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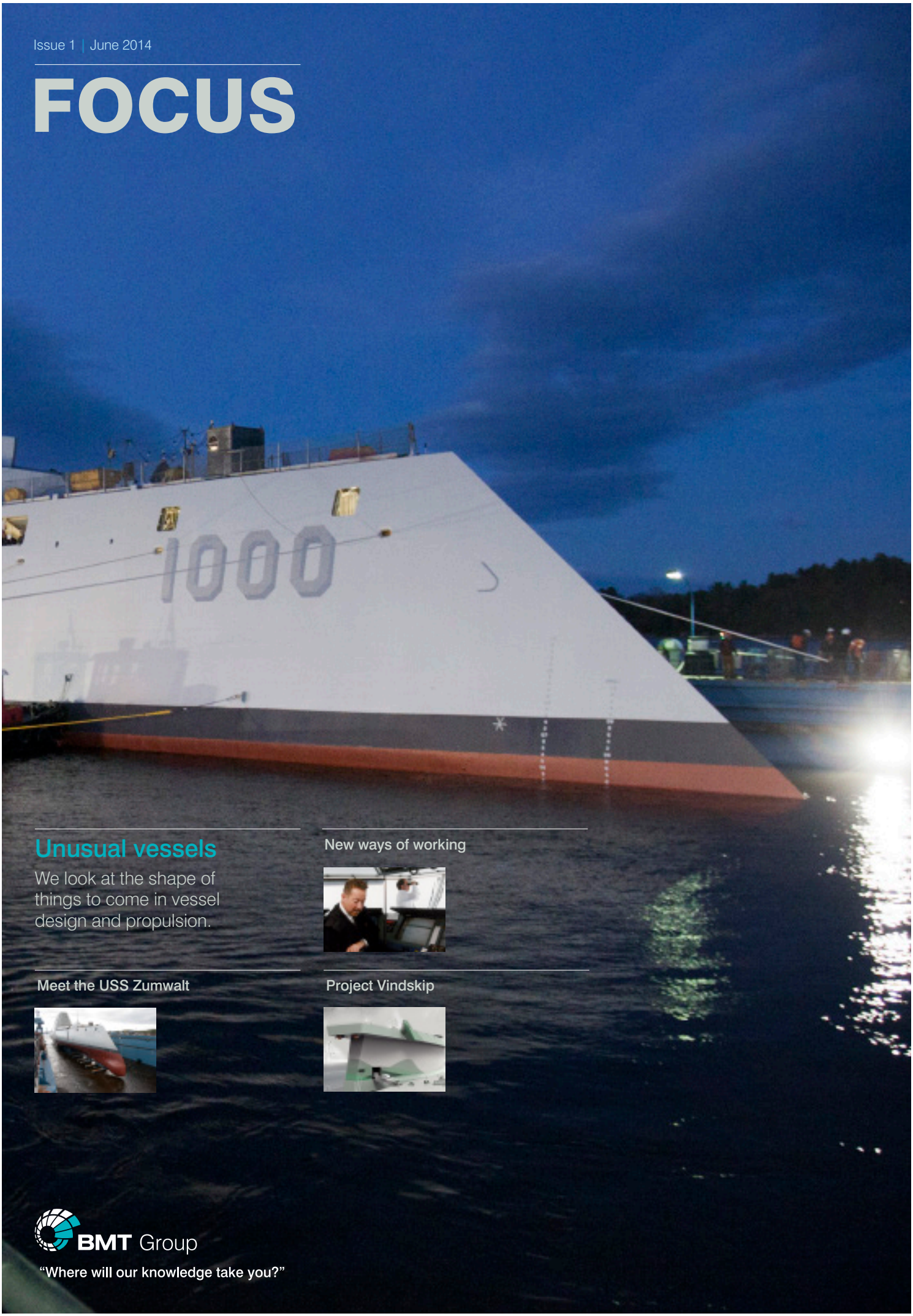
FOCUS



Unusual vessels

We look at the shape of things to come in vessel design and propulsion.

New ways of working

Meet the USS Zumwalt

Project Vindskip

BMT Group

"Where will our knowledge take you?"

Contents

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Editorial

Welcome to our first issue of Focus for 2014. As I write this, the first green shoots of a northern-hemisphere spring are coinciding with encouraging news on the state of the global economy. BMT continues to focus on its growth aspirations and while there are some major hurdles to overcome, particularly in sectors where government spending is a key factor, we have the opportunity to take advantage of the more positive outlook.

In this issue of Focus we return to our roots, looking at ships - specifically unusual vessels and how technology improvements are having an impact on vessel design.

Peter French
Chief Executive

In this issue

We showcase USS Zumwalt, the first of a radical new destroyer class which is commonly described as an 'all electric ship'.

We also have Arnstein Eknes, at DNV GL providing us with his insight into the world of classification and how the development of new designs and the use of new technologies can present challenges in terms of their validation and certification.

I hope you enjoy this issue and would like to thank all our authors who have given their time to provide us with their views and insights. We always welcome your feedback on the magazine. If you have any thoughts on any of the subjects we have covered or would prefer to receive this publication in electronic format, please send your feedback to our editor at jwilliamson@bmtmail.com.

Enabling technologies

driving new ways of working

The advances in technology that have revolutionised many areas of life over the last ten years are beginning to enable radical change in ship design and shipbuilding. In a world that has been shrunk by the advent of the internet, potential customers now have the opportunity to source vessels from anywhere around the globe to maximise their budget or best fit their technical requirements.

In response, naval architects and shipyards are looking to add value by using innovative technologies and utilising suppliers from multiple locations where it was previously very time consuming and difficult to do so. In many cases, hull form, platform design, internal systems and powertrain can now be chosen to more closely suit a client's specific operational patterns and other bespoke requirements more closely. This is particularly relevant and valuable when considering vessels that will be used in extreme environments and when meeting operational performance standards is key to success.

Fuel-efficient, cost-effective

This paradigm shift in approach also has the potential to address rising fuel prices by making the vessel's whole system more energy efficient and deliver significant, operational cost savings. The use of hybrid powertrains can leverage the best of both diesel and electrical power throughout the vessel's operational profile, from manoeuvring, through slow steaming to cruising speed. While shipping is very energy efficient compared with other modes of transport, there are still major improvements and cost savings that can be achieved. We are in a decade of transition during which the prevalent energy source used by ships will evolve from heavy oil and diesel to alternative fuels. Energy storage by batteries will also drive change in both efficiency and reliability of operations.

