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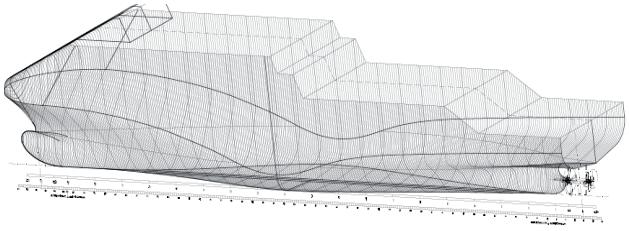
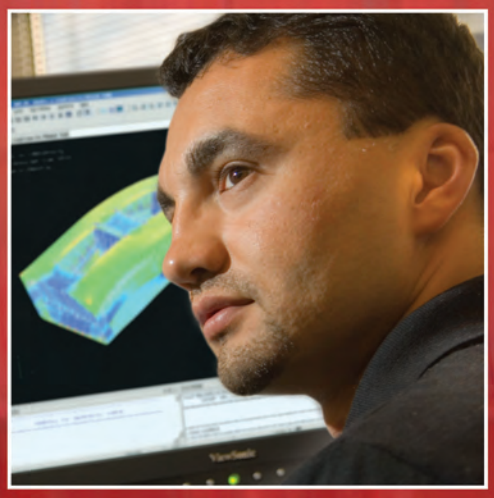
A model of *Frauke*, which will be the first of eight new heavylift vessels to be delivered to German owner SAL.

The 11,000TEU containership *Eugen Maersk* at the outfitting quay of Odense Steel Shipyard (Photograph by Jon Nordahl).

28 Body lines of 'New ship'.





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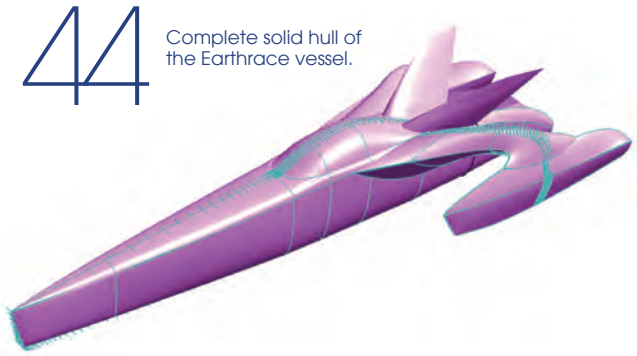
32 A representative photo that gives an indication of the intensity of the fire during tests in Borås, Sweden.



44 Complete solid hull of the Earthrace vessel.

51 The Metropolis onboard *Ventura*, designed with British tastes firmly in mind.

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- Environmental Issues
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European champions and Asian dragons

Laying the keel of Genesis at Aker Yards – another jewel in the crown of European shipbuilding.

One senior Aker executive approached at Seatrade Miami by *The Naval Architect* last month for his views on an emerging 'European champion' for cruise and ferry building expressed his scepticism so colourfully that his words have no place in a family journal. The gist was that the European Commission would block any alliance between Aker and Fincantieri, a link-up which could lay claim to approaching 80% of the cruiseship market.

However, if doubters are aplenty, there are many who view recent machinations within Aker Yards, Europe's largest shipbuilder, as clearly pointing to such an eventuality.

The catalyst for speculation was prompted by STX Corp, when the South Korean yard group audaciously scooped 39.2% of Aker Yards equity for US$800 million late last year. Share prices at time of writing meant that the Korean shipbuilder could pick up the remainder of equity for around the same amount.

But, and of course, the STX transaction has been referred to European Commission competition authorities. What has been interesting, though, is that authorities have so far made no statement of objections over the Korean incursion, and some say the EC has tacitly signalled reluctance to interfere.

Meanwhile, Aker has looked to offload the bulk of its merchant shipbuilding interests, with a preliminary agreement to sell the majority of its German and Ukraine-based shipbuilding interests, at Wismar, Warnermunde, and Nikolaev, to Russian investment group FLC, for €292m.

In the wider picture, the move supports suggestions of a carving up of the group's interests into four segments – cruise and ferry, merchant, offshore, and specialist vessels, in line with demands made by Hayvard Invest, Aker's second largest shareholder.

> "For all its strengths, innovations, supplier networks, and pre-financing opportunities, European shipbuilding has weaknesses"

French president Nicolas Sarkozy is reported as making overtures to the Finnish government over a possible deal to create a European cruise and ferry shipbuilding force, with the French, Norwegian, and Finnish governments to fund a holding in Fincantieri.

Fincantieri chairman Corrado Antonini has gone on record as a keen believer in the notion of the European cruiseship building champion. He said Asian interests eyeing the market, with current orders valued by Barry Rogliano Salles at a mouth-watering US$23 billion, needed to bear in mind the high level of third party activities distinguishing the cruiseship construction market, where up to 80% of the value in a ship's build lay with subcontractors. The shipbuilder's role had become that of an engineering company, coordinating the contributions made by hundreds of different enterprises.

'It is not true to say that there is a specific niche of cruiseship building – anyone could do it, provided the competence is there. We know our Asian colleagues are looking at it, but what they need to bear in mind is, first, the need for a network of suppliers, and second, that volumes are minimal; 80% of the money does not belong to the shipyards.'

Mr Antonini said Fincantieri did not so much want to create a barrier to acquisition from overseas, but rather to offer an alternative to the acquisition of a major European shipbuilding player by outside interests. He cited Airbus as a possible model for European cruise shipbuilding.

But, for all its historic strengths, innovations, supplier networks, and pre-financing opportunities, European shipbuilding has plenty of weaknesses. Among those pointed out by Jean-Bernard Raoust of BRS were: the strong Euro, high manpower costs, ageing production facilities and, already, the small number of players controlling the market. And, with March seeing Carnival Corp's Mickey Arison citing the strength of the Euro as a strong influence on his decision to hold fire on future orders for the market's dominant customer, it is not hard to see that any European champion may soon face a contest from an equally determined Asian dragon.

Who knows, the power of Korean shipbuilders may indeed squeeze sub-suppliers to wear the 15%-20% discount some think necessary to break into the market. *NA*

Environment

US stance on emissions

New emissions standards have been cleared in the USA, designed to slash pollution from locomotive and marine diesel engines by up to 90% as soon as this year.

The new rules look to reduce soot or particulate matter (PM) by 90% or 27,000tonnes and reduce nitrogen oxides emissions (NOx) by 80%, or nearly 800,000tonnes. The Environment Protection Agency projected that, nationwide, the regulation would help prevent 1400 premature deaths, and 120,000 lost workdays annually by 2030.

The EPA's Clean Diesel Locomotive and Marine programme would cut emissions from a wide range of marine sources, including ferries, tugboats, Great Lakes freighters, and all types of marine auxiliary engines.

For the first time ever, rules require remanufacturing standards for marine engines, reductions in engine idling, and the use of after-treatment technology will further reduce diesel emissions. Phasing in tighter long-term standards for PM and NOx will begin in 2014 for marine diesel engines. Advanced after-treatment technology will apply. The effective dates for NOx will be two years earlier from last year's proposal.

The EPA has now finalised a three part programme that will dramatically reduce emissions from marine diesel engines below 30litres per cylinder displacement.

The final rule includes the first-ever national emission standards for existing marine diesel engines, applying to engines larger than 600kW when they are remanufactured - to take effect as soon as certified systems are available, as early as 2008. The rule also sets Tier 3 emissions standards for newly-built engines that will phase in, beginning in 2009. Finally, the rule establishes Tier 4 standards for newly-built commercial marine diesel engines above 600kW, based on the application of high-efficiency catalytic after-treatment technology, phasing in beginning 2014.

Business

RR signs MoU with Vinashin

Rolls-Royce has formally signed a memorandum of understanding (MoU) with Vietnam Shipbuilding Industry Group (Vinashin) in Hanoi, with a view to working together to help develop Vietnam's fast-growing marine industry.

Pham Thanh Binh, chairman of Vinashin shakes hands with John Paterson, president of marine, Rolls-Royce.

The scope of the partnership will include identifying potential strategic partners for development of shared business interests, which include the delivery of propulsion systems, as well as developing a sourcing strategy that enhances the business activities of both parties in Vietnam and for the export market.

The agreement includes the development of a training structure which will call on the technical expertise of Rolls-Royce.

The signing ceremony was attended by John Paterson – president of marine, Rolls-Royce, and Pham Thanh Binh – chairman, Vinashin.

Vinashin Business Group not only represents approximately 80% of the domestic shipbuilding capacity in Vietnam, but also a diversified spectrum of products which include shiprepair, shipping and logistics, heavy industries, civil and offshore constructions, financial and research service. It operates 30 shipyards.

Business

Royal Haskoning scoops First Marine

Royal Haskoning has acquired First Marine International, the UK-based independent specialist consultancy providing expert advice within the shipbuilding and shiprepair sectors. The company currently has a team of 12 consultants working on projects around the world including the UK, Europe, the Middle East, Africa, and the Americas.

First Marine International is working on a range of projects including master planning for four major

new shipyards, a market study to identify potential future regional shiprepair volumes, performance benchmarking and improvement advice for a group of commercial yards, and provision of strategic advice on supplier selection for a naval procurement programme.

First Marine International's managing director, John Craggs, will continue to head up the team.

Dutch consultancy group Royal Haskoning said the acquisition would bring new expertise to its service portfolio, including marine industry studies, market studies, shipyard concept layout development and master planning, technology and performance benchmarking, and development, implementation, and management of shipyard performance improvement programmes.

Frauke, the first of eight new heavylift ships for the joint venture between K-Line and German owner SAL.

Heavylift

Advanced thinking from SAL

The naming of *Frauke* makes good on the unfolding commitment of the SAL/K-Line joint venture SAL to a range of new generation heavylift vessels for the oil and gas sector.

Frauke will be the first of eight new heavylift vessels to be delivered to SAL. The vessel, of type 176, will offer what is claimed to be an unrivalled speed of 20knots and a combined crane capacity of 1400tonnes SWL. This vessel will be followed by three sister ships which will enter the market during 2008.

The venture's newbuilding programme will be further expanded in 2010, when another four newbuildings of type 179 are added to the SAL heavylift fleet. These vessels will be equipped with two cranes of 1000tonnes SWL each. They will feature an unobstructed working deck of 135m x 27.50m, an on/under deck area of 7000m^2, a speed of 20knots, and a Dynamic Positioning System (DP2), making these newbuildings unique in the heavylift/offshore market to date, according to the owner.

All eight upcoming vessels are being built by German shipyard Sietas.

The dynamic positioning systems will allow these vessels to provide a combination of both transportation and construction/installation services to the oil and gas sector, including subsea operations. Furthermore, all vessels will feature additional accommodation and a helideck for flexible crew change.

All upcoming newbuildings will be equipped with an environmental passport encompassing a ballast water management plan and a biological sewage treatment plan. In addition, the vessels will have a garbage recycling system onboard which will prevent any waste from being discharged at sea. Furthermore, all vessels will be equipped with a chemical dosing centre.

LNG

FLEX LNG to nearly double

FLEX LNG Ltd's newbuild orders with Samsung Heavy Industries for an innovative batch of Panamax LNG carriers (LNGP) has been adjusted, such that their capacity will now be 170,000m^3, rather than an initially envisaged 90,000m^3.

FLEX LNG said the maximum production capacity the LNGP hulls would be able to support has been increased from previously communicated 1mtpa to about 1.7mtpa. The three contracts replace the three previous shipbuilding contracts with SHI for three 90,000m^3 SPB.

The size and design change also encompasses all future options held by FLEX LNG with SHI for additional LNGP Hulls.

The firm contract price per LNGP Hull is now US$458,455,000, which includes gas loading systems, topside supports, and utilities for up to 1.7mtpa production capacity.

Based on current estimates for the topside and installation cost this will bring the CAPEX per tonne liquefaction capacity for the units to approximately US$ ~500/tonne per year. The delivery windows for the LNGP Hulls remain the same as for the SPB Panamax LNG Carriers.

FLEX LNG said the adjusted design was deemed beneficial for most of the projects it was developing in the Atlantic and Asia/Pacific basin. *NA*

Propulsion

Wärtsilä's low-speed Chinese

Jiangsu Rongsheng Heavy Industries Group Co Ltd (RSHI) has signed an accord with Wärtsilä to manufacture and sell the Finnish concern's low-speed marine diesel engines in China. RSHI plans to build a new factory in Heifei to allow for the extra capacity required. The plant will have a targeted annual engine production capacity aggregating 3600MW.

The agreement grants RSHI the right to manufacture Wärtsilä low-speed engines between 48cm and 96cm bore, including those utilising common-rail technology. Support for the range will be provided by Wärtsilä's Swiss outlet. The first engine delivery is scheduled to take place by the end of 2009.

Contact Wärtsilä Corp, John Stenbergin ranta 2, PO Box 196, FI-00531 Helsinki
Tel +358 10 709 0000
Fax +358 10 709 5700
www.wartsila.com

Power

American superpower

American Superconductor Corp (AMSC) has received the first orders from the commercial marine market for its PowerModule-based electrical systems. The systems will be used to manage more than 30MW of power altogether, aboard three megayachts of over 85m and one river cruiser of more than 100m in length being built in Europe.

PowerModule converters are power dense and programmable, allowing them to be customised for many electrical applications, and are also scalable for many different vessel types. The electrical systems will enable reliable operation of the vessels' propulsion motors, diesel generators, and power distribution systems by controlling power flows, regulating voltage, and monitoring system performance to maximise efficiency.

AMSC will deliver all of the electrical systems in 2009.

The company also recently received an order for its PowerModule power converters and system developer kit (SDK) from a Canadian maritime engineering firm. Utilising the SDK, which speeds and simplifies the development of power conversion systems, the customer will use the PowerModule converters to interface with batteries powering tugboats, increasing their efficiency and making them more environmentally friendly.

Contact AMSC, 64 Jackson Road, Devens, MA 01434-4020, USA
Tel +1 978 842 3000
Fax +1 978 842 3024
www.amsc.com

AMSC's PowerModule is scheduled for installation onboard three megayachts and one river cruiser.

Noise and vibration

Ships quieten with MTU

Tognum subsidiary MTU Friedrichshafen has signed a contract with Paulstra and Stop-Choc for the distribution of active engine mountings. With this cooperation, MTU said it was expanding its core competencies.

The jointly-developed system, which MTU has successfully trialled on test benches and in ships, is claimed to reduce the structure-borne noise emitted by diesel engines significantly. The engines are installed on special rubber mountings as standard, and the new active mountings support the passive rubber mountings to make their noise reduction more effective.

The active mountings are based on the noise cancellation principle: they create sound waves with the same amplitude and the opposite polarity to the original structure-borne waves of the engine. In this way, noise and anti-noise cancel each other out to a large extent.

Contact MTU Friedrichshafen GmbH, Maybachplatz 1, 88045 Friedrichshafen, Germany
Tel +49 7541 90 0
Fax +49 7541 90 5000
www.mtu-online.com

Ancillary equipment

Brother's in Aker

Peter Brotherhood Ltd has delivered three 5MW steam turbine-driven generator sets to Aker Floating

Lightweight conference

Description

Lightweight materials are being introduced for the construction of SOLAS-classed vessels, a development driven by increasing fuel costs and environmental concerns. Case studies have demonstrated that weight reductions of 50-60% are possible using composite materials instead of conventional steel. Cost analyses have shown a great economic potential for these new materials.

A shipyard renowned for their lightweight composite constructions is Kockums in Karlskrona, Sweden, and on the 28th and 29th of May, a conference will be held at the ship yard, organised by representatives from two different research projects: DE-LIGHT Transport (www.delight-trans.net) and LASS (www.lass.nu). The target audience for the conference is ship owners and ship operators interested in how and why lightweight construction materials should be used for ship building.

At the conference, ship owners will offer their point of view and existing or planned lightweight ship constructions will be described. Naval architects and ship builders experienced in lightweight construction will also be present, together with representatives from regulators and classification societies. A tour will be made of the yard to show some practical aspects of composite ship building.

Welcome!!

Register at *www.delight-trans.net* under tag "Conference"

The Royal Institution of Naval Architects

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Lloyd's Register

3 – 4 July 2008, London, UK.

Second notice

The trend towards increased size of Container Ships presents unique challenges for Owners, Designers, Operators and Classification Societies. The high speeds and unconventional structural arrangement of Container Ships can increase the risks associated with innovation. The expansion plans for the Panama Canal are also set to create a new breed of Panamax vessels.

Questions of structural strength, severe weather loads and stability must be addressed. Thought is also being given to deck cargo arrangements; problems with securing the containers to resist green water and potential problems with the safety and speed of loading and unloading are beginning to be addressed.

To meet demands for the new generation of Container Ship, Naval Architects and Operators are constantly striving for innovation. This conference will explore the very latest in Container Ship thinking.

RINA invites papers on all aspects of the design and operation of container ships, including;

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Production of Norway. The turbines will be installed on the top deck of *Aker Smart 1* floating production, storage, and offloading vessel (FPSO), which will operate in the Indian Ocean and will be maintained by Aker Borgestad Operations AS.

The three Peter Brotherhood steam turbine-driven generator sets onboard FPSO *Aker Smart 1*.

The three generator sets each consist of a turbine, gearbox, and generator, all mounted on a common bedplate which incorporates the oil system and a separate water-cooled condenser, mounted directly below the turbine's exhaust.

Aker chose Peter Brotherhood because of the company's experience in manufacturing steam turbine-driven generator sets for installation onboard FPSOs. These sets have to incorporate features to enable them to operate reliably in a floating environment where they can be affected by, for example, the pitch and roll of a ship.

Contact Peter Brotherhood Ltd, Werrington Parkway, Peterborough PE4 5HG, UK
Tel +44 1733 292200
Fax +44 1733 292300
E-mail sales@peterbrotherhood.co.uk
www.peterbrotherhood.co.uk

Lifesaving

VIKING on the slide

VIKING Life-Saving Equipment has recently completed a new capacity test for its double slide evacuation system, the VES. The system is reckoned to have the largest certified marine evacuation system (MES) capacity currently available on the market.

Det Norske Veritas certified that the system capacity is 657 persons within 30 minutes, according to SOLAS guidelines, or 386 persons within 17 minutes and 40 seconds for craft sailing under the High Speed Code. This means the VES could create considerable savings in deck space and expense, as fewer systems are required to evacuate the same number of passengers. For example, a vessel with a MES capacity requirement of approximately 1300 can now install two VESs instead of the four systems previously required.

USCG approval will also be amended as the VES system is approved via mutual recognition agreement.

