bonding system for the cargo containment system's secondary barrier, which was achieved using polyurethane (PU) glue. In addition, the primary barrier has been reinforced with ribs and wedges to enhance its sloshing resistance."

LR construction guide highlights the rise of South Asia

The rapid growth of shipyards and shipbuilding interests in south Asia has prompted LR to issue the first guide to the region's new construction.

The LR guide, which is an overview of more than 80 shipyards and 18 ship designers, reflects the region's burgeoning maritime trade, the growing size, capacity and capability of its local fleet, its rising naval power and the increasing local demand for energy infrastructure.

The region's high growth potential was identified by LR's recently released report, *Global Marine Trends 2030*. The LR guide gives factual information about the expansion of shipbuilding centres, including joint ventures with local workforces, in a region that includes India, Bangladesh, Indonesia, Malaysia, the Philippines, Singapore, Sri Lanka, Thailand and Vietnam.

The Philippines is now the world's fourth largest shipbuilder and the Indian government plans to expand the country's global shipbuilding market share from 1% to 5%. You can download a PDF of the report from www.lr.org/southasia

Paris MOU recognises LR's good vessel safety record

Lloyd's Register was rated third best performing Recognised Organisation (RO) by the Paris MOU (Memorandum of Understanding), the global index for flag performance, in the three-year period from 2010 to 2012.

Jim Barclay, LR's Principal Specialist for Port State Control

In 2012 we had only two detentions of ships with "class-related detainable deficiencies" out of 3,661 inspections on a total of 3,018 vessels. During the three-year period, when 12,636 LR inspections were carried out, we had only nine detentions, figures from the 2012 Report on Port State Control (PSC) reveal.

The Paris MOU carries out port inspections on behalf of 27 flag states in Europe and the North Atlantic Basin, stretching from North America to Europe. Recognised Organisations (RO) carry out the majority of statutory surveys for flag states.

Jim Barclay, LR's Principal Specialist for Port State Control, said: "This improving performance has been due to our clients, the effectiveness of our Fleet Quality Management Programme, along with our RO related appeal process, which has had the full support of the technical performance managers. LR's surveyors have given heightened attention to our Concentrated Survey Campaign, which has helped reduced the potential risk areas of PSC deficiencies."

Biggest ship built to LR in India delivered

Panamax bulk carrier *Golden Pearl*, the largest ship built to Lloyd's Register class in India, was recently delivered at India's Pipavav Shipyard, the largest yard on India's west coast.

Lloyd's Register surveyors Srikanth Saripaka and Abu Yadav (both wearing orange) with the Pipavav team and the *Golden Pearl*

A naming ceremony was held by the Pipavav Defence Offshore Engineering Company (PDOECL) and the vessel's owner, Kalloni Shipping.

Golden Pearl is the first of a series of four 73,500 dwt Panamax bulk carriers. The 225m long vessel was designed by KOMAC, Korea and its plans were approved by LR's Busan Design Support Office. The vessel is flagged by the Marshall Islands.

LR wins India consultancy deal

Lloyd's Register in India has won an extensive contract with the Shipping Corporation of India (SCI) to provide consultancy services. LR initially approached SCI, which operates more than 180 vessels, to assist its preparations for the implementation of the recently-ratified MLC on their fleet.

With LR not authorised to carry out MLC inspections on India-flagged vessels (IRS is the only authorised recognised organisation), this win is particularly satisfying.

The contract includes assistance during preparation of company MLC procedures, an MLC training course for shore staff, an awareness course for onboard staff, gap analysis, mock audits on sample ships and support during certification.

Chitta Dash, LR's Marine Manager for India, said: "This win is a particular testament to the customer-centric understanding of Ratan Kumar (LR's Marine Operations Manager for West Coast India) and Shobhit Kapoor (LR's Marine Consultancy Manager for India), who were able to anticipate the needs of SCI management and focus on the recent MLC deadline and possible lack of in-house expertise. The idea was then put forward that LR could successfully provide this comprehensive package."

Lloyd's Register to support development of LNG bunkering in Singapore

An LR surveyor in the Port of Singapore

LR recently won a Maritime and Port Authority of Singapore (MPA) contract to develop operational procedures and technical standards required to develop LNG bunkering capabilities in the Port of Singapore.

In the contracted work, which has already commenced, LR will identify technical specifications, LNG bunkering procedures and development of crew competency for LNG bunkering in the Port of Singapore. This will support Singapore in developing its ambitions to develop the capability and infrastructure to supply LNG as a fuel for ships.

Ng Kean Seng, LR's Marine Country Manager in Singapore, said: "Singapore is supporting efforts to create a clean fuel future for global shipping by developing LNG bunkering operations. We are supporting Singapore in realising that ambition. We have assembled a global team experienced in addressing the requirements and identifying what needs to be done to really address safety, and the operational issues to make safe LNG bunkering possible."

LR will provide detailed guidance to MPA on what is required to ensure that the technical specifications of hardware are identified; the right operational procedures are established; port safety and emergency planning is provided for; and personnel competence can be developed effectively and put in place.

Luis Benito, LR's Global Marine Marketing Manager, commented: "This contract allows us to apply the knowledge and experience gained in the technical consultancy, de-risk and classification approvals we have delivered to recent innovative gas transferring systems and gas fuelled ships globally. It allows us to support Singapore Port to prepare for real LNG bunkering operations, both for short-sea and deep-sea shipping, making safe LNG bunkering possible."

Lloyd's Register joins Titanic II project

LR will review the main design drawings, calculations and studies for the building of a modern version of the famous cruise ship *Titanic*, which sank with the loss of almost 1,500 lives in 1912.

The contract, which was signed with Blue Star Line, will include class rules and SOLAS requirements relating to the structure, stability and safety of the new vessel, *Titanic II*, according to Blue Star Line Chairman, Clive Palmer.

The new cruise ship is due to be delivered and launched in China in 2016 ahead of her maiden voyage retracing the original ship's journey from Southampton to New York.

Paul Nichols, Lead Specialist with LR's Passenger Ship Support Centre in the UK is delighted that LR is part of the *Titanic II* project. "We will work with Blue Star Line and *Titanic II*'s designers, Deltamarin to help ensure the vessel's compliance with all current statutory and classification regulations," he said.

Clive Palmer concluded: "This magnificent vessel is being constructed in memory of the heroic people who served on the first ship, as well as the passengers who sadly shared their fate."

First ISO 50001 certification in Middle East

United Arab Shipping Company (UASC) Dubai recently became the first shipping company to achieve ISO 50001 certification from Lloyd's Register Quality Assurance (LRQA) in the Middle East and Africa (MEA) region.

This achievement is a result of LR's continued efforts to promote our portfolio of services to the shipping industry. The ISO 50001 standard specifies requirements for establishing, implementing, maintaining and improving an energy management system.

The ISO 50001 certificate was presented to Jorn Hinge, President of UASC, by Apostolos Poulovassilis, LR EMEA Regional Marine Manager, during his visit to UAE and Qatar. Waleed Al Dawood, COO of UASC, and Zahid Rahman, LR Vice President, Marine Business Team, Dubai, were also in attendance.

Stavros Meidanis, LRQA's Marine Business Centre Manager, said: "This shows the increasing interest of the marine industry in a systematic approach regarding energy management through enhancing energy efficiency, reducing operational costs and greenhouse gas emissions and, at the same time, gaining competitive advantage through LRQA certification."