Automation

Automation is another key element where improvements can be made. Modern, more complex systems need different maintenance regimes to those of 20 years ago to remain reliable. Maybe the future will show fewer people on-board at all times as proactive, better planned maintenance can take place in port. Furthermore, this approach addresses a potential skills shortage as fewer young people are keen to go to sea for protracted periods of time. There is no need to inflict the complexities of a modern system on the end user. We can use technology to create a simpler, more elegant, clean interface for the user that will allow the officers to focus more on navigation and keeping the ship safe.

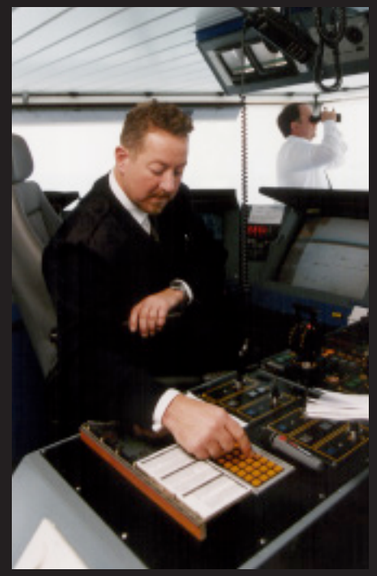
Automation can also be used to build in more reliability, especially with software driven systems, where the system checks itself to help ensure more reliable operation of the vessel. The oil and gas industry is at the forefront of this approach with vessels supporting offshore fields. Because of the proximity of sensitive structures in poor weather and sea conditions, offshore vessels have to be very reliable, capable and robust, equipped with smart systems, including built in redundancy. The systems have also been developed so that the crew can focus on safe navigation, effective operation and close communication with the rig, thus minimising the workload under stressful conditions. However, there are hurdles to overcome in delivering this new type of design methodology.

Classifying new technologies

Where in the past the engine, a propulsion system or steering gear were all provided by different suppliers, each system could be installed and validated independently of the other parts. Today, it's not uncommon to find all of these parts together with many others integrated into the same package - maybe delivered by the same company. With more systems inter-dependable, it is not always simple to identify the root cause of failure. The increased use of hybrid, electrical and electronic systems can deliver huge benefits but bring their own potential issues.

Part of the role of the classification society is to collect good practice and drive development of new international standards where there is the opportunity. Over the last 20 years the shipping industry has accepted common structural rules for all bulk carriers and oil tankers. The same approach should be taken with new ship concepts and functions to promote standardisation without the need for over-regulation. Collaboration is key and we really encourage co-operation not only between the builder and the end user, but also those that are involved in validation including the classification societies and any manufacturers producing systems or significant components.

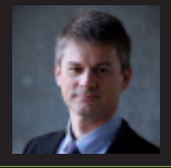
From the perspective of the classification societies, increased complexity demands increased vigilance. Instead of validating one system as stand-alone only, we also need to make sure that the interface between systems and their interaction is working effectively. Complementary to regulating one system by one rulebook and another system by another rulebook, we also need to look at



the sum of the parts and understand whether we need a third set of principles to govern the whole.

When introducing new technology, or more complex systems, our role is to take a more holistic view on key functions to safeguard the whole operation – a team effort by competent people is necessary. Specialists from several disciplines can pool knowledge and share the worries and concerns to deliver an analysis that is greater than the sum of its parts.

Looking to the future, nanotechnology and new lightweight materials will undoubtedly act as enabling technologies to precipitate further improvements and refinements of design. There will continue to be more integration and I hope that the companies producing the technology will learn from other industries and come together to agree industry-wide standards, rather than producing many different types of un-interoperable equipment. That would certainly create global impact for a safe and sustainable future, safeguarding life, property and the environment.



Arnstein Eknes

Arnstein is segment director for offshore support vessels and special ships in DNV GL. The role includes a global responsibility for DNV GL's strategic direction within the market segment. His background after graduating with an MSc in Marine Structures includes 20 years' experience in different technical and management positions in DNV, including five years as head of section for offshore support, special vessels and conversions. Before taking the position as segment director, he was responsible for the maritime activities of DNV in Finland and the Baltic states.

John Bonafoux, Managing Director of BMT Nigel Gee comments:

"We strongly believe that small modular reactor (SMR) technology could provide a viable, alternative propulsion system for future commercial vessels to help reduce carbon emissions from shipping. We were therefore delighted to contribute to this leading piece of research. Our work included risk-based ship design for the development of safety systems, ship structure, radiological protection, optimisation of machinery and propulsion system arrangements, powering and stability analysis".

TAKING THE NUCLEAR OPTION

Despite fears over the inevitably strong social and environmental impact of a possible disaster, modern nuclear technology has been recognised in the commercial maritime industry as a potential and useful propulsion alternative in terms of efficiency and reduced CO_2 emissions.

Playing a key role in a recent, ground breaking R&D project, Spyros Hirdaris, Lead Specialist at Lloyd's Register Asia showcases a concept design which demonstrates the viability of a Suezmax tanker propelled by modern nuclear power.

International agreements on the need to combat climate change and the increasing cost of marine fuel have led many in the industry to question whether the present methods of ship propulsion are sustainable. Notwithstanding the potential of renewable or alternative energy solutions on-board ocean going ships, nuclear engineering is also being considered as a realistic, alternative option. Indeed, the US defence industry has been reaping the benefits of such technology since the early 1960s.

Political and regulatory issues, business risks and a lack of understanding of the influence modern nuclear technology could have on maritime applications have hindered the development and expansion of a nuclear fleet of ocean going vessels. Although many of these issues still remain, the increasing influence of the global decarbonisation agenda, the advances in nuclear technology and the potential modernisation of the regulatory framework are all now offering an opportunity to explore the potential benefits of applying modern nuclear propulsion solutions to the merchant marine sector. The proviso being that the risks are well realised and understood.

Recent research conducted by a leading consortium including Lloyd's Register Group, BMT Nigel Gee, Gen4Energy and Enterprises Shipping and Trading of Greece, has explored the feasibility of developing a commercially viable concept for a Suezmax tanker with a conventional hull form, but with alternative arrangements for accommodating a 70MW Small Modular Reactor (SMR) propulsion plant. SMRs with an equivalent electrical power of less than 300MW are today a reality but only within land based industries.

In principle, SMR technology offers a more simple, standardised and safer modular design by being factory built and therefore cheaper and easier to manufacture. The biggest difference of an SMR in comparison with a modern Light Water Reactor for example, is that it operates at near atmospheric pressure meaning that there is no pressure to be released in a postulated accident.

As part of a three year R&D project, the consortium studied a 159,000dwt Suezmax tanker with a conventional hull form and a typical operational life of 25 years, noting that this was not the only asset where the application of SMR technology might be worthwhile to explore.