VIKING was due to install slide systems on Corsica Ferries/Forship's M/S *Mega Express Four* in March. These new slides replace existing systems and will be used in conjunction with Viking 100-man liferafts.

Contact VIKING Life-Saving Equipment A/S, Saedding Ringvej 13, 6710 Esbjerg V, Denmark
Tel +45 76 11 81 00
Fax +45 76 11 81 01
E-mail VIKING@VIKING-life.com
www.viking-life.com

Services

Imtech expands services

Marine technical service provider Imtech has expanded its service network with new branches in South Africa, Norway, and Panama. In South Africa it has acquired maritime services provider Pertec, in Panama an asset deal has been made with a local maritime company, while Imtech has opened a new branch of its own in Norway.

The Imtech and Pertec branches in Cape Town and Durban will be integrated, leading to scale benefits, but Pertec's management will remain to facilitate continuity. The acquisition makes Imtech the leading maritime services provider and marine electronics distributor in South Africa.

The Panama service branch is the result of an asset deal with a local company called Seatroniks, and includes several maritime service specialists, materials, and a service ship. The new branch will be reinforced with service know-how and maintenance concepts from the existing Imtech organisation.

The company has been active in Oslo since 1972, but has now opened a base in Bergen to keep pace with the rising number of customers in Scandinavia.

Contact Imtech Marine & Offshore, Sluisjesdijk 155, 3087 AG Rotterdam, The Netherlands
Tel +31 10 487 19 11
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E-mail info@imtechmarine.com
www.imtechmarine.co.uk

LR launches safety initiative

Lloyd's Register (LR) has published a series of pocket checklist booklets as part of its drive to reduce the risk of Port State Control detentions, reports Clare Nicholls.

In partnership with insurer UK P&I Club, LR has produced three booklets to highlight the importance of safe working practices aboard vessels. These pocket checklists are entitled: *Port State Inspections*, *Marine Pollution Prevention*, and *Life-Saving Appliances*.

This is the second time that the UK P&I Club has collaborated with LR to produce checklists, and the joint venture between the mutual insurer and the class society is said to be unusual. The advantage of the cooperation is that LR is looking at the problem from a rules- and standards-based position, while simultaneously the UK P&I Club is looking at it from a risk- and claims-based perspective.

The first checklists, produced in 2005, were aimed at LR-classed vessels only and just 10,000 copies were circulated. However, demand was strong from the marine industry, so the new versions of the checklists relate to all vessels and, starting in March this year, 200,000 were distributed worldwide. Feedback from inspectors suggested that crews like the booklets as they are a handy size and raise awareness of safety issues, but can be used as crews think fit.

The guides are printed in polypropylene which, when burned, only emits carbon dioxide and water vapour, without producing toxic gases or waste.

It is the first time that club inspectors have liaised with people on the front line of vessel inspection, such as class surveyors, in order to filter their practical experience into the advice given. The pocket books are intended to be an aide memoir for ship masters and crew and should be read before any voyage.

The revised versions have been updated to demonstrate the most common items which cause Port State Control (PSC) detentions, to inform ship masters of criteria used by PSCs to target ships for inspection, along with practical tips and photographs depicting deficiencies such as incorrectly-mounted equipment.

The *Port State Inspections* publication includes checklists for areas including the bridge, accommodation, deck, and engineroom, in order to reduce the risk of PSC detentions.

The three checklists have been published by LR and the UK P&I Club.

The *Marine Pollution Prevention Pocket Checklist* points out possible MARPOL deficiencies aboard vessels. It demonstrates practical Annexes I to VI compliance, covering pollution, sewage, noxious liquids, and ballast water management. Since the launch of the original MARPOL checklist, deficiencies in this category on LR-classed ships have been reduced from 1.47% in 2006 to 1.05% in 2007.

The *Life-Saving Appliances* booklet contains checklists for certification, documents and records, and inventories for lifeboats and liferafts. It is essential that all personnel on a vessel should be familiar with the safety appliances onboard and ensure the equipment is up to the required standard. The checklist also warns that if equipment is broken or missing, or a ship suffers damage en route, the master has to notify port authorities prior to entry, or run the risk of detention.

The idea behind these publications is not just to reduce deficiencies, but to decrease serious incidents, injuries, and insurance claims. The intention is not to tell seafarers what to do, but to raise awareness as to what will happen if they don't follow the guidelines.

Between 2005 and 2007 just over 1000 deficiencies were reported by PSCs on LR-classed vessels and one third of that number were caused by lifeboats, three times as many as for launching arrangements of survival craft and lifebuoys. During that same period LR Fairplay reports that around 2500 lives were lost at sea.

Currently there is a debate surrounding problems with lifeboat on-load release hooks. 31 large lifeboat incidents with claims of over US$100,000 were recorded between 1987 and 2006, and 74% of them were due to the unintentional release of lifeboats. In that period these incidents caused six deaths and 10 multiple injuries, and the worrying fact was that it was senior seafarers who were injured, rather than inexperienced crew members.

A lot more processed claims have cost less than US$100,000 but LR's statisticians have found them difficult to research accurately. The published statistics include developing world vessels as well as developed world merchant ships.

Many people in shipping support standardisation of release hooks, but warn that legislation should not prevent innovation. In this scenario, equipment manufacturers should still try and create better designs and aim to go beyond compliance.

During the IMO subcommittee on ship design and equipment meeting in February (DE51), the issue of lifeboat release gears was due to be raised but due to lack of time this has been postponed to DE52 next year. This has exasperated many in the industry, who would like to see this legislation created as soon as possible, to prevent the growing number of injuries and deaths caused by these accidents.

Some instances of vessels contravening PSC requirements, especially in developing world countries, are due to crews tying down lifeboats to prevent theft. It is acceptable to unlock equipment when at sea if it needs to be locked shoreside, but there has to be

An example of a deficiency: incorrectly mounted hydrostatic release unit (HRU) on an inflatable liferaft. The painter should be attached to the HRU.

documentation to prove that this is the case so that the crew can demonstrate to PSC that the appliances are available when at sea.

The joint venture is trying to rid the industry of permanent equipment attachment situations, and reckons a culture change is needed, as the equipment has to be ready to use at all times. The mentality of prioritising other issues, such as theft, before safety is the problem, yet it is only a minority of ship owners and crews that do not conform to the PSC requirements. Another aim of this drive is to eradicate these complacent attitudes.

The UK P&I Club is supportive of the PSC system as it is government run and therefore accountable and not profit-driven. Karl Lumbers, the Club's loss prevention director said that PSC should be used as a benchmark and that the industry should support the system rather than criticise it, as it has been efficient in recent years.

He commented that the industry has to get to the core of why vessels are detained and not make exceptions. Training and experience should remedy the problem.

It is clear that owners, operators, and ship's crew need to invest time and money to ensure that equipment is fully functioning and the crew is well-trained in its use. *NA*

Odense yard spreads its wings

Odense Steel Shipyard is expanding its portfolio, with an orderbook now including significant work from sources other than parent A. P. Møller-Maersk. Report by Henrik Segercrantz.

A. P. Møller-Maersk Group subsidiary Odense Steel Shipyard Ltd (OSS) is by far Denmark's biggest shipyard and a leading player in containership design and production. The group's main facility, at Lindø on Fyn island is currently expanding its product range.

The shipyard built its first ro-ro container vessels in 1979 and its first container vessel in 1980, having previously focused mainly on producing tankers for its owner. The first Panamax container vessel, with a capacity of 4300TEU, was delivered in 1988, and the first double-hull 300,000dwt VLCC crude oil carrier in 1992. Since the mid-1990s, the yard has built around 60 containerships altogether.

In 1996 the yard built the world's first post-Panamax containership with the new standard breadth of 42.8m and 6000TEU capacity. Then, in 2006 and driven by its ground-breaking parent, the yard delivered *Emma Maersk*, the first ever 11,000TEU containership. In January this year, the eighth sister ship to *Emma Maersk* in the yard's E-class series was delivered, the newbuilding L210 *Eugen Maersk*.

OSS employs 5400 people in all. At the Lindø yard there are 3100 staff, about 500 covering administrative tasks and 2600 in production, plus trainees. The 108hectare yard has three newbuilding docks, one for building VLCCs and ULCCs up to 600,000dwt, and two drydocks for building vessels up to 200,000dwt. The biggest building dock measures 415m x 90m x 11m. The water depth is 8.5m. A lifting capacity of up to 1000tonnes is arranged with a 110m high gantry crane spanning 148.5m. The two other newbuilding docks measure 300m x 45m x 10m. Water depth is 7.5m and the maximum block lifting capacity is some 200tonnes.

In the 1990s the company acquired production facilities in Estonia, Lithuania, and eastern Germany, to lower production costs of primarily steel work and superstructures. According to Christian Schmidt, OSS senior vice president design and engineering: 'At the Lindø shipyard we produce the grand blocks which are easier to automate.' Loksa Shipyard in Estonia specialises in the production of pontoon lift-away hatch covers and non-curved steel blocks weighing up to 100tonnes. Loksa produces all the flat panels for Lindø, as well as blocks for other yards.

The 11,000TEU containership *Eugen Maersk* at the outfitting quay of Odense Steel Shipyard (Photograph by Jon Nordahl).

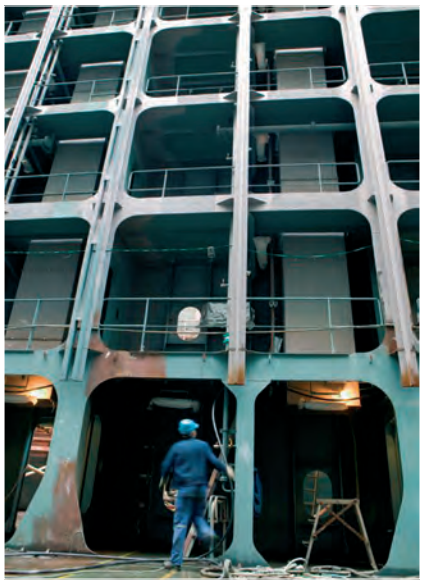
Baltija Shipbuilding Yard in Klaipeda specialises in supplying outfitted superstructures and man-hour heavy blocks, such as bow and stern sections, for Lindø. It also supplies blocks for external clients. The yard recently delivered the eighth, and last, superstructure for the *Emma Maersk* series. The deck house, including furniture, was transported to Denmark in two pieces, the lower and upper parts.

OSS also acquired the UAB Baltic Engineering Centre, a maritime consulting engineering company based in Klaipeda, Lithuania, with a staff of 55.

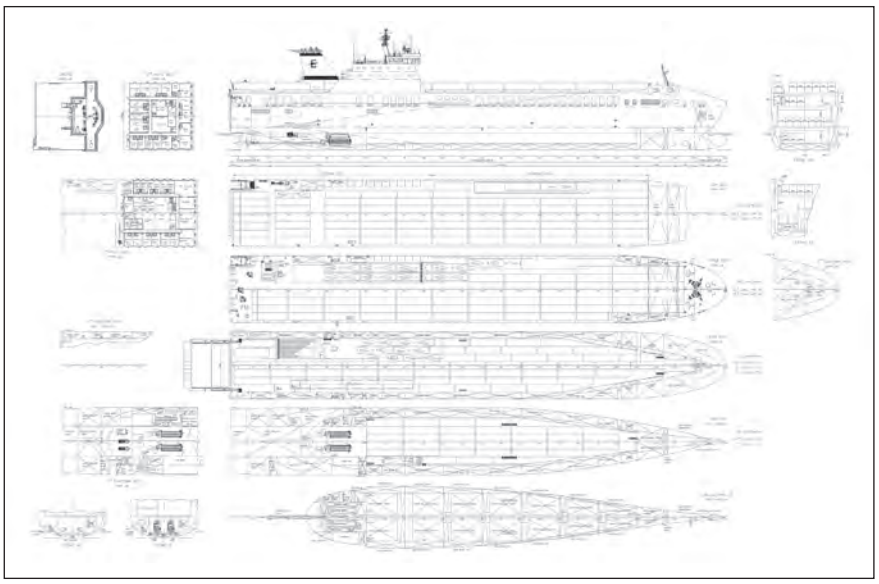
Orderbook

As in former times, ordering from its shipowning parent provides a mainstay of the OSS orderbook. Six 7500TEU containerships are on order for Maersk, due for delivery this year (the first ship in the series, L211, *Margrethe Maersk*, was delivered 8 March) to February 2009 (L216). The vessels are near sisters to the previous G-class series of six ships built in 2005 and 2006. These 115,700dwt vessels have a length of 367.3m, breadth 42.8m, depth 24m, and maximum draught 15m. Capacity is 7668TEU at 14tonnes weight. A Wärtsilä Sulzer 12RT-flex96C common-rail engine produces 68,640kW and a maximum speed is 25knots. In contrast to the previous vessels, the deck house design of the six newbuildings will have cabins facing the side of the ship, towards the containers, instead of forward.

However, primarily to level out a temporary dip in production volume at its biggest newbuilding dock (no 3), and to provide work by also utilising one of the two other smaller building docks (no 2) at the yard, last year OSS snared significant external



Construction of cell guides for *Margrethe Maersk*, the first (L211) in a series of six 7500TEU containerships under construction (Photograph by Jon Nordahl).



General arrangement plan of the L217 series of ro-ro vessels, eight of which are being built for Epic Shipping Ltd and Pacific Basin Group, for delivery in 2009 and 2010.

orders, with very short delivery schedules. According to Mr Schmidt, the strategy is to diversify into different product segments in order not to be too vulnerable to changing market conditions.

In July 2007, the company received an order for six ro-ro vessels from British Epic Shipping Ltd, while orders for two sister ships were placed in February this year by Hong Kong-based Pacific Basin Group. The design licence of these vessels was bought from Flensburger Schiffbau Gesellschaft, although the final configuration has been slightly modified. The 11,339dwt vessels will have a length overall of 193.00m, breadth 26.00m, depth to upper deck of 16.7m, design draught 6.45m, as well as 3663 lane metres of space for cars, with a capacity for 249 trailers. Two nine-cylinder in-line MaK engines produce a total MCR of 16.2MW and service speed is 21knots. With production to begin this summer, the vessels are due for delivery in 2009 and 2010.

Again, in August last year, the yard received an order for a series of Capesize 182,000dwt bulk carriers for two Greek shipowners with deliveries scheduled as soon as May 2009, running through to autumn 2010. The design has been developed by the yard together with Carras Hellas Group, which will be the owner of some of the vessels. The vessels will have a maximum length of 292.00m, breadth 44.98m, depth approximately 24.85m, and design draught 18.15m. Deadweight at scantling draught is 181,900dwt and at design draught a minimum of 180,000dwt. One six-cylinder MAN engine produces an MCR of 18,660kW at 91rev/min. Service speed is 14knots. There are nine cargo holds with a total (grain) capacity of some 198,000m^3. DNV classed the vessel.

'We utilised the current boom in the bulk carrier market,' said Mr Schmidt. 'The production time is very short, but this type of ship suits our production very well.'

In addition, the yard is also building vessels for the Royal Danish Navy. The current orderbook includes three frigates with deliveries between 2010 and 2012. The newbuilding dock (no 1) is being used for this purpose.

Automated shipbuilding

Integral to the OSS story has been its hi-tech approach to shipbuilding. It takes an estimated 10 to 11 months to complete the construction of a container vessel. The time in the building dock is around six to 10 weeks. Final outfitting takes five weeks, after which some additional days are allocated for the sea trials.

In order to be able to produce ships at competitive prices to those of Asian yards, the Lindø yard has systematically developed its use of welding robots. One robot installation is used for welding straight sections with a maximum height of 12m. In all, 12 independent robots in a giant frame weld up to 2000m per day. There is also a robot welding station with four welding robots for automated welding of containership hatch coamings in another block assembly workshop. A special laboratory is used for developing and testing robot prototypes, in close cooperation with some other Danish companies. According to Mr Schmidt: 'After a most active period of developing robots for our production in the 1990s we have now again started to look at using robots in processes where robots have not been used before. We are developing simple robots that can do smaller jobs in narrow confined spaces. We want to enhance the process by simple means and call this philosophy micro-engineering. Another development which OSS is looking into is automation of painting.' The yard also uses one robot for steel cutting.

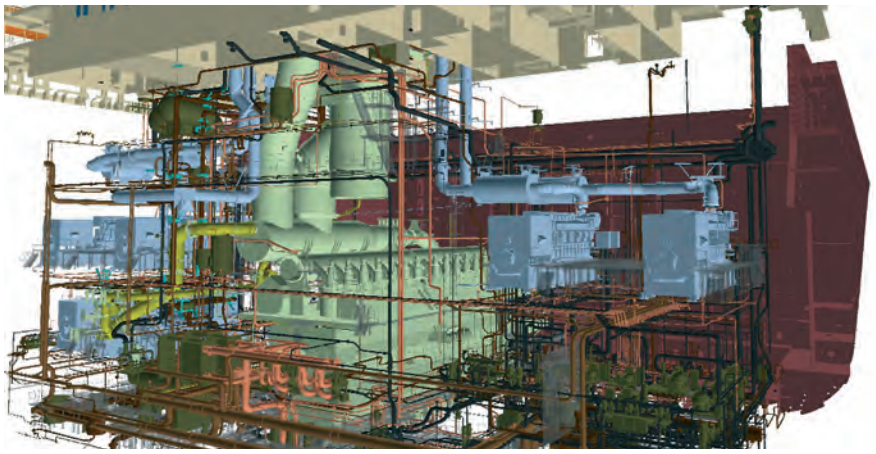
OSS has also embarked on plans to increase automation levels at its sites in Estonia and Lithuania, where labour costs have risen. The company is also outsourcing components and steel work to China, including hatch covers and lashing bridges. 'The distance requires sufficient shipping volumes, which means that the orders have to be placed in good time,' said Mr Schmidt.

Also typical of its forward–looking approach has been the company's use of design resources, including those provided

by GHESA Andalusia in Sevilla.

'We are continuously looking for partners which are able to deliver a high quality service using the most advanced CAD/CAM software SmartMarine 3D,' Mr Schmidt said. 'We want to work with companies which have sufficient capacity to ensure flexibility and a long track record for delivery on time.

'Remote design capabilities are very important for us,' noted Mr Schmidt. 'Today we are able to work remotely with GHESA and [the] Baltic Engineering Centre in different locations in outfitting design, using distributed databases of project parts replicated to local servers. The goal is to work towards one single central database.'



The engineroom of newbuilding *Margrethe Maersk*, designed using the SmartMarine 3D CAD system, which was developed by Intergraph, Samsung, and Universal Shipbuilding.

Intergraph's SmartMarine 3D is currently integrated in the outfitting design and manufacturing process, including detailed piping/outfitting engineering of enginerooms, deck houses and casing, shaft tunnels and steering machine rooms, and will from the next newbuilding project also be implemented in steel design.