Damen delivers first of six platform supply vessels

The first of a series of PSVs with axe-bows and anti-roll tanks – and all classed by Lloyd's Register – has been delivered at a Romanian shipyard

Profile of Remoy Management

The company, based in Fosnavag, Norway and founded 41 years ago, has been closely involved in both the offshore and fisheries industries. It has been one of the pioneers of diesel-electric OSVs and using LNG to drive OPVs.

Remoy has supplied three large LNG-powered OPVs in the Barentshav Class to the Norwegian coastguard and a Reine Class multi-purpose vessel to the Royal Norwegian Navy. As well as fuel-saving technology, the company also actively promotes energy efficient hulls.

Remoy is the largest single investor in World Wide Supply and manages all its vessels.

World Diamond PSV
Credit: Damen Group

***World Diamond*, the first of a series of six uniquely designed platform supply vessels (PSV), was christened recently by the ship's godmother, Princess Margareta of Romania, at Damen Shipyards' Galati in Romania.**

A main feature of the new 80.1-metre long PSV 3300 vessels is their axe-bow, or wave-piercing bow, which cuts through the water faster than other types of PSV. This, combined with the vessels' diesel-electric propulsion, azimuth stern drives and dynamic positioning (DP 2), is designed to minimise fuel consumption.

The PSVs, which are classed by Lloyd's Register, weigh 3,300 dwt and have breadths of 16.2 metres and draughts of 6.5 metres. They can accommodate 16 crew plus six passengers and travel at up to 13.7 knots.

Development of the new design involved extensive CAD/CAM modelling by Damen Shipyards Gorinchem in the Netherlands and rigorous model testing at MARIN (Maritime Research Institute Netherlands). The vessels have a deck load capacity of 1,500 tonnes and will carry cargoes ranging from fuel to drilling pipes, plus crews to and from offshore drilling rigs and production platforms.

The PSVs can also carry containers on deck for other types of cargo. They have fire-fighting capabilities and oil pollution recovery equipment. They have exceptional seakeeping capabilities and are ideal for the rough seas found at many offshore production sites. They have newly designed anti-roll tanks* and an optimised superstructure for maximum crew comfort.

The remaining five PSVs will be delivered to their owner, Norwegian offshore support company, World Wide Supply AS, later this year. Four of the vessels will support the oil multinational Petrobas in offshore Brazil from next year, including *World Diamond*, which is operating in the North Sea spot market for the rest of 2013.

Streamlined hulls

Staale Remoy, CEO of the PSVs' operator Remoy Management AS, said: "The advantage of these vessels is their streamlined hulls and axe-bow, which allow them to move silently through the water and use less fuel because of their sleek design. They also follow Damen's green E3 principles: environmentally friendly, efficient in operation and economically viable.

"The other five vessels are being delivered at the rate of one a month during the rest of 2013, with four leaving for Brazil in 2014."

Leif Gunnar Sandvik, Marine Client Manager for Lloyd's Register EMEA in Bergen, Norway, added: "We are very pleased that Remoy Management AS, and World Wide Supply AS, have chosen LR to class their new vessels and are looking forward to a good and long-term co-operation with them.

"Offshore Supply Vessels (OSV) is a segment with high focus from LR, as well as high demands from clients. We will do our utmost to support our new client Remoy in the best possible way to enhance safety for life and assets, as well as environmental protection, which can help their business."

*The water in a vessel's anti-roll tanks moves back and forth from one side to the other in the opposite direction of the vessel's motion and so helps to counteract any rolling it might otherwise experience.

How I achieved my dream job

Lloyd's Register Surveyor Min-Hee Kim's childhood hopes and enthusiasms about the sea, oceans and ships helped her find her own 'treasure island'

Whenever I go to a new shipyard or pipe inspection, for the first few weeks the people I meet ask me questions like: "Why are you doing this job? You could be working in the office and living your life more comfortably. You're a woman. Why are you doing this dangerous, difficult and physically hard job?" And I always answer: "Because it is valuable and I am learning something new every day."

I grew up on a small island and there were both big and small shipyards in my town. Most of my neighbours worked in the shipyard or were engaged in business related to shipbuilding or deep sea fishery. My father was also one of them (he was a machinery site surveyor). On my way to kindergarten I used to pass through small factories and I liked to collect pieces of fish net, strings, screws and small buoys and play with them. Every day I could see people building ships, as well as other ships mooring along the harbour. I was always curious how those big ships could be built floating on the sea. I wanted to know where they were going and why they were travelling around the world. I wanted to know all the answers.

When I was in third grade of high school, my teacher wanted me to go to medical school. I was a good student with good grades, so he did not understand why I wanted instead to study for a major in naval architecture. However, for me, I recalled the questions that came up during my childhood and l still wanted to know the answers. I was so excited about my dream.

I have to confess that on the very first day I went to Seoul National University in 2001, I questioned my decision when I found out that I was the only girl in my major. It was not easy to live and study there for four years as the only female student, but because of that experience, I grew used to being a woman in this field and I learned important theoretical knowledge about shipbuilding. I also realised how lucky and privileged I was, and I felt that I needed to contribute to society. I didn't know how to do it, so I started making donations to UNICEF (United Nations International Children's Emergency Fund).

After graduating from university, I joined Samsung Heavy Industries for one year and then moved to Lloyd's Register, working as a plan approval surveyor in Busan Design Support Office (BDSO) for more than five years. I carried out structural analysis for container ships, ro-ros, CSR B/C and tankers, and approved drawings for CSR bulk carriers, tankers and container ships, loading manuals and instruments among others.

I still had many things to learn in BDSO. However, more than that, I still sought the answers to my childhood questions. I wanted to work in the real world. I wanted to participate in the real shipbuilding stage and I wanted to meet real shipyard people, shipowners and manufacturers.

I wanted to live each day with enthusiasm and at my full potential. I already had a map from my plan approval experience, so it was about time to depart to the Treasure Island.

As luck would have it, I found a job opening on the Lloyd's Register Hub. I thought it was the perfect chance for me because if I got the job, I could work in the energy group. I still wanted to contribute to society and thought that if I participated in the FLNG project, I could not only help to go a long way towards solving the exhaustion of resources, but also participate in the real world of building the world's biggest FLNG unit. It was the exact opportunity that I was looking for.

My colleagues and friends were worried about my decision and told me that being a site surveyor was very dangerous and physically tiring. In some ways "yes" and in some ways "no". Physically it is not easy. However I've enjoyed horse riding for many years and am quite confident about the strength of my legs. Korea's hot season, the summer, will not last forever and will definitely pass. And as for safety, if you follow the right procedure and remain wide awake all the time, I believe you will be safe. I work for Lloyd's Register which has the slogan "LIFE MATTERS", so what was there to be afraid of?

It's been six months since I started as a site surveyor and I find myself happy again. These days, when I go on an inspection, people I meet often eye me curiously and ask: "Why do you smile all the time?" I feel very happy whenever I hear that. I feel happy that people can tell that that I love my job and notice my happiness.Why am I smiling? It is because I have my passion back. I have a fabulous future and I can enjoy my life today and appreciate the beautiful nature of Koje every day. And I'm getting closer and closer to my dream and even have a new one to fulfil. How can I not smile?

On a final note, I would like to say thank you to Ciaran McIntyre and Gavin Wallace for giving me such a wonderful opportunity working for the Shell FLNG Prelude project and showing me that there is no glass ceiling in LR. And I would also like to say thank you to all of my colleagues in the Koje office for helping me and encouraging me every single day.