The concept ship design process led to the development of a design that promised an 'As Low As Reasonably Practicable' (ALARP) potential of environmental damage or loss of life due to nuclear radiation or oil spills. On the basis of openly available data describing the risk profile of tankers and nuclear propelled vessels, it was concluded that placing the SMR after the cargo tanks and below the forward end of the accommodation, may be subject to low or medium risk levels.

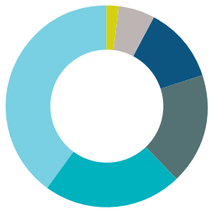
This part of the assessment also revealed that a well-designed nuclear mechanical option would take up less space, weigh less and provide better propulsive efficiencies in comparison with electric propulsion. As part of a Hazard Identification Study (HAZID), further technical scenarios and recommendations were considered to determine more detailed risks associated with twin and single screw nuclear mechanical propulsion train arrangements. Developing a risk based design allowed the consortium to identify all the associated risks and their implications and provide the opportunity to implement the necessary mitigations.

The risk assessment process and engineering solutions developed in this study are indeed feasible. However, the current prescriptive style of regulation within the maritime industry and the highly segmented nature of national nuclear administrations, regulators and organisations involved means harmonised performance based standards will be crucial to readdress the needs of the technology.

The Lloyd's Register guidance notes for marine nuclear propulsion could support these efforts.

There are no significant engineering obstacles to the introduction of nuclear power, providing the engineering issues are well assessed and assured. The main issue is the need for global political and public acceptance. Perhaps the most likely driver for nuclear shipping could be a bilateral agreement between two significant trading nations to introduce nuclear powered ships, but it seems unlikely anytime soon. Nuclear power has huge potential but there needs to be strong political will and a comprehensive understanding of the engineering challenges and the potential economic benefits before both businesses and society will truly embrace this viable alternative energy source.

Oil Tanker Accident Statistics
Source data from C4TX (2013)



- Cargo transfer **2%**
- Machinery failure **6%**
- Error including navigation **12%**
- Bad inerting / Hot work / Explosions **18%**
- Collision **22%**
- Structural failure **40%**

Key naval nuclear submarine accidents
Indicative % of submarine accidents

- Other reason **12%**
- Fire **25%**
- Explosion **7%**
- Loss of cooling **25%**
- Criticality **12%**
- Reactor **7%**
- Propulsion **12 %**

Key naval nuclear submarine accidents
Indicative submarine fatalities

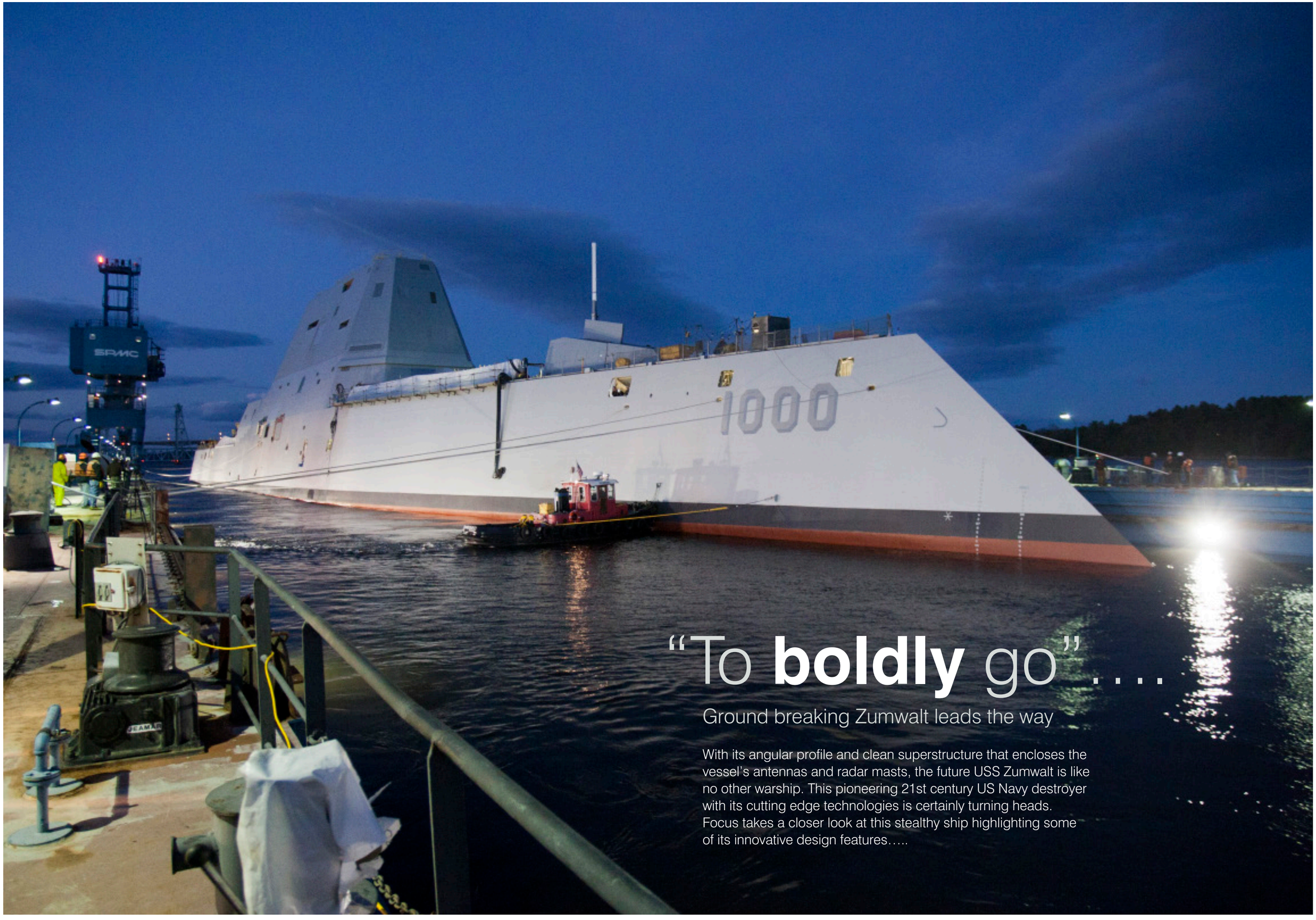
- Fires **194**
- Other reason **29**
- Propulsion failure **1**
- Reactor accidents **5**
- Criticality **10**
- Loss of cooling **17**
- Explosions **240**

Key naval nuclear submarine accidents
Indicative % of submarines sunk

- Loss of cooling **17%**
- Explosion **50%**
- Fire **33%**

Dr. Spyros Hirdaris

Dr. Spyros Hirdaris obtained his PhD in 2002 from the University of Southampton. Following brief spells with maritime engineering consultancy firms he joined Lloyd's Register in 2004 and has worked in the technology departments focusing on the development of engineering solutions for products and services, as well as long-term strategic research initiatives. His current role involves leading global Joint Engineering and Technology initiatives in association with the Korean maritime industry majors. He is a Chartered Engineer, Member of the Royal Institution of Naval Architects and the Institute of Marine Engineering Science and Technology in the UK.