For steel design, the company has used the Japanese HICADEC CAD design system, developed and maintained since 1982 in cooperation with Universal Shipbuilding. The 3D steel CAD model produced in Hicadec or Tribon (AVEVA), used by all the partners today, can be imported into SmartMarine to provide the base for outfitting design and further production planning.

Meanwhile, OSS has also developed its own computer-based planning system (DPS) for the planning of activities, management of workforce and work areas. For production control an in-house production management system is used for planning steel consumption. For outfitting consumption control the Baan enterprise resource planning system is used. ***NA***

Production shuffle for MAN Diesel

MAN Diesel plans to rely solely on licensees to deliver its two-stroke engine products, with restructured in-house production focused on boosting four-stroke capacity. Henrik Segercrantz outlines the consequences for its Danish arm.

In 2006 MAN Diesel decided to re-arrange its manufacturing divisions in order to create new resources for its four-stroke business. The decision was made to stop the in-house production of two-stroke engines altogether by 2009 and to build these engines entirely through licensees.

MAN Diesel A/S operates at three locations in Denmark. Its headquarters in Copenhagen includes a large R&D department and test centre, where new MAN B&W two-stroke engines are developed. Copenhagen also handles the group's two-stroke licensing business, production of key components and spare parts, and the two-stroke engine service business.

In Frederikshavn, MAN Diesel manufactures smaller two-stroke marine engines up to the 50cm bore S50-series, in the 2000kW-12,640kW power range. This two-stroke production will phase out after 2009. MAN Diesel, Frederikshavn, also develops and manufactures complete propulsion systems for small and medium size vessels based on four-stroke engines, in the power range of 960kW-3060kW. These include engines, gearboxes, CP propellers, and remote control systems. Auxiliary marine and stationary generating sets are also produced, in the 450kW-4230kW power range. Frederikshavn also handles the sales and service of these propulsion systems. The generating set sales and service is handled from Holeby.

Production of four-stroke engines is currently divided between plants in Augsburg, Germany; St Nazaire, France; and Fredrikshavn. To free up capacity for component manufacturing in Augsburg, the V-type 48/60B engine as well as the V-type 51/60DF dual-fuel engine for LNG carriers will, in the future, be assembled in France. Production of all four-stroke core components will take place in Augsburg, as will the assembly of the lightweight large-scale engines. Frederikshavn currently manufactures MAN Diesel's small-bore medium-speed engines with a cylinder diameter of up to 28cm and power up to 4MW. The assembly and testing of the biggest four stroke engines, weighing over 200tonnes, will be done entirely in St Nazaire and, from 2009, in Frederikshavn, where the assembly and testing of the largest bore diameter 58/64-type engine will take place.

The aim of this re-allocation is to achieve a significantly greater production volume at established locations.

'This measure, as well as adjustments to our four-stroke product portfolio, will create additional capacity,' MAN Diesel chief executive Dr Pachta-Reyhofen commented last year.

Thomas S Knudsen was recently appointed head of MAN Diesel's two-stroke business unit. Based at MAN Diesel A/S in Copenhagen, he has taken over from Peter Sunn Pedersen, who will retire at the end of this year. Mr Knudsen previously headed the R&D department of MAN Diesel A/S, and this role has now been taken over by Søren H Jensen.

The first MAN B&W S40ME-B9 low-speed small-bore engine built at STX in Changwon.

The first three ships are part of a Qatargas series of 45 LNG carriers with MAN B&W two-stroke prime movers.

Two-stroke licensee

Currently, there are 35 individual licensees of MAN Diesel engines and exhaust-gas

The engineroom aboard one of the first three Q-Flex LNG carriers.

turbochargers throughout the world, of which 17 are licensed manufacturers for two-stroke engines; in China, Japan, South Korea, Vietnam, Russia, Poland, and Croatia. The latest two-stroke licensee contract, signed in January, is with Zhenjiang CME Co Ltd (ZJCME), a Chinese engine manufacturer and subsidiary of CSSC, for engines up to 50cm bore. Seven of MAN Diesel's licensees for two-stroke engines are based in China. In August 2007, an agreement with Wuxi Antai Power Machinery Co Ltd was signed for small- to medium-bore two-stroke engines. Earlier last year MAN B&W additionally signed a licence contract with CSSC-MES Diesel Co Ltd, located near Shanghai.

MAN Diesel's two-stroke MC engine programme has evolved to embrace bore sizes from 260mm to 980mm, and even 1080mm – which is not yet in production. In January, Polish licensee H. Cegielski - Poznan SA tested its first electronically-controlled MAN B&W ME-C7 engine, which will be installed as the main engine in a series of car and truck carriers ordered by Ray Car Carriers Ltd of Douglas, Isle of Man.

In December 2007, meanwhile, the first MAN B&W S40ME-B9 low-speed small-bore engine was built by STX Heavy Industries Co Ltd, South Korea. The ME-B design is based on the experience from the popular MC-C and ME-C engines. To suit the small-bore segment, the economical ME-B design utilises a camshaft-operated exhaust valve and an electronically-controlled fuel-injection system, as seen with the ME-C range. To achieve the lowest possible propeller revolutions in relation to bore size, the new ME-B9 engine has a stroke/bore ratio of 4.4. This has been achieved by increasing maximum cylinder pressure, resulting in improved fuel consumption that is 2g/kWh lower than existing, small-bore engines.

In early 2007 MAN Diesel launched the S50ME-B9 engine design. The ME-B programme now has an output range from 2975kW to 16,020kW and the market reception has been very positive to date, with more than 60 orders placed.

The two-stroke S50ME-B8 engines being built by DMD Dalian Marine Diesel for seven chemical/product tankers on behalf of Torm Group are the first engines fitted with TCA66 turbochargers with variable nozzle rings technology (VTA).

Another milestone was reached in LNG carrier propulsion in September last year, with the successful conclusion of testing for the first two-stroke propulsion engines to be installed aboard three of Qatargas' 45 newbuildings, in the form of a pair of 6S70ME-C or 7S70ME-C7 electronically-controlled, two-stroke, low-speed diesel engines. These engines will operate on heavy fuel oil, but MAN B&W is also promoting its range of dual-fuel ME-GI engines, containing a high-pressure injection system of natural gas.

The engine programme also includes the 51/60DF dual-fuel medium-speed engine, which is targeted at LNG carriers with a diesel electric-propulsion configuration. *NA*

S50ME-B9 stokes fuel economy

The sterns of merchant vessels are often redesigned to accommodate bigger propellers with higher efficiency and lower optimum speed (rev/min). Today, the optimum propeller speed of large Handymax or small Panamax bulk carriers and tankers is often lower than the nominal 127rev/min figure quoted for an S50MC-C7 engine, and higher than the equivalent 105rev/min value for the next bore up, the S60MC-C7. Accordingly, the optimum main engine may be one with an SMCR (specified maximum continuous rating) speed within this 105rev/min-127rev/min range.

The new S50ME-B9 engine from MAN Diesel is a competitive alternative with a nominal MCR speed of 117rev/min. The engine adopts the design features introduced by the smaller ME-B9 engines with their MEP (mean effective pressure) of 21bar and stroke/bore ratio of 4.4.

Fuel savings achieved through the installation of a propeller with lower revolutions are dependent on the propeller diameter - the bigger the better - and on the corresponding lowest optimum propeller speed. The influence on propulsion power necessary to maintain ship speed can be expressed by means of the constant ship speed factor, α

$$p2 = p1 \times (n2/n1)^{\alpha}$$

where p = propulsion power;
n = propeller speed.

In situations where optimum SMCR speed is $\leq$ 117rev/min, MAN Diesel says it might thus be advantageous to install an S50ME-B9 engine. A MAN Diesel study shows that fuel savings could be of the order of 5%-6%.

Advancing with FORCE

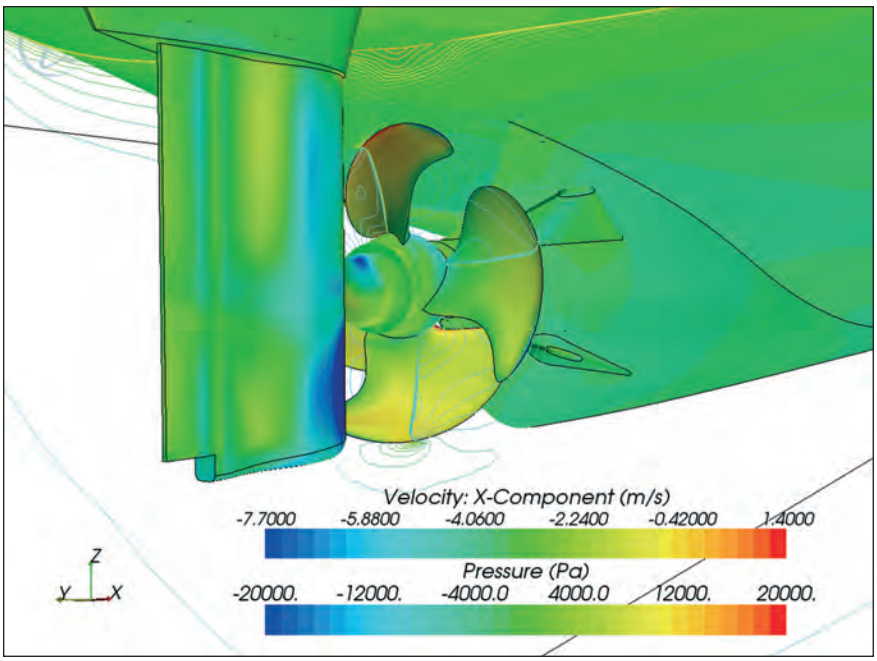
Advanced development projects to improve ship design have been initiated at FORCE Technology.

In 2006 the Technical University of Denmark and FORCE Technology established the Danish Centre for Maritime Technology (DCMT). The objective is to promote and develop Danish maritime technology know-how through increased research, development, and innovation within the maritime industry, and also to promote an influx of new engineers to the segment. One task of the centre is to ensure that the research activities undertaken are considered relevant by the maritime industry.

The Danish Maritime Foundation has funded the activities over five years with DKK25 million (US$5.3m). A total of nine R&D projects have already been initialised in the areas of safety, environment, and efficiency.

Typical of the work underway is SeaTrend, a project identifying the fact that even minor degradation in the antifouling or fouling of the propeller blades increases fuel consumption. A professional tool is now being developed for monitoring ships' hydrodynamic performances. Online instant monitoring of the performance and propulsion enables the evaluation of the degradation of the hull and propulsion over time. Daily observations are fed into the system. All data is transferred to a central server ashore for data processing and analysis, and the performance of the vessel is displayed to the shipowner on a dedicated website. The first version of SeaTrend has already been installed on four product tankers, and more installations are already planned this spring.

Another interesting project initiated by FORCE Technology is the documentation of the IMO CO_2 index of commercial ships as part of their model testing services. This service enables clients to evaluate the 'carbon footprint' of their ship at the development stage. Based on the cargo capacity of the ship the corresponding CO_2 index, CO_2 emitted per tonne-mile, is to be documented for the normal speed range of the ship. The CO_2 index will also be benchmarked with similar vessels, to compare the environmental performance of a vessel.



A joint industrial project to enhance computations of hydrodynamics of a ship with a working propeller using CFD will be concluded in autumn 2008.

Elsewhere, a joint industrial project was launched last autumn, involving a collaboration between MAN Diesel A/S (propeller equipment, Fredrikshavn), Technical University of Denmark (DTU), and FORCE Technology. The aim is to enhance the applicability of advanced RANSE-based CFD codes for computations of the hydrodynamics of ships. FORCE has a broad experience with using CFD as a ship hullform optimisation tool and MAN Diesel has used CFD for developing nozzle and propeller blade designs. In addition to the validation of CFD codes, DTU will join the project with a degree examination study on blade cavitation and transition using the highly recognised CFD code EllipSys, which has been developed by DTU in cooperation with Risø National Laboratory.

It is expected that the CFD codes will prove a valuable supplement to the optimisation of hull lines and propellers, as will the research on the cavitation models for RANSE CFD codes for further developments.

FORCE Technology, of course, has long been involved in offering services designed to optimise hull lines and to improve propulsion efficiency in ships. It has considerable experience in using ShipFlow for optimisation of hull lines, but now services also include highly complex RANSE CFD computations using STAR-CCM+ and COMET developed by CD-Adapco. These new advanced CFD programs provide a detailed visualisation of the flow along the hull, including vortices and regions with flow separation in the aft ship.

With a large number of calculations already made using the STAR-CCM+ for commercial ship types, the results are promising, with an accuracy error of less than 5% when compared to model tests. Therefore, FORCE Technology now offers speed and power predictions based on CFD calculations as an effective and fast supplement to model tests. It recently acquired a large cluster of CPUs, enabling calculations of up to 80 parallel calculation nodes. *NA*

More shipyards migrate to MARS

A growing number of shipyards are specifying the MARS ERP system as part of their design software packages.

Some 60 shipyards worldwide use Danish company Logimatic's (ERP) enterprise resource planning product MARS, first introduced 18 years ago, but uptake of the refined product shows little sign of slowing down.

MARS is a vertical ERP system especially developed for shipyards, with the information flow of all core yard processes integrated. There are four major applications: MARS Material for material management, MARS Production for production management, MARS Planning for resource planning and control, and MARS Tendering for cost estimation.

'Significantly increased production efficiency has been reached with MARS,' Ivan Siksne-Pedersen, sales director at Logimatic told *The Naval Architect*.

MARS is built around industry-standard tools, including Oracle three-tier architecture. It is compatible with office tools and CAD systems. It can be run as a traditional client/server solution and in web architecture. A core feature for the success of MARS is the planning module. Some years ago a company specialised in systems for shipyard resource planning was acquired, and the software has now been further developed and fully integrated in the MARS Material module.

The MARS Planning module includes main planning, detail planning, design planning, and space management, for planning quays, production halls, cranes, storage areas, space, etc.

The basic plan for implementing the MARS system at a shipyard.

'All recent yard contracts have also included the MARS Planning module, emphasising the importance of logistics planning for newbuilding and repair yards,' Mr Siksne-Pedersen said.

MARS supports tendering and pre-calculation, project establishment and planning, project and budget control, design and engineering, material definition, material management, procurement, warehousing, production control, subcontracting, document management, drawing management, tool management, and after-sales. Through its modularity it is straightforward for shipyards to maintain existing IT systems, or parts of these, and integrate them with MARS.

Logimatic has a staff of 115 based in offices in Aalborg, Denmark; Germany; Beijing, China; and in the USA, with one further office currently being set up. Recently, Shanghai Shipyard and CSSC CDP acquired MARS. Shanghai Shipyard will implement all three main modules of MARS, resource and project planning, material management, and production control, at its two construction sites.

CSSC Central Purchase Department in Shanghai (CPD) is a newly-established organisation which will be in charge of purchase of materials and other deliveries for the entire CSSC shipbuilding group. When fully operational, CPD will have the largest purchasing volume of all shipbuilding organisations globally.

'Last year, new clients included the major US shipbuilders Northrop Grumman and BAE Systems, and we expect to be able to announce some other major new contracts in the USA and Asia this spring,' said Mr Siksne-Pedersen.

Recent major contracts include an ERP frame agreement with Aker Yards, eight yards of which already use MARS. Other ERP clients include Dutch IHC Holland, Nam Trieu Shipyard in Vietnam, and Estaleiro Atlântico Sul in Brazil – which is implementing MARS at its new shipyard being built in Recife. Turkish Sedef Shipyard also recently upgraded its MARS installation with the planning module. *NA*

GMCB bulks up

Grontmij Carl Bro's (GMCB) series of Diamond bulk carriers continues to prove its popularity.

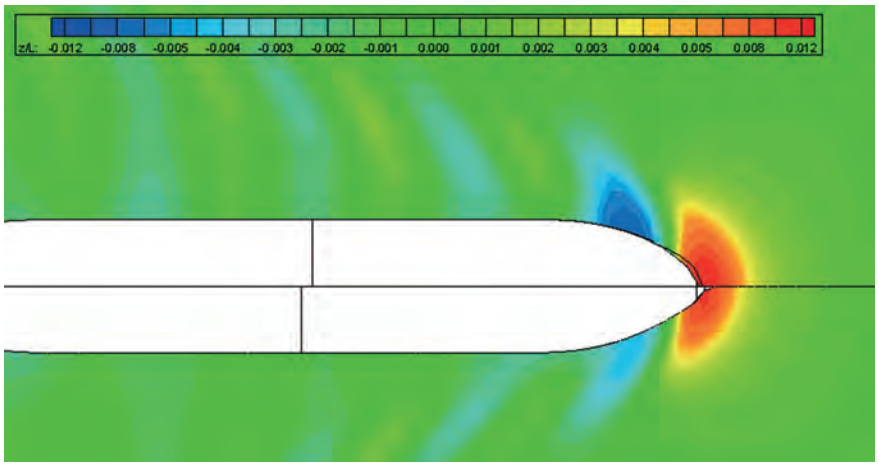
The task of creating a vessel that offers owners and charterers major operational cost savings in maintenance and harbour turnaround time, while significantly enhancing safety and environmental protection, was initiated by GMCB with operational and regulatory input from Graig Group and Det Norske Veritas (DNV). The process resulted in the much-publicised Diamond 53 bulk carrier design.

The geared, wide hatched, 53,000dwt Handymax bulk carrier has a high specification to address the concerns raised by IMO/IACS at the time it was designed regarding bulk carrier safety. Feedback from the first five vessels delivered from Chinese yards indicated efficient cargo operation and easy hold cleaning and manoeuvrability. In China, a total of 53 vessels have been ordered to date and 25 have been delivered. Last year GMCB, with Chengxi Shipyard and DNV, upgraded the design of the steel structure to meet the requirements of the new Common Structural Rules (CSR) for bulk carriers.

The first two Diamond 53 bulk carriers were delivered from Vietnam last summer; one vessel by Vietnam's Ha Long Shipyard and another by Nam Trieu Shipbuilding Industry Co. Vinashin is to build a further 27 Diamond 53s at Nam Trieu and Ha Long. The deliveries of the two first vessels were somewhat delayed, but the delivery schedules are expected to improve.

Based on the success of the Diamond 53 design, GMCB also designed a smaller 34,000dwt version, the Diamond 34. The main dimensions of this Handysize shallow draught geared double-hull bulk carrier is a length overall of 180.00m, length bp 176.75m, max moulded breadth 30.00m, moulded depth 14.70m, scantling draught 9.75m, and design draught 9.00m. The deadweight at design draught is 30,300tonnes. The five cargo holds have a total capacity of 45,500m^3 (grain) and are equipped with end-folding hydraulically-operated hatch covers and four 30tonne deck cranes. Service speed is 14.0knots.

