THE AUSTRALIAN NAVAL ARCHITECT

Volume 16 Number 4
November 2012

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THE AUSTRALIAN NAVAL ARCHITECT

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(Australian Division)

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Cover Photo:

The flagship of the Sydney Heritage Fleet, *Lady Hopetoun*, and HMAS *Parramatta* during the launch of the 2013 International Fleet Review on a very windy day in Sydney on 22 October
(RAN photograph)

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RINA Australian Division
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From the Division President

As indicated in my last column, we have revived the annual Walter Atkinson Award for the encouragement of quality naval architectural technical papers presented within Australia; my thanks to the sub-committee for their good work on this: Kim Klaka, Martin Renilson and Rob Gehling. You will find the award conditions and details within these pages, and I encourage you all to promote this prestigious award amongst you colleagues and to consider the formalisation of your own specialisation into a written paper for a seminar, conference or Section presentation or publication in *The ANA*. Even if you don't win the award, you will have helped broaden the knowledge base within Australia and will certainly have boosted your own CPD.

The National System for Domestic Commercial Vessel Safety (or Single National Jurisdiction as we were calling it) will be with us in a couple of months and there is a lot happening as the new Navigation Act and National Law Act and their associated regulations are finalised and implemented. Via your Sections, or directly from AMSA, most of you will have received the National System October Stakeholder Bulletin, listing the information sessions which AMSA is holding around the country from late October to early December. I encourage you to attend your nearest meeting, to understand where AMSA and the States are currently at, and for them to hear your voice.

One of our main concerns has been, and still is, that this should be a truly *National* System, *nationally* implemented and *nationally* interpreted. Our concerns in this direction have been expressed to AMSA during the recent round of public consultation — you will find our letter to AMSA within this issue of *The ANA*. I cannot emphasise enough how important I see this insistence on uniformity around the country, so that we really are all working under the same system. I arrived in this fair country a few years before the introduction of the "Uniform" Shipping Laws Code in 1979 and, at the time, we all hailed it as the answer to our problems, a "uniform national" system that we could all work to. Unfortunately it was not nationally administered and we all know how diverse its interpretations and exceptions became over the years, from jurisdiction to jurisdiction.

We have a chance to get this right now, and I hope that you will all keep a watching brief for any divergence from a truly national system and shout loudly if you see that happening. I see this as a higher priority than any particular shortcoming in any of the regulations, including the NSCV — there will be processes in place to review and correct these matters, albeit probably rather slower and more cumbersome than we would wish, but if there is no really effective national enforcement then we may be no better off than we were in 1979. Let's each do our bit, wherever we can, to ensure that it actually works this time round.

As always, I am available for discussion and comment on any topic of relevance to Australian naval architects: email jimb@austal.com or telephone (0418) 918 050.

Jim Black

Jim Black
President, RINA Australian Division

Editorial

The rescheduling of the air-warfare destroyer construction program, extending the keel-laying interval between each ship to eighteen months, to 'reduce peak demand on project-critical resources and facilities' and to help maintain essential skills in the naval shipbuilding industry is a welcome recognition by the Government of the need to maintain continuity in that industry in Australia — at last.

It is expected that this move will close the gap between the destroyer program and the start of construction of the RAN's future submarine. Hopefully, there will be no submarine program delays to squander the benefit.

It is stated that this extension will occur without additional cost to the destroyer construction program. Well, hopefully — fixed costs will continue each month of the extended plan (resulting in a condition known to shipbuilders as 'prolongitis escalitis') and the RAN is likely to face additional costs keeping old ships in service longer than planned. Despite these possible additional costs, the benefits for industry continuity and an easier timescale for the RAN to introduce the ships into service are likely to be worth any additional cost.

Ultimately we must recognise that industry is an integral part of the defence of the nation and its skills cannot be turned on and off at the drop of a hat any more easily than the navy can instantly produce the suitably-trained and skilled people needed to crew and support new ships and submarines.

John Jeremy

LETTERS TO THE EDITOR

Dear Sir,

We are seeing yachts becoming larger and lighter using composite materials. How big are they going to get? Are we going to see a trend to large sail-powered vessels in Australia for the rich and powerful?

Fuel prices are rising and people are becoming more environmentally conscious, wind is becoming an increasingly-popular power source. Motor yachts are still very popular in the 70–80 m range but, with fuel prices rising, are we going to see a trend to sail power and yachts in this large size with multiple masts becoming popular?

Wally Yachts' latest 50 m project has just had the world's largest mast fitted with a height of a massive 66.7 m. It was so a large that it had to be shipped in two sections.

Oyster Marine has recently won the award for Europe's best luxury cruiser, and have 30 m and 38 m vessels in production. This UK company teamed up with long-time luxury maxi-yacht building company, RMK, in Istanbul, Turkey.

Australia, with such a vast coastline and various boat building industries, should be producing more of these luxury sailing vessels, rather than turning to America and Europe.

Thank you for your hard work; *The ANA* is excellent for keeping up-to-date with what is happening in the industry around Australia.

Sam Henson
UNSW Student

Dear Sir,

I am writing to you to highlight the recent trends in, as well as the future prospects of, the shipbuilding industry in China and its relevance to Australia and the rest of the world.

Since the introduction of the Open Door Policy in the 1970s, China has benefitted significantly from economic reforms, especially in its shipbuilding industry. Initially, this industrial strategy focussed on enabling China to be self-sufficient in sea transport. However, in the last few decades, China has developed a great interest in entering the world shipbuilding industry. According to the latest statistics, China clinched a global market share of 33.7% in shipbuilding in 2011.

The most-recent trends in the Chinese shipbuilding industry involve firstly, the serious entry of Chinese shipbuilders into the international shipbuilding market to take advantage of the very buoyant market for new vessels. This has resulted in greater integration and adherence to various classification societies' rules other than CCS (China Classification Society) and new international maritime regulations, and into their design due to a rise in orders from overseas clients. Secondly, China's shipbuilding industry is also trying to direct its effort away from low-cost vessels, like bulk carriers, and investing more into building and designing high value-added marine structures and specialised vessels. In fact, several large Chinese shipyards have shown great promise in mastering the technologies of LNG carriers and offshore vessels like FPSOs (floating production, storage and offloading vessels), semi-submersibles and drillships. The active support and policies implemented by the central government has further helped to expand the Chinese shipbuilding industry. For instance, the setting up of the ORDIC (Offshore Research and Design Institute of China), a National Enterprise Technology Centre which is committed to promoting research capabilities and the innovation of advanced technologies in the offshore oil and gas industry, has fulfilled a series of significant technological breakthroughs.

Although China has become a dominant player with a substantial global market share in the shipbuilding industry, the majority of its orders remain in less technologically-advanced products. Nevertheless, this industry is enjoying significant rises in profits due to greater demands from both local and overseas clients having favourable economic conditions. It is not unexpected that, in the near future, China will face a growing risk of shipbuilding overcapacity. However, I do anticipate that this expansion will assist in the structural readjustment of China's shipbuilding industry towards producing more technologically-advanced, high value-added vessels. Also, with the rapid economic growth in China, the rise of the rich and affluent class will, no doubt, fuel the luxury-boat industry. The demand for high-quality and high-speed recreational boats will create another booming market, specifically to design small boats for the shipbuilding industry.

Finally, considering the future prospects of China's shipbuilding industry, it is very likely that it will be able to dominate the industry for the next 30–40 years. As for the future development of the luxury-boat industry in China, I think that Australia, which is well known for its quality design of small craft and recreational boats, will enjoy a period of significant growth in demand from Chinese buyers, at least until China's small-craft industry is capable of designing cheaper and more technologically-advanced recreational boats.

Lucy Xu
UNSW Student

THE AUSTRALIAN NAVAL ARCHITECT

Contributions from RINA members for *The Australian Naval Architect* are most welcome

Material can be sent by email or hard copy. Contributions sent by email can be in any common word-processor format, but please use a minimum of formatting — it all has to be removed or simplified before layout.

Photographs and figures should be sent as separate files (not embedded) with a minimum resolution of 150 dpi. A resolution of 300 dpi is preferred.

NEWS FROM THE SECTIONS

ACT Section

The ACT section has held a number of technical and social meetings since the previous report in the February issue of *The ANA*.

On 2 May Dr Alan Wilson (Head of Group — Platform Sensors and Systems) and Dr Seref Aksu (Naval Architecture and Platform Systems Analysis Group) from the Maritime Platforms Division of the Defence Science and Technology Organisation (DSTO) within the Department of Defence provided a presentation on *Monitoring of an Armidale-class Patrol Boat* at a joint meeting of EA's Australian Society for Defence Engineering (ASDE) and RINA. The presentation described the long-term structural and performance monitoring system installed on board HMAS *Glenelg*. This system incorporates strain, corrosion and temperature monitoring sensors, accelerometers, a six-degree-of-freedom motion sensor, torsion meters on the shafts and GPS unit, amongst other systems, and was partially installed when the boat was initially built. Alan addressed the "nuts and bolts" of the sensor network, covering the sensor interfaces and networking developed by DSTO while Seref addressed the analysis of the data to date. Plans for the installation of a similar, but more-comprehensive system which also incorporates pressure sensors, primarily for slamming events, on another of the Armidale-class boats were also outlined.

The ACT section AGM was held on 17 May. The incoming committee has remained largely the same as the previous year; however, we welcomed Richard Dunworth and Brocque Preece aboard.

On 19 June Jim Black, Manager Through Life Support Programs at Austal Ships and current President of the Australian Division, gave an updated presentation of his Pacific 2012 paper *HSV* WestPac Express — *Ten Years Service to USMC,* detailing the experience with the operation of the Austal-built 101 m catamaran on charter to the United States Marine Corps since 2001 for operations out of Okinawa, Japan. The catamaran has primarily been used by the Okinawa-based Third Marine Expeditionary Force (IIIMEF) for virtually all of their off-island operations and exercises in the region. Operational statistics were presented and lessons learned on how to operate a high-speed commercial ferry as a regional military theatre-support asset were discussed. This presentation tied in with a visit by Jim to Canberra to chair a Division Council meeting the following day. We thank Jim for this presentation when his original intention was simply to determine whether the ACT section would have any other technical meetings scheduled so that he could attend on an opportunity basis!

On 7 August Ian Laverock, National Manager Marine Acquisitions, Australian Customs and Border Protection Service, provided a presentation on the procurement, design and production aspects of the new Cape-class patrol boats currently being acquired by the Australian Customs Service from Austal Ships to replace the existing Bay-class patrol boats in the Australian Customs service. Construction of the first vessel in the class was already well underway at the time of the presentation, allowing Ian to demonstrate features of the boats from recent photos and contrast specifications of the Cape class with the previous Bay class and the Armidale class currently in RAN service.

On 29 August Kerry Johnson, Hydrodynamics Technology Manager within the Directorate of Navy Platform Systems (DNPS) provided a presentation on *Ship Motion Recording by use of Commercial Off-the-shelf (COTS) Arduino Systems*. These Arduino motion-sensing and data-logging units have provided a cheap means of instrumentation for a number of tests and trials undertaken by DNPS over the last year. Kerry outlined some of the trials and tribulations associated with the use of these units and provided a comprehensive review of options available filtering the data obtained from the units. These compact units, which are becoming popular amongst unmanned aerial vehicle (UAV) hobbyists, can record motion data to either an attached SD card or direct to a PC via radio transmission, which has allowed their used for free-running model tests in waves, testing of lifejacket-equipped mannequins in waves, trials on small craft, and ad-hoc comparative trials with more-sophisticated and expensive motion sensors during first-of-class flight trials on HMAS *Choules*.

On 19 September, the ACT section held its annual dinner at O'Stratos Greek Taverna in Canberra. Geoff Davis, a former electrical engineer and project manager within the Department of Defence, now consulting, was our guest speaker. Geoff described his 10/10/10 project to build a wooden motor boat in his garage with the aid of a slide sequence of progress photos of the building of the boat. The name of the project stems from the target set for the vessel to achieve 10 knots at 10 mpg with a 10-thousand mile endurance. The boat is to Geoff's own design, and further details of the project can be found as a series of regular columns in the *Australian Amateur Boatbuilder* magazine. The boat fully occupies the detached garage of his coastal home and turning over the hull when planked up to prepare it for outfit was a hair-raising challenge in its own right. Thanks to Geoff for the presentation and John Lord for identifying the project as the subject for the dinner presentation.

On 14 November Jonathan Windsor, Assistant Project Liaison Officer — Surface Combatants, within the Directorate of Navy Platform Systems gave a presentation on *Damage Stability of a Warship in Waves*. This was the subject of Jonathan's AMC final year thesis project a number of years ago. The aim for the thesis was to experiment with using the FREDYN software to determine a capsize boundary (limiting KG against sea state) of a damaged destroyer. FREDYN is a non-linear time-domain ship-motion code developed primarily by MARIN for the Cooperative Research Navies (CRNav) project which has been active for some years. Using a model of a generic destroyer, which was also used for a DSTO research program related to the CRNav project, a square hole was placed in the side of the hull to simulate the damage. This model was then tested across a range of wave heights and periods and the results were subsequently compared to numerical predictions for the same cases from FREDYN to validate the software. FREDYN was then used to produce the capsize boundary.