“To **boldly** go”….

Ground breaking Zumwalt leads the way

With its angular profile and clean superstructure that encloses the vessel’s antennas and radar masts, the future USS Zumwalt is like no other warship. This pioneering 21st century US Navy destroyer with its cutting edge technologies is certainly turning heads. Focus takes a closer look at this stealthy ship highlighting some of its innovative design features…..

Comment from Jim Davis,
President of BMT Syntek Technologies:

The US Navy has worked long and hard to design and build this modern warship with integrated electric propulsion and power distribution. It will support with aplomb the high-powered weapons and sensors anticipated for use in the next few years. Its power system is the culmination of years of Navy research, and extends the capability of the "full electric" power plant well beyond those seen in cruise ships and cargo vessels.

Our team of experts are proud to have been given the opportunity to contribute to the development of the propulsion and electrical plant. The shift from mechanical/hybrid propulsion to electric propulsion is as dramatic a change for warships as was the change from steam to gas turbines in the 1970s. The Zumwalt shares this powering distinction with the UK Type 45 class of destroyers and will ably support the future missions of the US Navy.

For further information, contact Jim Davis at: info@bmtsyntek.com

The future USS Zumwalt (DDG-1000) is the lead ship of the Zumwalt class and the first ship to be named after Admiral Elmo Zumwalt, the youngest ever man in American history to serve as Chief of Naval Operations. Zumwalt played a major role in US military history, especially during the Vietnam War.

This unusual vessel has a displacement of approximately 15,000 tons and measures 610ft in length, 100ft longer than the existing class of destroyers: a similar size and displacement to that of a WWII era pocket-battleship with levels of complexity increased by at least an order of magnitude. Indeed, the builder, Bath Iron Works, a subsidiary of General Dynamics, had to build a special 'Ultra Hall' specifically to accommodate the large hull segments.

Keeping a low profile

Developed under the US Department of Defense's DD(X) program, it is the first of three ships in its class and is due to undergo at-sea trials next year. One of the most obvious differences between Zumwalt and almost all other ships is its basic shape. The steel hullform structure used is known as a tumblehome hull which narrows rather than widens with height above the waterline. Unlike warships with towering radar and antenna-laden superstructures, the Zumwalt will have a minimised radar cross section, making it stealthier and harder for enemies to detect the ship whilst at sea. The hullform also has an exaggerated ram bow, a wave-piercing bow shape where the structure at the front of the vessel leans towards the stern. This results in a more stable weapons platform, as the vessel does not rise over waves but passes through them.

The electric navy

In another break from the US Navy's usual designs, the Zumwalt's propellers and drive shafts are turned by electric motors rather than being directly attached to combustion engines. Such electric-drive systems are nothing new for big ships but a rarity for a naval vessel. What is new and different is the flexibility of the systems. The 78 megawatts of electricity, enough energy to power approximately 78,000 homes, from its four gas-turbine generators can be directed through the ship's power distribution network wherever it is needed. The presence of such a tightly integrated power generation and distribution system which provides all the energy needed for propulsion, combat, environmental and other systems used, is a game-changer for modern warships.

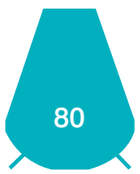
Built for the frontline

Despite the future USS Zumwalt's deployment of cutting edge and innovative technology it is important to note that she is not a technology demonstrator but a frontline warship that is currently undergoing test and activation. Thanks to the rigorous standards demanded by the US Navy, any new technology that is approved for service will be more than fit for purpose and will undoubtedly find its way into other designs, both military and civilian.

Considering the level of innovative technology at his disposal, it is appropriate that Captain James Kirk has been appointed as the future USS Zumwalt's first commanding officer.

Zumwalt in numbers

Length in feet

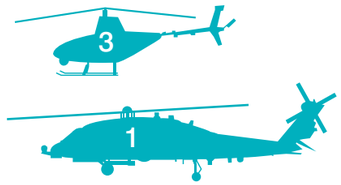


Beam in feet

Number of crew members

Number of houses that could be powered by USS Zumwalt's 78 megawatts of electricity

Aircraft capacity option 1:
2x MH-60R helicopters



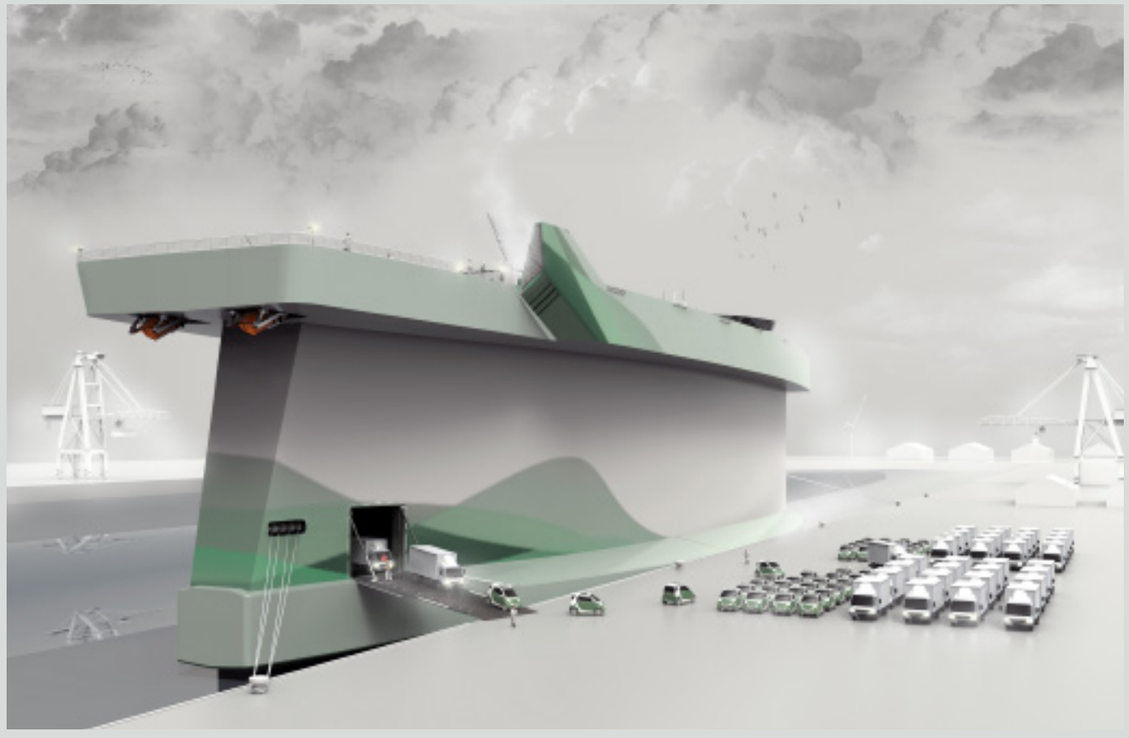
Aircraft capacity option 2:
1x MH-60R helicopter
3x VTUAV2