Diamond 34, the latest bulk carrier design by GMCB and Graig Group.



CFD calculations of wave pattern for original hull lines (upper) and optimised hull lines (lower) for the Diamond 34.

In 2006 Graig Group contracted four such vessels, with four options, at Vinashin's Pha Rung shipyard with delivery dates beginning in mid 2008. Towards the end of the same year, GMCB signed a contract for delivery of design documentation for two plus two vessels for Shandong Baibuting Shipbuilding Co Ltd in China. The delivery of the first ship is expected before the end of 2008.

The hull shape of the Diamond 34 was developed together with FORCE Technology, and a number of different hull shapes were examined. The tests and simulations showed that a practically vertical stem without a bulb resulted in the smallest resistance and best propulsion efficiency and fuel economy. With the help of potential flow Shipflow CFD calculations prior to model testing, total resistance was reduced by some 2% from the original. Flowtech's Chapman viscous flow programme was used to optimise the aftship. According to Thomas Eefsen at FORCE Technology, the Chapman software is very efficient for evaluating the ship's wake field, and is now commonly used in single-propeller projects. The calculations were later documented by model tests and by 3D wake measurements. *NA*

Offshore capacity rises in the wind

A builder is being sought for an innovative 1600tonne jack-up offshore installation vessel for UK/Guernsey registered company gaoh Offshore, whose design demonstrates the market's appetite for rising lift capacity.

Concept development has been completed for a new, higher lift capacity offshore installation vessel for the windfarm market. Design has come from Danish company OSK-ShipTech (formerly Ole Steen Knudsen), which points to high levels of interest in vessels for the growing market niche.

OSK has previously been involved in the development of two smaller vessels for Danish operator A2Sea, which were among the pioneers in turbine installation.

Its latest project envisages delivery of the finished ship by end of 2010 or early 2011.

At this stage, the design is for a 140.6m long DP2 vessel (lpp 135m), 36.2m across the beam, and offering a payload of 4500tonnes (enough for four 3.5MW wind turbines).

The ship will also be equipped with a Liebherr MTC offshore crane, able to operate in wind speeds of up to 16m/s. The crane will offer 1600tonne lift capacity at a 35m radius, 72m above the water, or 400tonnes at 35m radius, minimum 100m above the water's surface.

Such a capability means that the vessel will offer capacity more than three times greater than *Mayflower Resolution*, the first offshore installation vessel built specifically for the offshore windfarm sector, which was delivered in 2004 by China's Shanhaiguan shipyard to Mayflower Energy.

Also of interest is the fact that the new vessel is to be capable of utilising its crane potential both when jacked up and when afloat. This, OSK-ShipTech points out, will save considerable time during the installation procedure.

Meanwhile, the envisaged vessel's jack-up capability is given as 1.5m above the water's surface at water depth of 45m. Powered by a 14MW diesel electric solution, the vessel will be capable of 12knots and will offer deck loading capability of 10tonnes/m^2. It will offer accommodation for 122 personnel and be equipped with its own helideck, configured to handle a Sikorsky S61N helicopter.

OSK-ShipTech said that the future challenge in the windfarm installation market would be to develop methods for turbine installation in water depths in excess of 50m. 'Here, also, OSK-ShipTech is involved in a number of projects,' said the company. *NA*

Concept for a new breed of offshore installation vessel, capable of lifting 1600tonnes.

Easeacon gains new markets

Marine Alignment's Easeacon system gauges the strength and stability of a vessel, and can be tailored to shipowners' requirements.

Although there are some 500 applications in operation of the Easeacon loading software for containerships, Danish supplier Marine Alignment has increasingly looked beyond this market to embrace a range of vessel types, including offshore production units.

Now, there are ship-specific versions for onboard or office planning and versions capable of bay planning of different ships in an owner's fleet, all offering extensive online communication features.

Indeed, almost 1000 ships have been equipped with the Easeacon system to date.

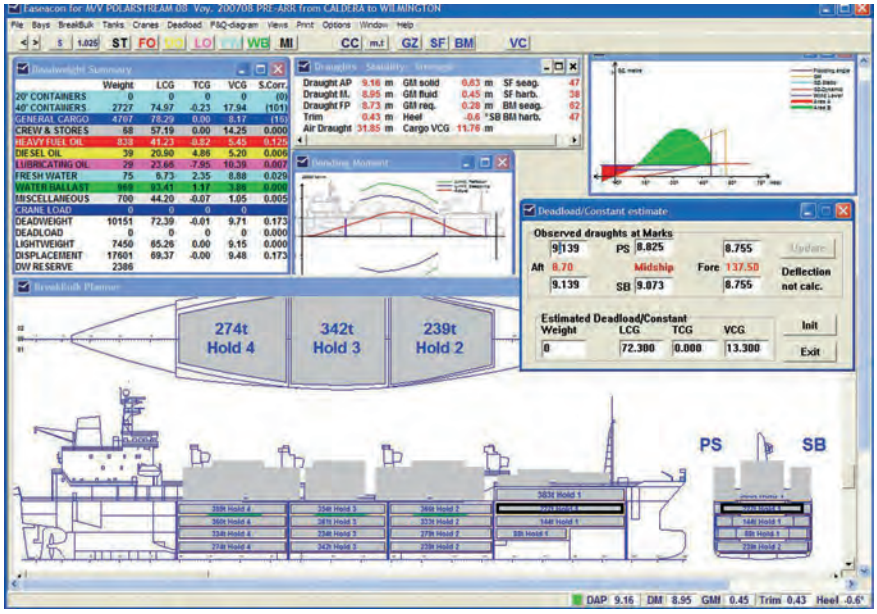
Customers include companies like CMA CGM, Rickmers, COSCO, and MISC. Easeacon is a class-approved loading computer package for strength and/or stability assessments. There is a shore-based officers' tool to ensure safe and efficient operation. Easeacon undertakes strength and stability calculations; and cargo handling, management, and planning.

Having obtained class type approval, Easeacon offers a genuine 3D damage stability calculation engine.

Using Easeacon, loading calculations can either be done traditionally with tabular databases or by using a direct calculation method. The cheaper version, using tabular databases, gives quick, reliable, and reasonable accuracy. In the direct method, all stability data can be calculated, including the equilibrium for the ship, with a list generated to flag up a damaged condition.

The type of loading instrument that should be used is dependent on the stability requirements for the individual ship, based on the Unified Requirements, UR L5, issued by the International Association of Classification Societies (IACS). For ships contracted after July 2005, three types of stability criteria will prevail: intact stability only; intact stability with checks against the damage stability KG limiting curve; or damage stability.

Easeacon can be configured to interface with almost any other system. Links to IMDG codes, stowage segregation guides, ASTM tables, etc allow for accurate assessment of any cargo situation, taking into account even last-minute decisions. Linking to ASTM tables, for example, minimises the workload for the operator, and the risk of human error. There are interfaces to tank level gauging, draught measuring, and communications systems.



The Easeacon loading computer is tailor-made for a wide range of ships.

With an integrated inclining test module, Easeacon can even calculate the VCG of the ship. 'One of the Easeacon strongholds is its degree of customisation,' said Sven Dyrdal, sales and marketing manager, Marine Alignment. 'This relates to interfacing with other systems, such as tank and reefer monitoring, and to booking systems, as well as implementing features and reports of customer requests.'

Recently, an interface was developed for Dutch company Amarcon's data collection system Octopus, which is installed on a series of CMA CGM containerships. Easeacon exports draught, trim, stability, and strength data to Octopus.

Range of versions

Today, there are versions of Easeacon developed for ro-ro vessels, multi-purpose vessels, reefers, LPG and LNG carriers, bulk carriers, and tankers. There are more than 100 bulk carriers using the system. For reefer ships, Easeacon has been working closely with the Dutch shipowner Seatrade in developing a special module for the transport of palletised goods.

With Lauritzen Kosan as development partner in the LPG carrier market, Easeacon was developed to accommodate the demands for accuracy and the rather extensive calculation needs. Easeacon is also used on VLCCs and smaller crude oil carriers, and on a number of product and chemical tankers.

On the ro-ro vessel side, Easeacon has strong cooperation from companies such as Grimaldi Lines and NileDutch Shipping. According to Mr Dyrdal, the operation of ro-ro ships constitutes the challenge of fast decision-making and the ability to assess possible loading changes quickly. Various checks and improved visualisation techniques, interface to booking systems, and features for pre-planning of cargo loading have additionally been developed for ro-pax vessels. *NA*

Hempasil put to the test

Significant fuel savings are claimed for Hempel's new low resistance anti-fouling coating.

A recent study from FORCE Technology suggests that Hempel A/S's silicone-based fouling release coating Hempasil can result in a fuel savings of 10.6% for a large container vessel.

Hempel says that one of its main targets is to develop products with less impact on the environment. Hempasil, the company says, is such a product. The silicone-based fouling release system features a 'non-stick' smooth and flexible surface with very low surface tension. Fouling organisms do not easily stick to the surface, while its smoothness reduces drag, thus lowering fuel consumption and costs. Hempasil is biocide free.

In the FORCE Technology tests, the silicone-based antifouling coating was compared with a conventional tin-free self-polishing surface coating (SPC). A dedicated test rig was engineered with 2.5m long test plates attached to the towing carriage.

Initial tests in a 220m long towing tank were done using uncoated hydraulically-smooth plates, which demonstrated that the rig could achieve measurement errors as small as 0.3% at 15knots speed. The hydraulically-smooth plates also compared favourably to the classical theory propounded in textbooks.

Coating surfaces for three different conditions were compared: a surface of a newbuild vessel, and two ship hulls with longer service time manifesting different levels of corrosion. The 'medium roughness' condition corresponded to a ship with several years service, and the 'high roughness' for an even older vessel. Each of these surfaces was coated with either Hempasil or with a conventional SPC coating.

The test results consistently showed that the skin friction for Hempasil at three roughness levels was significantly lower than the corresponding skin friction values for the SPC antifouling, according to the manufacturer. The re-calculation to full-scale was done using hydrodynamic and turbulence theories and computer calculations of the resistance of real hull shapes of various ship types, including the skin friction component originating from the difference in surfaces texture and coating, the wave resistance component, as well as wake and air resistance components.

The results were translated into power, fuel, and environmental savings to show the full effect on fuel consumption, and CO_2 and NOx emissions. The results were also calculated for four different vessel types, in addition to the three different hull roughness categories.

The improvement in skin friction was up to 5% for a Reynolds number corresponding to that of a large container vessel. Fuel savings of between 2% and 11% were achieved for the various types and sizes of vessels. *NA*

FORCE Technology developed a dedicated test rig with specially-designed 2.5m long test plates which were towed while attached to the towing carriage.

Building to IMPROVE standards

An innovative concept of a large ro-pax vessel is one of three new ship designs emerging from the EC-backed IMPROVE project.

Supported by the European Commission, the three year 'IMPROVE' ship design research project is approaching the half-way stage in its bid to deliver a rationale for making decisions pertaining to the design, production, and operation of three new ship generations.

Coordinated by ANAST, University of Liege, IMPROVE involves 17 partners, including Aker Yards of France, Uljanik shipyard of Croatia, Szczecin New Shipyard of Poland, owners Grimaldi, Exmar, and Tankerska Plovidba Zadar, Bureau Veritas, two ship design companies, two engineering companies, and two software companies, as well as WEGEMT (European Association of Universities in Marine Technology and Related Sciences).

The team hopes that the project's results will help the European shipbuilding industry to claw back market share it has lost to yards operating on a lower labour cost base, such as those in China.

IMPROVE aims to use advanced synthesis and analysis techniques at the earliest stage of the design process, considering structure, production, operational performance, and safety criteria on a concurrent basis. The ship types are new generations of LNG gas carriers and chemical tankers and, as the focus of this article, an innovative concept for a large ro-pax vessel.

Over recent years, Uljanik Shipyard has designed several car-carriers, con-ro, and ro-pax vessels for different shipowners. Its enduring association with Grimaldi provides the bedrock for the development of the new ro-pax vessel, whose evolution has already gone through general and structural analysis. The shipbuilder has performed extensive multi-objective structural optimisation of a ro-pax structure using OCTOPUS-MAESTRO software, with a view to developing a ship design promising minimum cost, minimum weight, and maximum safety measures, while also satisfying structural constraints: yielding, buckling, displacements, and ultimate strength of hull girder and ship panels. Meanwhile, large operational savings are predicted due to a novel propulsion concept.

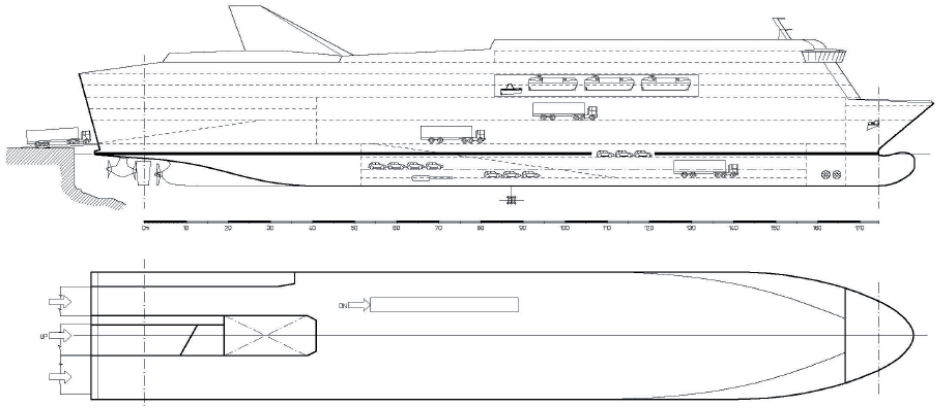
The main dimension criteria envisage a ship with a maximum length of slipway ≈ 230m, and maximum breadth given as 30.40m.

From the owner's point of view, the new vessel will be developed for Mediterranean Sea operations and general design requirements including: load carrying flexibility; a perceptible improvement in operational performance and efficiency when compared to existing ships; design for the redundancy and simplicity of systems; an increase in ship's manoeuvrability; optimised sea-keeping performance; maximised comfort and minimised vibrations.

There is also a specific requirement for an 8% increase in carrying capacity (lane metres) on the tank top, to be achieved by decreasing the length of the engineroom. This involves developing a 'pre-formed' new design for the stern part of the ship.

Uljanik's design objectives are to develop a ro-pax ship taking into account large variations in seasonal trade (summer 3000pax, winter 100pax). The monohull ship is to feature a superstructure constructed of steel or composite (no aluminium).

Ultimate vessel dimensions are to be optimised to improve the hydrodynamics, while a slow-speed main engine has been pre-selected to improve maintenance and consumption. The criteria also dictate: minimum height of deck transverses; an improvement in design using existing and improved tools for early design phase; rule calculation – simplified CAD modelling, leading to simplified FEM and LBR5 modelling; minimum weight of freeboard deck transverses; minimum height of deck No3 and deck No4 transverses; accurate calculation at the early design stage of building tolerances and deformation constraints; superstructure decks effectiveness in the longitudinal strength to be considered; web frame spacing and longitudinal spacing to be optimised, while there are to be no pillars in cargo space.



'Standard Ship', the existing ship or yard prototype.

Further objectives include the minimising of maintenance costs over a 25 year lifetime, while the design must also take account of the probability of a potential conversion after 10 years due to new Rules or comfort standards (that is the ship's design must be flexible enough for easy conversion). Cargo handling will be of the traditional type – stern door and internal ramps. One aspect of sea-keeping will be defined by the fact that no fin stabiliser is envisaged, instead there will be internal active stabiliser tanks.

With these parameters in mind, Uljanik also has other expectations for IMPROVE. Among its goals are: reducing production costs by 10%; reducing fuel oil consumption by 12%; and reducing maintenance costs by 10%.

Uljanik is committed to simplifying the production process, through standardisation and an increase in subassembly activities, and to cutting hull erection time on berth from 18 to nine weeks (plus three weeks for finishing). It also envisages reducing the number of erection blocks from 330 to 130 blocks, with all parts to be painted before erection.

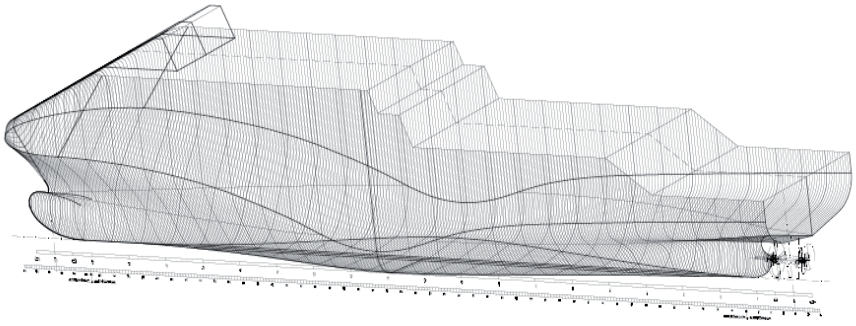
For the new design, extensive structural analysis (global and detail FE analysis) are being performed to evaluate structural feasibility and eliminate hard spots regarding stress concentration problems.

Sophisticated solutions

The arrangement of cargo space without pillars requires sophisticated structural solutions. Reducing the height of the deck structure is also a very demanding task, but can result in many benefits regarding general ship design, eg:

- Lower VCG (better stability)
- Reduced light ship weight (increased deadweight)
- Smaller gross tonnage

The challenge is to improve Rule structural design at the early stage of design (concept stage), to find optimal design solutions using IMPROVE tools, and continue the design process in the preliminary stage (where more detailed FEM calculations are performed) with the better starting point/design.



Body lines of 'New Ship'.

Regarding the general ship design the other targets are:

- Selection of resistance-friendly hullform
- Smaller propulsion engine for same speed
- Reduced fuel oil consumption
- Selection of hullform in order to reduce length of engineroom (increased length of cargo space)

The design methodology in the IMPROVE project defines three design levels as the project unfolds:

- STANDARD SHIP is the existing ship or yard prototype
- NEW SHIP, which has been designed during the first period of the project. The design has been realised mainly using existing methodology and includes improvements to the main dimensions, general arrangement, hydrodynamics, and propulsion
- IMPROVE PROJECT SHIP, which will be obtained from the Level 2 design using multi-criteria structural optimisation including the production and maintenance models

The main characteristics of the 'standard' ship are: length overall – 193m + 4m; breadth – 29.8m; draught design – 7.5m; trial speed – 24.5knots; cargo capacities – trailers 3000 lane metres + 300 cars; capacities: HFO – 1400m^3, DO – 250tonnnes, FW – 1200m^3, SW – 600m^3; passengers - 350 cabins + 200 aircraft seats; crew 200 persons. This design was developed in cooperation with Siemens Schottel and Sea Trade from Oslo. Such a ship is propelled by two pods behind two skegs.