Martin Grimm

New South Wales Section

Committee Meetings

The NSW Section Committee met on 12 September and, other than routine matters, discussed:

- SMIX Bash 2012: The venue has been paid for; sponsorships are still being arranged; bookings are due to open soon; and Bill Bollard has completed the model for the silent auction.
- TM Program for 2013: Suggestions were made for presentations for next year, all to be followed up. Discussions have taken place with IMarEST re having presentations in reserve in case of late withdrawals.
- Re-activation of the Walter Atkinson Award: Comments were made on the draft document for re-activation of this award.
- Medals and/or Certificates for Presenters: The Victorian Branch of IMarEST gives a medal and certificate to presenters at their technical meetings; examples were on hand, and the issue of giving these in addition to (or as well as) the usual bottle of wine discussed — a mock-up certificate to be produced.
- National Engineering Registration Board: The NERB website is at www.nerb.org.au, and on the site they have guidelines for registration in the field of naval architecture. A quick search shows 18 currently-registered naval architects across Australia.

The NSW Section Committee also met on 24 October and, other than routine matters, discussed:

- SMIX Bash 2012: Sponsorships are being finalised; bookings have opened, with credit-card bookings finishing on 31 October, and no early-bird pricing this year because tickets always sell out.
- TM Program for 2013: Presentations have been arranged for March, May, July and October, with only September TBA, and the remainder by IMarEST.
- Medals and/or Certificates for Presenters: A draft certificate was tabled, and the decision made that we would present a certificate and bottle of wine.
- RINA records of the Australian Branch and Division, which have been housed at Incat Designs at Lane Cove, will be transferred to the Australian Division in Canberra.

The next meeting of the NSW Section is scheduled for 28 November.

Towards More Sustainable Shipping

Rodney Humphrey of Det Norske gave a presentation on *Towards More Sustainable Shipping: Results and Lessons Learned from the FellowSHIP Project* to a joint meeting with the IMarEST attended by sixteen on 5 September in the Harricks Auditorium at Engineers Australia, Chatswood.

Introduction

Rodney began his presentation with the background to the need to pursue sustainability for shipping. One issue is the forecast price of fuel, which is predicted to more than double from current levels of around $600/t by 2030. In addition, carbon dioxide emissions from shipping is a global challenge. Shipping burns approximately 335 Mt of fuel per year while transporting over 85% of the world's goods. The associated emission of CO_2 is around 1 Gt per year or 3% of global emissions. If shipping were a country, it would be a bigger emitter than Germany! Emission of CO_2 by shipping is projected to increase by 20% by 2020. The shipping community is no longer able to hide behind the fact that shipping is the most-efficient form of transport

Political bodies are now shaping global efforts to reduce greenhouse-gas (GHG) emissions from shipping. The United Nations Framework Convention on Climate Change (UNFCCC) is the arena for international climate negotiations and considers shipping to be a key source of climate-change mitigation and adaptation funding. The International Maritime Organisation (IMO) is working to reach industry-wide global agreements reducing the amount of CO_2 emissions from international shipping. The European Union (EU) is proposing to cut shipping CO_2 emissions by 40% by 2050 when compared with 2005 levels and is working on regional regulations.

Rodney then showed a table giving an overview of sulphur emission (SOx) regulations, ranging from 0.1% in EU waters through emission-control areas (ECAs) to non-ECAs and 3.5% in open oceans now, reducing to 0.1% in EU waters and ECAs to 0.5% in non-ECAs and open oceans in 2020. This was followed by a graph of the Tier I, Tier II and Tier III NOx limits. Tiers I and II are already in force globally for new-build ships, and Tier III will come into force in NOx ECAs on 1 January 2016. Tier III is a significant reduction from 8–14 g/kW/h to 2–3.5 g/kW/h (depending on engine RPM, the higher limits applying at lower RPM). No current engine on conventional fuel meets Tier III requirements, and so will need additional post treatment (e.g. selective catalytic reduction). LNG-fuelled engines will likely be approved as a Tier III equivalent measure.

Yesterday's press release (see www.marinelink.com/news/emissions-australia347409.aspx) said that recent research by CSIRO Marine and Atmospheric Research and the Australian Maritime College had estimated that approximately 30% of anthropogenic nitrogen oxide emissions and 20% sulphur oxide emissions generated in the Australian region may come from shipping. These are non-greenhouse gases, but have the potential to affect the air quality near coastal regions and, hence, have consequences for human health and amenity.

The next slide showed a demanding regulatory timeline for emissions of CO_2, NOx and SOx, the entry into force of the ballast-water convention and its application to various vessels, the entry into force of IMO's Energy Efficiency Design Index (EEDI), Ship Energy Efficiency Management Plan (SEEMP) and, in the EU, Market-Based Measures (MBM).

Existing ECAs include the east and west coasts of the USA, the North Sea and the Baltic Sea. Possible future ECAs include the east and west coasts of Mexico, the Mediterranean Sea, the coast of Norway and the coast of Japan.

As a final incentive for sustainable shipping initiatives, Rodney showed a picture of a pristine Norwegian fjord taken thirty years go, and a recent picture of the same fjord from a similar vantage point which showed the low-lying

smog from cruise vessels and the not-so-pristine hillsides!

Fuel Cell Technology

Fuel cells can already be found on buses in Perth, on submarines, and in fuel cells for home use. In Victoria, the feed-in tariff has recently been extended (from solar-panel generation) to include generation from fuel cells.

The basic fuel cell reactions require the input of hydrogen at the anode (e.g. from natural gas, ethanol, methanol or ammonia) and the reaction

$$H2 \rightarrow 2H^+ + 2e^-$$

and the input of air at the cathode to form water via the reaction

$$O_2 + 4H^+ + 4e^- \rightarrow 2H_2O$$

Fuel cells are advantageous for on-board power generation because:

- they have low emissions to air (no SOx and particulate matter, and negligible NOx);
- they use clean fuels and have low (or nil) CO_2 emissions;
- they have high electric and thermal efficiencies, also at part load;
- they have no vibrations and insignificant noise levels; and
- they have low operating and maintenance requirements.

Fuel cell types are characterised by the materials used in the electrolytic membrane between the anode and cathode:

Fuel Cell Type	Electrolyte	Temperature	Reactants	Efficiency
Proton exchange membrane (PEM)	Polymer membrane	30–100°C	H_2, O_2	35–40%
High temperature PEM (HTPEM)	Polymer membrane	160–200°C	H_2, O_2	≈45%
Molten carbonate (MCFC)	Potassium carbonate	≈650°C	H_2, O_2, CO	45–50%
Solid Oxide (SOFC)	Zirconium ceramic	500–1100°C	H_2, O_2, CO	45–50%

The challenges for fuel cells lie in the size, weight and cost when compared to other means of power generation:

Generator type	Efficiency	Potential for thermal integration	Specific energy kW/m²	Power density W/kg	Installation costs $/kW
Fuel cell (MCFC)	45–50%	High	3	15	3000
Fuel cell (HTPEM)	≈45%	Medium	30	60	unknown
Marine diesel (4 stroke)	40%	Medium	80	90	300–400
Marine gas (4 stroke)	45%	Medium	80	90	≈600

Note: The values in this table are based on limited data available.

The FellowSHIP Project

The FellowSHIP Project began in 2003 as a partnership between:

- Det Norske Veritas AS providing ship classification/ rules, risk analysis/safety and project management;
- Eidesvik Offshore AS, a shipping company, providing offshore vessels for the project;
- MTU Onsite Energy GmbH providing the molten carbonate fuel cells;
- Wärtsilä Ship Design AS providing ship technical design office services; and
- Wärtsilä Norway AS providing electro and control systems.

Financial support was provided by the Research Council of Norway, Innovation Norway and the Eureka Network.

The project was undertaken in three phases:

Phase 1 (2003–05) undertook the feasibility study and the development of a basic design for fuel-cell power pack.

Phase 2 (2006–10) developed, designed, built, tested and qualified the stand-alone fuel-cell power pack (330 kW) and integrated in a ship.

Phase 3 (2011–13), currently under way, is to develop, design, build, test and qualify a low-emission hybrid energy system with energy storage and waste-heat recovery for marine propulsion.

Design challenges for the molten carbonate fuel cell in the marine environment include gas safety (requiring redesign to comply with class rules, and hydrogen as a new fuel), motions and vibrations (the fuel-cell stack neds to be restrained during transport and operation), and interphasing with the electric propulsion system (to avoid frequent load changes).

DNV developed rules for fuel cells in the marine environment with the following notations:

Ships where the fuel-cell power is used for essential, important or emergency services … will be given class notation FC-POWER.

Ships where the fuel-cell power is not used for essential, important or emergency services … will be given class notation FC-SAFETY.

Viking Lady

Viking Lady is a state-of-the-art offshore supply vessel, specially designed to safely service offshore installations in the extremely harsh waters of the North Sea. She is the first commercial ship ever with a fuel cell specially adapted for marine use. The fuel cell and combustion engines on board *Viking Lady* are powered by LNG. *Viking Lady* was designed and built on the west coast of Norway by Vik Sandvik (now Wärtsilä Ship Design) and West Contractors. The Norwegian shipowner, Eidesvik Offshore, took delivery of *Viking Lady* on 29 April 2009.

Principal particulars of *Viking Lady* are

Length	92.2 m
Beam	21 m
Depth	7.6m
Deck area	945 m²
Gross tonnage	6100
Deadweight	5900 t
Main engines	4×2010 kW dual-fuel engines
Propulsion	2×Azipull 2×2200 kW/1×azimuth
Berths	25 persons
IMO No.	9409675
Class notations	✠1A1 ICE-C Supply Vessel Fire Fighter I OILREC SF LFL* COMF-V(3) E0 FC-SAFETY DYNPOS-AUTR NAUT-OSV(A) CLEAN DESIGN DK(+) HL(2,5) GAS FUELLED

The fuel-cell power pack added to the vessel for the FellowSHIP demonstration comprised one purpose-built 13×5×4.4 m 80 t container for the fuel cell and fuel-processing system (using the existing fuel-supply system), and one standard 20 ft 30 t container for the electrical components protecting the fuel cell from potentially-harmful disturbances on the ship's power grid (690 V and 450 V).

Viking Lady
(Photo courtesy Eidesvik Offshore)

The containers were located in the aft tunnel under the accommodation block.

The purpose of the power electronics is to provide stable load conditions for the fuel-cell stack, and to enable isolation from the electric propulsion system in case of malfunction. The fuel-cell power was integrated with the ship's electrical propulsion system as supplementary power. The fuel-cell stack is connected to a DC link, and the power converters and transformers connect the DC power to ship's AC grid.

Testing

Onshore testing of the system took place over the (northern) summer of 2009. Power and control interfaces between the fuel-cell system and power electronics was demonstrated, and the sensors, alarms and emergency stops were tested.

Offshore testing was conducted from December 2009 to June 2010 and included 7000 h of operation during the project period, running at a variety of load conditions. Exhaust gas testing showed no NOx emissions, but some some CO and CH_4. Rapid load changes were tested, and the system efficiency measured and estimated.

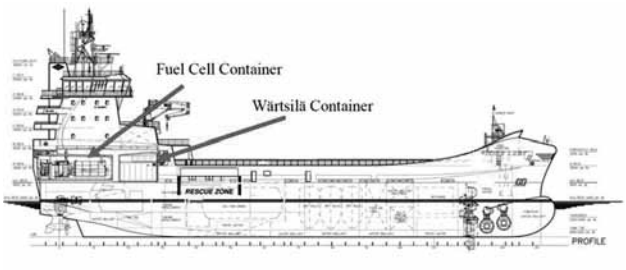
Operating Experience

Operating experience with the MCFC has shown that it is suited for frequent operation at reduced loads to avoid dual-fuel engines running on diesel when in DP operations and docked. Load changes are slow, of the order of 20–100% in two days. MTU support showed fewer stops and smoother operation than for most stationary plants. There were no signs of degradation after more than 18 500 h of operation. Fuel-cell auxiliary systems can be better integrated with existing ship systems.

The fuel cell is currently conserved for hybrid test with batteries. There is a need to optimise dual-fuel engine and fuel-cell loads, and reduce the transient loads on DF engines. Idling engines can be replaced with batteries for power redundancy. Fuel cells can save fuel and engine maintenance, and save emissions in environmentally-sensitive areas.

Conclusions

The FellowSHIP demonstration project, led by DNV, developed and installed a 330 kW fuel-cell power pack on board the offshore supply vessel *Viking Lady*. This was the first large-scale fuel-cell unit installed on a commercial ship, and the system delivered power to the ship grid for over 7000 h. The fuel cell on board *Viking Lady* had an overall efficiency approaching 55%, although high efficiency was not the aim of the FellowSHIP project but, rather, to show



Viking Lady showing position of fuel cell and electrical containers
(Drawing courtesy Wartsila)

what was achievable with current commercially-available equipment. DNV Rules for fuel cells were developed, ensuring safe integration of new fuels and fuel cells into a ship's power system. The main benefits of fuel cells are high fuel efficiency over a wide range of loads and the elimination of emissions.

Optimal system integration, resulting in additional electrical and thermal power, is essential. Significant reduction in costs in fuel-cell technologies are required for this to be competitive for ships — and this is happening. For ship applications, reduction in fuel-cell size and weight are of immense importance.