Terje Lade

Terje has been working in marketing and sales of Norwegian Ships Equipment in China, South Korea and Japan for the last 15 years. He has also spent 10 years as a designer within Offshore Engineering and in his spare time he has been working on the design of speed sailing boats. Terje has a BSc in Mechanical Engineering and was a member of the British organisation AYRS (Amateur Yacht Research Society).

Project **Vindskip**

Although a relatively small Scandinavian country with a population of just over five million people, there is nothing insignificant about the maritime innovation Norway continues to demonstrate. Steeped in a rich heritage and affiliation with the sea, as well as a keen eye on associated environmental impacts, it is no surprise therefore to see the latest avant-garde design, Project Vindskip™ emanating from Lade AS, a Norwegian-based organisation established to develop this hybrid, merchant vessel. Focus talks to Terje Lade, creator of this design about the drivers behind the development and the technical challenges that needed to be addressed.



Focus: What were the drivers behind the development of Project Vindskip™?

Terje: Much of the industry's desire in the past had been associated with what I call 'greed for speed'. In particular, I had been working on the design of speed sailing vessels in my spare time for many years where the objective was very much centred upon maximum speed for a given sail area. Over time, this 'greed for speed' was gradually being replaced by a growing concern for the environment and the possible impacts the maritime industry was having on our planet, as well as an increasing need to look at developing more fuel efficient designs.

Focus: Where did you take your inspiration from?

Terje: I often describe Vindskip™ as a cross between sailing and flying on water. Inspired by the aerospace industry and sailboat environment where the relative wind is a crucial factor in designing aircrafts, propellers and sailing boats, Vindskip™ is designed to exploit the wind for propulsion. For the construction of commercial vessels, this is a revolutionary way of thinking.

Focus: What are the unique aspects of this project?

Terje: The concept is so simple you don't even have to really think about it. True wind is the wind measured on board a stationary ship. When the ship starts moving, the so-called relative wind is being generated or in other words, the apparent wind measured on board a ship. A merchant vessel travelling at an average speed of 17 – 18 knots for example, will have a headwind more than 50% of the time, regardless of the course it is taking. This in turn will cause a great drag force from the wind. The wind power system of Vindskip™ utilises this apparent wind and generates a positive force in the longitudinal direction of the ship as a function of the angle of attack. In addition, the vessel has an LNG-powered propulsion system. Starting the ship from zero, one can exploit the aerodynamic lift generated to create speed and save fuel, therefore it becomes a dynamic system keeping a constant speed on the ship through a cruise control.

Focus: What technical challenges did you have to overcome?

Terje: For a merchant vessel turning the negative drag forces from the wind into a positive pull created some design challenges. Even though a vessel with a hull shaped like a symmetrical air foil travelling in the relative wind will generate an aerodynamic lift, it does not necessarily follow that the design will generate a positive pull in the ship's speed direction. The first wind tunnel test we conducted clearly demonstrated this. We had to then look at generating a two-dimensional flow alongside the above water hull in order to achieve this. Recent wind tunnel tests at Cranfield University, as well as CFD optimisation testing has helped us to improve the performance where we are now seeing a positive pull in a sector from 18 to 180 degrees apparent wind angle of attack, which is an incredible achievement. This year we will look at performing further CFD optimisation tests for the underwater hull and subsequent tests in a model tank.

Focus: Why is it so important to develop these types of projects?

Terje: Stakeholders globally are recognising the importance of creating more sustainable solutions to help address the ongoing environmental issues we as a planet face. This is evident through the introduction of new or amended regulations for the marine environment such as MARPOL Annex VI. Furthermore, Emission Control Areas (ECAs) are being introduced to help reduce emissions of SOx. Due to its very low fuel consumption, Vindskip™ can utilise LNG as fuel and will be capable of 70 days of steaming, worst case, between bunkering.

Focus: How long would it take to build and how much would it cost?

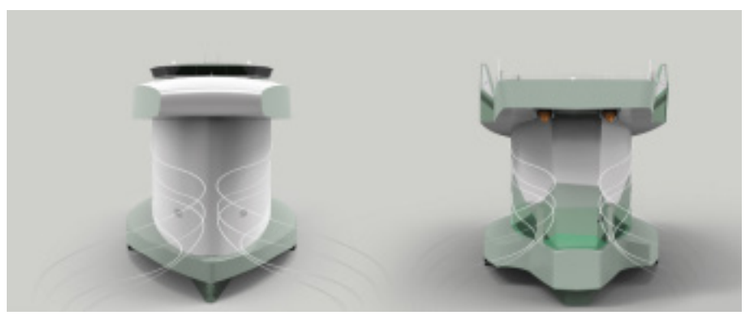
Terje: It will take another year to finish the Vindskip™ development project and we would estimate engineering and build will take approximately two years. Regarding costs, it's hard to say at this stage as we've not yet received an offer from a shipyard. However, what I would say is that the estimated cost would not be that different of existing vessels due to the fact that the propulsion machinery required will be smaller than that of today's vessels.