The main dimensions of the second stage 'new ship' have already been defined, with optimisation achieved using TRIDENT/SEAKING software in order to obtain minimal main engine power and sufficient stability. A new application has been developed, which finds a best combination of main dimensions in order to achieve minimal resistance. After resistance calculation, it was decided that this 'level 2' ro-pax would have a fixed pitch propeller (FPP) as main, and active rudder as auxiliary propulsion. The auxiliary propeller is to be driven by a direct electric drive of 5000kW using bevel gears at the top and the bottom of the leg (inside circular torpedo body). Planetary gears for steering are driven by frequency-controlled electric motors.

Here, the original hullform was Uljanik's biggest PCTC, which was then transformed into the new (level 2) form. In comparison with the standard ship, the new design would need almost 7000kW less power, while the weight of machinery would be reduced by 450tonnes, fuel oil consumption would be 28% lower, and finally, the propulsion system is characterised as more reliable. The index of redundancy is 100% (two independent enginerooms, two engines, two independent propulsion systems).

The main characteristics of this level 2 ship are: length overall – abt 193m; length between perpendiculars – 180m; breadth – 29.8m; design draught – 7.5m; block coefficient – 0.53; trial speed – 24.5knots; main engine power – 14,940kW; active rudder output – 5000kW.

With 18 months of the project to run, the full 'stage 3 IMPROVE project ship' has yet to emerge, although it is already known that Uljanik anticipates a 500tonne reduction in steel content over the forerunning design,

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This conference, the 28th in RINA's successful Warship series, will look at 'Naval Submarines'. Submarines are among the most complex of engineering products, comparable in complexity with aerospace projects such as the space shuttle. To design, manufacture and support them in service requires a sophisticated industrial base and the willingness to incur the long term cost of ownership.

Submarines used by the world's major navies have evolved for 'blue water' warfare, in a period when cost was effectively secondary to capability. In this arena, the submarines themselves and their supporting industrial base are well developed, to the point where further change to their overall architecture is limited to incremental or evolutionary development.

This situation is now being challenged, both by the desire to reduce the cost of ownership and by a change of emphasis from 'blue water' to littoral warfare. Submarines are now required to accommodate roles which may change substantially during their service lives, and to undergo continuous updating while minimising the time spent in refit and hence unavailable for service. These changes affect the submarine throughout its lifecycle and the design not only of the submarine but the organisations involved with it.

Paper will cover all aspects of the design, construction and operation of Naval Submarines, including the following topics:

- Future Submarine requirements and their strategic context.
- Affordable, available and adaptive submarines.
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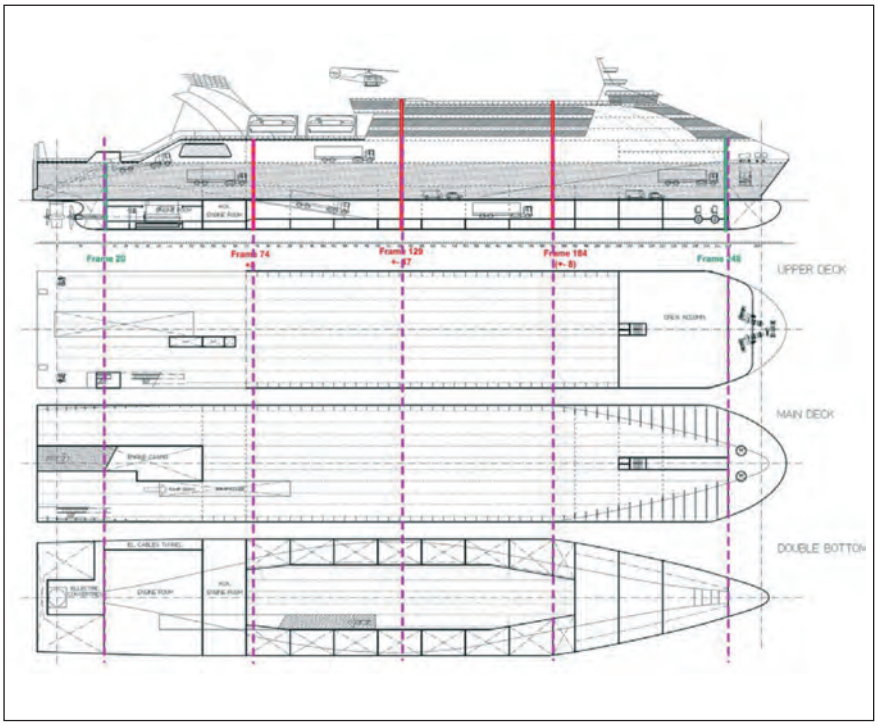

General arrangement plan with marked specific positions (characteristic sub-sections at Frs 74, 129, and 184) influencing ship zones 1-3.

and that the propulsion solution will feature a novel combination approach, using a single skeg and single pod configuration, working in combination with two-stroke engines.

The project is currently in the model integration phase (IMPROVE WP5), so the most important tasks and development of new products are forthcoming. The expected most important design goals are: 4% less lightship mass, 8% more lane metres on tank top, 9.5% less power requirement, 3.5% less machinery mass, 4.5% less fuel oil consumption, 5%-10% less cost of maintenance, 10%-15% more operational efficiency, 8% less production cost, and 11% less lead time. *NA*

Fire tests for ro-pax composites

Large-scale fire tests have been conducted focusing on alternative lightweight materials for ro-pax cabin and corridor construction. Tommy Hertzberg, Jesper Axelsson, and Magnus Arvidson, all of the Department of Fire Technology at SP Technical Research Institute of Sweden, report.

Interest is growing in the use of lightweight construction materials for shipbuilding. Combustible lightweight materials for shipbuilding, previously prohibited by the SOLAS requirement for 'steel or equivalent' construction material, are now permissible through the new (2002) Regulation 17 on 'Alternative design and arrangements'.

However, the (equivalent) safety level has to be demonstrated and the below described fire experiment involving combustible composites should be seen in this light.

Two Swedish research projects focused on lightweight shipbuilding - LASS (Lightweight construction applications at sea, www.lass.nu) and DIBS (Design basis for fires at sea) - jointly conducted large-scale fire tests recently. For this purpose, a two bed cabin and corridor 'ro-pax replicate', surrounded by a properly insulated FRP (Fibre Reinforced Plastic) composite superstructure, were built in the SP fire lab in Borås, Sweden.

All materials used (bedding materials, flooring materials, etc), except the composite, were materials one would expect to find on a standard ro-pax vessel. Furthermore, a realistic amount of luggage was placed in the cabin. Fire was initiated by igniting a small wooden crib placed in the lower, left hand side cabin bed (see Figure 1). The intensity and duration of the fire that developed when the cabin door was left open and the sprinkler was disconnected was somewhat surprising.

Composite conditions

The main idea of the project was to design experiments to resemble possible fires in a ro-pax cabin. The objectives were to study design fires, eg fire development and the influence of sprinklers, ventilation, etc, and to evaluate the behaviour of a composite structure under realistic fire conditions.

Figure 1: The cabin interior.

The test set up consisted of two B-15 passenger cabins connected to a corridor, built inside a fire insulated plastic composite superstructure. Each of the cabins had a window opening. An open deluge (drencher) sprinkler system was installed on the outside of the superstructure in order to evaluate fire protection of the composite 'hull'.

The outer construction consisted of a composite front with two window openings and one bulkhead at the right hand side, as viewed in Figure 2.

The composite 'decks' were situated above and below the two cabins and the corridor. All composite materials except the below deck were insulated using certified FRD 60 (Fire Restricting Division) insulation. A floating floor system was used on the bottom deck.

Four cabin fire experiments were conducted where either the (water mist) sprinkler system activated as expected, thereby efficiently controlling the fire, or where the door and window openings were sealed closed and the limited amount of oxygen made the fire self-extinguish. These tests will be described in detail in a forthcoming SP report. Discussed here are the experiments made with particular importance for the composite construction only: the flashover fire test and the tests where the drencher system on the outside of the superstructure was activated.

Flashover fire test

In the fifth fire test several simultaneous fault functions were simulated: the sprinkler system was disconnected and the door of the cabin was left open. However, the window was closed and mounted with fireproof glass. This resulted in a very intense flashover fire, a 2MW-3MW fire that lasted 35-40 minutes in the cabin ignited. The other cabin was closed and not furnished.

The fire involved all combustible interior materials and the floor covering inside the cabin (denoted 'Cabin A') and the corridor. After the fire, it was observed that all cabin panels were more or less deformed and that two ceiling panels had fallen to the floor. The cabin's aluminium floor plates had melted over a large area and were completely consumed in an area between the bunk beds. The underlying floating floor insulation and part of the composite deck were also severely damaged in a limited area.

The fire insulation under the upper deck and on the bulkheads was almost unaffected, except for a small spot centred approximately below the cabin, where the insulation seemed to be

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Preferred for innovation

Figure 2: The composite construction. Note the drencher system installation on the outside, above the window openings. The front is relatively high in order to provide surface area for outside flame spread.

Figure 3: A representative photo that gives an indication of the intensity of the fire. Note the separation of wall elements in the cabin.

Figure 4: Fire spread on the outer wall from the pool fire without drencher activation.

Figure 5: The wall a few seconds (5-10 seconds) after the drencher was activated.

eroded. It was also observed that the exposed surface of the insulation had hardened in an area that corresponded to the inner footprint of Cabin A, which indicates very high temperatures.

In order to test the exterior drencher system, a heptane pool fire was arranged at the window opening of Cabin B to simulate a flashover fire spilling out of the window (Figure 5). In the first test, the drencher was activated just after the fire was ignited and in the second test, fire spread was allowed on the outer surface before the drencher was activated. It was found that without a drencher, flame spread was quite rapid on the outer surface but the drencher efficiently prevented fire spread and also very quickly extinguished an initiated surface fire.

Investigation needed

The original plan was to finalise the test programme with a very intense flashover fire using a heptane pool as fire source. The reason was that it was not believed that a standard fire would provide sufficient energy to really challenge the construction materials and, in particular, the composite construction. However, it was found that the flashover fire in the fifth experiment, using only standard interior cabin materials and realistic luggage, was indeed entirely enough to provide a very intense and long-lasting fire. Actually, the result was such that one conclusion from the experiment must be that a more thorough investigation should be undertaken in order to

perhaps reconsider the IMO regulations on the allowed amount of combustible material in a ro-pax cabin section.

From the composite construction viewpoint it was found that, although the flashover fire had long duration and high intensity, the maximum temperature obtained in the composite core in the deck just above the fire cabin reached just 140°C. This was enough for a de-lamination to occur but the limited area involved could probably quite easily have been repaired after the fire.

However, an A0 steel deck construction made in accordance with SOLAS prescriptive regulations would most likely have been severely damaged and the probability of fire spread through the deck due to the temperatures involved would have been very high. Important to note from the test is that the maximum temperature in the composite was attained approximately 90 minutes after the fire started, which was actually some time after the fire had burnt out. If cooling of the construction had been initiated when the fire ended, material temperatures and damage of the composite material would have been less.

The fire protection given by the floating floor in the cabin was insufficient, which led to damages in the composite deck below. The 20mm thick mineral wool layer used was covered with an aluminium plates that had partially melted, which means that the floor had reached a least 660°C.

After the fire

Conclusions from the described experiments are:

1. It is possible to obtain a high degree of fire safety in a composite construction using appropriate insulating materials
2. A drencher is an efficient means to control fire spread on the outside on a composite surface
3. A ro-pax cabin-corridor fire using IMO-accepted interior materials can be very intense and quick developing if the sprinkler system fails to operate properly
4. It is very important for a high degree of fire safety that the installed sprinkler/water mist systems functions properly and that air entrance to enclosures such as a cabin is inhibited, ie that doors are kept closed

Acknowledgements

Fire tests on this scale are rarely made due to high costs and they were possible only due to sponsorship by VINNOVA, the Swedish Governmental Agency for Innovation Systems (LASS and DIBS support), STENA Rederi AB, Kockums AB, DIAB AB, Callenberg Fläkt Marine AB, Ultra Fog AB, Thermal Ceramics Europe, Consilium Fire & Gas AB, Isolamin AB, Hellbergs International AB, ScanMarine AB, and TYCO Building Services Products (Sweden).

Also involved in the project was a DNV-led subgroup of the EU project SAFEDOR, that also included the two Norwegian companies Brødrene Aa AS and Fireco AS. The assistance of DNV-SAFEDOR and other project partners is greatly acknowledged. *NA*

Car deck drainage procedures required

Safety concerns persist over car deck drainage in the ro-ro sector, writes Rolf C Imstøl*, Bergen University College, Norway, while doors at the bulkhead deck should not be used for supplementary drainage.

The *Al Salam Boccaccio 98* disaster, where 1069 passengers and crew lost their lives in February 2006, highlighted the drainage problems of ro-ro ferries and a number of modifications of SOLAS are now being discussed by IMO in order to improve the situation. The disaster furthermore indicated that pilot-doors were considered as useable for drainage at a time of peril [1]. (The sources studied merely state that such use was discussed by ship command. Whether or not any such doors were open, at time of disaster, is unknown.)

The rear ramp of the *Estonia*-wreck was found slightly ajar, and drainage by doors at the bulkhead deck was indeed discussed some 10 years ago. The problem was raised again last summer when a scenario, suggesting the pilot door of *Estonia* might have been used for drainage, was presented at the 9th International Ship Stability Workshop in Hamburg.

In fact, the *Al Salam Boccaccio 98* disaster was to an extent foreseen by Danish authorities who addressed IMO on the subject in 2005 [2]. The background for the Danish concern was an incident where a Danish ro-ro vessel nearly capsized due to the presence of a plastic bag during a routine sprinkler test.

While naval architects may consider ro-ro ship designs to be perfectly in accordance with some kind of rule or regulation, this may be considered awkward by others. Officers of the merchant navy may, in particular, be entitled to have other expectations since the rules of the road, which they have to learn by heart, are not open to any folly regarding safety at sea. 'In construing and complying with these Rules due regard shall be had at all dangers of navigation and collision and to any other special circumstances….'[3].

Al Salam Boccaccio 98. Some 1069 passengers and crew lost their lives in February 2006, highlighting the drainage problems of ro-ro ferries.

Throughout the previously mentioned Danish routine sprinkler test, the ship in question was presumably located in calm waters undisturbed by waves. When a ship is actuated by waves, the trapped water is likely to distribute itself over a huge deck area as long as the ship's behaviour is governed by the ship's natural roll frequency. After some time, however, the ship may be expected to become thoroughly unstable while the list continues to be zero. Sooner or later the Free Surface Moment (FSM) will overwhelm the wave excitement. The ship is then likely to roll heavily, by the natural frequency of the FSM, for some periods until it finds its new equilibrium, at one side or the other. Thereafter the ship must be expected to roll by its natural frequency with some list. Such behaviour of a ship in peril may cause panic and it should consequently be avoided.

At present, with scuppers only along the ship's sides, the best operational option might be to force the ship to heel when the sprinkler system is started. Such handling should of course be analysed in advance, since it is important that the officers have proper knowledge. Pre-prepared procedures are furthermore likely to improve the ship command's authority, if it is forced to initiate actions that might cause alarm, at time of peril.

The prevailing controversy regarding the *Estonia* disaster seems to be due to the fact that the official scenario (*Estonia* scooped water by way of an open bow ramp) seems physically insupportable. She would, according to known simulations of such scenarios, not sink but capsize and remain afloat buoyed up by the trapped air. A new scenario, suggesting that a pilot-door was opened to drain water from the car deck, was presented last summer. The

* Rolf C Imstøl is a master of nautical science and a former merchant officer. He presently holds the position of head of the marine technical department at Bergen University College. He furthermore acts as a nautical and marine technical consultant for solicitors representing many bereaved in the *Al Salam Boccaccio 98* as well as the *Rocknes* cases. He has previously published a set of papers regarding ship disasters where ship stability has been of main concern [7].

scenario fits well with various well known factual analyses, presented by critics of the official scenario. Due to recent erudition the scenario has later been modified and republished February 2008 [4].

The suggestion to open the pilot door of *Al Salam Boccaccio 98*, if the scuppers did not drain satisfactorily, was brought forth by a Scandinavian naval architect, a long term consultant of the owners [5]. Dismissing the suggestion as a panicky initiative by the ship's command at time of peril is consequently out of the question. Furthermore, from the *Estonia* case we know that the rear ramp of the wreck was slightly open. The experts assisting the shipyard suggest this might have been a measure to drain water from the car deck. Whether or not such acts are an unspoken art of the trade is unknown. However, other means should be available and this one omitted!

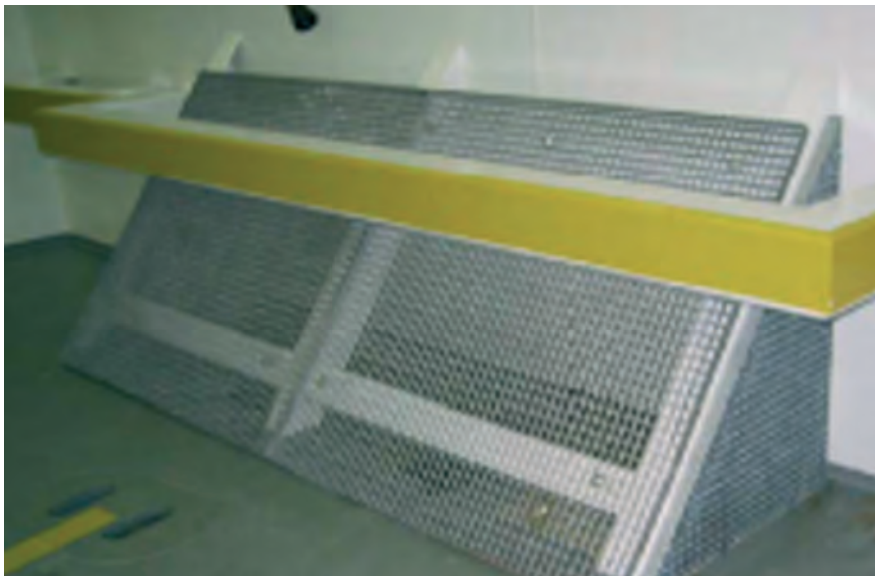

Figure 1. Possible scupper grating (2).