So let's enjoy today and be safe, everyone, because Life Matters!

John Stansfeld, LR's Group Human Resources Director, says:

This is a great story of how it is perfectly possible for technical careers in engineering to be as open to females as to males, in what has historically been a very male dominated industry. Our graduate programmes and recruitment channels are open equally to both and we welcome applications irrespective of gender, race or ethnicity. The truth is that these jobs represent a very exciting challenge for young engineers, with opportunities to work on big projects with international significance. Min-Hee Kim's excitement shines through and it is to her credit that she has the determination to follow her dreams and advance her career in the way she is doing. We would love to see more people like her joining Lloyd's Register.

INNOVATION

LR's versatility and experience is nowhere better reflected than in the projects we support. In this Innovation and Technology section you can read about a selection of four exciting and diverse design concepts we are currently involved with.

Back to the future: How ASPS would change the appearance of a bulk carrier

Windship sail concept could help shipowners cut their fuel bills

CFD tests on a new two-masted wind concept show how technology could make a significant impact on the economy and performance of seagoing vessels

Windship Technology Ltd, a sail power concept that is being developed by a consortium of five key players in the global shipping industry, could revolutionise the way tomorrow's vessels carry goods across the world's oceans.

The new concept, which is known as an Auxiliary Sail Propulsion System (ASPS), uses fixed wing sail technology, whereby two 35-metre high masts installed on the deck of a vessel will each have three aerodynamic wings fitted. The masts or rigs rotate automatically to exploit the power of the prevailing wind and, as the speeds and angles of the wind change, the system develops more power, allowing reductions in engine power to be made in order to achieve the same speed and so maximise on fuel saving.

The consortium approached Lloyd's Register to give an independent assessment of the ASPS. LR's Technical Investigation Department (TID) carried out CFD work on a Supramax bulk carrier in varying wind directions and speeds.

These showed that ASPS has the potential to provide more than 50% of the required propulsive thrust a vessel needs, depending on conditions. In the right conditions this could save a typical bulk carrier 30% of its fuel costs on a voyage.

Hector Sewell, LR's Head of Sales and Marketing, said: "Should these results be reflected in actual operation of a real ship, the operational fuel savings will be very significant and will be of great interest to the owners and operators of suitable ships. We look forward to helping clients understand how such a system can help them."

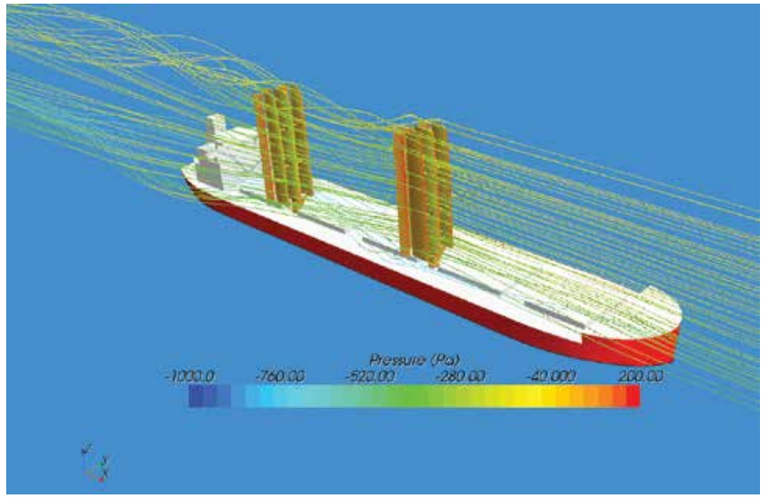
The designer of the ASPS is Hampshire-based, award-winning yacht designer, Simon Rogers. He told *Horizons*: "I am very excited by the new concept, which is taking the very latest principles of sailing and applying them to modern ship design."

Scrapping risk

Windship Technology consortium member, Lars Carlsson, former President of Concordia Maritime, and one of Rogers' four partners, said: "There is a huge fleet of ships built during the last 10 years which risk being scrapped prematurely due to their high bunker consumption. They consume about 15% more bunker oil than the best ships being ordered today. Prudent charterers prefer low-consuming ships for economical and environmental reasons, and the previous fleet risks being left as a second or third alternative for charter.

"Windship Technology installed in these older ships would immediately reduce their bunker consumption and also save them from premature scrapping so they can be replaced by new ships. This is a terrible waste of time and money and creates toxic emissions in the environment," added Carlsson, a former chairman of Intertanko, the tanker owners association, and SEAaT (Shipping Emission Abatement and Trading).

Robert Elliott, Senior Partner of the London-based global law firm Linklaters, also a consortium member, added: "The ability to retrofit vessels in a substantial part of the commercial fleet will help not only the shipping industry, but also the banks with significant portfolios. Lowering the cost of transportation should also help consumers and countries like China which, to maintain its economic leadership, relies on food, natural resources and raw materials being delivered efficiently and at the right price."



CFD analysis of Windship Technology showing wind pressures

Lars Carlsson: "Ships risk being scrapped due to high bunker consumption"

Windship Technology's award-winning Designer, Simon Rogers

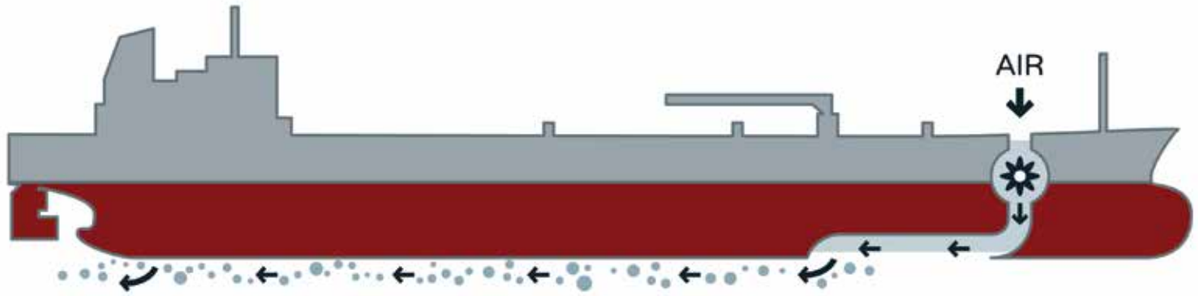
Paul McStay, Lead Environmental Specialist at LR and the LR Windship Technology project co-ordinator, said: "LR is working closely with Windship Technology to provide concept through to full-scale support, covering both classification, installation, integration and design approval support, as well as performance verification and operational assurance at a time when the system is fitted for full-scale application."

As the unrelenting quest to find more fuel-efficient and emission-free sources of energy continues, the idea of using sail power first fired the maritime industry's imagination five years ago when German technologists experimented with towing kites. Two years ago in 2011, a Canadian group signed an agreement with a ship management company to fit a 320m² kite to a dry bulk vessel. Since then Lloyd's Register has either carried out tests and assessments or been associated with several schemes using sailpower (*Horizons* featured three projects on pages 22 to 25 of the May 2013 issue), seeking to create a competitive energy source that will attract owners, operators, ports and suppliers.

Paul McStay concluded: "Let's not forget that sail power is not a new technology to shipping. While the old trade wind routes used sails effectively in centuries gone by, the idea to build upon and improve the concept, given today's knowledge and modelling capabilities to create a truly efficient source of renewable power onboard, is very exciting. Could this enable a step-change in efficiency? Quite possibly."