80%

Estimated reduction in emissions

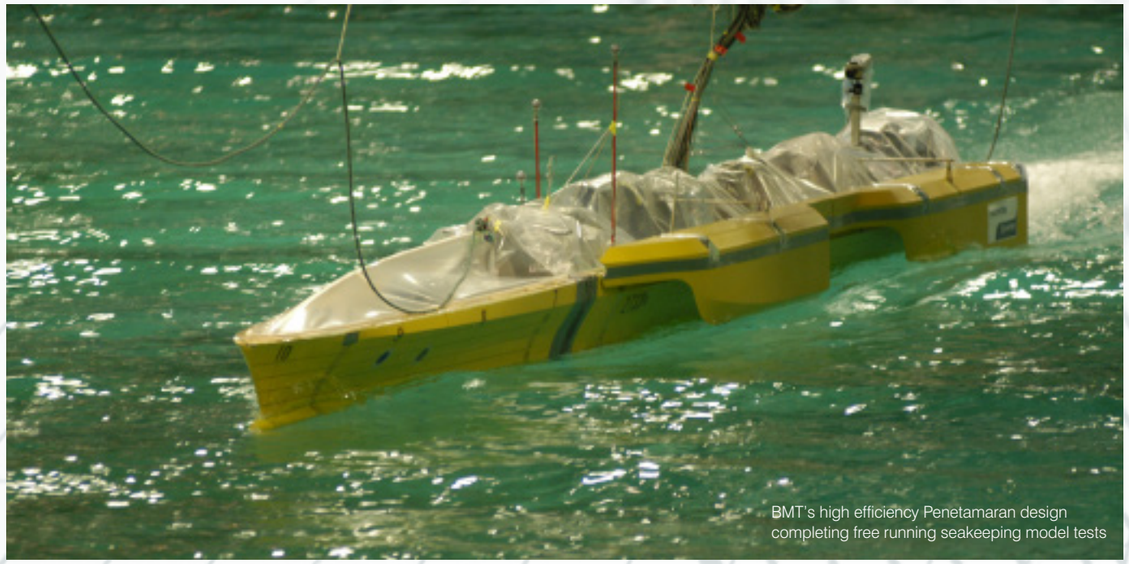
60%

Estimated fuel savings



Evolution over Revolution?

Although many would argue that in recent years there has been no single ‘step change’ or revolution in vessel design, continuous development of new materials, propulsion systems and hull-forms are helping to provide a myriad of new and exciting, design possibilities. John Bonafoux, Managing Director of BMT Nigel Gee explains further.



BMT’s high efficiency Penetamaran design completing free running seakeeping model tests

John Bonafoux

John was a founding partner of Nigel Gee and Associates in 1986 and helped grow the company, now known as BMT Nigel Gee, to the success it is today. John understands the importance of a having a strong team who are passionate about producing designs that really meet clients’ requirements. John is still involved at every level of the company and gets a buzz from taking a vessel design from concept to successful delivery.

For further information, contact John Bonafoux at: admin@bmtng.com

Whether it is for high-speed passenger ferries, workboats, yachts or specialist military vessels, we now have access to a far wider range of materials that all require due consideration – anything from steel and aluminium through to advanced composites using carbon fibre, Kevlar and honeycomb sandwich construction, all with their own distinct advantages.

Furthermore, the development of pioneering propulsion systems such as the voith linear jet (VLJ), a hybrid design between a propeller and a waterjet, is also a key enabler and many owners are recognising the potential efficiencies and improvements in operational performance that such systems can offer. There is also huge interest in ‘green’ propulsion systems and innovative designs such as Project Vindskip™ that exploit the wind for propulsion is a fascinating concept with huge efficiency potential.

The use of modern nuclear power is yet another propulsion alternative which could offer huge benefits in terms of efficiency and reduced CO_2 emissions. However, it is still very much a politically sensitive and contentious issue within the commercial maritime sector. Although there are still some engineering challenges to overcome, R&D projects such as the the small modular reactor (SMR), discussed earlier in this issue of Focus, clearly highlight the viability of this clean energy source and further R&D investment should certainly be encouraged.

A subtle revolution

Ironically, what makes a new, ‘radical’ hull form work so effectively can often come down to very subtle changes in the design. There are many examples where small changes in the hull form design have resulted in significant reductions in resistance, or major improvements in sea keeping ability. It is about taking a holistic approach to optimising the overall design that will ultimately have the biggest or most radical impact. Our new high efficiency crew boat design is a good example of this, where we have managed to achieve a 14% improvement in fuel efficiency over existing, high performance designs through careful optimisation of the overall hull form.

Although it is important for any design and engineering company to establish a culture of freedom where its people are encouraged to ‘innovate’ - think outside the box and experiment with new ideas, it is equally important to be grounded and realistic. Far too often we see wild claims related to vessel performance and possible fuel efficiencies for new designs that are somewhat overly optimistic.

Design for the economic climate

In these challenging economic times being grounded in commercial realities is equally important when looking to remain competitive in the market place. Often, new vessel designs will be driven by a specific set of requirements from the customer. In other cases, the drivers for a more advanced vessel design stem from us working closely with the customer to understand their operational challenges or needs better and then developing a new design which we can demonstrate will provide substantial benefits to their operation.

Our diversity across different sectors can also lead to a significant competitive advantage. Our involvement in the design of most types of hull forms provides a breadth of knowledge with exposure to many different materials and technologies. Indeed, if you are limited to designing container vessels, then you are unlikely to get involved in any lightweight, aluminium or advanced composite material. Having a diverse portfolio of vessels provides the opportunity to cross fertilise technologies and consider all of the options to help deliver the optimum design for the customer.

XSS24.The proof is in the pudding

The crew transfer vessels that BMT Nigel Gee has developed for the wind farm and offshore industries provide an excellent insight into how state-of-the-art technology can be used to fulfil a specific client brief by achieving outstanding speed and ride comfort (seakeeping) performance in high sea states. The XSS24 catamaran developed on behalf of Turbine Transfers is a highly advanced, next generation wind farm support vessel that will be used to support and service far offshore wind turbines all year round.

To date, existing catamaran designs of typically up to 20 metres in length have been used to provide an excellent service to wind farms located relatively close to the mainland. However, in order to service the next generation of wind farms located further offshore, where wave heights will be greater and transit times longer, maximising the operating envelope becomes more critical. The ability to transit and transfer personnel to and from wind farms in higher sea conditions means that wind farms can be accessed more often with less weather days, potentially resulting in fewer vessels and technicians on each wind farm.

Specialist hull form designs such as the Small Waterplane Area Twin Hull (SWATH) have been developed and proven in commercial and military applications by vessels which demonstrate by far the best seakeeping performance in large waves. However, the downside of the SWATH design is very high powering requirements, high capital costs and much higher running costs in comparison with less complex, fuel efficient catamarans. To achieve improved seakeeping whilst maintaining reasonable powering and fuel consumption levels semi-SWATH hullforms have been developed such as BMT’s ModCat.

In 2001, BMT Nigel Gee undertook a research and development project sponsored by the US Navy’s Office of Naval Research (ONR) to develop a catamaran hullform offering significantly improved seakeeping performance with minimal increased drag. The advanced semi-SWATH hullform of the ModCat demonstrated substantially improved seakeeping performance with only a 5% increase in drag when tested against a comparable conventional catamaran hullform. The ModCat hullform has subsequently been adopted for military applications in the Atlantic Ocean (e.g. 79m ‘Sea Fighter’ for the US Navy) and for rough water ferry operations in the Pacific Ocean (e.g. 57m ‘Betico II’ for Sudiles).

More recently there has been huge interest from major oil companies in adopting the BMT ModCat hullform for personnel transfer vessels to replace helicopter operations for transferring personnel to offshore oil platforms.