Though drainage by pilot doors may reduce heel, it certainly has a destructive effect on the GZ-arm. Furthermore, it seems far from obvious that drainage by such doors might exceed the pulsating inflow by waves if the ship, at time of peril, is turned in bad weather and the open pilot-door faces the weather. Note: Both *Al Salam Boccaccio 98* and *Estonia* were turned in severe but not extreme weather.

The freeboards of these ships were alarmingly low and this explains the dramatic loss of the righting arm. For *Al Salam Boccaccio 98*, the bulkhead deck would in fact be submerged at mere 7° of list [6]. This is why Egypt has recommended that the drainage of the car decks of these ships should be fitted with pumps.

The perils of the low freeboards of these ships were particularly highlighted by Professor Vassalos at the 9th International Ship Stability Workshop last summer when he strongly warned against the 2009 SOLAS regulations now being discussed. The general survivability of these ships was also strongly criticised by various scholars at the Passenger Ships Conference in London last year. Seemingly they considered that close to zero-tolerance should be adopted for all likely damage scenarios entailing huge loss of life.

Proposed regulations

The Scandinavian proposal to IMO will, if brought into effect, guarantee proper drainage in port [2]. It is, however, not obvious that the proposed regulations will prevent unacceptable accumulation of water at sea, in as much as the proposal seems to consider static heel, rather than roll. Modern simulators, like the ones now being used for the *Estonia* analyses, should be able to simulate the dynamics of the drainage systems fairly well. The use of time-domain simulations of various distress scenarios may consequently be analysed and precautionary measures may be taken. Use of such simulations might as well improve the deterministic/probabilistic proposals now being analysed by IMO regarding drainage as well as damage stability.

The existing rule merely states: 'In view of the serious loss of stability which could arise due to large quantities of water accumulating on the deck or decks consequent on the operation of the fixed pressure water-spraying system, scuppers shall be fitted so as to ensure that such water is rapidly discharged directly overboard'.

Common to all of the proposals now being analysed by IMO are that they describe deterministic measures to mend the way this functional rule has been put to use. Although new regulations should be expected to improve the situation, it is not altogether obvious that they will maintain the obligation to design prudently.

Taking into account the unwritten grandfather rule of IMO, that alterations should generally not be expected on existing ships, rapid improvement may not be taken for granted. Nevertheless:

- The scupper systems of ro-ro vessels should be scrupulously analysed
- Drainage procedures for ro-ro vessels should be drawn up
- Use of doors at bulkhead deck for drainage should be avoided
- Dynamic simulations should be carried out to analyse whether these ships will function as intended, at time of peril, or not *NA*

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WWL drives orderbook onwards

Four ro-ro carriers to be delivered by Mitsubishi Heavy Industries' Nagasaki yard to Wilh. Wilhelmsen ASA (WW) and Wallenius Lines (OW) in 2011 and 2012 are claimed to be the largest ships of their type.

Four new ro-ro carriers commissioned for WW and OW joint venture Wallenius Wilhelmsen Logistics will have a cargo volume of 138,000m^3, almost 10% greater than the most recent such carriers used by the owners.

The ships have been designed for efficient transportation and the handling of high and heavy cargo (H&H), non-containerised cargo (NCC), and cars.

Several major, innovative design-criteria mark the vessels out as unique in their class including high ramp capacity, deck strength and height, low fuel-consumption, good transportation economy, and safe cargo handling, according to WWL.

A special focus has been put on environmental considerations, with particular attention paid to hull-line development in order to reduce fuel-oil consumption and exhaust-gas emissions.

The ships will also benefit from a new generation Kawasaki MAN B&W 7L70ME-C8 main engine from MAN Diesel's electronically-controlled diesel range.

The engine is designed to reduce operating costs and emissions, and delivers 22,890kW at 108rev/min with an MEP of 20bar.

Exhaust-gas energy will also be recovered to generate all electrical power requirements at sea. Additionally, a 1100kW frequency-converted PTO has been chosen as power supplement for parallel operation with the turbo generator (max output 1200kW). This is for use in situations where the sea-load demands more power than can be met by the turbo generator alone. This enables optimal usage of the main engine's power capacity and increases its overall efficiency, while simultaneously reducing CO_2, NOx, SOx, and FOC emissions.

The orderbook for the group of companies now comprises some 45 vessels to be delivered through 2012, after the two owners said in March that they had also agreed to build eight new Large Car and Truck Carriers (LCTCs), with Hyundai Heavy Industries and Daewoo Shipbuilding & Marine Engineering to construct four apiece.

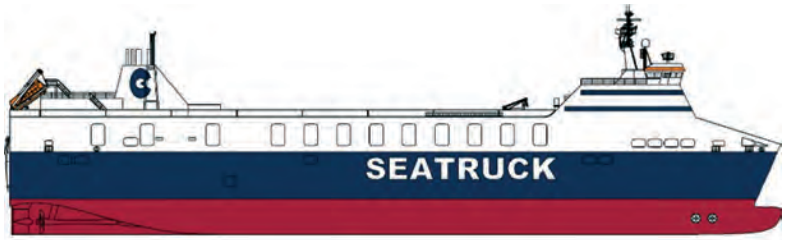
The vessels will be 228m long and have a car carrying capacity of 8000 units. *NA*

Wilh. Wilhelmsen and Wallenius Lines have taken their on-order requirement to 45 ships, after contracting eight new LCTCs in March. They will all resemble *Faust*.

Four-deck specials for Seatruck

Irish Sea freight-only specialist Seatruck Ferries has placed an order for four new generation ro-ro vessels with German shipbuilder FSG (Flensburger Schiffbau Gesellschaft).

The vessels have what is said to be a groundbreaking four-deck configuration. The design provides 151 (13.6m) trailer spaces in a length of just 142m, with breadth given as 25m. The new ships will also be fast for their size, with a service speed of 21knots.



New four-deck ro-ro ship design for Seatruck Ferries.

The ships are due delivery between November 2011 and June 2012. Their design draught has been limited to 5.2m, in order to offer operational flexibility.

This design provides for the four decks to be connected by fixed ramps, with a single stern door. The newbuildings will be powered by two 8000kW main engines. They will have two 1000kW bow thrusters and high lift rudders will enhance manoeuvrability in confined areas.

The order doubles Seatruck's newbuilding programme to eight ships. During 2008, Clipper subsidiary Seatruck will take delivery of the first four 120 unit vessels, all from the Spanish builder Astilleros de Huelva. The first, *Clipper Point*, joined the fleet in March.

Höegh expands in more ways than one

Newbuilding is underway on Vietnam's first pure car and truck carriers, while owner Höegh also has an ambitious lengthening programme for existing ships.

Steel cutting began on 26 February at Vietnam's Nam Trieu Shipbuilding Industry on the first of four 'Horizon' class pure car and truck carriers, marking the beginning of a new chapter in Vietnamese shipbuilding.

The Höegh Autoliner ships were ordered through yard parent Vinashin in a US$536 million deal in 2006, which also had options for four more PCTCs attached. The ships will be capable of carrying 6900 cars and sail at a speed of 20.5knots, and will be built under the supervision of Norway's DNV and a specially-assembled seven to eight-strong site and project management team from the shipowner itself.

Each of the vessels will be 199.9m long and 32.26m high, with the first vessel scheduled for completion by December 2009 and the last of the initial four due in the first half of 2011. The Nam Trieu yard has signed a contract covering detailed and production design for the vessels with Finnish company DeltaMarin (see *The Naval Architect*, January 2008, pp29-31).

The design includes an aerodynamically shaped bow section to reduce wind resistance as well as an optimised hull design verified by comprehensive series of model tests to provide reduced energy consumption.

The 'hinged design' has been chosen for the hull structure in the upper decks to enable maximum freedom for location of ramp ways and minimum traffic obstructions as well as increased utilisation of deck area. Frame spacing and web spacing has been adjusted to take the corresponding loads. The double bottom will consist of a horizontal divided compartment, where there will be water ballast tanks in the bottom and fuel oil tanks on the top.

For the moment, the build plan envisages construction at Nam Trieu's existing slipway, although the yard's plans to build a new drydock may enter the equation should the option for four more ships be taken up.

A spokesman for Höegh Autoliner said that, with the exception of steel itself, the shipowner was undertaking all procurement on behalf of Vinashin, also characterising the construction as 'involving much more pre-outfitting than Vinashin is used to'.

The ships will include low-speed MAN B&W 7S60 ME-C mark 8 diesel engines and a controllable pitch propeller.

Cargo access equipment will be to TTS designs, with Vinashin undertaking production, but all essential equipment coming from TTS.

Höegh is also boosting its capacity through efforts elsewhere in Vietnam, following last September's deal to elongate 10 existing car carriers at Hyundai Mipo Dockyards' satellite yard Hyundai Vinashin Shipyard, and an agreement with Daewoo Shipbuilding and Marine Engineering that it would lengthen two more ships currently under construction.

The 'jumboising' projects will see each of the 200m long 10 ships cut in two amidships, with sections floated apart before a new 28m-long, 12-deck section inserted. The whole operation will take less than two months per ship to complete.

With a steep increase in cargo volumes in its Asian trades, the carrier needs larger vessels fast. Lengthening the vessels will have only a minor effect on vessel performance, with speeds slowed from 20.5knots to 18.5knots, but the impact on capacity will be significant. The car deck area will be increased from 54,000m^2 to 67,000m^2, boosting capacity from 6100 cars to 7600 units.

All the vessels will be elongated before the end of 2009. *NA*

Opportunities in the East

Latest significant Chinese ro-ro contract for Italian cargo access equipment supplier Navalimpianti.

Due delivery before the end of 2008, the Shandong Huangai Ship Building Co-built ro-ro ferries *Bohai Zhenzhu* and *Bohai Yinzhu* will feature a raft of cargo access equipment from Navalimpianti Tecnimpianti.

Destined for shipowner Shandong Bohai Ferry Co, these 2000 lane metre and 1500 seater ships will include an axial stern door hinged to the stern at main deck for loading/unloading trailers, cars etc; it will be of standard Navalimpianti open girder design with longitudinal reinforced beams and common transversal girders, single leaf with hinged flaps. The manoeuvring of the ramp will be by means of two hydraulic cylinders located at the sides of the structure and the cleating devices, which will be hydraulically operated and have been designed to retain the ramps safely in the closed condition. The control stand will be of electrical type.

The contract also calls for the supply of stern inner doors (watertight top hinged), bow visors, main bow ramps, and watertight bow inner doors.

More business for Navalimpianti through Chinese shipbuilder Shandong Huangai.

Also included will be a tiltable ramp from the upper deck to maindeck and vice-versa, and elevator connecting first (tank top) and third main decks, an internal watertight cover at the main deck over the elevator, and hydraulic power units. *NA*

Biggest PCTC service for TTS

TTS has begun work under the terms of a contract with ship management firm Höegh Fleet Services to provide maintenance for 29 vessels. The deal is believed to be the biggest ever service contract for pure car/truck carrier (PCTC) ro-ro equipment.

The contract follows TTS' successful design and supply of cargo access equipment for a series of PCTCs built for Höegh by Hyundai Heavy Industries, Gdynia Shipyard, Daewoo, and Uljanik. Other ships are currently on order from Vinashin in Vietnam.

The service contract includes inspections, operational tests, hydraulic condition tests, steel structure survey, and spare part stock agreement. The contract also features deck machinery, ideal for TTS, which boasts one of the world-leading deck machinery makers, TTS Kocks in Bremen, Germany. TTS Kocks also has factories in South Korea and China.

MacGregor secures more contracts

Series orders for the cargo access specialist show no sign of slowing down.

MacGregor's ro-ro division has signed a new contract with Aker Yards for delivery of cargo access equipment to the world's largest ro-pax ferries. Gothenburg-based Stena Rederi AB has ordered two 62,000gt ships, which will be built in Germany by Aker MTW, and there is an option for two additional vessels. MacGregor's order includes design, fabrication, and installation of 800tonnes of ro-ro equipment and is one of the biggest single contracts taken by the ro-ro division.

The 240m-long, 32m-wide ships will be delivered in 2010. Each will accommodate vehicle space comprising 5500m of trailer lanes and 700m of car lanes, and passenger capacity will be 1200.

Meanwhile, four new pure car and truck carriers being built at Kyokuyo Shipyard Corp, Japan, for Norwegian owner Gram will be fitted with MacGregor equipment. The equipment comprises a stern ramp, a quarter ramp, two ramp covers, three internal ramps, and 10 hoistable car deck panels. All the internal equipment will be operated fully by electric drive, which is an environmentally-friendly solution for operation and also avoids oil leakage and damage to cargo. The vessels will be delivered in 2009 and onwards.

This order follows hard on the heels of deals secured in January, when the company won contracts to equip 12 more PCTCs in China and South Korea, totalling over €20 million. Eight of the PCTCs are to be built at Xiamen Shipbuilding Industry in China, six for Maersk and two for Lauterjung. The other four ships will be built at Hyundai Heavy Industries, Korea, for EUKOR. *NA*

New solution for hull surface modelling

An innovative patchwise surface generation tool allows advanced hulls to be modelled with speed and ease, according to its developer.

GRC Ltd has been developing what it says is a powerful new tool for the creation of high quality surfaces and hullforms. Paramarine is an integrated product for naval architecture design and analysis, and is reckoned to be the only product that deals specifically with surface ship and submarine design in an integrated fashion through a single user interface.

Paramarine capabilities include early stage design, hullform generation, design for production, stability and hydrostatics, damage stability, structural definition, ultimate strength, radar cross section, blast and fragmentation, powering and endurance, manoeuvring, and sea-keeping.

The development of the advanced hull generation capability is regarded as a key component of the early stage design process and needs to provide a rapid, intuitive, and parametric capability, such that multiple hullform concepts can be designed, assessed, and optimised within the software.

Designers need a tool that provides the maximum amount of control over the surface generation coupled with a high quality output, as the surfaces and corresponding solids will be used for the various analyses available within Paramarine.

There is, thus a clear need to enable hulls or other complex surface shapes, such as curved superstructures and submarine casings, to be defined rapidly, and then parametrically altered if necessary without having to be completely re-worked. That means an intuitive user interface, allowing easy control over the definition of the curves.

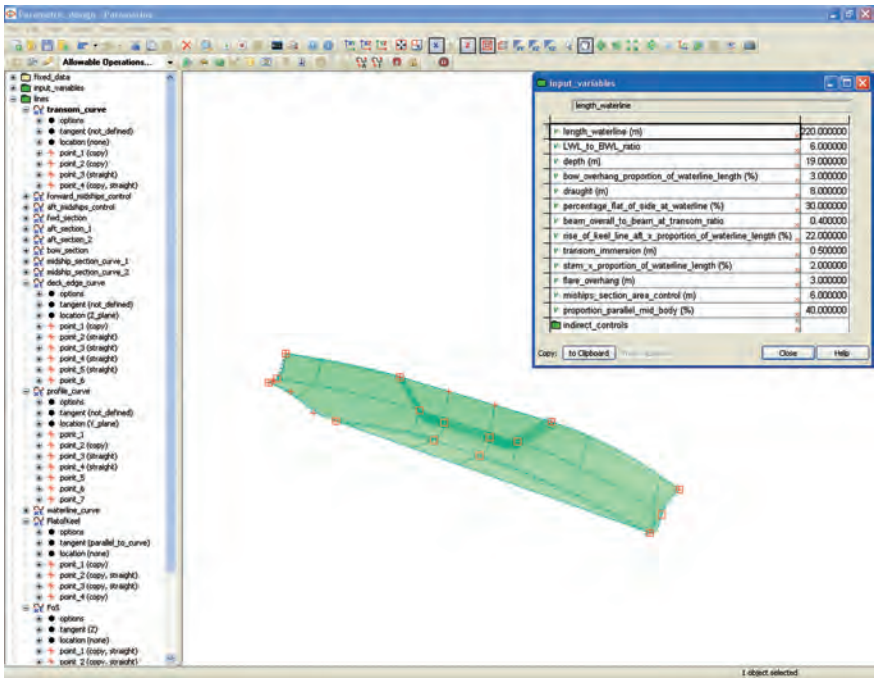


Figure 1: Exemplary parametric Hull Generator surface.

The Hull Generator

The solution developed by GRC to satisfy these requirements is known as Hull Generator, which will be presented first at this year's CompIT symposium in Liege (Belgium) at the end of April. The tool will be available in the next release of Paramarine due in the early summer.

Hull Generator incorporates functionality known as 'X-Topology' which refers to the process of forming a topological network from the curves supplied and using this topology for infer-boundary conditions at the edges of the surface patches formed for the multi-patch hull.

From the earliest stages of development, users' views on the proposed functionality have been sought, paying particular attention to UK shipbuilders and other naval architecture consultants. Naturally, not all users require the same things in a hull generation system, but what became clear during this process was that users need to define the hull in terms of 2D and 3D curves representing particular hull features, for example, flat of side, flat of keel, waterline, and knuckle lines. Secondary curves can then be developed (mainly in 2D) to give key section lines, buttock lines, and waterlines.

Further key user requirements were identified from workshops and discussions with users: ease of use, speed of use, flexibility, audit trail, diagnostics, ability to import images such as bitmaps for rapid development of curves, and compatibility with external software. Users then expect the hull generation system to calculate the shapes of the 3D surface patches formed in between the curves, with slope and curvature continuity where expected. This is a very tall order for a patchwise hull generation system but one which Hull Generator has achieved.

The user defines curves from a high-level perspective. Strategic points are placed and the corresponding features of the curve are described in terms familiar to the user. The user does not need to be an expert in NURBS mathematics and is free to concentrate on what hull shape and features are required, rather than how it should be achieved in the software.

The example in Figure 1 shows the graphical display of the port side of a hull designed in Hull Generator. The user, generally, will firstly define the edges of the surface he/she is trying to create: in this case the deck edge, the profile, and transom curve define the boundaries of the surface. The user inserts these curves graphically and defines the way they are connected together by snapping points together or by snapping points along

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another curve (beads). Once the boundaries are defined the user is free to add further detail by inserting curves where more definition is required. In Figure 1 the flat of keel curve and the flat of side curve can be seen. The user is allowed maximum flexibility by inserting as many curves as necessary to define all the major features of the hull required.

Paramarine's native parametric capability then further enhances the tool allowing the designer to connect the definition of curves to parameters in the design. Once the definition is complete, the user can easily modify the features of the hull simply by typing new values for the parameters, and allowing the curves and surfaces to regenerate.

The flexibility of the system allows complex shapes to be represented and linked to the naval architecture analysis tools available very quickly. In Figure 2 the reproduction of the Earthrace hull is shown, together with the curves used to define it. It can be seen that, although the Earthrace hull is very advanced in its features, a small number of curves are able to represent its shape accurately and produce a faithful solid model.