DNV recognises that fuel cells can become part of the future power production on ships. By leading R&D in this area, DNV has built competence and developed Rules, paving the way for safe and smooth introduction of fuel cells. It will take time for fuel cells to be a realistic alternative due to cost and limited production towards marine installations. Incentive schemes could play a central role here.

In the near future you can expect to see successful niche applications on specialised ships, particularly for hybrid systems.

For further information on the FellowSHIP Project, refer to www.vikinglady.no.

For further information on fuel cells for the marine environment, refer to DNV's position paper, *Fuel Cells for Ships,* available from www.dnv.com.

Questions

Question time was lengthy and elicited some further interesting points.

Viking Lady was built with forward planning for the testing of the fuel-cell equipment in mind, and space was made available.

BlueGen is a company in Melbourne manufacturing fuel cells for domestic use.

Fuel-cell installation cannot handle rapid changes in load. If such changes occur, then a dual-fuel engine has to cut in to take up the additional load or, in a hybrid system, the battery bank has to take over.

If there are no government incentives, then it is hard for an owner to justify the expense of installation of a fuel-cell system. However, the benefits of the fuel-cell system are realised in the low emissions.

There is the likelihood that developments in ECAs, and in low-power applications such as dynamic-positioning modes and in port, will lead to more use of fuel cells.

There is a design life on fuel cells, and the cell needs re-

stacking after about 40 000 h, because the membranes degrade.

The vote of thanks was proposed, and the "thank you" bottle of wine presented, by Graham Taylor. The vote was carried with acclamation.

Rodney's presentation was recorded by Engineers Australia and is available as a webcast at www.mediavisionz.com/ea/2012/easyd/120905-easyd/index.htm#.

Future Submarines

RADM Rowan Moffitt, Head Future Submarines Program, gave a presentation on *Future Submarines — Few Easy Choices* in Engineers Australia's Eminent Speaker Series attended by sixty on 2 October in the Harricks Auditorium at Engineers Australia, Chatswood.

Introduction

Rowan began his presentation by asking were there any submarine builders in the audience? Any journalists, politicians, or submariners?

The Defence White Paper 2009 outlined the Government's intentions for the replacement of Australia's six Collins-class submarines with twelve more-capable vessels. The timescale for procurement looks something like this if a new design of submarine is selected:

Definition	2–4 years
Design	7–8 years
Build	7–8 years
Operational Test and Evaluation	1–2 years

The whole project could therefore take 20 years until the first-of-class is in operation — if it's a brand new design. Successive vessels will not take as long to build as the first one, but the delivery rate may not increase. For one thing, Navy has to recruit more crew. If the RAN takes in 8 people off the street today then, in 15 years' time, they get one commanding officer. If one submarine is commissioned every two years, then delivery will take another 22 years on top of the 20 already allowed to get the first vessel into service; i.e. 42 years from pressing the GO button.

In time, new technology emerges which we would want to integrate into the vessels. Take, for example, batteries. Lead-acid batteries are 1.5 m × 0.8 m × 0.4 m, and each Collins-class submarine needs 400. Transitioning to lithium batteries offers advantages; they are better in performance, and lighter, so the design of the vessel needs to be re-visited for stability. Other technologies also mature. It is estimated that 70% of the technology we will use in 2040 has not yet been invented! So, if we deliver the last vessel in the same configuration as the first, then it will be obsolete by the time it hits the water. This program therefore needs to insert new technology into batches of build, e.g. Hulls 1, 2 and 3 can be the same, and so on in batches, the size of each batch being driven by technology maturing.

Traditionally, each vessel has around a 30 year service life and so, but the time the twelfth vessel is delivered, the first vessel needs to be replaced. The vessels will also need through-life sustainment of in-service submarines as well as continuous design-and-development activity, with developments being built in continuously as we build each new batch of submarines. This was not a necessary part of the plan for the smaller Collins-class build program that ran over only about a decade.

All of these industrial elements — sustainment, design and build — must exist, either here or overseas, and we must have access to them, irrespective of which submarines we acquire. No matter where the elements exist, we will pay for them or we will not have a submarine capability that we can expect to keep up with the potential opposition and to do what we need to. There is therefore no peer to this program because, in our history, it has not been done before in Australia. In fact, this type of national industrial undertaking is independent of which specific submarines we actually acquire.

The design life of ships and submarines is traditionally of the order of 30 years. This is a long time for technology, so we have made it our habit to do mid-life upgrades to keep the vessels militarily relevant. These upgrades have been more (or less) successful, but expensive (some more than the initial platform acquisition cost!) However, such upgrades always take the vessel out of service for very long periods — longer generally than routine maintenance activity.

Major upgrades to submarines are harder than for surface ships. Submarines are more densely packed, and inside a pressure vessel and so are more complex, are more expensive, and take longer. We could plan for less than 30-year life, and aim for 18–20 year life span, with no mid-life upgrade. This could lead to 5–8% less cost over the life of the vessels, which doesn't sound like a lot, but we are potentially talking in tens of billions of dollars here! Another benefit is that the average age of the fleet is less, so maintenance costs should be lower overall — costs tend to increase as vessels get older and they become more expensive to maintain.

Workforce

One challenge is the workforce, which will certainly need to be larger than it is today, but not massively. We will need thousands, not tens of thousands; say 5000 new jobs, with 1000 companies (mostly small-to-medium enterprises), plus more serving personnel.

For the first time, we will be in a position to provide a steady and reliable workflow to sustain all elements which we need, and to do that without having to export submarines. So, all in all, there is a lot more than just jobs or technology involved.

Parenting

Australia ran her six O-boats (Oberon-class submarines) successfully only by being competent operators and maintainers. We drew on other expertise from the UK as the parent nation. We were able to access the designers and builders, and a successful operating navy. When the UK retired their own O-boats before ours, life became significantly harder for us. With the Collins class, we became the parent nation, and we had no previous experience of the cost of parental responsibility. We need to meet parental obligations by having someone competent to do the job, and we need to decide who that will be — either Australian, or from overseas.

The Rand Report, *Australia's Submarine Design Capabilities and Capacities: Challenges and Options for the Future Submarine* (available at www.rand.org/pubs/monographs/MG1033.html) assesses one area of the expertise we will need — the domestic design skills that Australian industry

and government have. This report outlines what we would need to design a new submarine, identifies the skills we currently possess, and evaluates how best to fill the gaps that exist between the two. We will clearly need partners — nations or companies who will transfer technology, skills and people.

Collins Class

The Collins experience taught us a great deal. One lesson was that there can be no pessimism as a basis on which to begin. "Success comes in cans; failure comes in cant's".

Australian men and women built the Collins class, and there is no problem with the class which was caused by poor Australian workmanship. Problems were caused by our own project management inexperience, or were imported from apparently-skilled overseas suppliers. All of the problems have been solved here — sometimes with overseas help, but mostly on our own. Australian submariners are praised constantly for their operations and professional expertise in the so-called "dud subs" — something else for which Australians rarely see the credit being given. Apart from the failures though — which Defence acknowledges — there were also many spectacular successes on which we can build the future with confidence.

Why do All Governments Keep Wanting Submarines?

Submarines are good at intelligence collection and fighting, carrying big, powerful, sophisticated weapons — such as the Mk 48 torpedo, just one of which has the capability of blowing a frigate in half. Carrying offensive weapons takes the fight to the adversary. This is good versus surface ships, but is also good versus other submarines — in fact, it is the best, but must be used cleverly.

Defending against a submarine is very resource-intensive and expensive, and the cost of failure is high. During the Falklands campaign, the Argentine cruiser *General Belgrano* was sunk by one submarine, and the result was that all Argentine naval vessels returned to their home ports and stayed there except for one submarine which was unsuccessful against the Royal Navy because of a faulty torpedo fire-control system. So submarines create a deterrent effect, which is the primary goal of the Australian Defence Force.

Conflicts tend to be resolved when soldiers prevail over the other side on land. We are surrounded, and our region is dominated, by seas. Air transport is limited by distances in our region. It is therefore difficult to move land forces and, hence, the resources and equipment required, by anything other than sea. So protecting our ships is vital.

There are many threats to ships. However, adversaries' submarines pose the greatest threat to our ships and submarines. By 2030 we expect that more than 200 submarines will be owned by nations in our region, and we may not always be on friendly terms with all of them! Countering an enemy's submarines is easiest when you know where they are, and this, in turn is easiest near their home or a choke point that they cannot avoid using (such as the Sunda Strait). There are many such choke points in our region, but twelve submarines cannot cover them all — so our submarines need to be able to reach the home ports of potential adversary submarines to be most effective, be there persistently, and come home again in a single mission profile.

Submarines are hard to find when dived, because the oceans are opaque. There is technology under development to locate dived submarines, but there is nothing to make the oceans transparent any time soon. So, to give a deterrent effect, Australia needs long-range submarines, which can stay on station, up to 6000 n miles from home, for a long time, and return. We could use a forward operating base, but these are all owned by other nations, and this is risky if the other nation does not want to be involved. Fremantle and Brisbane were used as forward operating bases for submarines by the Allies during the war in the Pacific.

Water temperatures to Australia's north are 30^{o}C or more, so vessels need to have cooling designed in from the start. This uses power, and so we need batteries, and these need to be charged, requiring fuel. Patrol durations for these vessels can be up to 60 days. Endurance is a function of people, rather than fuel capacity, and they require stores, water, etc., for the duration of the patrol. The Collins class was the largest conventional submarine in the world in its day, for all of the above reasons, including Australian sea conditions. Collins is half as big again as the submarines available on the export market today. It had twice the crew, far more battery capacity and carries significantly more weapons — all for these reasons. So the new submarines must be at least of a size and capability similar to Collins, or they will not create a deterrent effect in the mind of an adversary.

Conclusion

Unquestionably, the future submarines are a challenging undertaking. For one thing, the way in which we choose to approach this program will define how we see ourselves as a nation in the 21st Century. We could take a high-tech approach, or we could let someone else make money telling us what they think we need—but letting someone else do it would be a tragedy.

There are few easy choices!

Questions

Question time was lengthy and elicited some further interesting points.

Why do we need submarines—not all countries in our region are going to be enemies? Other nations in our region are acquiring submarines. Some (e.g. Malaysia and Indonesia) buy them and upgrade periodically; others (e.g. Korea, Japan and China) build them and have a continuous design-and-build program. Japan, for example, who has more submarines than Australia, plans on an 18-year life for their submarines, and puts one new one into service each year.

Who will protect the new LHDs? The acquisition of the new air-warfare destroyers and the replacement of the Anzac-class frigates will provide a layer of protection in the fleet for the LHDs. The role of the submarine is to reduce the enemy's capacity to attack by taking him out first.

How do we ensure Australian content? There was a target of 70% Australian content for the Collins-class submarines, and this was achieved. However, we have to draw on the lessons learned from Collins—there is a different, more-pragmatic policy now. Collins showed up the difficulty associated with generators, for example, built under licence in Australia by a company which is no longer in business, to a French design but without French supervision, and differently to how the

French designed them. There was no help to Australia at all. Each country does it differently; some are successful and some not. We need to set targets, but to understand the long-term objective.

Twenty years ago, Spain said that they wanted to be capable of doing their own design and construction. They set about doing exactly that, and now they can. We have struggled to have our objectives realised because there has been no agreement on, or commitment to, a long term aspiration.

Why are we not using nuclear power, but relying on old technology? Australia is not a nuclear nation; granted, we have a research reactor and a few nuclear physicists. We cannot simply replace the conventional Collins-class crew with people sufficiently competent to operate nuclear-powered submarines at sea. It needs 15–20 years to make the transition to being a nuclear nation —if properly funded and pursued diligently. The fact is that it is impossible for Australia to achieve, as the nation is not prepared to commit.

The USA would not give us a Virginia-class submarine—why would they? We are a friend, not family. The UK wouldn't give us one of their nuclear submarines either, because they obtained design know-how from the USA, and would not want to upset them. The French *might* give us nuclear submarine technology, but at a cost! The cost would probably double the budget for the whole navy, before you start looking at crewing, maintenance, and the like. The Australian people would not go for it.

Why 12 submarines? The number did not originate in Defence but from the Government. What does this let you do? This is a massive country, with a small population. How much are we prepared to spend? We could spend all of the GDP, and it would still not be enough. 12 submarines gives you the capacity over a long period to have one on station up to 6000 n miles from Australia 24/7, with some spare capacity available to do other things. We have had 12 frigates in the fleet, with one on station in the middle-east for the last 20 years almost non stop, with spare capacity. Six gives you the capacity for less than half of that, and is not critical mass. The program may well cost $36 billion over some 30 years as some commentators suggest, but Australia has had 12 frigates/destroyers for the last 30 years, and we have spent almost that amount on acquisition and upgrades, not accounting for sustainment for which we pay as we go. This is not a bulk funds issue or total cost issue, it is a cash-flow management issue, and we need to have the will to do it.

This proposal is for us to eventually become self-sufficient in submarine design and construction, for which we will need to obtain expertise from overseas; but who will provide the expertise, and why should they? Clearly this could not a competitor, but there could be other things involved. Japan operates a fleet of 16 submarines, and their design, construction and operation is now pretty much indigenous. We have also looked at the USA, the UK and Sweden. We are not a threat to Japan militarily or commercially. Our strategic interests are well aligned, so Japan could well be interested in partnering with us.