Using the fully proven ModCat hullform as a basis, the XSS24 has been developed to go beyond semi-SWATH technology specifically to meet the exacting requirements of the offshore wind industry. The extreme semi-SWATH (XSS) technology being developed by BMT and Turbine Transfers effectively closes the gap between ModCat and SWATH technology, enabling the XSS24 to operate comfortably in high sea states with waves approaching from all directions, not only during transit, but also at zero speed. The result is a vessel which offers exceptional operational capability in a very specific role through highly intelligent, evolved design.

The first XXS Catamaran windfarm support vessel, Cymyran Bay, in service with Turbine Transfers

For further information, contact Richard Colwill at:
hongkong@bmtasiapacific.com

One is never un oeuf

BMT's 'Sea-Suite' series of houseboats, floating lodges and beach houses are based on an innovative and sustainable design that delivers a modern and elegant structure. The unique egg-shaped form which drives Sea-Suite's signature styling featuring clean lines and smooth, organic curves, was originally developed as a composite radome for the new landmark cruise liner terminal in Hong Kong.

Designed by BMT Asia Pacific's Managing Director, Dr. Richard Colwill and Henry Ward of Henry Ward Design, Sea-Suite reuses the large construction mould fabricated for Hong Kong's cruise liner terminal radome to develop its unique shell. Richard Colwill, who was project leader for the radome delivery, believed the compelling shape had the opportunity for a second life to maximise the significant investment of the huge moulds' design, development and fabrication. After reviewing opportunities for the use of the mould's two "half shells" which formed the egg, a series of options from swimming pools to temporary stages were examined. However, staying true to BMT's maritime pedigree the first offerings are to be waterborne and coastal structures.

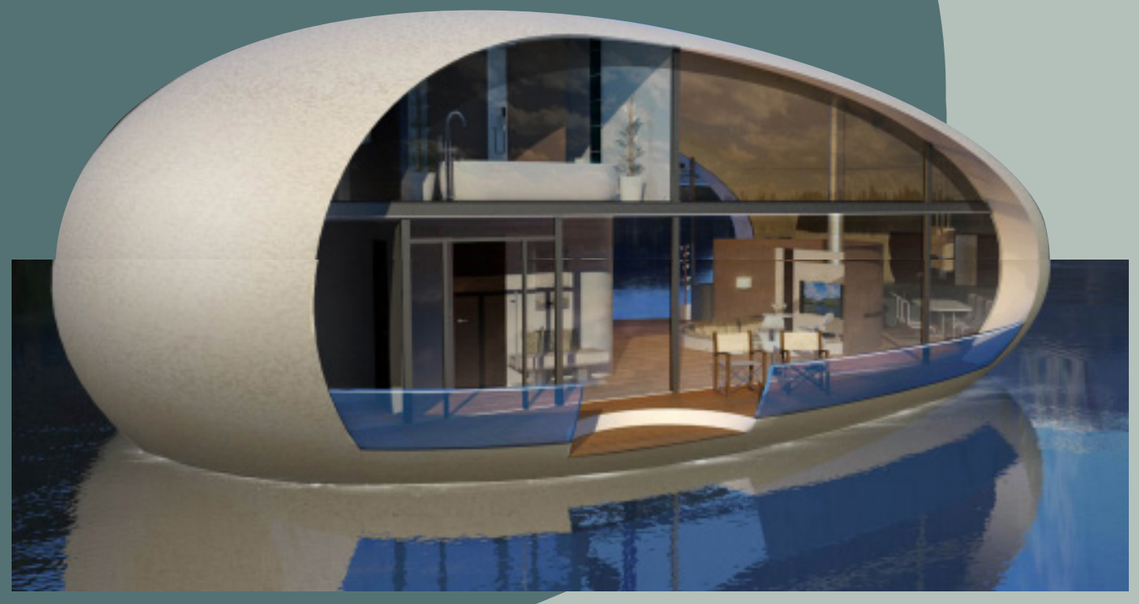
The floating lodge takes its form from the mould's original shape and provides a fantastic space in which a stunning two bedroom home has been created. The luxury space is envisaged as easily at home along a lake or riverside, or as part of a cluster hotel/studio development. The high levels of roof insulation, moderation of temperature from its water setting and potential addition of solar panels to the expansive roof creates a sustainable unit for all climates.

Taking the concept a step further, the design team "cracked the egg" raising and separating the top shell, which has been sculpted to form a terracotta roof edged with flowing curves. This created an airy loft style houseboat with stepped mezzanine levels leading up to a master bedroom, featuring expansive views through full height windows. This houseboat was designed asymmetrically with a "front of house" shielding the private rear terrace, accessible from the lounge and offering open views from study, kitchen, "snug" and dining areas.

Readily transportable to almost any site accessible by sea the design flexibility intrinsic to the form provides a wide range of options for the concept 'Sea-Suite', from individual houseboat and lakeland lodge to resort cabin, marina office, beach house, and even art galleries and other novel commercial spaces.

Stand-out design: the natural, organic appeal of the radome finds new expression as a luxury housing concept.

Every bit as at home on the beach as on top of Hong Kong's new cruise liner terminal.



Houseboat or lakeland lodge, art gallery or marina office, Sea-Suite's distinctive spaces give flexibility and comfort.

BMT news
from around the globe

BMT Secures Six Year Deal

BMT WBM has secured a six year contract to provide all environmental monitoring services to the Port of Brisbane Pty Ltd (PBPL). BMT's extensive experience, reputation and innovative approach were highly regarded by PBPL during the tender evaluation phase.

BMT's services will focus on addressing the primary aims of PBPL's environmental monitoring program. This includes assessment of the health and long-term trends in the condition of the local environment to determine potential impacts to the port and surrounding marine habitats, and providing information that supports and informs port planning and management activities.

EU R&D Project to Demonstrate Unique Technologies to Help Improve Port Security

Practical results from the SUPPORT (Security UPgrade for PORTS) project, co-ordinated by BMT Group and part-funded by the European Commission's FP7 Security Research Programme have been demonstrated to key stakeholders at Stena Line's ferry terminals starting at Masthuggskajen in the Port of Gothenburg.

Guests were given the opportunity to be part of a live demonstration which included the automatic detection and tracking of a number of divers, swimmers and small crafts. Based on a system of subsea and surface sensors including hydrophones, Infra-Red cameras, video cameras and radars, the Sea Side Intrusion Detection System (SSID), has been developed by FOI, the Swedish Defence Research Agency.

BMT to Upgrade MIS/MAS Systems for Shell

Shell has selected BMT Scientific Marine Services to implement the replacement of marine instrumentation systems (MIS) and marine advisory systems (MAS) across its Gulf of Mexico tension-leg platform fleet.