Figure 2: Earthrace, complete solid hull.

Tools have also been added for ease of use and speed, such as controllable grids in three axes for snapping, the ability to lock curves and points together in the graphics pane, and the ability to import images as background reference data from which curves can be generated.

The power of the tool and the methods behind it are said to be clear, because a complex hull can be created in a matter of hours or days (clearly depending on complexity) with a high degree of accuracy. Creating a full parametric model takes a little longer but gives the ability to try different propulsion options, different hullform parameters, assess the effect on structure, sea-keeping etc with an easily variable geometry but one that maintains its accuracy and controllability. *NA*

Sener tools up for Intership

The vast Intership Project has allowed software supplier Sener to contribute to the development of safer, cost-effective, and environmentally-friendly ships. Clare Nicholls reports.

The results of the Intership Project, which aims to improve the competitiveness of European cruise and ferry shipbuilders, were presented to the European Commission at sessions taking place in Delft, Holland, in December 2007. The programme was coordinated by Aker Yards and divided into seven sub-projects. The rest of the seven shipyards involved comprised Aker's Chantiers de L'Atlantique facility, Fincantieri, Meyer Werft, Navantia, Estaleiros Navais de Viana do Castelo, and Flensburger Schiffbau-Gesellschaft mbH & Co.

Presentations were given for seven sub-projects, and six discussion tables were arranged to show and debate the results. Software developer Sener took part in one of these tables, carrying out presentations of the new Ship Spaces Management Tool, which was the result of sub-project I-4, Early Design Methods and Tools, a module which was led by Navantia.

Sener has played a significant role within the project, also being one of the main technology providers of sub-project I-2, Collaborative Working Environment Tools and Implementation, spearheaded by Fincantieri, and sub-project V, entitled Modularisation, led by Aker Yards.

Sener and Navantia at the Intership Project presentation in Delft, Holland.

Serving project I-2

During I-2, Sener developed a CAD/PLM integration server prototype (CAD Integration Server-CIS), which integrates the services-oriented architecture with surrounding PML by means of web services, using the HTTP SOAP protocol. The prototype allows basic document management functionality, for which a specified series of generic web services have been developed, such as the types and classes of documents definition, document creation and search, check-in, check-out, and document version creation.

To check the system's viability, Sener demonstrated integrating documentary management of the FORAN CAD/CAM program with ERP, plus PLM systems, SAP, and Windchill, with satisfactory results. To facilitate integration with other systems, this tool allows the import of ship forms in STEP AP216 and IGES formats, as well as exporting components in STEP AP215.

Defining ship spaces

As part of sub-project I-4, Sener created a the Ship Spaces Management Tool (SSMT), focusing on the definition of 3D ship spaces, and incorporating features developed to facilitate the compartments of ships among the initial phases of the design. Storing the modelling of ship spaces in a relational database now allows multiple users to access the model.

Spaces definition can be carried out, beginning with existing surfaces, hull decks, and bulkheads of a ship. The definition can be made either on an individual basis (defining each space limit), by subdivision, or using parametric zones.

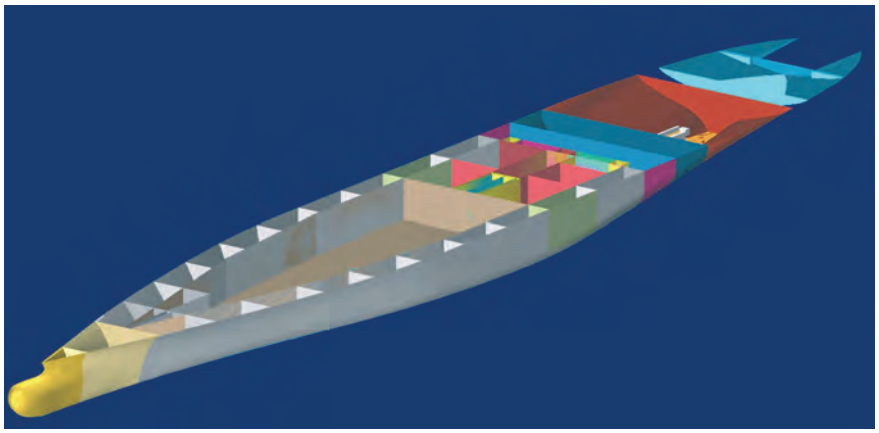
In addition, the tool can automatically subdivide the existing ship zones, starting in the bulkheads and existing decks. These spaces are generated geometrically as solid and limited by trimmed NURBS surfaces.

SSMT lays out advanced model and 3D visualisation functions that facilitate ship compartment definitions. Compartments can be grouped hierarchically by means of trees with different characteristics (evacuation zones, accommodation area), and it is also possible to define user-configurable general attributes to assign different characteristics to the compartments.

The new tool contains an integrated development environment that allows access to compartment trees, including spaces characteristics and attributes either for report generation or the development of specific functions for compartment design tests that meet international regulations. The system can remove spaces from the initial design phase through macros and parametric objects.

Modularisation tools

Sub-project V enabled Sener to develop a series of specific tools to facilitate the use and definition of modules during initial ship design stages. The aim of the first stage of the subproject was a conceptual study to define module specification in a CAD/CAM system, and in particular in FORAN. During the second stage, the results were applied to an engineroom.



A visualisation of a ship space using the Ship Spaces Management Tool.

For the practical application of modularisation some parametric adjustments and configurations could be required, but the design criteria and the methodology must be applied during the initial stages of the conceptual design, using advanced tools to simulate the product and process.

The FORAN approach for the general and specific module concept utilises the standard module and a unit of a module respectively, and incorporates new applications for a simplified or parametric geometric representation of attributes and connections. It can also be stored in configurable libraries.

The access to the standard module is available from two different points: simplified geometry and detail 3D geometry. Simplified geometry includes a 3D module representation, allowing certain parametric applications and the evaluation of different design alternatives and their interfaces, depending on surrounding spaces. This approach is suitable for the initial design stages and has already been implemented in FORAN.

Detail 3D geometry is for developing detail design and should take advantage of the serial effect when the design solution becomes generic. Finally, the simplification and coordination between disciplines, and in particular between structure and outfitting, is a clear consequence of modularisation in CAD/CAM systems. *NA*

AVEVA pushes forward

New contracts and a product launch see AVEVA starting 2008 on a firm footing.

South Korean shipbuilder C& Heavy Industries is the latest company to purchase the AVEVA Marine solutions software package, signing a multi-million US dollar agreement with AVEVA in March. C& Heavy Industries is part of the C& Group, based in Mokpo City.

The company will be using AVEVA Marine solutions to build a series of 81,000dwt Panamax bulk carriers and will gradually introduce the software for further ship designs after 2010. The yard currently has the capacity to build 18 ships a year, a figure which will rise to 24 after 2010. It was recently awarded a contract to build six bulk carriers worth US$550 million from two shipping companies based in Asia and Europe.

Elsewhere, AVEVA will also be providing its marine package for the Institute of Technical Education (ITE), Singapore, for use in Higher National ITE Certificate engineering courses. This will be the second AVEVA suite to be incorporated into ITE's curriculum, where AVEVA PDMS has been a feature since 2000.

ITE's students will be offered hands-on experience using the software. In their fourth semester, they will get the opportunity to put their skills into practice during a three-month industrial placement at shipyards which use the same program.

As well as winning new business, AVEVA is developing new products, with the latest release being AVEVA Review 6.4 - the current version of the 3D visualisation tool used with large complex plant and marine models.

Taking data from 3D plant design systems, the program delivers a realistic representation of the model to a wide range of project personnel, providing the ability to share, inspect the design, and communicate details to everyone involved in design, installation, operations, and maintenance.

Features include: enhanced support for laser scanned models, now with the same functionality as the AVEVA Laser Model Interface; enhanced user features such as easier definition and manipulation of clipping volumes and section planes; and an improved user interface that is reckoned to provide quicker and simpler navigation, selection, and modification.

When there is a requirement to communicate ideas or undertake project reviews, particularly across multiple remote sites, the software provides a visual collaboration link for use through all stages of the plant lifecycle, whilst using standard enterprise communications.

AVEVA ReviewShare is bundled with the version 6.4 release at no extra cost to enhance collaboration across all project stakeholders. The tool has been developed to support collaborative 3D design review across teams, sites, regions, and even continents.

It uses AVEVA's 3D streaming technology, combining the 3D visualisation of AVEVA Review with intuitive comment and mark-up tools, to create compact and distributable 3D collaboration documents. Fully integrated with Review, it allows each reviewer to add his or her own individually auditable comments, incorporating text, 2D screenshots, and 3D views, and share them with other reviewers, even over low-bandwidth connections. *NA*

Updates adding value

The most recent clutch of technical package revisions see existing CAD/CAM products pushing the boundaries of the possible, writes Clare Nicholls.

Extending software features is useful to both users and manufacturers of programs, as adding to an existing platform retains familiarity of operation, yet the updates can still reflect current requirements.

CCE, for example, has announced the release of the updated EnSuite Version 2, its multi-CAD viewing, translation, and productivity software. This release provides a wide range of new features, including the ability to view two models superimposed on top of each other, with the differences highlighted.

Isolation of a part from a complex assembly is enabled by making the rest of the assembly transparent, a feature which has many uses, such as allowing purchasing staff to identify and view the part they are currently discussing with a supplier quickly.

Another new capability permits users to search for features based on parameter values. Users can enter a value or range of values for the dimensions of fillets, chamfers, or holes. For example, with holes, users can enter the diameter, draught angle, depth, or any combination of these features, and also specify whether the hole is blind or through. The software will immediately highlight all of the features in the part that match the search criteria.

A new functionality allows users to compare parts in Version 2, making it possible to identify the differences between any two models easily. This function can be used in many situations, such as when comparing a first article submitted by a vendor to the original design intent. Users can control the way the differences between the models are highlighted, utilising different colours or different levels of transparency. The feature can also be used during the design process to track the way the design has evolved.

Other new features include the ability to measure geometric dimensions of lines, circles, edges, and angles, as well as the capacity to cut cross-sections and check properties such as perimeter, area, and volume. Stepped holes that have been counter-bored or counter-sunk can also easily be measured.

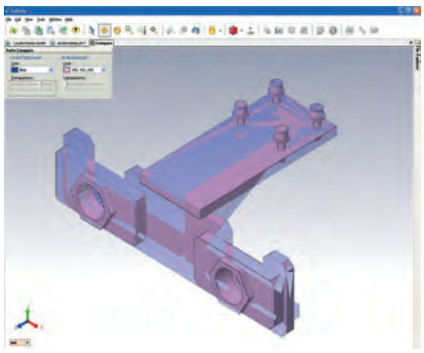


Image from CCE's updated EnSuite Version 2 software.

Autoship hull design

Competition between hull design programs is fierce, with Autoship Systems releasing two new features this year for its flagship software Autoship Pro. The revisions are claimed to make ship hull design almost effortless.

When combined with Autostructure, the structural design program in the Autoship suite, and utilising Autostructure's regenerating capabilities, time savings can be realised.

One of the new features is called Targeted Variation. This tool allows for making small, automated adjustments in hull shape, based on simple input. Given target values for certain parameters, it attempts to modify the hull to achieve these targets by shifting control points (the governing entities for the hull shape) parallel to the longitudinal axis.

'Piecewise Linear Scaling' is the other new facility, allowing the designer to transform the hull shape by longitudinal and transverse scaling, which varies with location. This tool calculates complex, iterated non-linear longitudinal shifts to arrive at target values.

Autoship's suite of programs are interconnected; for instance, the hull modeller, Autoship, feeds directly into the hydrostatic calculator, Autohydro, for detailed hydrostatic analysis, and Autoplate, which is used for shell plate expansion, builds on and augments the Autoship model.

Maxsurf to the max

Another hull design application, Maxsurf, also recently had new features added, with its version 13 release. Software manufacturer Formsys has included some novel techniques in the program for fitting surfaces to the existing hull offsets in a way which makes it fast and easy to analyse existing designs.

The new approach utilises a 3D surface called a TriMesh, which is made up of a network of small triangles. It facilitates the analysis of vessels for which offsets or lines data exists but where no NURB surface model is available. The advantage of this approach is that, unlike the complexities of NURB surface fitting, a TriMesh surface can be generated in seconds, completely automatically and with the same degree of accuracy as the source offset data.

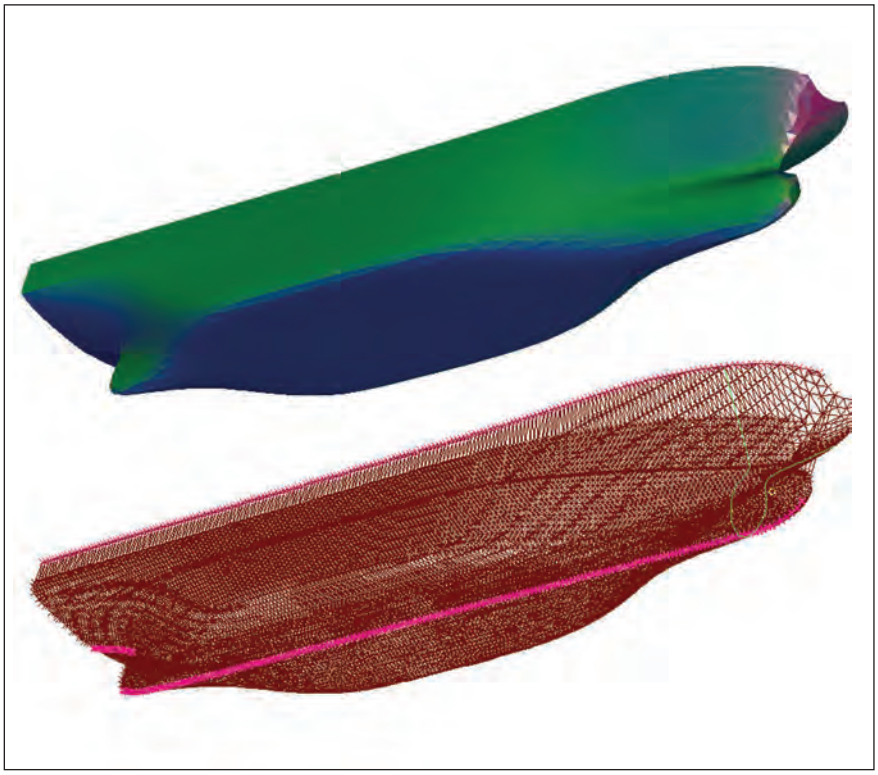
Some of the fitting facilities provided with this add-on include automated sorting of imported point data and automatic trimming of tanks and compartments to the generated TriMesh surface. It is also possible to model new, complex compartment shapes using NURB surfaces and intersect them with the TriMesh model.

The process usually starts with existing model data in the form of offsets. This can be imported from a text file, from Excel, from a DXF file, or from other data sources such as survey instruments or laser scan data that have been sorted into sections. These data points are called markers in Maxsurf and up to 30,000 markers can be used.

Maxsurf analyses the relative positions of the markers in such a manner so as to produce a surface comprised of triangular facets. Markers can be used as visual reference points, as target points for semi-automatic fitting of NURB surfaces, or for the automatic generation of TriMesh surfaces.

For the purposes of generating a TriMesh surface, the markers must be structured into sorted groups representing sections and, optionally, bow and stern profile. Maxsurf provides functions to automate this process, and once the TriMesh surface is created, it can be read into other modules for analysis.

Marine software is a crowded market, and technology companies will have to continue to update their software to keep their competitive edge. *NA*



Formsys' Maxsurf version 13 now includes this TriMesh add-on.

Built for the British

Due to be launched in April 2008, P&O Cruises' latest luxury cruiseship, *Ventura*, has been designed with British passengers in mind.

The 115,000dwt cruiseship *Ventura*, due delivery by Fincantieri next month, will be distinguished by her very 'British' feel.

Ventura, which is due to be named in Southampton on 16 April by Dame Helen Mirren, will be based in Southampton from April to October, offering holidays of between two and 16 nights in duration in the Mediterranean, Baltic, and Atlantic Isles. From October 2008 to March 2009 she will offer 14 night Caribbean fly-cruise holidays from Barbados.

Ventura's interiors have been designed to match the tastes of a British family audience, according to P&O Cruises. 'Every space has the comfort and tastes of British passengers at heart,' the owner said.

This commitment extends from the exterior of the ship through to the interior design, with British designer Nick Munro brought onboard as a design consultant. Mr Munro has been involved in the design of *Ventura* from the very beginning, taking an interest in the commissioning of the furnishings, glassware, and tableware. Renowned for his furniture, ceramic, and homeware designs, P&O Cruises said that Mr Munro 'has created bespoke items designed specifically for contemporary British tastes from a broad selection of materials including crystal, silver, slate, and china'.

Ventura is also a floating showcase for British contemporary art with 7000 different pieces from 40 artists decorating the ship. Over £1 million has been spent commissioning modern art by leading British artists.

The featured artists reflect the best contemporary art in the UK today. The collection, taking in artists from Kent to Tyne and Wear, Cornwall to North Yorkshire, will showcase work from all disciplines including sculpture, photography, digital print, mural, painting, glasswork, lenticular, and mosaic.

Of the other pieces being designed for *Ventura*, the collection includes a multi-coloured glass ceiling for the atrium, designed by Cornwall artist Jo Downs, and a collection of Cuba images for salsa bar Havana, created by Birmingham photographer Paul Ward.

Ventura's Atrium by night.

The Metropolis, designed with British tastes firmly in mind.

Fitting out the vessel has also brought marine outfitters Trimline its largest ever soft furnishing manufacturing contract, in a project that has seen the Southampton-based company supplying more than 18,000 items. Trimline has supplied the soft furnishings for more than 1500 passenger cabins and over 600 crew cabins.

Among the items supplied by Trimline were window curtains, bed valances, bed throws, and scatter cushions. In addition, a Trimline team of around 10 specialists visited the ship to fit curtain tracks in all the passenger cabins.

In February, Trimline crew put the finishing touches by installing the various items, in preparation for the ship's maiden voyage to Southampton, in readiness for her first season cruising ex-UK.

Although better known for refurbishing and refitting passenger and other vessels, Trimline has been building on a reputation for supplying high quality soft furnishings with previous projects including Cunard's *Queen Mary 2* where more than 12,000 items were made for passenger cabins.

Trimline sales and marketing director Mike Oliver said: 'With ex-UK cruising booming, the fleet of new ships is continually increasing and we have established ourselves as a supplier of bulk soft furnishing orders. *QM2* was a major exercise but *Ventura* will even surpass that.'