How do you future-proof vessels which are sub-optimal with respect to margins for upgrades? This is tough for surface ships, but even tougher for submarines which have tighter margins. We have an understanding of margins from the Collins class. As we become older, we become fatter. As technology becomes miniaturised, this creates more space and allows more to be fitted. But this requires more power, and thus requires more cooling, etc.

The vote of thanks was proposed by Chris Skinner, who said that submarines are one of the most-interesting subjects which can be addressed by engineers. Two aspects need to be addressed. Firstly, how do we encourage the study of science, technology and maths at school? Submarines are a focal area, so comparisons with the Snowy Mountains Scheme do not tell the full story. Like JFK with his proposal to put a man on the moon, Rowan is proposing to put submarines into the water and engage in nation building. Secondly, there are various technical and theoretical challenges. Nuclear power may give you greater endurance and speed, but nuclear-powered submarines are noisier, and what do you do with them when they reach the end of their lives? The USA does not have a solution, and Russia has an enormous problem with its rusting nuclear submarines. There are many other avenues. $214 million was granted for studies commenced in May on an energy-conversion test site ashore. We are going about this in a good way, because we need modern propulsion systems. Finally, maintaining a submarine 6000 n miles away is not necessarily something that you need to do, but the other side needs to know that you *might* be doing it. Everyone can see surface vessels, but not submarines. Rowan has put all of this into a story which is exciting and challenging, and we wish him every success. The vote was carried with acclamation.

Rowan's presentation was recorded by Engineers Australia and is available at www.mediavisionz.com/ea/2012/eav/120904-eav/index.htm.

NOx and SOx Emissions from Shipping

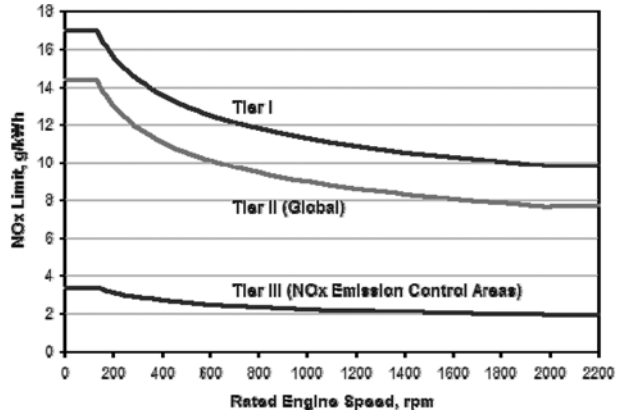
Aslak Suopanki of Wärtsilä Environmental Solutions gave a presentation on *Wärtsilä After treatment Solutions for NOx and SOx Emissions from Shipping* to a joint meeting with the IMarEST attended by sixteen on 3 October in the Harricks Auditorium at Engineers Australia, Chatswood.

Introduction

Aslak began his presentation by saying that this was his first trip to Australia, and that the weather was better here than in Finland!

A principal reason for reducing emissions is the introduction of regulations. NOx emission limits are set for diesel engines by IMO's MARPOL Annex VI Regulation 13, depending on the engine maximum operating speed (n, rpm), as shown in the table and presented graphically below. Tier I and Tier II limits are global and already in force, while the Tier III standards apply only in NOx Emission Control Areas (Tier II standards apply outside ECAs) for new-build ships from 2016.

Tier	Date	NOx limit (g/kWh)		
		$n<130$	$130\leq n<2000$	$n\geq2000$
I	2000	17.0	$45n^{-0.2}$	9.8
II	2011	14.4	$44n^{-0.23}$	7.7
III	2016	3.4	$9n^{-0.2}$	1.96

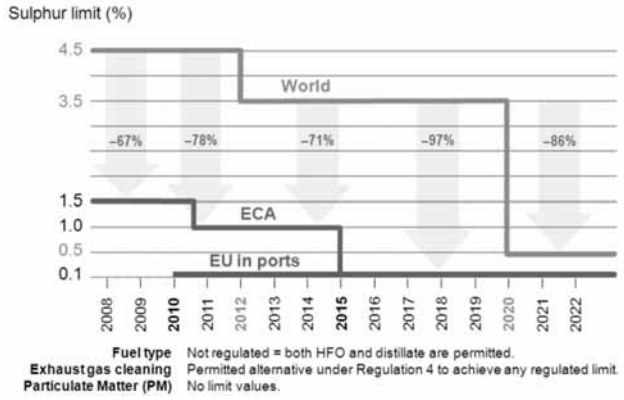


(from Dieselnet website)

Tier II standards are usually met by combustion process optimisation. The parameters examined by engine manufacturers include fuel injection timing, pressure, rate, fuel nozzle flow area, exhaust-valve timing, and cylinder compression volume.

Tier III standards are expected to require dedicated NOx emission-control technologies, such as various forms of water induction into the combustion process (with fuel, scavenging air, or in-cylinder), exhaust gas recirculation, or selective catalytic reduction.

For SOx, Aslak showed a chart of limits proposed for adoption in the world, in emission-control areas, and by the European Union for ports, by year. California has limits similar to those for ECAs and the EU in ports.



IMO sulphur limits for the years 2008–2020 (% mass)
(from gCaptain website)

The proposed limits are causing a lot of debate in the shipping industry. Are we ready to do this? It is certainly going to place a financial burden.

Current geographically-defined SOx emission-control areas (SECAs) where ships must limit their emissions include the North Sea, English Channel and the Baltic Sea since 2006. Both SOx and NOx must be limited within 200 n miles of the USA east and west coasts and the Galapagos Islands since August 2012. A recent (2102) report by the CSIRO and AMC indicated that possible new ECAs included Australia, Japan, Korea and Canada.

How to Minimise SOx Emissions?

There is a number of methods of reducing SOx emission, but they all have their advantages and disadvantages.

- Switching to low-sulphur fuel in SECAs is flexible and requires a small investment, but has high operating cost in SECAs, requires fuel change-over procedures, requires lube oil TBN management, and may depend on fuel availability.
- Changing over to run full-time on marine gas oil (MGO) is convenient, because it requires no change-over in SECAs, but has a high operating cost and depends on future availablity of MGO.
- Converting engines to run full-time on LNG is a solution which also reduces NOx and particulates, but has a high investment cost and depends on LNG availability.
- Installing an exhaust-gas cleaning system (scrubber) works with high-sulphur HFO, has the lowest total lifecycle cost, can be used everywhere, and is easy to operate, but the return on investment depends on fuel oil price difference between low-sulphur fuel oil and high-sulphur HFO.

How a Wet Scrubber Works

A wet scrubber comprises a vertical cylindrical tank housing a water spray (either plain sea water or fresh water plus caustic soda, NaOH) over a packed bed. Exhaust gas is fed in at the bottom and rises through the packed bed and water spray to exit to the funnel at the top. Water and sulphates are drained from the bottom of the tank.

Here Aslak showed a graph of the SOx reduction vs pH of the water spray. Alkalinity reflects the ability to react with acids and neutralise them, and alkaline power reduces as neutralisation takes effect. Alkalinity and, hence, scrubber efficiency is controlled by either adjusting flow in sea water scrubbers, or adjusting NaOH quantity in fresh-water scrubbers.

Wärtsilä SOx Scrubbers

Wärtsilä manufactures three types of scrubbers: closed-loop, open-loop, and hybrid, with selection of type being made according to customer's needs.

The first certified seagoing scrubber was a closed-loop fresh-water system installed on MT *Suula* by Wärtsilä, and compliance with MARPOL was certified by DNV, GL and BV. The report on the tests on this vessel is available on the Wärtsilä website (search for "suula", and click on the top result to download).

There are two types of scrubber approvals according to IMO:

- Scheme A: Exhaust gas cleaning (EGC) system approval, survey and certification using parameter and emission checks in which compliance is demonstrated by emission tests, and it is possible to obtain approval for serially-manufactured units and for a certain production range.
- Scheme B: Exhaust gas cleaning (EGC), survey and certification using continuous monitoring of SOx emissions, and compliance is demonstrated in service by continuous exhaust-gas monitoring.

Wärtsilä closed-loop scrubbers are approved according to both Schemes A and B.

Aslak then showed diagrams of the layout of closed-loop, open-loop and hybrid scrubber systems, with the scrubber unit typically being mounted high up (e.g. in the funnel casing), and the other components (pumps, tanks, control gear, etc.) in the engine room.

These were followed by graphs of caustic soda consumption vs engine power for various levels of sulphur in the fuel (higher sulphur content requiring more caustic soda) and fresh water consumption vs water temperature (higher water temperature requiring more fresh water).

The open-loop system only has sea water passing in and out, there is no circulation, and no added chemicals. The sea water acts as the scrubbing medium. Wärtsilä open-loop scrubbers and hybrid scrubbers also include a venturi in front of the actual scrubber unit as a default. The venturi is good for taking down particulate matter (particulates have not yet been regulated).The inlet and outlet water quality are monitored.

The hybrid scrubber combines both the open-loop and closed-loop systems, and is consequently more complicated than either, but is also more flexible than either. It uses either sea water (alone when possible, to minimise costs) or sea water plus caustic soda (when necessary for augmentation in areas such as specific parts of the Baltic Sea where the alkalinity of the sea water is low).

Installation and Retrofit Aspects

For existing ships, the retrofit of a scrubber requires tailor-making. Some aspects to be considered for retrofits are:

- space required and the design of the exhaust-gas funnel;
- ship stability;
- space available for tanks, pumps and water treatment unit(s);
- power demand for the scrubber system;
- sea chest, and capacity of supplying water to the scrubber system; and
- fresh water capacity (closed loop only).

The principal consideration for retrofits will likely be the space available.

Wärtsilä Scrubber Installations

Examples of installations of Wärtsilä scrubbers include

Vessel/Owner	Newbuilding or retrofit	Open loop	Closed loop	Hybrid	Delivery
MS *Pride of Kent*/P&O European Ferries	Retrofit	✓			2005
MS *Zaandam*/Carnival Corporation	Retrofit	✓			2007
MT *Suula*/Neste shipping	Retrofit		✓		2008
Containerships VII/Containership	Retrofit		✓		2011
APL England/APL	Retrofit	✓			2011
5 vessels/Ignazio Messina and CSpA	Newbuilding	✓			2011 (3 vessels) 2012 (2 vessels)
MV *Tarago*/Wilh. Wilhelmsen ASA	Retrofit			✓	2012
8 vessels/Algoma	Newbuilding		✓		2012 (4 vessels) 2013(4 vessels)
2 vessels/x*	Newbuilding			✓	2013/2014
1 vessel/x*	Newbuilding			✓	2013
HHI Hull 2516 and 2517/Solvang	Newbuilding	✓			2012/2013

* customer wants to remain anonymous

Scrubber Economics

The economics of fitting scrubber units can be simplified by considering the price difference between low-sulphur fuel and HFO, the hours to be spent in SECAs, the savings afforded by the scrubber unit and, hence, the payback time.

Parameters to be considered which affect the economics of fitting include

- Equipment on board to cover main engine(s), auxiliary engine(s) and boiler(s).
- Vessel operation and routes (i.e. the operation profile and fuel oil consumption, and the number of hours in/out of SECA waters).
- Pricing of consumables (HFO vs MGO price, and NaOH price for closed-loop scrubbers).
- Current configuration (existing fresh water capacity for closed-loop scrubbers, ship design layout, tank arrangement, available space, and elevation).

Here Aslak showed a graph of the differences in MGO and HFO prices (based on Amsterdam) from mid-2007 to mid-2012, with the difference varying between US$140/t and US$700/t. The difference peaked in mid-2008, but has generally increased from early 2009 to now, currently standing at about US$350/t. The price for distillates is currently about 1.5 times that of HFO, but the long-term average price for distillates is more like two to three times the price of HFO, so scrubber economics are likely to become more attractive.

Wärtsilä NOx Reducers

The NOx reducer (NOR) is designed by Wärtsilä and is based on selective catalytic reduction (SCR) technology. The NOR portfolio covers Wärtsilä's medium-speed engine portfolio — there are 40 different standard sizes available in the portfolio. NOR is also available for non-portfolio and non-Wärtsilä engines. The size of the NOR is optimised in terms of modularity, performance and costs. Typical NOx emission reduction is up to 90%. The main component of the NOR installation is the reactor with the catalyst inside. Other modular essential parts of the system are the urea pumping unit, urea dosing unit, control and automation unit, and urea injection and mixing unit.

The functional principle of the NOR/SCR unit comprises the exhaust gases being ducted into a chamber containing the catalytic elements and where soot blowing takes place. Before entering the catalyst chamber, urea is injected and mixed with the gases. In the chamber the reaction

$$4NO + 2CO(NH_2)_2 + O_2 \rightarrow 4N_2 + 4H_2O + 2CO_2$$

takes place. The operating temperature is 300–450°C, and the exhaust gases leave the catalytic chamber to exit via the funnel.

Here Aslak showed several diagrams of the layouts of NOR systems, both for a single engine and for multiple engine installations. The main components (aside from the NOR unit itself) include a urea tank, urea pump, compressed air tank and dosing-and-control unit.