Saving fuel on a carpet of bubbles

A new air hull lubrication system devised by the London-based DK Group could help reduce seagoing vessels' fuel consumption and CO^2 emissions by up to 10%



Computerised image of air bubbles under a vessel's hull

The continuing quest by owners, operators, shipbuilders and designers to find recession-beating, fuel-efficient and more CO_2 friendly sources of power has been one of the marine industry's overriding campaigns over the past 10 years.

Sleeker hulls and trials and tests with alternative fuels have been two of the options favoured by leading companies to improve the performances of their fleets. Now designers are exploring novel energy-saving and energy-generating technologies. One of these is known as an air hull lubrication system.

Noah Silberschmidt, DK Group Managing Director: "An alternative to new tonnage"

Quite simply, the air hull lubrication system enables a reduction in a ship's through-water frictional resistance by generating a carpet of bubbles underneath the hull. One particular version of this technology is called the Air Cavity System (ACS), which works using compressors to fill with air a series of cavities (chambers) fitted to the leading edge of the flat bottom of a vessel. Then, as water from the surrounding sea flows past the still air in the cavities, it draws micro-air bubbles out of the chamber, which then form on the boundary layer of the hull.

Thus the vessel floats on a thin layer of air bubbles on its bottom, which helps to eliminate any contact or resistance between the hull and the water and enables it to travel more freely and economically on any given route.

Fuel consumption

By reducing the friction between hull and water, ACS is able to reduce a ship's need for power and thus fuel consumption by up to an estimated 10%, according to the latest tests.

"We have been working very closely with Lloyd's Register and we see their brand as vital to this process, lending credibility and independent assurance to the new technology on its route to market," said Noah Silberschmidt, Managing Director of DK Group, the pioneers of the system.

Retrofit solution

ACS technology is best suited to large, flat-bottomed vessels, such as tankers, bulk carriers and broad-beamed container ships, with the number of chambers or cavities varying from eight on a small vessel to 30 on a larger one. As well as newbuilds, ACS can be retrofitted to existing vessels in dry dock in an estimated timespan of two weeks. Silberschmidt commented: "I am very excited about the retrofit variant. DK Group believes that the retrofit solution will be considered by shipowners as an alternative to investing in new tonnage. A potential 10% improvement of the efficiency on existing tonnage will narrow the gap considerably to new and more efficient vessels."

An earlier version of the system was tested on a full-scale demonstrator ship in the Norwegian fjords. After that, full-scale tests were successfully carried out in a cavitation tank at the HSVA Hamburg Ship Model Basin in Germany. Then DK Group approached Lloyd's Register's Technical Investigation Department (TID) to conduct a technology review of the system. Dejan Radosavljevic, TID's Fluid Dynamics Section Manager, said: "It is clear that at full operation, ACS provides significant reduction in frictional resistance compared to the case without a cavity."

The final stage of the process is due in December 2013 or January 2014, when DK Group plans to trial the technology on a 45,000 dwt Handymax tanker.

Sustainable future

One organisation taking an interest in this hydrodynamic technology is the Sustainable Shipping Initiative (SSI), a 25-year initiative to make the maritime industry more sustainable and environmental throughout the whole supply chain, from producers and manufacturers to end-users that include the world's poorest countries.

Lloyd's Register is a founder-member of the SSI, together with leading shipowners, charterers, builders, engineers and financial institutions.

LR's Lead Environmental Specialist Paul McStay: "LR is always seeking better ways to improve vessel performance"

LR's Lead Environmental Specialist Paul McStay, a member of the SSI's technology workstream committee and LR's Co-ordinator of ACS, said: "The SSI is keen to work with technologies that have the potential to deliver step changes in energy efficiency for the industry and the ACS is one of these. LR fully supports this project and after it has been fully tested and the performance validated on a full-size vessel, there is every reason to believe it could be rolled out to owners and operators in the global fleet.

"When we were approached by DK Group, we could see that here was a system that was built on earlier generation ideas to create a much more viable product. As with many new technologies, getting some specific details right is the key to success, and we have been very pleased to participate, not least with DK Group themselves, in order to really understand the technology, but also with our clients to help them explore how to exploit it to meet their needs.

"Lloyd's Register is always seeking better ways to improve vessel performance and operational efficiency and to prove that projects do what they say 'on the tin', as well as satisfying the rules, regulations and, in this case, the SOLAS and MARPOL conventions. ACS has the potential to give owners and operators the environmental benefits of fewer emissions due to reduced fuel consumption," concluded McStay.

How wireless sensors can help save lives at sea

The cry of "man overboard" can often mark the start of a full-scale evacuation operation

Recent sea disasters have highlighted the need for up-to-the-minute lifesaving and evacuation techniques and a group of technical experts have devised a new, high-tech way to track missing passengers and crew, says Lloyd's Register's Senior Specialist **Teo Karayannis**

Tragedies at sea, notably the 2012 *Costa Concordia* incident, have led to a series of new global safety initiatives and measures. Shortly after the ship went aground off the Italian coast with the loss of 32 lives, the Cruise Lines International Association (CLIA) and the European Cruise Council (ECC) launched a Global Cruise Industry Operational Safety Review.

One of the issues identified in the review was the difficulties faced by both crews and rescue bodies when trying to locate people during the evacuation and abandonment of a ship; a problem that often adds to the number of fatalities in an incident. As passenger ships grow larger, this only makes the issue ever more urgent.

A group of companies involved in wireless technology and the manufacture of safety and life-saving equipment launched the Lynceus project (www.lynceus-project.eu) with the avowed aim of "People localisation for safe ship evacuation during emergency". Funded by the European Union's Seventh Framework Programme*, the project has been developing a wireless sensor network system that can track and locate passengers who are in danger, either onboard a ship or at sea.

A series of personal tracking devices, including sensors on passengers' lifejackets and wrist bracelets, will enable the network to pinpoint a passenger's location, movements and even state of health onboard a ship. While lifejacket-mounted reflectors will help small aircraft or UAVs (unmanned aerial vehicles) to track passengers who have fallen overboard, or else found themselves adrift in the sea.

Teo Karayannis, LR's Project Manager and Senior Specialist with LR's Strategic Research and Technology Policy Group (SRTP), said of the project: "The Lynceus concept provides a very interesting alternative to existing technologies and procedures, whereby an integrated decision support system based on wireless technology can allow the crew to remotely localise and identify passengers – particularly those that for any reason do not follow the expected evacuation process or else require special assistance – and manage the overall process more efficiently. The ultimate aim is, of course, to ensure all passengers abandon the ship safely and in the minimum possible time."

Passenger review

LR's participation in the three-year project is managed by the SRTP and includes a significant contribution from LR Consulting. In our capacity, we have carried out a review of passengers and crew casualty characteristics and outcomes in evacuation and abandonment situations. Aided by a team of marine specialists, LR Consulting has developed a comprehensive set of user-centred human factors design requirements for the system, based on its extensive experience with cruise ship evacuation and emergency response.

> "It is no coincidence that when a big series of new ship types are ordered we are most often the lead classification society"

LR Marine, through SRTP, has been contributing on the specificities of passenger ship design and operation in terms of fire safety and evacuation, including insights on the relevant regulatory framework. "LR's contributions have been invaluable for the wireless technology developers, who do not originate from the maritime sector, in adapting their concepts for use onboard ships," continued Karayannis.