Trimline was also involved in customising Cunard's 90,000tonne *Queen Victoria* for the UK market. Nearly 20 Trimline personnel accompanied the ship when she set sail from Venice to the UK in December 2007, carrying out tasks including fitting over 500 television brackets in crew cabins and converting bunk beds to doubles, plus other work. ***NA***

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Expedition voyaging in style

Prince Albert II sets a new standard in luxury for the increasingly popular expedition cruising sector.

Silversea has announced details of its 'new' expedition ship, *Prince Albert II*. Built in 1989 as *Delfin Clipper* and most recently in service as *World Discoverer*, the 108m long, 6072gt ship will emerge from a major refit at Fincantieri's Trieste shipyard with 132 berths in 66 suites. She is due to enter service on 12 June 2008. The ship was previously laid up in Singapore following the bankruptcy of her then operator, Society Expeditions.

With *Prince Albert II*, Silversea said it aimed to bring the amenities of its larger ships to an expedition ship able to offer itineraries, especially in the polar regions, that conventional cruiseships cannot reach. Among the features that make *Prince Albert II* well-suited for expeditions include her 1A ice class, among the highest of any cruiseship, and a new fleet of eight Zodiac boats for shore landings.

The ship's interior has been completely overhauled, with amenities including cabins and suites ranging from 180ft^2 to 650ft^2 (the 'Grand' suites on deck 7 are the largest onboard any expedition ships), with 18 suites all told of over 400ft^2 in size.

Public spaces that have been overhauled include the main reception on deck 3, which also houses a medical centre and changing room. There is also a refurbished observation lounge and the 144 seater theatre on deck 6, which will be mainly used for lectures. There is a single-seating 148 seater capacity main dining room, boutique and gym on deck 4, a library, Internet centre, and 'panorama' lounge with its own dancefloor on deck 5, which connects to the 'Humidor' restaurant, and a full-service spa on deck 6. The spa connects to an outdoor grill and bar area, an area which was thought to be too small for a 'meaningful' pool. Instead, the area benefits from two large Jacuzzis.

The vessel will also feature ship-wide wireless Internet and mobile phone access.

Prince Albert II's inaugural season of 10- to 21-night cruises will encompass cruises to the Arctic Circle, Svalbard, Iceland, and Greenland in the summer, with the ship then repositioning for winter cruises to Antarctica and South America. ***NA***

The completely refurbished *Prince Albert II* is due to enter service on 12 June 2008.

Observation deck onboard *Prince Albert II*.

Bolidt partnership approval

Meyer Werft shipyard has chosen Bolidt Synthetic Products & Systems of The Netherlands as one of five key supply partners of the year for 2007, having assessed around 150 of its sub-suppliers.

Bolidt applies the deck systems to cruiseships built by Meyer Werft, including vessels built on behalf of AIDA Cruises and Norwegian Cruise Line and, indeed, has been contracted by the shipbuilder for the next five years to supply its products for five coming cruiseships for Royal Caribbean International's Celebrity Cruises, five remaining AIDA ships, two Disney cruise vessels, as well as a passenger ferry due delivery to Indonesia.

At the end of each project, Meyer evaluates every vendor against several criteria, including technical design, production, application, finance, safety, and speed of delivery and installation.

In this year's assessment, Bolidt's mean score was 9.3 out of 10, making it one of five suppliers at various stages of shipbuilding production to achieve 'partner of the year' status.

Meyer chief executive Bernard Meyer said: 'Bolidt's power as a dependable supplier was proven once again during the construction of the vessels *AIDAdiva* and *Norwegian Gem*. The market is changing dramatically, due to heavier cost pressures, sharply rising commodity prices, and the increasing competition from in particular Korea, Japan, and China, and this can only be confronted by collaborating closely with the best suppliers.'

It is understood that, as part of a continuous process, Meyer Werft has asked its suppliers to explore opportunities to cut costs further, but that this time a future 'supplier of the year' award may be up for grabs for the most amenable candidate. Bolidt said that, as one possible step, it would investigate the feasibility of supplying whole prefabricated balcony sections.

Meanwhile, the Dutch company continues to innovate in developing its synthetic 'Bolidt Future Teak' decking and rail material. The C-Rail, hollow composite sectional rail capping system, which can be produced in lengths of up to 6m, is now available in curved and angled sections, as well as straight sections. Curved and angled sections have already been installed onboard six cruiseships on a trial basis, with Disney said to be particularly interested in using the low maintenance material for environmental reasons. *NA*

Colourful entrance from DuPont

DuPont has unveiled two new products aiming to bring new choice to designers working on luxury interiors.

DuPont selected March's Seatrade Cruise Shipping Convention, Miami, as the stage to launch both its innovative Corian Illumination Series of surfaces, and the Corian Terra Collection, the latter marked out by its inclusion of pre-consumer recycled content that includes a wide array of tones, said to be ideal for creating contemporary design possibilities for marine environments.

Corian is a nonporous material and, with proper cleaning, does not promote the growth of mould, mildew, or bacteria, according to the manufacturer. It can be thermoformed into custom shapes and contours, sandblasted, routed, carved, laser-etched and backlit, making it ideal for a wide range of applications both above and below the deck.

Speaking of the new Illumination series, featuring four translucent colours, Mint Ice, Strawberry Ice, Lime Ice, and Glacier Ice, Ginguei Ebnesajjad, director of product styling and development - DuPont Surfaces, enthused: 'Through the opulence of illuminated Corian, marine architects and designers can dazzle modern interiors with design.'

The new Corian Terra Collection.

Designed for galley countertops, wet bars, head showers, baths, or walls, the Illumination Series is backlit to create 'radiant aesthetics'. The colours allow up to three times as much light to pass through than other Corian variants.

The Corian Terra Collection, meanwhile, offers a range of 25 colours that include warm neutrals and jewel tones. Seven of the colours are certified by Scientific Certification Systems to have a minimum of 13% pre-consumer recycled material and 18 colours made with at least 6% pre-consumer recycled content.

'By issuing this certificate of achievement, the SCS acknowledges that manufacturers such as DuPont are in compliance with their content claim,' said Ed Wyatt, SCS, programme manager, material content certification. *NA*

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WATERJET PROPULSION 5

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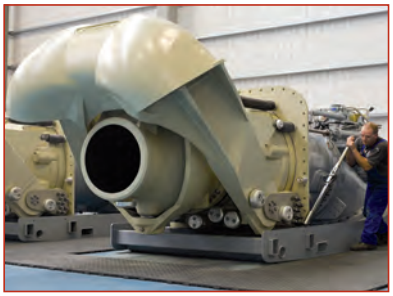
First Announcement & Call for Papers



This international conference continues the very successful series of RINA events looking at developments in waterjet propulsion.

Waterjets are now accepted as a proven technology, particularly for high speed craft and they are increasing their penetration into small craft, leisure, workboat, patrol and military markets. Today, waterjets are becoming the preferred propulsion choice where high efficiency, enhanced manoeuvrability, shallow draft capability and low maintenance are key requirements. Continuing developments now include very large units of 30MW capacity and the use of waterjets for high speed boost propulsion.

As the technology matures, designers need better tools to help predict the performance and efficiency of these systems across a wide range of operating conditions. Computational fluid dynamics is an increasingly powerful tool which has become almost universal, but traditional model testing and trials measurements are still required to confirm critical results.

Designers and manufacturers also continue to seek to reduce noise, wake and wash as well as optimise the strength and weight of the various mechanical components and to improve reliability, reduce installation time and maintenance.

RINA invites papers on all aspects of waterjet design, production and operation, from designers, researchers, manufacturers and operators. Topics may include the following:

- Simulation for research and design
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The rise and demise of Swan Hunter

Review by E C Tupper

Swan Hunter Built Warships, by Ian Buxton, published by Maritime Books as a hardback, 2007, 375 pp. ISBN 978-1-904459-29-3, £17.99.

The author is well known as a naval architect and as a professor at Newcastle University. His interest in warships and shipbuilding spans 50 years. Having lived on Tyneside for much of his professional career he has seen the many changes at the Swan Hunter Shipyards. He is an active member of RINA and continues to lecture at Newcastle University. He is a vice-president of the World Ship Society.

The book has four pages outlining the rather complex history of the Swan Hunter Shipyards from initial opening, through nationalisation and subsequent privatisation, to its final demise as a shipbuilding facility. There are more than 120 full page black and white photographs depicting the various warships built there.

Charles S Swan began to build ships at Wallsend in 1874. He drowned in 1879 and George Hunter was invited to manage the company which became C S Swan and Hunter. The yard began building floating docks in the 1890s and this led, in 1900, to an Admiralty order for a floating dock for Bermuda which was completed in 1902. In 1903 the company merged with Wigham Richardson to form Swan, Hunter and Wigham Richardson Ltd (SHWR). It also took a majority interest in the Wallsend Slipway & Engineering Co Ltd (WSE) who built much of the machinery for the ships.

As a Quaker, John Richardson was opposed to building warships and it was not until after his death in 1908 that SHWR entered the warship building market. The first contract was for a 755-ton destroyer – HMS *Hope*. Ordered in September 1909, *Hope* was delivered in March 1911. A succession of destroyer orders followed. The outbreak of the Great War led to large warship building programme and by the end of 1914 SHWR had orders for one 14-inch monitor, six destroyers, and three submarines. Over the years the shipyard built some 217 warships including a battleship (HMS *Anson*) and a number of cruisers and carriers and five submarines. The warship which was to carry the last yard number in the original SHWR series was the guided missile destroyer HMS *Bristol*. Intended as the first of a class to escort the new carrier she was the only one built to this design after the carrier was cancelled. Being the first design to carry the Seadart and Exocet missile systems she was completed to carry out comprehensive trials of these weapons.

> "The author outlines the complex history of the company through mergers with other yards, the creation of British Shipbuilders, and then privatisation."

The author outlines the rather complex history of the company through mergers with other yards in the area, the creation of British Shipbuilders, and then privatisation. It became known as Swan Hunter Shipbuilders Ltd (SHS) in 1969. Due to financial troubles the receivers were called in in May 1993 and the shipyard and all its equipment were auctioned in June 1995. This followed the completion of three frigates – HMS *Westminster*, HMS *Northumberland,* and HMS *Richmond*. Now known as Swan Hunter (Tyneside) Ltd the yard became involved in offshore work. However, the firm gained an order for two Landing Platform Ships at the end of 2000. The price and build time was overly optimistic and only one ship was completed. The second was towed away to be completed elsewhere. In late 2006 the company announced that it was selling its cranes and much of its shipbuilding plant.

As the author says: 'Altogether a sad end to a proud heritage of shipbuilding on the River Tyne'. *NA*

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Same old story on *Annabella*

Sir – I refer to the editorial comment concerning the *Annabella* case (February 2008).

It is a shame that the owners/operators seem not to have been aware of Lloyd's Register's Rules for the Certification of Freight Container Securing Arrangements, first introduced in 1980. When these were developed they took into account the ISO Standards for container racking and crushing and the consequent requirements for stackweight control and strength of lashing and securing arrangements. In the subsequent decade I remember approving stowage and securing systems for a large number of ships using relatively simple computer programs and our feedback was that the results were satisfactory. Modern computer programs would presumably have improved quality analysis further.

I see nothing in your report that we would not have expected to see implemented nearly 30 years ago. Why do people never learn?

A J Williams MRINA (by e-mail)

Explorer identifies key issues

Sir – I was much absorbed by the excellent account on pages 16 - 18 (February 2008, *The Naval Architect*) by Andy White, FRINA, of his alarming and very close [escape] from shipwreck as a passenger on *Explorer* in November 2007. Andy White identifies the considerable disadvantages of the standard issue box shaped foam-filled lifejackets. I quite agree. In my experience the mostly unfit, often obese, and often elderly passengers as may be found on popular cruiseships these days, when at Muster for Emergency Drill are clearly uncomfortable and much impeded by such lifejackets and that in the comfort of the air conditioned Muster Location! How such passengers would manage to negotiate corridors and gangways defies imagination.

The Zodiacs were crucial and the load carrying capacity and manouverability of such craft was clearly of significance but it is notable that the Zodiac drivers lacked understanding of how to use them to tow and steer.

Serious questions must be raised as to the optimal type of passenger lifejacket for issue on cruiseships and also as to the design of lifeboats which, apart from now being made from GRP, show little advance on the philosophy of the traditional wooden clinker lifeboat of two centuries ago. Surely it is time for a re-think. Perhaps an evolution along the lines of rigid inflatable boats.

Dr Rodney Pell (by e-mail)

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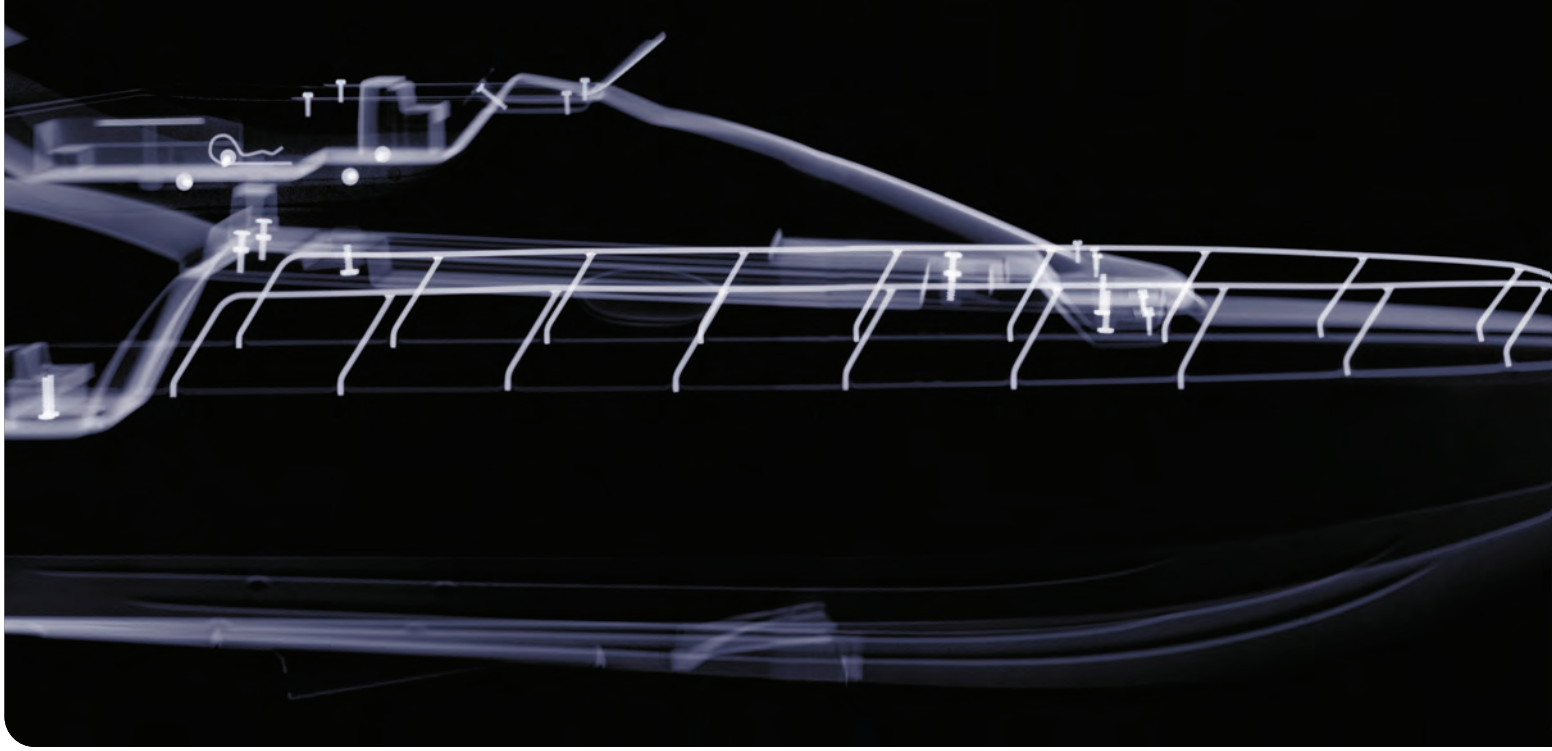

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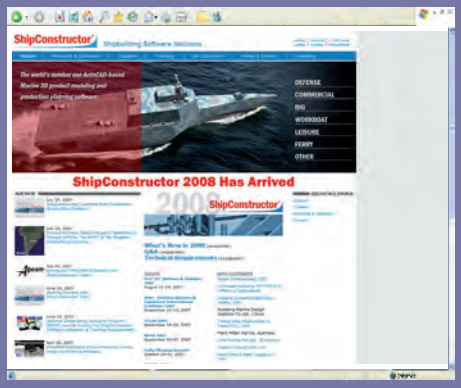

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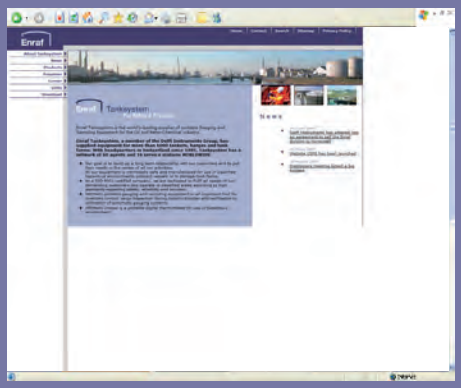

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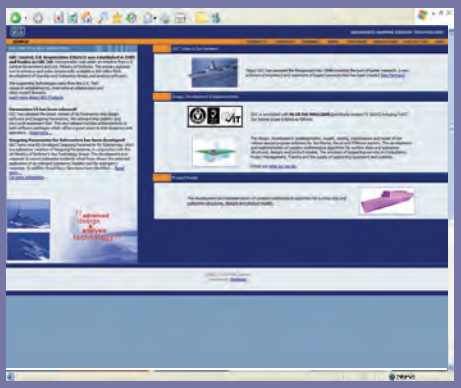

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By Patrick G Martin FRINA FImarEST Ref: FYSB
Having pursued the science of mapmaking, his earliest excursion abroad took him to the interior of Newfoundland as explorer and surveyor. Returning to Scotland, he was debarred from his intended entry to the Royal Navy due to colour blindness, but instead devoted the rest of his working life to Naval Architecture and Marine Engineering. After serving his time as apprentice in a Scottish shipyard, he spent 4 years 'seatime' as an Engineer in the liners of Alfred Holt & Company of Liverpool mainly on the China Coast. Appointed Assistant Naval Architect with the same company in 1956, he later became Chief Naval Architect at Verolme Cork Dockyard (1960-1984), and finally a design consultant, principally in India, Singapore and Australia. This book tells the story of his fifty years as a shipbuilder.
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