The updated systems will use BMT's WinMon data acquisition software to implement the MIS functions to monitor, log and display data from the existing suite of sensors. The system performs data quality monitoring and processing and provides storage of measured time series and derived operational information. The validated information is then passed to the Marine Advisory System and key stability metrics are collected and archived by the Marine Instrumentation System.

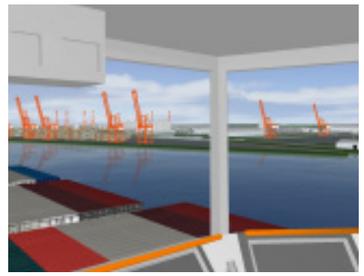
BMT Announces Four New Offices

BMT Group recently announced the opening of a new central London office close to St. Katharine's Dock which will house staff from operating companies BMT Hi-Q Sigma, BMT Surveys, and BMT WBM under one roof. BMT Surveys has also opened a new office in Geneva, which will focus on P&I, hull and machinery, cargo insurance and maritime law through BMT's global survey network, based in more than 250 ports worldwide. A new office for BMT Isis in Plymouth and additional office space in Bath for BMT Defence Services further supports BMT's rapid growth in a number of key market sectors.

BMT Completes Studies for Peel Ports

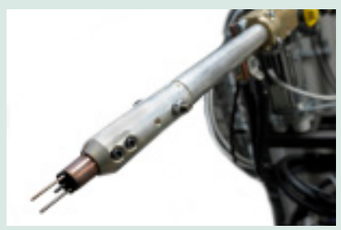
BMT operating companies, BMT ARGOSS and BMT Isis have completed a series of studies for the Port of Liverpool's new Seaforth 'Liverpool2' (L2) Container Terminal Construction. BMT was commissioned to carry out specialist studies to identify and assess the associated impacts of introducing larger vessels of up to 13,500 TEU to the proposed L2 development.

BMT also simulated the movements of the ship at the quay using REMBRANDT DMA (Dynamic Mooring Analysis). This software delivered a more advanced simulation of the moored ship's response to all the weather affecting it (wind, waves, currents, passing ships), providing Peel Ports with more reliable results and avoiding the need for over-design because of the uncertainties often involved with a less advanced approach.

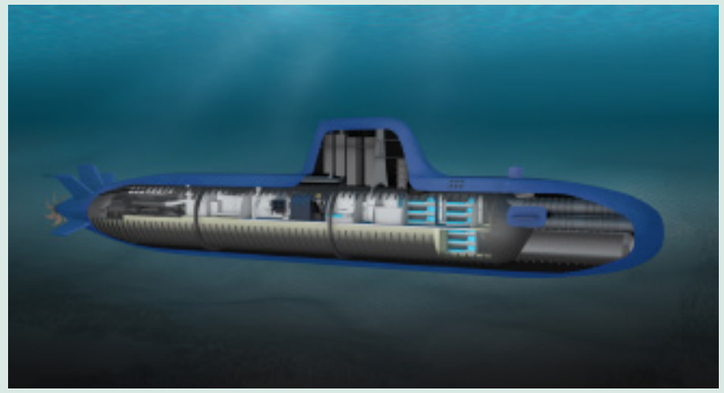


BMT to Support Welding Research Project for NSRP

BMT Fleet Technology has announced its latest research project with the National Shipbuilding Research Program to evaluate recent advancements in Integrated Cold Electrode welding technology. This project will look at how this technology can improve productivity rates and reduce the construction costs of both commercial and naval vessels.



New Platform Design Concepts Launched



BMT Defence Services has launched two new innovative, platform design concepts. Both the BMT Venator®-110 Multi-Mission Reconfigurable Warship and the Vidar®-7 Small Modern SSK Submarine have been developed to deliver maximum capability, flexibility and longevity within the limitations of current fiscal constraints.

Movers and shakers

Two new appointments to BMT Board of Directors

Jan Kopernicki

BMT Group has announced that Jan Kopernicki has joined the Board of Directors as a non-executive Director.

Jan has extensive experience in the shipping industry, with his career at Shell spanning over 40 years. He was appointed Companion of the Order of St Michael and St George (CMG) in the 2012 New Year's Honours list for his services to the safety and security of the international shipping community, recognising his role as President of the UK Chamber of Shipping, Chairmanship of the Oil Companies International Marine Forum (OCIMF) and contribution to combatting the threat of international piracy.

Commenting upon his appointment, Jan said:

"I am very pleased to be joining such an exciting, innovative and international group, rooted as it is in scientific excellence. I look forward to supporting the continued success of the company and its people."

Charles Packshaw

Also joining the BMT Board as non-executive Director is Charles Packshaw. Charles has thirty years' experience working with financial institutions in the City of London and is currently Head of UK Advisory at HSBC Bank, where he is responsible for advice to clients on strategy, acquisitions, capital structure, equity and debt financing and shareholder relationships. Prior to this, Charles was Managing Director of Lazard's Corporate Finance Division in London. He began his career working in the construction industry and is a Chartered Civil Engineer.

He is a non-executive Director of Diploma PLC and a member of its Audit and Remuneration Committees. He has formerly been a non-executive Director of The Restaurant Group, where he was Chairman of the Audit Committee, and of Diagonal PLC and a trustee of the Lazard Directors Pension Scheme.

Commenting upon his appointment, Charles said:

"I am delighted to be joining the Board of BMT, a company with a strong reputation for scientific and engineering excellence. I look forward to contributing to its future development and success. "

BMT Group announces new operating company

Peter Mantel

BMT Group has announced a new commercial operating company which will focus on the provision of high value, innovative vessel performance management and decision support solutions for the maritime industry.

Peter Mantel has been appointed Managing Director of BMT SMART. A Marine Engineering graduate, with over 20 years of senior marine management experience, Peter brings a wealth of expertise working in digital and e-navigation shipping markets.

BMT SMART will draw on years of experience and knowledge from around the group to help accelerate the delivery of SMART^{SERVICES} business line, and build a strong presence in the digital shipping markets.

Also joining...

Ralph Duncan

Ralph Duncan has been appointed Vice President of Business Development at BMT Designers & Planners. A University of New Mexico, Naval Postgraduate School and Stanford University graduate, Ralph has over 30 years' experience in the marine engineering sector. Ralph will take responsibility for identifying emerging market trends, whilst developing and qualifying commercial marine engineering opportunities, to support the company's continued expansion and development.

Jason Steward

BMT Design & Technology has appointed Jason Steward as Business Development Manager. Jason's new role will see him take responsibility for evaluating current and potential future markets and support the company's continued expansion and development.