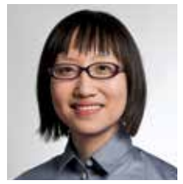
"During the project's latter stages, LR Marine will support and provide oversight to the testing and validation of prototype hardware and software system modules onboard a cruise ship operated by the project consortium partner, Louis Cruises.

"Safe and efficient passenger evacuation in case of an emergency, for both cruise ships and ferries, is a very important issue within the context of passenger ship safety. This is a hot topic in the IMO today in the aftermath of the Costa Concordia incident, but we should not forget that this is a wider problem highlighted by numerous incidents that don't always receive the same amount of public attention," noted Karayannis.

He concluded: "Through participation in this project, LR achieves a twofold objective. On the one hand, we ensure that the developed system will be suited to the specificities of maritime application. This entails both technical or regulatory requirements related to life-saving and evacuation equipment and procedures onboard passenger ships, not to mention human element considerations including the system's usability by the crew, as well as the perception of operators and passengers towards it. On the other hand, we gain timely familiarity with this novel technology, which could eventually become an available option for cruise and ferry lines, thus being in an advantageous position to offer relevant and reliable support to our clients."

*The Lynceus project has received funding from the European Union's Seventh Framework Programme managed by REA-Research Executive Agency (FP7/2007-2013) under grant agreement number 286148

Why robots can reach the parts the others cannot reach



LR is part of an EU-funded project called X-Scan to explore robotic and automated inspection techniques for the welding on ships' hulls. The technology is being demonstrated on a vessel in Greece later this year, as **Ivy Fang**, LR's Senior Specialist, reports

The structural integrity of a ship depends on the quality of its welds, which can run into thousands of metres. The quality of these welds requires inspection during construction and operation.

However, many of the techniques currently used to inspect the quality of welds, such as magnetic particle and radiography testing, are hazardous, time-consuming and not very cost-effective. So research into advanced technology for use in rapid assessment of weld quality has become a top priority.

LR is part of a consortium of European Union (EU) companies and research organisations* that recently launched a project known as X-Scan to develop a series of more reliable, cost-effective, faster and safer welding inspection techniques than before. It is expected that the technology will be able to be used on both newbuilds and existing ships.

The main aims of the project, which is funded by the EU**, are to:

- determine the performance of thin welds using an automatic system;
- develop and validate models for the development of new inspection techniques – both ultrasonic and electromagnetic;
- develop a laser tracking system that will guide a robot and visually inspect welds;
- design, integrate and manufacture an automated system containing three sub-systems;
- validate the final prototype by carrying out laboratory and field trials.

The role of LR, being a leading class society with decades of weld inspection experience, is to provide its inspection procedures and industrial insights into current practices – managed by LR's Strategic Research and Technology Policy Group (SRTP) and with expert support from our Materials and NDE Department.

Ivy Fang, SRTP Senior Specialist and LR's Project Manager for X-Scan, said: "Inspection of welding quality is generally checked manually using various non-destructive testing (NDT) techniques. Some potential risks on current technology and working practices, such as working at heights and in high-energy radiation environments, can hopefully be reduced or eliminated by using new technologies."

Thinner plates

Building ships with thinner steel plates is a recent trend aimed at reducing their weight, increasing the available space on deck and, at the same time, reducing their building and operating costs. However the welding inspection of these thinner steel plates currently uses radiography, since other NDT techniques such as conventional ultrasonic testing cannot provide reliable defect analysis.

As radiography employs short wavelength radiation, such as X-rays or gamma-rays, a major disadvantage is the potential health hazards, including radiation burns, cancer or an increased risk of genetic problems, that might be caused, particularly when the equipment is mishandled.

As well as safety, the shipping industry is seeking a more economic approach to welding inspection that saves time, money and manpower and that better supports the construction and in-service maintenance of ships. For example, the current safety procedures needed for radiographic testing often need evacuation of the working zone before the inspection, which can disrupt construction and maintenance work in the shipyard.

Instead of using welding surveyors, the new inspection system will be automated, using a robot controlled by a laser-guided manipulator. All data readings from the welding inspections will be collected and stored in a database.

"Apart from saving on the obvious costs of using teams of inspectors, the robotic system will enable shipyards and classification societies to inspect previously inaccessible welding areas," explained Fang, "In addition the technology developed under the X-Scan project will enable builders and classification societies to record data digitally for analysis in a data processing system, thus greatly enhancing the speed of inspection and the quality of results produced. The next stage of the project is to conduct a demonstration of X-Scan technologies on a suitable working vessel in Greece in November this year."

* The X-Scan project (www.x-scan.eu) is co-ordinated by TWI Ltd, a highly reputable welding institute. The work is also shared between five other organisations – Innora Robotics & Automation, Brunel Innovation Centre (BIC) at Brunel University, Technitest Ingenieros, Spectrumlabs and Vermon.

** The research leading to these results has received funding from the European Union's Seventh Framework Programme managed by REA Research Executive Agency http://ec.europa.eu/research/rea (FP7/2007-2013) under grant agreement no 283284

A welder at work on a ship's hull
Picture credit: TWI Ltd (http://www.twi.co.uk)

All rules are made to be broken. Or are they?

LR's Global Marine Risk Advisor, **Vince Jenkins**, takes a novel look at rules and rule-making and draws some surprising conclusions

Like any classification society, LR is always evolving its classification rules. Today is no exception. In fact, the speed of new rule development is currently very high. There is a different look and feel to some of these new rules, however, for they are no longer completely prescriptive. Some might even say they are no longer rules, since they don't tell you what to do.

So what is wrong with traditional prescriptive rules? The answer is simple – absolutely nothing! Prescriptive rules are excellent, providing there is a high degree of confidence that the hazards of a technology are understood.

Typically prescriptive classification rules are one solution to managing the unwanted hazards of a known technology. Hence, classification rules are generally pragmatic and cost effective and have become the accepted route to managing a known technological hazard.

One of the many challenges the maritime industry faces today is the rate of deployment of new, complex and integrated technology to meet new regulations and maintain a competitive edge. Prescriptive rules alone are not the most effective way of managing the hazards of new, complex and integrated technology, since these new hazards are not fully understood. Prescriptive rules offer only one solution to a known problem, so some might say they do not facilitate innovation.

Hatch covers

To give an example. Hatch covers on bulk carriers (see image, right) are standard and are the subject of classification rules. In this case, the safety hazards being managed are: 1) Cargo liquefaction due to the cargo becoming wet from moisture (from rain or sea spray entering through the cargo hold hatch). 2) Loss of excess buoyancy or ship stability by green seas coming into the holds through the hatch. A 'lid' on the hold does this simply and neatly, and is an obvious solution.

A hatch cover will also help keep the cargo in spec for the end user. Clearly, hatch covers are not the only way these safety hazards could be managed. Frequently, the rule requirement asks for a specific hardware measure, since there is considerable confidence in the measure, providing it is adequately maintained.

Here we touch on an important element which any classification society requires – confidence in the measure. There is a high level of confidence in hatch covers, given deep sea trade and varying weather conditions. This is not to say, though, that other solutions to managing the hazard are not acceptable. For instance, in benign sheltered waters, management controls might form part of an alternative approach, instead of using hatch covers. Gaining the same level of confidence in management controls, however, involves considerably more effort.