Typical consumables include urea, compressed air for urea injection and soot blowing, power for pumping and optional NOx monitoring, and catalytic elements (catalyst lifetime depends on the fuel type and other operating conditions, a typical lifetime being 3–5 years).

Summary

Scrubbing for SOx emissions has a number of advantages. Global demand for distillates is likely to increase, and the price of MGO is expected to increase, while the price of HFO will stay the same or slightly increase. Scrubbers have been demonstrated to work in the marine environment, and allow for the same bunkering and same engine operation as before. European SECAs and the North American ECA have now been ratified, and more can be expected in the future. Wärtsilä has the largest portfolio and reference base of marine scrubber solutions. Wärtsilä scrubber solutions are fit

for new builds and retrofits, for any engine and boiler brand.

The closed-loop scrubber is not dependent on seawater alkalinity, has zero effluent discharge as an option, has low power demand, and needs caustic soda as a reagent and freshwater. The applications are in waters with low alkalinity and for operators looking for zero effluent discharge possibility.

The open-loop scrubber uses sea water i.e. no freshwater needs, has slightly higher power demand than the closed-loop scrubber, and does not need caustic soda. This type is the most feasible alternative for ocean-going ships.

The hybrid scrubber is a flexible system as it has the ability to operate in either closed-loop or open-loop mode, but is a somewhat more complex system than the other two. The applications are in ships requiring full flexibility of operations (e.g. sailing both in low alkalinity areas as well in open oceans, or requiring zero effluent discharge possibility).

NOx reduction (NOR) is designed by Wärtsilä and is based on selective catalytic reduction (SCR) technology. The NOR portfolio covers Wärtsilä's medium-speed engine portfolio mainly for marine applications. NOR is also available for non-portfolio and non-Wärtsilä engines. Due to the heat requirements of the catalyst, any heat-recovery systems must be located after the NOR reactor. The reagent (urea) is by far the biggest operating cost item of the NOR. In future, combinations of NOR and scrubber systems will likely be seen. Wärtsilä has already tested SCR in high-sulphur fuel oil applications.

Questions

Question time was lengthy and elicited some further interesting points.

An SCR unit is required for each engine, but only one scrubber is required for multiple engines (e.g. for two mains and three auxiliaries, five SCRs would be required, but only one scrubber).

The Great Lakes are also part of the ECA in the USA. However, there are certain exemptions within the Great Lakes (e.g. for steam ships).

Space for fitting the equipment is the major limitation for retrofitting scrubbers and NOR units, and depend very much on the particular vessel and the arrangement.

When handling the caustic soda and urea, the proper materials need to be utilised, as these are corrosive agents for certain materials. For the scrubber unit, corrosion-resistant duplex stainless steel can be used. Alternatively, GRP/FRP can be used in applications where all the exhaust gas flow into the scrubber can be stopped immediately without risking the engine or scrubber in question. Piping can be GRP/FRP or high-quality steel for the scrubbing water.

On land, flue-gas desulfurisation (FGD) is a set of technologies used to remove sulphur dioxide (SO_2) from exhaust flue gases of fossil-fuel power plants. Both dry scrubbers (e.g. $Ca(OH)_2$) and wet scrubbers ($CaCO_3$ or NaOH) are used, but freshwater availability, water-treatment requirements and economics favour dry scrubbers in very large installations.

When dealing with a NOR/SCR system, urea is injected into the system and so there is no sludge; the products are nitrogen, carbon dioxide and water.

High-sulphur fuels can be used with NOR units, and Wärtsilä have done this in power plant applications in Finland. For high-sulphur fuels you need to take into account the channel size in the catalytic elements, possibly change the chemical composition for the catalytic elements, and you may use bigger volumes compared to distillate systems. The system is very robust, and not subject to sulphur poisoning. There can be a problem with ash if the system starts to block due to the soot-blowing system not working properly, or with ammonium bisulphate in case urea injection is performed at too-low temperatures.

The vote of thanks was proposed, and the "thank you" bottle of wine presented, by Bill Bixley. The vote was carried with acclamation.

Aslak's presentation was recorded by Engineers Australia and is available as a webcast at www.mediavisionz.com/ea/2012/easyd/121003-easyd/index.htm.

Phil Helmore

It is not often that we see a new 8 m yacht under sail but on 4 November, after a suitable christening at the Sydney Amateur Sailing Club, Graeme Wood's beautiful *Juanita* provided that opportunity. Designed by Garry Lidgard and built on the Gold Coast by Keith Dobson of Huon Pine and other high-quality timbers, the boat is a work of art.

Juanita will head to Europe early next year to compete in the lead-up races for the World Championships which will be held in Helsinki in July/August 2013

(Photo John Jeremy)

Joint Industry Project on Assessing Requirements for LNG Bunkering in Australia

Det Norske Veritas (DNV) and nine key members of the Australian maritime, port and energy sectors have established a four-month study organised as a Joint Industry Project (JIP). This JIP's intention is to facilitate the adoption of LNG-fuelled vessels in Australian waters. Using LNG as marine fuel eliminates SOx and particulate matter emissions, nets a 15% reduction in greenhouse gas (GHG) emissions and diminishes that of NOx by 85–90%. This addresses both local and global pollution issues.

The study aims to cover the infrastructure and regulatory requirements as well as the potential benefits and risks faced by energy majors, ports and ship-owners considering LNG-fuelled vessels. The study concentrates on LNG-fuelled OSVs and tugs plying in Australian waters, but the key recommendations developed will be valid for most ship types. Geographically, that focus will be on the ports of Dampier, Darwin and Melbourne as points of inclusion.

The JIP is managed by DNV and is co-sponsored by DNV along with nine industry parties and authorities, namely the Australian Maritime Safety Authority (AMSA), BOC Limited (Linde Group), Farstad Shipping Pty Ltd, Ports Australia, Rolls-Royce Marine AS, Svitzer Australasia, Swire Pacific Offshore Operations (Pte) Ltd, Teekay Shipping (Australia) Pty Ltd and Woodside Energy Ltd. Key obstacles in promoting LNG-fuelled ships will be identified, with an initial consideration of adequate infrastructure and existing regulations which, in Australia, are complicated by the diverse state-based legislative schemes. Safety is of the utmost importance for such a development and ports will face the challenge of offering safe storage and ship-specific bunkering of LNG. These challenges will also be incorporated in the study.

Project goals include an assessment of the regulatory framework and infrastructure necessary for LNG bunkering at the Federal level and for selected states. By the end of 2012 the JIP will deliver a gap analysis and a map of legal and infrastructural challenges and opportunities. The JIP will also produce internal and external reports covering key areas for improvements as well as recommendations on the direction and steps to be taken in the LNG fuel domain for the benefit of the Australian maritime industry.

This JIP aims to give the required exposure to LNG as a fuel and to provide objective information to be used in subsequent detailed studies in triggered LNG bunkering initiatives.

This JIP leverages on the increasing interest in LNG as a marine fuel in the general Pacific region. Dr Sanjay Kuttan, Managing Director of DNV's Clean Technology Centre (CTC), paints the vision behind the initiative: "The convergence of availability of gas, innovative technologies, progressive regulatory measures and visionary leadership will make LNG a major cleaner-energy source for power generation, land and sea transportation, petrochemical feedstock and domestic gas a reality in the near future. The team at DNV CTC is honoured to be part of this momentum to fulfil DNV's purpose in safeguarding life, property and the environment."

What is a JIP?

A JIP is a project funded by a number of industry players choosing to collaborate on a specific scope of work; it constitutes a platform where a consortium of companies, authorities and stakeholders collaborates to share knowledge and/or identify and recommend solutions to issues of common interest.

Why LNG?

In financial terms, there is an additional capital expenditure required by LNG-fuelled vessels. This is caused by the requirement of additional technology such as an advanced fuel tank, a gas-conversion and distribution system and double-walled piping. This additional capital expenditure is projected to be justified over the typical lifespan of such a vessel through returns in the form of lower fuel consumption, less maintenance and, most probably, a cheaper fuel as the price of LNG is expected to escalate slower than the price of oil.

In environmental terms, the benefits of fuelling ships with LNG may include giving such vessels a future competitive advantage due to lower emissions (as previously mentioned), without additional exhaust-gas abatement technologies or expensive low-sulphur distillates.

LNG-fuelled propulsion has been shown to meet the strictest emission-control regulations—such as the global 0.5% sulphur cap, to be implemented between 2020 and 2024—in addition to being technically feasible. With an increasing number of ships being delivered with LNG propulsion also outside the IMO emission control areas (ECA), the necessity of further infrastructure is growing on a global level.

Contact Information

For more information on the JIP, please feel free to contact Project Manager Henning Mohn at henning.mohn@dnv.com, Project Sponsor Timothy Holt at timothy.holt@DNV.com or Project Quality Committee leader Alex Dronoff, General Manager LNG of BOC Limited at alex.dronoff@boc.com.

Rodney Humphrey

Ballast Water Treatment Guidance

With the ratification of the Ballast Water Management Convention getting closer, Lloyd's Register has updated their guidance material regarding the requirements of the convention, together with selection and approval of Ballast Water Treatment Systems. To get hold of the guidance, visit www.lr.org/bwm.

LR Releases LNG Bunkering Study

Lloyd's Register has released the report *LNG-Fuelled Deep-sea Shipping — Outlook for LNG Bunker and Fuelled Newbuilding Demand up to 2025*, a study undertaken by LR to better understand the future demand for LNG as a fuel and to help refine and deliver its innovative portfolio of gas-technology services.

In August, the organisation's marine experts offered industry a snapshot of the report's findings, and have now released the full report in time for Gastech 2012 in London.

"We needed to develop an approach which would help us to get a clear sense of what LNG-as-fuel might mean for our clients", said Hector Sewell, Head of Marine Business Development for Lloyd's Register. "We have the in-depth capability to handle the technology and the risk issues associated with gas, but we wanted to be able to help our clients understand what will be driving industry adoption. We were most interested in the deep-sea trades as these are responsible for most of the world's tonnage, emissions and fuel bills."

The study found that widespread adoption of LNG-as-fuel will be driven by price, the growth of alternative fuels, and the degree of global collaboration. Its base-case scenario predicted that, by 2025, there could be 653 deep-sea LNG-fuelled ships in service, consuming 24 Mt of LNG annually. These ships are most likely to be containerships, cruise vessels and oil tankers.

LR Announces Breakthrough in Containership Capacity

Advanced research and development indicates that container stacking weights can be modified to allow the carriage of more cargo. In an 18 000 TEU design, the increase in cargo weight could be as much as 10%, says Tom Boardley, Lloyd's Register's Marine Director. The benefits are lower costs, lower emissions and a lower carbon footprint.

Boardley said that the results come from looking hard at ship efficiency — how can we optimise designs? Clearly there has been scepticism over many ship efficiency claims, and much of the problem comes down to lack of common approaches to measurement, so you end up comparing apples with oranges. But the work that we have been doing in examining the forces involved in container stacks is throwing up some really interesting and innovative results. These results indicate clearly that we will be able to allow much higher cargo weights and enable more operational flexibility — and to do this in safety. The potential in cargo increase is considerable.

I must emphasise the safety element here. We are helping the owners reduce risks and further reduce uncertainties in container-stowage planning and operations. We have been carrying out a broad range of investigations and re-formulation of the calculations of operational ship accelerations and ship motions. This is not just mathematics — real containers have been load tested at full scale and ships have been instrumented; we have been modelling the impact of our new insights for the larger 16–18 000 TEU designs now emerging and, looking to possibilities in future, for the next generation of 22 000+ TEU ships.

The results have been really interesting and positive. In some locations in some designs, you may have to reduce container weights. But having satisfied ourselves that the risks are managed, there are big benefits in overall carrying capacity. It's not about more container slots — it's about being able to load more containers which are carrying cargo and being able to have more options as to where to load, which can help speed up cargo operations, reducing time in port, energy used and driving increased asset efficiency ashore and afloat.

The larger the ship, the bigger the benefit as the efficiencies are scalable. The next steps towards final confirmation and the ability to offer new rules will go for validation by the Lloyd's Register Technical Committee in November.

These latest findings are important and support the approach that we can make considerable savings through innovative research and a greater understanding of operational requirements and realities. Anyone looking at big container ships will benefit from this work.

There is still more work to be done. But we will be changing our rules and hope to bring this into practice soon.

Christopher Hughes

COMING EVENTS

LR Seminar on LNG as Fuel

Lloyd's Register will be running a seminar in Sydney on Wednesday 5 December on the use of LNG as fuel within the marine industry. The seminar will include presentations from experts within LR and externally, including Austal, Wärtsilä and BOC. The seminar will be followed by drinks and canapés in the evening.

Topics to be covered include:

- New rules for LNG as fuel.
- Lloyd's Register's risk methodology for handling novel concepts.
- Critical technical issues involved in using LNG as fuel.
- Gas engine technology.
- The supply and availability of LNG.
- Newbuilding and bunkering case studies.

Places are limited. To register, or to obtain more details including a full agenda, contact christopher.hughes@lr.org

SMIX Bash 2012

The thirteenth SMIX (Sydney Marine Industry Christmas) Bash will be held on Thursday 6 December aboard the beautifully-restored *James Craig* alongside Wharf 7, Darling Harbour, from 1730 to 2130. This party for the whole marine industry is organised jointly by RINA (NSW Section) and IMarEST (Sydney Branch).