So why do an increasing number of LR's new rules additionally require the use of risk-based techniques? Employing prescriptive rules (for instance requiring a specific hardware measure) is adequate when small incremental steps are made in evolving or developing new rules that involve a known technology. In such cases, prescriptive rules can be produced that, with a high degree of confidence, ensure the technological hazard is adequately identified, understood and managed.

> "Prescriptive rules alone are not the most effective way of managing the hazards of new, complex and integrated technology"
>
> **Vince Jenkins,** LR's Global Marine Risk Advisor

Hatch covers on the LR-classed bulk carrier *Dorine*

New technologies

So, what about new technologies or increasingly integrated and complex systems where the hazards are not fully understood? Using or modifying existing prescriptive rules gives very little confidence that the potential new hazards are understood and adequately managed. A simple example is LNG as a fuel. If prescriptive class rules developed for HFO/MDO were used as they are or modified to manage LNG as a bunker fuel, it's entirely probable that adverse incidents would result. The process used to evolve the existing rules would not be sufficiently robust and systematic.

The fact that LNG is cryogenic and that it is used in the gas state will most probably lead to catastrophic incidents. When technologies involve inherently large hazards, are expensive or have high expectation of the stakeholders, developing rules by overt reliance on learning through incidents is not an acceptable system.

I hear you saying that LNG and methane are well understood, as indeed they are in certain industries and applications. LNG's use on board ship as a fuel, outside of boil-off gas in LNG tankers, is very new, and standard designs and their safety implications on ships have yet to be fully understood. In such cases, prescriptive rules alone do not give the adequate level of confidence that class requires to approve a design.

Additional methods need to be brought into operation, of sufficient rigour, to give class the confidence that there has been a robust and systematic approach to the identification and management of new technological hazards.

Prescriptive rules

There is good news however! As experience of a technology develops, and standard designs are evolved, prescriptive rules can be developed. It is quite possible that within two to five years of a new technology being introduced, a relevant set of prescriptive rules can be produced.

The industry is embracing new and complex technologies at an ever-increasing rate. Increasingly, these technologies have to be effectively integrated to ensure that unwanted hazards are managed, and that the benefits of the expenditure on new technology are realised. As an ex-seagoing engineer, I fondly remember a rotating mechanical engine governor; a wonderful piece of kit. When did you last see one of those?

Somewhere in my car there is a reciprocating engine, buried beneath mounds of electronics. Solid state logic circuits are the control systems of today and the future, and they are everywhere – microprocessors can be tiny things. Ensuring we have a robust and systematic understanding and management of the hazards of new technologies, complexity and integration is the only way to provide adequate confidence for class approval to be given.

If you want to be at the cutting edge of performance by gaining the benefits of new technology, complexity and system integration, then a robust and systematic risk assessment will be a large part of the design development. This is today's reality. If you are prepared to forgo a competitive performance edge, then you will need to wait a number of years until a particular new technology, complexity and integration is better understood – and when wholly prescriptive rules are likely to have been developed.

Global navy projects

Lloyd's Register's naval presence continues to grow around the globe. In this section we feature the UK aircraft carrier project, some exciting developments in Canada and international newbuild schemes

LR oversees exciting changes in Canada

LR's increased commitment to Canada, the Royal Canadian Navy and Canadian Coast Guard was marked by the incorporation of a new limited company in 2012

In 2012, Lloyd's Register strengthened its commitment in Canada by incorporating a new operating entity – Lloyd's Register Canada Ltd. This was in response to the needs of our growing commercial clients and, more specifically, to support the unique opportunity presented by the Government of Canada's National Shipbuilding Procurement Strategy (NSPS).

The NSPS is a $35 billion (£22.8 billion) programme to build large and small ships for the Canadian government and to provide refurbishment, modernisation and life extension to existing vessels. The programme spans a 30-year period and aims to revitalise the Canadian shipbuilding industry, while at the same time replacing ageing Coast Guard and Naval fleets. The build programme includes patrol ships, frigates, naval auxiliary vessels, science research vessels and ice breakers.

The Canadian Government has established strategic relationships with two Canadian shipyards: Irving Shipbuilding Inc. in Halifax, Nova Scotia and Vancouver Shipyards Ltd. in Vancouver, British Columbia. These yards will build the large government ships required by the NSPS programme. Smaller ships (1,000 tonnes displacement and under) will be competitively bid for by smaller shipyards across the country.

Currently, Lloyd's Register Canada Ltd is supporting the Royal Canadian Navy, Canadian Coast Guard, both NSPS shipyards and Canadian ship designers through numerous new construction and existing vessel projects. To date, these include the Arctic Offshore Patrol Ship (AOPS), Joint Support Ship, Polar Icebreaker, Offshore Oceanographic Science Vessel, Offshore Fisheries Science Vessel, Search and Rescue Lifeboat and various vessel assessments during their refit and life extension periods.

The AOPS project is significant because it represents a new capability for the Royal Canadian Navy – the ability to patrol Canada's three coastlines: eastern, western and northern (the Arctic).

Under the Definition Contract, Irving Shipbuilding will refine and complete the AOPS design to the high degree of detail necessary for actual ship construction. The design contract will be followed by a construction contract in 2015. It is anticipated that between six to eight ships will be built at Irving Shipbuilding's facility in Halifax, Nova Scotia.

Bud Streeter, President of Lloyd's Register, Canada, said: "We are excited about this opportunity to demonstrate our ability to support naval ship procurement in Canada. We have had a long and productive relationship with Irving Shipbuilding in Halifax and look forward to working with them once again on this milestone project."

An Irving Shipbuilding spokesman said: "As Canada's prime contractor for the AOPS project, Irving Shipbuilding has selected a team of exceptional and experienced sub-contractors to fulfil the mandate of the design phase."

The Canadian Coast Guard's new flagship Polar Icebreaker will be the largest and most powerful vessel of its kind ever owned by the Government of Canada when she is delivered. Named after the former Canadian Prime Minister, John George Diefenbaker, the vessel is a very high profile and strategic project for Canada's Arctic sovereignty.

The *CCGS John G. Diefenbaker* is in the concept design phase and will be 120 to 140 metres long and carry 100 crew and mission personnel. She is one of the centrepieces of Canada's northern strategy, which focuses on strengthening Canada's Arctic sovereignty, economic and social development, governance and environmental protection.

The vessel will provide increased coverage in the Canadian Arctic and will be able to operate throughout three seasons – or 270 days. Designing and building the huge polar icebreaker is a major national project and the vessel is expected to enter into full service in 2017.

Her missions will include search and rescue and environmental response, icebreaking, Arctic science, national security, northern re-supply and logistics support, weather and ice information/data collection and fisheries conservation and protection.

The concept design of the *CCGS John G. Diefenbaker* will accommodate two helicopters and is being designed to LR's Rules and Regulations for the classification of ships, including the provisional rules for the winterisation of ships, IACS polar ship rules, Canadian Shipping Act 2001 and the Arctic Waters Pollution Prevention Act regulations.

Bud Streeter went on to say: "The Polar Icebreaker, as identified by the Government of Canada as the *CCGS John G. Diefenbaker*, has been on Canada's fleet recapitalisation plan for many years, and it is exciting to finally be at this stage. Our work with the designers on the concept is a real collaborative relationship between us, the Canadian Coast Guard, and numerous Canadian suppliers to design the vessel that will take its place amongst the Canadian fleet.