This year's event is sponsored by the following organisations:

Platinum

Teekay Shipping (Australia)
Damen

Gold

ABS Pacific
AMC Search
Ausbarge Marine Services
Det Norske Veritas
Electrotech Australia
Energy Power Systems (Caterpillar)
International Paints
Lloyd's Register Asia
Noakes
PB Towage
Phoenix Engineering Group
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Composite Consulting Group
Cummins South Pacific
Germanischer Lloyd
GMT
Hanson Construction
Inco Ships
Jotun Australia
MTU Detroit Diesel Australia
Polaris Marine
ZF Services Australia

Bronze

Ayres Composite Panels
Edwards Marine
One2three Naval Architects
Shearforce Maritime Services
Twin Disc (Pacific)

Our thanks to them for their generosity and support of SMIX Bash 2012, without which it could not happen.

The response to SMIX Bash 2012 has been overwhelming, and registrations have now closed. To all those who have booked tickets — thank you. To those who were thinking about making a booking — sorry!

Australian Fluid Mechanics Conference

To be held at the Australian Maritime College on 3–7 December 2012, the Australasian Fluid Mechanics Conference provides a national and international forum for presentation of current research in all areas of fundamental and applied fluid mechanics including but not limited to aerodynamics, hydrodynamics industrial flows, combustion aero-acoustics, wind engineering, oceanography, atmospheric research, computational fluid dynamics, experimental techniques, multiphase flows, non-Newtonian flows, jets and wakes, boundary layers, gas dynamics, hydraulics, pipe flows, ground-water flows, microfluidics, fluid-structure interaction and heat transfer.

The 18th Conference will be the first of the series to be held biennially under the auspices of the Australasian Fluid Mechanics Society. The program will feature a diverse range of invited lectures by international experts as well as tours of the host institution's laboratories.

For further details see www.18afmc.com.au/.

Dry Dock Training Course

DM Consulting offers comprehensive dry dock training for all levels of personnel involved in dry docking ships and vessels. Attendees include

- Dock Masters
- Docking Officers
- Dry dock crews
- Engineers
- Naval Architects
- Port Engineers
- Program/Project Mangers
- Marine Surveyors
- Owners Representatives
- On-site Representatives
- Consultants
- Others involved/interested in the dry docking of ships and vessels

The course is presented through classroom lectures, student participation in projects and practical application exercises. The course addresses the deck-plate level of practical operation needed by the dock operator and the universally-accepted mathematical calculations required to carry out operations in accordance with established sound engineering practices. The course has accreditation with the Society of Naval Architects and Marine Engineers (SNAME) and the

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The Royal Institution of Naval Architects

Institute of Marine Engineering, Science & Technology IMAREST

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PACIFIC 2013
International Maritime Conference

7 – 9 OCTOBER 2013
SYDNEY CONVENTION & EXHIBITION CENTRE
DARLING HARBOUR, SYDNEY, AUSTRALIA

PRELIMINARY ANNOUNCEMENT & CALL FOR ABSTRACTS

MARK THE KEY DATES IN YOUR DIARY!

Abstract Submission Opens:
October 2012

Registration Opens:
November 2012

Abstract Submission Deadline:
5 March 2013

Author Acceptance Notification:
8 April 2013

Refereed Papers Submission deadline: 15 May 2013

Full Paper Submission Deadline:
5 June 2013

Presenter Registration Deadline:
5 August 2013

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- Pacific 2013 International Maritime Conference
- RAN Sea Power Conference 2013

In association with the **Pacific 2013 International Maritime Exposition**
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Register your Expression of Interest on the website www.pacific2013imc.com

OUTLINE PROGRAM & CALL FOR ABSTRACTS

The International Maritime Conference will have approximately 60 papers arranged in two streams of parallel sessions so as to give registrants a wide choice of papers.

Registrants to the Pacific 2013 International Maritime Conference will be issued with the Proceedings of the conference in CD-Rom format at the Registration Desk.

All submissions of abstracts are to be submitted online at: www.pacific2013imc.com

Further instructions regarding abstract format and guidelines are available on the website.

Authors are invited to submit abstracts on the following topics:

- Commercial Ship Technology
- Naval Ship Technology
- Submarine Technology
- Commercial Ship Operations
- Maritime Safety
- Maritime Environment Protection
- Offshore Resource Industry

For more information contact Pacific 2013 IMC Managers
Managed by arinex **pty ltd**: GPO Box 128 Sydney NSW 2001
P: +61 2 9265 0700 E: pacific2013imc@arinex.com.au
W: www.pacific2013imc.com

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Images courtesy Department of Defence and Australian Customs and Border Protection Service

Royal Institution of Naval Architects (RINA). The course curriculum includes

- Dry docking terminology
- Calculations
- Vessel stability
- Dry dock planning
- Dry docking procedures
- Lay period
- Undocking procedures
- Incidents/accidents

More details of the course content are shown on the website www.drydocktraining.com/outline.html; click on the Course Outline chapters.

The course is presented by dockmaster Joe Stiglich and is scheduled for 21–24 January 2013 in Melbourne, with the times and location to be advised.

For further details, contact Joe Stiglich at jstiglich@aol.com.

Registration forms are available for download at www.drydocktraining.com/Registration_Australia_2013.html and may be returned by e-mail (jstiglich@aol.com), by fax (1-858-538-5372) or by post (12316 Dormouse Rd, San Diego CA 92129, USA).

Symposium on Marine Propulsors

The 3rd International Symposium on Marine Propulsors will be held at the Tramsheds Function Centre in Launceston, Tasmania on 5–8 May 2013.

SMP'13 is the third in a series of international symposia dedicated to the design and hydrodynamics of all types of marine propulsors. SMP'13 provides a forum to present state-of-the-art research and studies on existing marine propulsors as well as a platform for introduction of new types of propulsors.

SMP'13 will also include, as a mini symposium, the 3rd T-Pod Conference on Technological Advances in Pod Propulsion. Environmental issues are addressed through topics on green propulsion and the hydrodynamic aspects of renewable energy devices.

The call for abstracts closed in early August, and the deadline for author registrations for the conference is 1 December 2012.

Further information can be found on the website www.certain.com/system/profile/web/index.cfm?PKWebId=0x3678222da1 or by contacting the Symposium Manager, Leishman Associates at renee@leishman-associates.com.au, or Neil Bose, Professor of Maritime Hydrodynamics and Acting Principal, Australian Maritime College, University of Tasmania at n.bose@amc.edu.au or phone (03) 6324 9403.

RAN 100th Anniversary International Fleet Review

On 4 October 1913 the first Royal Australian fleet entered Sydney Harbor led by battlecruiser HMAS *Australia*, followed by cruisers HMAS *Melbourne*, *Sydney* and *Encounter* and destroyers HMAS *Warrego*, *Parramatta* and *Yarra*. Many of the vessels featured in this historic event were newly commissioned for the Royal Australian Navy, including HMAS *Australia*. On the steps of Admiralty house, Admiral Sir George King-Hall, the last flag officer of the Royal Navy's Australian Station handed over command of the Australian station to the Royal Australian Navy.

In order to mark the 100th Anniversary, the Royal Australian Navy will hold an International Fleet Review of participating vessels in early October 2013. Proposed events include:

Late Sept	RAN and International naval vessels rendezvous in Jervis bay
Wed 2 Oct	Briefing and preparations for review
Thu 3	Tall ships entry to Sydney Harbour
Fri 4	Fleet entry to Sydney Harbour
Sat 5	International Fleet Review, pyrotechnics/light display in the evening
Sun 6	Religious services and ships open for inspection

For further details of planned events, contact CAPT Nick Bramwell at nick.bramwell@defence.gov.au.

Pacific 2013

The Pacific 2013 International Maritime Exposition and Congress will be held at the Sydney Convention and Exhibition Centre in Darling Harbour from Monday 7 to Wednesday 9 October 2013. It will include:

- The International Maritime and Naval Exposition, organised by Maritime Australia Ltd, to be held from Monday 7 to Wednesday 9 October.
- The Royal Australian Navy Sea Power Conference organised by the Royal Australian Navy and the Sea Power Centre — Australia, to be held from Monday 7 to Wednesday 9 October.
- The International Maritime Conference, organised by the Royal Institution of Naval Architects, the Institute of Marine Engineering, Science and Technology, and Engineers Australia, to be held from Monday 7 to Wednesday 9 October.

Pacific 2013 IMC

The Pacific 2013 International Maritime Conference, organised by the Royal Institution of Naval Architects, the Institute of Marine Engineering, Science and Technology, and Engineers Australia, will be held from Monday 7 to Wednesday 9 October.

The timescale for submission of papers for the International Maritime Conference is as follows:

Call for abstracts	October 2012
Registration opens	November 2012
Deadline for submission of abstracts	5 March 2013
Authors notified of acceptance	8 April 2013
Deadline for submission of refereed papers	15 July 2013
Deadline for submission of non-refereed papers	5 August
Deadline for presenter and early-bird registration	5 August

For any queries on submission of papers, contact the Chair of the IMC Papers Committee, Adrian Broadbent, at adrian.broadbent@lr.org.

Further information on the conference, including the conference and social programs, can be obtained from the conference website www.pacific2013imc.com or by contacting the conference organisers, Arinex Pty Ltd GPO Box 128, Sydney, NSW 2001, phone (02) 9265 0700, fax (02) 9267 5443 or email pacific2013imc@arinex.com.au.

GENERAL NEWS

Future Submarine Update

On 6 September the Minister for Defence, Stephen Smith, the Minister for Finance and Deregulation, Senator Penny Wong, and the Minister for Defence Materiel, Jason Clare, announced that Australia's Future Submarine Systems Centre will be based in Adelaide, continuing the strong relationship which has been formed between South Australia and the Commonwealth in support of Australia's maritime sector.

The Systems Centre will be the home of the future submarine program. It will be formally established this year and, over the next few years, will expand to include hundreds of Defence personnel from Navy, the Defence Materiel Organisation (DMO), the Defence Science and Technology Organisation (DSTO) and the Australian and international defence industry.

The Systems Centre is a similar facility to the one which was established for the air-warfare destroyer project. It will undertake a variety of tasks, including evaluation of options, design work, program management, engineering, logistics and production planning. The first Systems Centre staff are already working in Adelaide, and are temporarily based at ASC.

The Government is committed to acquiring 12 new submarines to be assembled in South Australia. This commitment will be reinforced as part of the 2013 Defence White Paper.

Four options are being considered for the future submarine fleet, ranging from military off-the-shelf to a wholly new design. Defence is undertaking a wide range of studies into these four options before returning to Government for First Pass approval around late 2013–early 2014.

The Minister for Defence and the Minister for Defence Materiel also welcomed Mr David Gould to his new role in the Department of Defence as General Manager Submarines.

As General Manager Submarines, Mr Gould has been given responsibility for the oversight of the maintenance of the current Collins-class fleet and the future submarine project. He began work in July and reports to Warren King, Chief Executive Officer of the DMO.

Mr Gould will work across government, navy and industry to pull together the remediation and support of the existing submarines and the project to replace them. He will oversee the implementation of recommendations made by the Coles Review of submarine sustainment, to improve the availability and reliability of the Collins-class submarines.

Mr Gould has extensive international experience in large-scale defence projects, including the UK aircraft carrier program, the Type 45 Destroyer and the restructuring of the Astute-class nuclear-powered submarine project.

Air-warfare Destroyer Update

On 6 September the Minister for Defence, Stephen Smith, the Minister for Finance and Deregulation, Senator Penny Wong, and the Minister for Defence Materiel, Jason Clare, attended the laying of the keel of the first air-warfare destroyer (AWD) in Adelaide and provided an update on the $8 billion project.

The air-warfare destroyer project is currently the largest Defence procurement project in Australia. Almost 2500 people are employed directly on the project throughout Australia, including a national shipyard production workforce of more than 1500 people in Adelaide, Newcastle and Melbourne.

Construction of the AWDs involves the fabrication of 90 separate steel blocks, 30 for each ship, as well as three sonar blocks, one for each ship, at a number of shipyards in Australia and overseas. ASC in Adelaide is the principal shipbuilder in the project. BAE Systems in Melbourne, Forgacs in Newcastle and Navantia in Spain are also building blocks.

These blocks will be brought together by ASC at the South Australian Government's Techport Common User Facility in Adelaide where the ships are being assembled.

The keel laying for the first destroyer, *Hobart,* is a significant milestone in the project as it marks the start of the next phase in the delivery of these three warships.

The International Fleet Review was launched on board HMAS *Parramatta* anchored in Sydney Harbour on a windy October day. *Endeavour* added to the spectacle of the occasion
(Photo John Jeremy)

The keel-laying ceremony for the future HMAS *Hobart*
(RAN photograph)

Over the coming months *Hobart* will very quickly start to take shape. *Hobart* and the two other ships, *Brisbane* and *Sydney*, will be assembled on a hardstand using a modular construction method which will see 31 ship blocks brought together.

Each of the 31 blocks is already fitted out with a range of equipment; however, further outfitting will be carried out as the blocks are joined, including fitting and integrating the combat and platform systems to form the whole ship.

Following the consolidation phase, the destroyers will be launched using the Techport shiplift and then undergo a series of sea trials and tests, prior to their delivery to the navy. *Hobart* is expected to be delivered in 2016.

A newly-minted silver coin was placed under the keel of the ship to bring good luck through the build phase and the life of the ship.

Minister Smith and Minister Clare also announced a re-baselining of the AWD construction schedule following extensive consultation with Australia's shipbuilding industry and the navy.

The AWD Alliance has conducted a detailed analysis of the construction schedule and advised Defence that the keel-to-keel interval should be extended to 18 months between each ship. Extending the AWD ship building program will help avoid a decline in naval shipbuilding skills before the commencement of Australia's largest and most complex naval project — the future submarine.

The construction of the AWDs began a number of years after the completion of the last Anzac-class frigate. This gap in naval shipbuilding led to a massive reduction in the skills required to build the AWD and increased the challenges for Defence and industry.

The improvement in workforce skills and shipbuilding capacity at the Forgacs shipyards in Newcastle, BAE shipyard in Melbourne and ASC shipyard in Adelaide over the last three years of the AWD project has been impressive.

The revised AWD project plan will reduce peak demand on project-critical resources and facilities, and reduces project risk. The new schedule will not increase the cost of the project nor result in the loss of any jobs. Very importantly, it will help retain skills in the naval shipbuilding industry. It will extend the period of work for the Alliance and its partners including the shipyards in Adelaide (ASC) and Newcastle (Forgacs).

The re-baselined construction schedule will help Navy reduce the challenge and risks associated with accepting into service two major capabilities (LHDs and AWDs) at around the same time.

The re-baselined schedule will mean that the delivery dates for the ships will be HMAS *Hobart* in March 2016; HMAS *Brisbane* in September 2017 and HMAS *Sydney* in March 2019.

The changes were made following extensive consultation with industry and with the Navy to maintain a skilled workforce in the naval shipbuilding industry and a timeline that meets the navy's operational, recruitment and training.

The new schedule was welcomed by industry.

"This decision reflects extensive consultation between Defence and industry, and ASC welcomes the Government's commitment to naval shipbuilding in this country," said Stephen Ludlam, Managing Director and Chief Executive Officer ASC.

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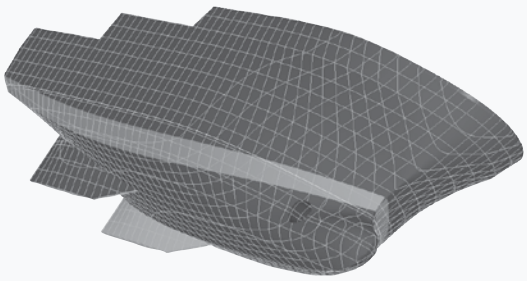

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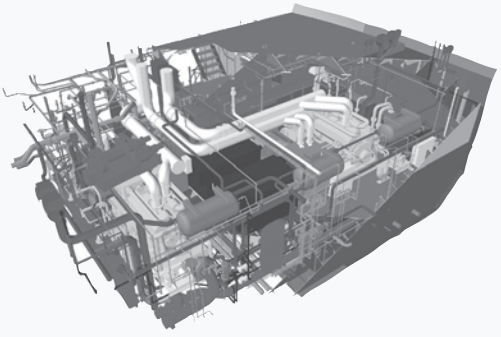

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"Raytheon Australia welcomes this collaborative and pragmatic decision which best serves the future interests of the Royal Australian Navy and naval shipbuilding," said Michael Ward, Managing Director Raytheon Australia.

"Forgacs wholeheartedly supports the extended AWD schedule. This is a major plus for both Forgacs and Australian shipbuilding capability. Forgacs can now retain its skilled marine engineering workforce of 1200 people — skills vital in supplying our nation with warship capability for a secure future," said Tony Lobb, Executive Director Forgacs Engineering.

Indonesian Trimaran Launched — and Destroyed by Fire

On 31 August Indonesia's North Sea Boats Ltd launched a 63 m trimaran warship to be named KRI *Klewang* — after a traditional Indonesian single-edged sword.

The result of a 24 month research, design and development collaboration with New Zealand naval architects, LOM-Ocean Design Ltd, the ship, the first of four, represented a significant step forward in the use of advanced warship-building technologies in countries outside of Western countries.

Designed for patrolling the littorals, the hull shape is intended to permit high speeds to be maintained and thus maximise crew operational capability in the short, steep seas characteristic of the coastline around the Indonesian Archipelago. The design borrows elements from previous trimarans from the same designer, including the 24 m *Earthrace* (later *Ady Gil*), holder of the record for the fastest circumnavigation of the globe by a power boat.

KRI *Klewang*
(Photo North Sea Boats)

The underwater sections have been optimised for extended range at fast patrol speeds; the length, transverse and longitudinal positions and immersion of each of the three hulls have been carefully tailored for least resistance using both slender body analysis and towing-tank testing.

Powering and propulsion is by multiple MAN V12 diesel engines, coupled to MJP 550 water jets, located in both the centre hull and each of the two side hulls for maximum propulsive thrust and manoeuvrability. The use of carbon foam sandwich composites on this scale in naval application is unprecedented outside of Scandinavia, and is representative

The RAN's first LHD, *Canberra*, arrived in Port Phillip Bay on 17 October on board the heavy lift ship *Blue Marlin*. *Canberra* is now alongside at Williamstown where BAE Systems will fit the superstructure and complete fitting out and trials. HMAS *Canberra* will join the fleet in 2014 and her recently launched sister ship, the future HMAS *Adelaide*, will be commissioned in 2016.
(RAN Photograph)

of the current state of the art in both maritime composites structural engineering and production technology.

The structural design was subject to third-party approval by Germanischer Lloyd in Hamburg, using design and approval methodologies tailored specifically for the unusual geometry of a large, wave-piercing trimaran.

Unfortunately, on 28 September, KRI *Klewang* was destroyed by fire alongside at Banyuwangi in Indonesia.

Austal Order for More Wind-farm Support Vessels

In October Austal secured a new contract for the design and construction of three wind-farm support vessels. The 27 m catamarans will be used by UK-based Turbine Transfers to support wind-turbine installation and maintenance activities in European waters. Austal will build them at its shipyard in the Philippines over a period of approximately nine months, commencing in March 2013.

Commenting on the new contract, Austal's Chief Executive Officer, Andrew Bellamy, said: "Austal decided to pursue the growing market for wind-farm boats in mid-2010. Having spent the first year working hard to better understand the market's expectations, we signed our first contract in July last year.

"During that initial 12 month marketing period we did a lot of research and design development, and confirmed that Austal needed to regionalise its manufacturing base in order to be successful. The company acquired a shipyard in the Philippines last November for that very reason.

"Now, as our contracts demonstrate, Austal has the vessel designs that customers want, and the right production cost base to successfully leverage that intellectual property. Our strategy has been so successful that the Philippines shipyard now employs over 220 staff, continues to grow, and is currently fully utilised into the first quarter of next financial year," he added.

Mr Bellamy stressed that Austal can still take on further projects and provide prospective clients with high quality vessels in short time frames.

Austal's 27 m wind-farm support vessel
(Image courtesy Austal)

"The capacity and efficiency of our Philippines shipyard means that we are still able to meet market demand for vessels delivered in the first half of 2014. We continue to aggressively pursue further projects for wind-farm boats, ferries and other commercial vessels," he said.

This is Austal's third new project for Turbine Transfers in a little over 15 months. Three 21 m catamarans were ordered in July 2011 and delivered to Europe earlier this year. Construction of a 27 m tri SWATH ordered in January 2012 is nearing completion at the Philippines shipyard.

Managing Director of Turbine Transfers, Captain Mark Meade, said that his company was using Austal technology to support the next phase of wind-farm development which would see a much larger number of turbines installed farther offshore and in other areas with rougher sea conditions.

Rugged and versatile, the new Wind Express 27 catamarans will be able to transport 12 personnel and 10 t of equipment/stores to and from turbines. This includes containerised items on forward and/or aft decks.

Powered by four Caterpillar C18 diesels and propelled and steered by Rolls Royce KaMeWa waterjets, they will be able to operate at speeds in excess of 27 kn. An Austal integrated monitoring, alarm and control system with touch-screen interface will be configured such that all vessel functions are available from a central location on the bridge.

Austal's advanced Z-bow hullform coupled with high tunnel clearance allows the Wind Express 27 to maintain higher speeds in waves than competing catamarans, reducing both

exposure to seasickness and service times per turbine. A ride-control system consisting of forward T-foils and transom interceptors is fitted to further reduce unwanted motion and provide dynamic trim control.

The vessels will normally operate with a crew of two; however, the design includes four single-berth cabins which makes it possible to operate around-the-clock with two crews of two. The cabins are in the superstructure, which is resiliently mounted to reduce noise and vibration transmitted from the hull.

The catamarans are being designed and built to Det Norske Veritas ✠1A1 HSLC Windfarm Service 1 R1 classification and United Kingdom MGN 280 Area Category 1 requirements.

Austal USA Progress

On 1 October Austal USA successfully completed the launching of the second Joint High Speed Vessel (JHSV), the recently-christened USNS *Choctaw County* (JHSV 2). This 103 m high-speed catamaran represents the US Department of Defense's next-generation multi-use platform. It is part of a ten-ship program potentially worth over $US1.6 billion.

The launch of USNS *Choctaw County* was conducted in a multi-step process as follows:

1. On Sunday 30 September, Goldhofer self-propelled modular transporters (SPMTs) lifted the entire 1600 t ship almost 0.9 m in the air and moved the JHSV approximately 120 m onto a moored deck barge adjacent to the assembly bay.
2. The deck barge with USNS *Choctaw County* onboard was towed a kilometre down river to BAE Systems' Southeast Shipyard, Mobile.
3. The vessel was transferred to *Drydock Alabama*, BAE's floating dry dock.
4. On 1 October the floating dry dock was submerged and USNS *Choctaw County* entered the water for the first time.
5. USNS *Choctaw County* was taken from the drydock and towed back up river to Austal USA's facility, where she will undergo final outfitting and activation before sea trials and delivery to the Navy.

This process was initially used during the launching of the Independence-variant Littoral Combat Ship *Coronado* (LCS 4) in January 2012. A major improvement in safety and efficiency, the new roll-out method has reduced the time of the transfer process, and serves as a capstone in Austal's effort to reduce the cost and time required in future JHSV and LCS deliveries. The first of the JHSVs, USNS *Spearhead*, successfully completed acceptance trials in the Gulf of Mexico in August.

On 18 October a keel-laying ceremony was held for the third LCS to be built by Austal, the future USS *Jackson* (LCS 6). Employment is expected to grow to around 4000 at the Alabama yard during the JHSV and LCS construction programs.

Westpac Express Charter Extended

In August the US Military Sealift Command (MSC) exercised the first of its three six-months options for the ongoing charter of *WestPac Express*. The option forms part of a 24-month contract which Austal was awarded in December 2011.

The 101 m aluminium catamaran has now been supporting the US Marine Corps in Okinawa, Japan, since July 2001 and has achieved virtually 100% availability over that time.

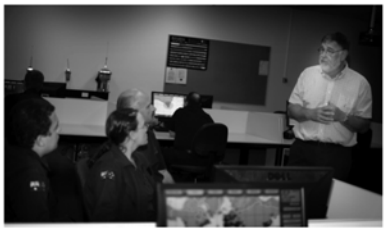
Choctaw County emerging from the assembly hall
(Photo courtesy Austal)

AMC Australian Leader in Maritime Training and Consultancy

In addition to the renowned Maritime Hydrodynamics Research facilities, Australia's national centre for maritime education and training, the Australian Maritime College (AMC) provides an extensive range of maritime training courses, consultancies and publications through its commercial arm, AMC Search Ltd. AMC Search Ltd Registered Training Organisation, and has ISO 9001:2008 Quality Accreditation.

- Deck Officer Revalidation & GMDSS Renewal
- Certificate of Sea Safety Training
- Fire Prevention and Fire Fighting
- Chief Integrated Ratings
- Ship Security Officer
- Tanker Safety
- Safe Bulk Loading Practice
- Fast Rescue Craft
- Vessel Traffic Services (VTS)
- Dynamic Positioning:
  - BASIC (Induction)
  - ADVANCED (Simulator)

An extensive range of port and terminal operations courses are also available. Many of these are designed specifically to meet the clients requirements.



Course information, including scheduled dates, fees and content is available at: www.amcsearch.com.au

Alternatively, if you would like to discuss how AMC Search can meet your specific training needs, contact:

Ms. Catherine Wilson
Deputy CEO
Telephone: (03) 6324 9852
Email: C.Wilson@amc.edu.au

AMC
DYNAMIC POSITIONING UNIT

AMCS
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The commercial arm of the Australian Maritime College

The Austal-managed charter operation includes in-service support, ship management services and integrated logistics support.

Austal Chief Executive Officer, Andrew Bellamy, said: "It is a great honour to be able to continue to support the operations to the United States military. Austal has been doing so successfully for well over a decade now, and we certainly plan to continue to do so into the future."

Austal says that the success of the *WestPac Express* reflects the utility and robustness of Austal's high-speed platforms and the effectiveness of its comprehensive support services. Austal provides those services to a broad range of clients from its facilities in Australia, the United States, Asia, Europe, the Caribbean, and the Middle East.