"The vessel is needed more than ever now with the increasing activity in Canada's Arctic waters, and we are very privileged to support both our commercial clients and the Canadian government during the concept design."

Beyond our classification services, Lloyd's Register Canada Ltd has provided training to the Canadian Marine Industry and the Government of Canada on Naval Classification, Environmental Ship Waste Stream Management, and support to designers on Transport Canada's regulatory regime.

In July this year, LR's Marine Director, Tom Boardley, visited our Government Operations Office in Ottawa and met senior staff from the Royal Canadian Navy and Canadian Coast Guard, thus emphasising our commitment to Canada and the influence the Canadian government's activities have on the global marine industry.

LR in Canada

Lloyd's Register's presence in Canada dates back to 1852. Since then, our commitment in Canada has grown steadily, and we now provide a wide range of marine classification and consultancy services including a growing Technical Support Office in Toronto and, more recently, a Government Operations Office in Ottawa. Lloyd's Register Canada Ltd is positioning itself to offer a total Canadian solution to new construction and existing vessel initiatives.

DSME builds four 200-metre long Royal Navy tankers

Four 200-metre long tankers are to be built to support the RN fleet and, in particular, the two Queen Elizabeth Class (QEC) aircraft carriers, which will form the UK's carrier strike capability when they come into service later this decade (see page 9).

The 38,000 tonnes Replenishment At Sea (RAS) ships will replace some of the UK Ministry of Defence's (MoD) existing tanker fleet and will be built to LR's Rules and Regulations for Naval Ships, instead of LR's Rules and Regulations for Ships, which has been the case to date.

The vessels will be equipped with three abeam and one stern RAS station, a flight deck and hangar to support Vertical Replenishment (Vertrep) and will have an organic aviation capability using a Royal Navy Merlin helicopter.

LR has been closely involved with the MoD (Defence Equipment & Support, Commercially Supported Shipping Platform Team) project right from its conception and provided support to the project team in the selection of appropriate technical standards for these new vessels.

The contract for the design and construction of the ships was awarded to South Korea's DSME in a global competition and the ships are to be built in their Special Ship Area in Okpo. DSME is partnered by BMT Defence Services (DSL), which has undertaken the basic design of the ships at their offices in Bath. LR's offices in Nailsea, London and Southampton have been closely involved with reviewing this basic design output to ensure that it meets class requirements.

Once complete, this basic design package will be handed over to DSME in Korea where LR's Korean offices will take over the final design appraisal and the construction monitoring of the build.

Shortly after being awarded the contract, DSME sent a number of their project staff to Bristol for a week-long, specially tailored Naval Ship Rules course run by the team from LR's Naval Liaison Office in Nailsea. They were joined on the course by representatives of the MoD and BMT DSL, demonstrating the project's team ethos.

RFA Tidespring, the first of this new class of RFA tankers, is scheduled to have her keel laid in January 2015, with her sister ships, RFAs Tiderace, Tidesurge and Tideforce, following at six-monthly intervals. Tidespring is due to be delivered in October 2015. Once delivered, each ship will return to the UK for the final fitting of communications equipment and self-defence weapon systems.

Computer generated image of a Replenishment at Sea tanker (left)

RFA Cardigan Bay (left) which provides support to the UK Royal Navy

"VALUE FOR MONEY"

LR clinches new RFA contract

Lloyd's Register's efforts in helping to save the Ministry of Defence 25% of its costs at the Royal Fleet Auxiliary led to us winning an extended five-year term

Lloyd's Register has been involved with the Royal Fleet Auxiliary (RFA) since 1911 when we classed the steam tanker *Burma*; the first RFA vessel to be classed in the highest classification category, +100A1.

Since then our relationship has continued to expand and flourish, and in 2004 we were involved when the RFA formed a category management team to carry out a radical new approach to how the RFA contracted with industry. The aim was to move away from selecting suppliers through competitions based on price (see right-hand panel).

Under the new process there were no supplier relationships and thus no "buy in" to the through life support (TLS) of the RFA's platforms. The vessels the RFA operated at the time were divided between six clusters. Invitations to tender were issued for dockyard support of each cluster, and flotilla support for classification, paint and furnishings.

In 2008, the TLS contracts were awarded – two ship cluster contracts with Northwestern Shipbuilders and Repairers (now Cammell Laird) and the A&P Group, and three market-facing category (MFC) contracts.

Value for money

LR has been able to achieve year-on-year cost reductions without impacting performance. This is based on developing a congruent relationship between supplier and the authority (the UK government's Ministry of Defence [MoD]) and by jointly developing skills and relationships to benefit the business.

This joint development covered such areas as communication, improvements (i.e. costs, efficiencies and process improvements, staff development and governance). It has been positive in its outcomes with clear measurable results demonstrating the effectiveness of this holistic approach to support of the RFA fleet.

The TLS contract to the RFA fleet awarded for five years to LR in 2008 has been successful in achieving safe, materially available and capable ships to a costed programme and, at the same time, has contributed to the delivery of MoD departmental savings of 25%.

This success has meant that, following positive negotiations in 2012 and 2013, the contract has been extended for a further five years.

Philip Dunne, the UK government's Minister for Defence, Equipment, Support and Technology, said: "These Royal Fleet Auxiliary ships are crucial to the work of the Royal Navy and without them, it simply could not operate. These substantial contracts will not only safeguard hundreds of UK jobs, but will ensure that these ships can continue in their roles for years to come."

Commodore (RFA) David Preston OBE, Head of the UK government's Commercially Supported Shipping for Defence, Equipment and Support, said: "These contracts represent the best value for money for defence and each of the companies has a proven track record in supporting the Royal Fleet Auxiliary on a worldwide basis. This ability to support the Royal Navy wherever they are deployed is critical to UK defence."

John Zinn, LR's Naval Business Delivery Manager, said: "Lloyd's Register has been proud to be part of this contract and helped to deliver year-on-year cost reductions without impacting performance."

The RFA's history and background

The Royal Fleet Auxiliary was founded in 1905 as part of the UK Ministry of Defence. Its role is to supply food, fuel, munitions and other vital commodities at sea to the UK Royal Navy and other defence forces and to provide humanitarian assistance and disaster relief.

It operates a fleet of 13 vessels, including a one-off platform for casualty evacuation and helicopter flight training, a forward repair ship which supports submarines and mine counter measures vessels, amphibious landing ships, oil tankers and supply vessels – all on a global basis.

Maintenance and upkeep of the vessels is the responsibility of the commercially supported shipping arm of the Ships Directorate based in Abbey Wood, Bristol, under the auspices of Defence Equipment and Support (DE&S).

LR's relationship with the RFA began in 1911 when the steam tanker *Burma* was the first RFA vessel to be classed.

In 2004 a category management team was formed to implement a radical new approach to how the RFA contracted with industry. The aim was to move away from the hundreds of competitions transacted annually to award contracts to suppliers to maintain its vessels with selection based purely on price.

UNDER THE WAVES

Applying LR's assurance processes to subsurface vessels

***HMS Ambush*, one of the UK Royal Navy's Astute Class submarines, arrives at the HM Naval Base at Clyde in Scotland to begin sea trials. The 7,400 tonne submarine is the second of seven Astute Class vessels planned for the Royal Navy (RN) and are the most advanced and powerful attack submarines the UK has ever sent to sea**
Credit: Crown copyright 2012

Providing certification services to the seven Astute Class submarines

While many submersibles and several passenger-carrying submarines operate commercially, most vessels that operate beneath the surface of the oceans are in naval service, either as part of a nation's armed forces, or as part of a rescue system, should a submarine become stranded on the seabed. This is a very niche technical area, but one where LR has significant expertise and is able to contribute a valuable service.

Today's submarine is viewed by some as complex as the space shuttle and they certainly operate in a similarly hostile environment. Perhaps the biggest difference though, is that at any one time there are more people underwater than there are in space. So it is entirely appropriate that with our commitment to safety, LR should bring our expertise to this complex technical challenge.

Our main objective is to give crews and operators confidence that systems will function as and when required. This is achieved by applying the same principles and practices within submarine project supply chains as we do for such projects as the UK's aircraft carrier (see story on page 11) and Astute submarine.

By identifying all of the technical standards that any system, module or piece of equipment needs to comply with and what level of performance is required from these items, we are able to adapt the same assurance process used elsewhere to bring an appropriate level of risk management to sub-surface vessels.

Having our surveyors available close to suppliers throughout the world also means that LR can provide a very cost-effective verification service to both the builders of the submarines and, more importantly, to navies which will ultimately rely on them for their own safety.

Should an emergency arise and the submarine crew need to be rescued, they can be confident that the submarine rescue systems (such as the NATO Submarine Rescue System, see panel right), which were classed by LR, will be able to bring the crew back to the surface safely.

The knowledge and experience of delivering this assurance in such complex systems is then captured in our Rules and Processes for other projects, both naval and commercial, to benefit from.

So whether we're talking about a floating gas processing vessel, a luxury cruise ship or a submarine operating hundreds of metres below the surface, all these vessels share in the assurance inherent from LR's services.

How the Astute project works

BAE Systems is currently building the Astute Class of nuclear submarines for the Royal Navy. These highly capable vessels are now entering service, with the keel of the sixth of Class having recently been laid.

The submarines feature the latest nuclear-powered technology, which means they never need to be refuelled and can circumnavigate the world submerged. The crew's oxygen is manufactured from seawater while the submarine is travelling.

The Astute Class is quieter than any of her predecessors and can operate covertly and remain undetected in almost all situations, despite being 50% bigger that the RN's current Trafalgar Class submarines.

LR is providing a range of product verification and build assurance services to ensure that all aspects comply with the chosen technical standards, including specific naval engineering ones. The service extends through the entire supply chain and is based on the fundamentals of the classification process. As there are no submarine rules, our role is essentially a consultancy one, carrying out gap analyses to identify any issues.

Where improvements to process or use of alternative methodologies are identified, these are submitted, demonstrating the inherent added value from LR's participation in this complex project.

NATO Submarine Rescue System

The NATO Submarine Rescue System (NSRS) is jointly owned by France, Norway and the UK and is an air portable system for the recovery of submariners from distressed submarines. The system can be deployed from its base near Prestwick, Scotland at short notice to assist in rescue operations anywhere in the world.

The NSRS comprises two submersibles, a launch and recovery system, transfer under pressure and decompression chambers, plus ancillary modules to provide an independent package for deployment onto a mother ship.

The system was classed by LR during construction and is being maintained in class throughout its operational life.

An Arctic RHIB (rigid hulled inflatable boat) mid operation

Why the Grey Code works for the UK's small naval craft

A new safety framework devised by LR that combines the standards needed for vessels of four to 24 metres in length into a single template

A new safety framework known as the Grey Code has been devised by LR for small UK ships in military service.

The Code is a hybrid solution that combines the various standards needed for small craft ranging from four to 24 metres long into a single document template. The template is then tailored to meet the needs of specific naval operations.

"When we first started looking at small craft there were some conflicts where the commercial code did not consider the military/naval operational philosophy for small craft, so we have developed a model for certification that is working and delivering results," said Keith Ivory, Senior Specialist at LR's Naval Liaison Office in Bristol.

"We found that applying the UK flag's various codes of practice was too onerous for some craft and certain requirements were inappropriate in some cases. So we developed a hybrid solution for many of the boat classes, which we term the Grey Code Approach," he added.

In the past eight years, LR has applied this approach to more than 500 small vessels and a similar approach is being taken for other classes of vessel too.

"The survey record generated has significant benefits to the UK Ministry of Defence (MoD)", continued Ivory. "There is a consistency across a boat class in the survey record and the standards applied, which can accommodate different operational areas.

"We can strengthen the safety assurance by including within the record template additional owner's requirements over and above the Code baseline. The survey record can cross-reference to the safety case where a survey item is managed through the safety case.

"This gives transparency to all stakeholders in the standards and agreed tailoring for a boat class to operators, yards, surveyors, platform duty holders and the naval authority.

"Individual boat certification has not been the appropriate solution for all boat classes and we have therefore considered local management processes, standard operating procedures and other inspections in demonstrating an appropriate level of safety assurance to meet MoD policy."

UK's QEC aircraft carrier project continues apace

The Queen Elizabeth Class (QEC) project to build two aircraft carriers for the UK Royal Navy is the largest single project LR has worked on with the UK Ministry of Defence. The size and scale of the project is such that several shipyards across the UK have been involved – as no single yard could deliver each of the two ships alone.

Progress on the project, which originally started with concept designs in 1999, has continued apace. Steelwork on the first carrier, *Queen Elizabeth*, is nearing completion; the vessel's fore and aft islands are installed; the flight deck is almost complete and the main propulsion machinery and cabins have been installed.

Work on some of the main outfits of the second ship, *Prince of Wales*, is at a fairly advanced stage and the first dry surveys have begun at Scotlands's Rosyth shipyard, with pipe installation scheduled to begin later this year.

"With 15 surveyors across six yards in the UK, Lloyd's Register is playing a key and well recognised role in the survey and acceptance of a full set of class notations, which will ultimately allow the ships to be delivered to and accepted by the Royal Navy," explained Ian White, LR's QEC Project Manager.

The ships are being built to 2005 Naval Ship Rules and also comply with other regulations, including 2005 LR Ship Rules, SOLAS, MARPOL, defence standards, naval authority and client requirements.

> "The size and scale of the project is such that several shipyards across the UK have been involved"

A full report on the progress and achievements of the QEC aircraft carrier project will be published in the January 2014 issue of *Horizons*.

The part-completed *Queen Elizabeth* at Rosyth shipyard

LR guide to naval assurance

LR has been providing safety assurance for the world's navies for more than 150 years. Now, a new guide from LR's naval business team explains the assurance process, showing how it provides confidence in vessel safety and reliability through life, from concept and procurement through to operation and disposal.

The guide details the role that the LR Rules and Regulations for the Classification of Naval Ships play in this process, but also demonstrates that assurance is much wider and more complex than simply applying prescriptive standards – it is about helping ensure that each vessel will be safe for its specific operations.

The guide is available to download at www.lr.org/naval. It should make useful reading for anyone responsible for procuring, operating and managing naval vessels, as well as those involved in safety regulation.

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How can I bunker LNG safely?

With interest growing in LNG as a maritime fuel, the need for expert guidance on LNG bunkering and assurance in its safety is increasing. Lloyd's Register is at the forefront of research and risk management in this rapidly developing area.

We are helping ports, regulators, shipowners and shipbuilders understand the design and operational risks associated with LNG, to help ships bunker more safely.

Whatever bunkering options you are exploring, we can help you assess them, understand them and make them safe.

Discover more at www.lr.org/bunkering

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