Strategic partnership for Austal and Marina Barcelona 92

In September Marina Barcelona 92 (MB92), the largest shipyard in the Mediterranean specialising in the refit and repair of superyachts, and Austal announced a strategic partnership to offer leading support services to the superyacht and high-speed vessel markets. As part of this agreement, Austal will commence operations in MB'92's Barcelona facility.

As part of this agreement, Austal will provide naval architecture, engineering, aluminium fabrication, welding, pipe-work and consultancy services. Marina Barcelona 92 is a company dedicated to the yacht industry providing refit, repair and maintenance works to more than 70 super yachts per year with overall lengths from 35 m to 180 m.

MB92 is located in the port of Barcelona which is a strategic stop-off point for the yachts on their journey between the Mediterranean and the Caribbean.

With 20 years experience in the superyacht industry, MB92 has 100 employees and subcontracts work to more than 500 professionals, engineers and specialists from local workshops and international firms. The company's facilities cover a surface area of 76,000 m^2 and comprise a 210 m dry dock, a 2000 t Syncrolift® (with a second 4000 t Syncrolift® to complete in 2013), a 125 m paint shed, a 150 t Travelift, and docking repair wharves with the capacity to berth eight yachts up to 110 m in length (with another berthing repair area for six yachts up to 200 m completing in 2012) making it one of the largest superyacht refit facilities in the world.

The shipyard of Marina Barcelona 92
(Photo courtesy Austal)

Vacuum Cleaner Innocent

In the last edition of *The ANA* we reported on a fire on board USS *Miami* (SSN 755) during refit at the Portsmouth Naval Shipyard, New Hampshire, initially thought to have been caused by a stored vacuum cleaner.

It turns out that the fire was arson, lit by a civilian worker at the dockyard and who is in jail awaiting trial.

The repair cost is now estimated at $US450 million. The 22-year-old submarine was, at the time of the fire, about two months into a planned 20-month refit at the dockyard. The US Navy had planned to decommission the boat in 2020 after 30 years of service but, if the fire repairs are completed at the end of April 2015, she is expected to serve another decade, or enough for five full-length deployments.

Smeralda from Hanseatic Marine

The spectacular 77 m superyacht *Smeralda* was successfully launched on 17 March 2012 by her builder Hanseatic Marine. With her distinctive hull lines and super-sleek profile, *Smeralda* is third in the multiple award-winning Silver series designed by Espen Øino. The vessel represents the latest incarnation of a ground-breaking superyacht concept which marries unprecedented levels of speed and performance with impressive long-range cruising capabilities.

Smeralda at sea
(Photo courtesy Hanseatic Marine)

Equipped with more powerful engines than her predecessors, *Smeralda*'s top speed is close to 30 kn. With a predicted range of 5000 n miles at 18 kn cruising speed, *Smeralda* will reinforce the extraordinary and already well-proven fuel-efficient credentials of the Silver series which is

Smeralda on trials
(Photo courtesy Hanseatic Marine)

characterised by lightweight aluminium construction combined with an advanced hull and engineering platform.

The largest superyacht to be built in Australia and a testament to the professional talents of her project team, *Smeralda* boasts the highest level of northern-European luxury craftsmanship and outfitting. The sophisticated Italian-styled contemporary interior was designed by Andreas Holnburger of Vain Interiors in Germany, and features American walnut panelling, high-gloss lacquers, and innumerable custom finishes such as sculptured carpets, woven leathers and artisan stonework.

The main saloon is framed by large picture windows offering panoramic views and plenty of natural light. Spacious VIP guest accommodation is configured across nine cabins. The owner's apartment occupies the entire upper-deck level and features a large private aft-facing deck area. A large air-conditioned alfresco dining area with removable glass panels is situated on the main deck aft and complements the numerous outdoor leisure spaces.

Among *Smeralda*'s unique features are the helicopter touchdown pad, glass-fronted deck jacuzzi, outdoor cinema, outdoor nightclub sound system, large forward gull-wing doors which house the vessel's inventory of water toys: two 7.3 m tenders, jet skis and Sea Bobs, as well as the expansive sea-level 'Beach Club' which provides a day spa complete with saunarium.

The vessel arrived in the Mediterranean at the end of July.

Further details and more photos can be found at www.superyachttimes.com/editorial/33/article/id/8223.

Principal particulars of *Smeralda* are

Length OA	77 m
Beam	10 m
Depth	4.90 m
Draft	2.56 m
Guests	22
Crew	18
Fuel oil	113 000 L
Fresh water	30 000 L
Main engines	2×MTU 16V4000M90 each 2720 kW
Propellers	2×5 blade high-skew fixed pitch
Speed	27 kn
Range	5000 n miles at 18 kn

Nick Stark

35 m Catamaran from One2three

Inter-Island Boats, who operate under the Cat Cocos brand, have placed an order with Aluminium Boats Australia for a One2three-designed 35 m catamaran, for use on their ferry runs between Mahe, Praslin and La Digue islands in the Seychelles.

One2three have optimised the hull to suit the additional passengers and cargo, resulting in significant fuel savings over their existing fleet. The new hull has a shape which is also suitable for the offshore nature of the route, and it will be fitted with a Humphree interceptor ride-control system to further enhance the seakeeping and passenger comfort.

Powered by twin MTU 16V2000 M72 engines at 1440 kW brake power with ZF 4540 gearboxes driving conventional propellers, the vessel's service speed is 27 kn at 70% MCR and the full-load speed is 31 kn. This is the sixth 35 m One2three-designed passenger catamaran contracted by ABA in the past 3 years.

Principal particulars of the new vessel are

Length OA	34.95 m
Beam moulded	9.60 m
Passengers	
Main saloon	221
Upper Saloon	24 (first class)
External	132
Sundeck	60
Total seats	437
Fuel oil	2×4500 L
Fresh water	1200 L
Sullage	2×1200 L
Main engines	2×MTU 16V2000 M72 each 1440 kW
Gearboxes	2×ZF 4540
Propulsion	2×propellers
Speed (service)	27 kn at 70% MCR
(maximum)	31 kn

Profile of 35 m catamaran ferry for Cat Cocos
(Image courtesy One2three Naval Architects)

24 m Eco-ferry from One2three

Aluminium Boats Australia is nearing completion of a fifth One2three-designed 24 m eco-ferry. Due for launch in mid-November 2012, the vessel has been built for Eko Water Buses in Nigeria for operation on the Lagos Lagoon. The first vessel is the pilot for 20 boats to be delivered in the first two years, with a remaining 40 vessels to be delivered over the following four years.

The vessel is configured for 153 seated passengers, with an additional 47 passengers standing on short routes.

Powered by twin Scania DI-13 diesels at 405 kW brake power and Hamilton HJ402 waterjets, the vessel has an anticipated service speed of 20 kn. Waterjet propulsion enables the vessel to operate in shallow-draft areas, with a full-load draft of less than 1 m. The vessel also features the eco-ferry mammal-friendly hullform as utilised on the existing One2three-designed 24 m vessels operating in Dugong-breeding grounds in Gladstone and Brisbane's Morton Bay.

Unlike the previous 24 m eco-ferries, the latest vessel has an aluminium superstructure in lieu of an E-glass/vinylester composite construction. The change to aluminium was made for this particular customer as a capital-cost-reduction measure. Lifting lugs have been incorporated into the aluminium structure to enable a four-point lift for shipping/relocation.

Principal particulars of the new vessel are

Length OA	23.99 m
Beam moulded	6.25 m
Passengers	
Main Saloon	126
External	27
Total seats	153
Total capacity	200
Fuel	2×2000 L
Fresh water	1×200 L
Main engines	2×Scania DI-13 each 405 kW
Propulsion	2×Hamilton HJ402 waterjets
Speed (service)	20 kn

Rob Tulk

24 m eco-ferry for Nigeria under construction at Aluminium Boats Australia
(Photo courtesy One2three Naval Architects)

Inclining of SMB *Conder* and SMB *John Gowland* by BCTQ

Burness Corlett Three Quays recently conducted inclining experiments on two Royal Australian Navy survey motor boats, *Conder* and *John Gowland*, at HMAS *Waterhen*. Lightship mass of the vessels was determined by lifting each vessel out of the water and measuring the mass by load cell. This mass was correlated with the mass determined from the stability model, using freeboards measured on the day. Both *Conder* and *John Gowland* had grown since their last measured lightship mass in 2002.

The inclining experiments were witnessed by the Stability Technology Manager of the Directorate of Navy Platform Systems, Richard Dunworth. The new lightship particulars were accepted by DNPS as the basis for future stability analysis.

Lifting of SMB *Conder* prior to inclining
(Photo courtesy BCTQ)

LPG and ULP Stowage on STS *Young Endeavour* by BCTQ

BCTQ provided a detailed design package for the installation of LPG and ULP stowage underneath an existing RIB stowage on board the Sail Training Ship *Young Endeavour*.

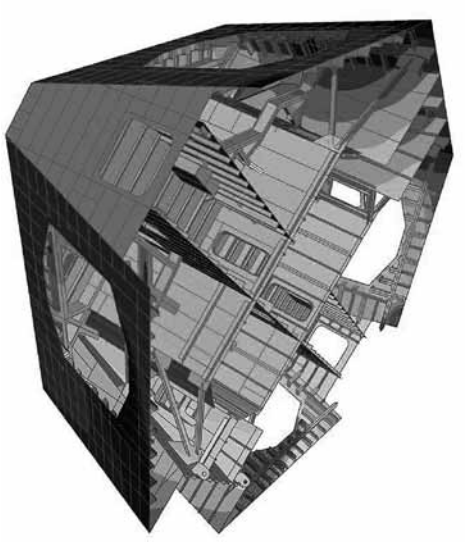
Arrangement of LPG and ULP Stowage on STS Young Endeavour
(Image courtesy BCTQ)

The ULP and LPG canisters are released via trap doors in the aft deck which are activated by a lever from a remote location near the helm. Activation allows the tanks to drop out of the cage into the water.

The package included ripout drawings for the existing structure, installation drawings of new structure and a testing and maintenance plan as well as structural analysis of the aft platform. The image displays the design prepared for the Royal Australian Navy.

AWD Support by BCTQ

BCTQ continue to provide production support to ASC for the AU$8 billion air-warfare destroyer project for the Royal Australian Navy. The AWDs are being constructed using a block-build method.



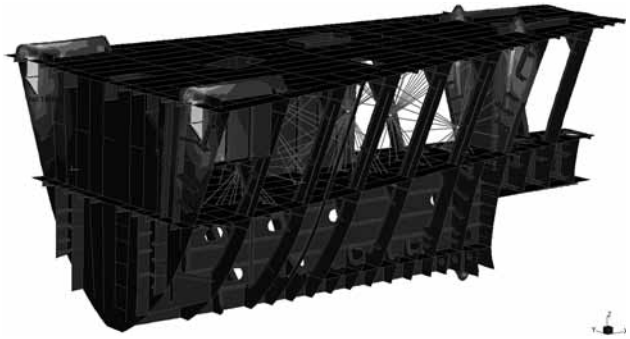
Finite –element analysis rendering of turn over of AWD Block 709
(Image courtesy BCTQ)

A successful lift and turnover was recently performed at ASC in Adelaide on half of Block 709 which had a mass of approximately 62 t. BCTQ's finite-element analysis showed that substantial bracing was required on the longitudinal bulkheads to prevent buckling of the block structure. Detailed design drawings were provided to assist in the manufacturing of the required additional bracing structure throughout the block. The image and photo display a two lug equilibrium step during the turnover process.

Turn over of AWD Block 709
(Photo courtesy BCTQ)

A successful lift and turnover was also recently performed at ASC in Adelaide on Block 113 which had a mass of approximately 48 t. BCTQ's finite-element analysis showed

that additional bracing was required under the lifting lugs on the aft bulkhead of the block. A full FEA report and detailed design drawings were provided to assist in the manufacturing of the required additional bracing structure.



Finite–element analysis rendering of turn over of AWD Block 113
(Image courtesy BCTQ)

Modifications to *Mermaid Sapphire* by BCTQ

BCTQ provided fabrication drawings, finite-element analysis reports and loads due to ship motions reports on new structure being installed on the offshore supply vessel *Mermaid Sapphire*. The new structure provided support for cargo containers, a new radome on the upper deck, a crane-resting pedestal, and a collapsible composite hangar used to house a deep-sea submarine.

The vessel was used as the support vessel for the deep-sea expedition to the Mariana Trench in March 2012. Sponsored by National Geographic, this expedition was filmed by James Cameron who made history by diving to 11 000 m in the Challenger Deep section of the trench, the deepest point of the earth's oceans. During this voyage, *Mermaid Sapphire* was subjected to Force 6 conditions, which confirmed the strength of the newly-installed equipment and structure.

First test of new equipment aboard *Mermaid Sapphire*
(Photo courtesy BCTQ)

HMAS *Newcastle* Capability Enhancements by BCTQ

The Royal Australian Navy required capability enhancements for the FFG, HMAS *Newcastle*. This included installation of the Mini Typhoon System, ballistic protection upgrades and increased stowage capacity. As part of this detailed design package for HMAS *Newcastle*, BCTQ provided removal/installation drawings, FEA reports, test and trials plans, and safety assessments for the supporting systems of the equipment upgrades. The scope of work was multi-faceted, involving the enhancement of mechanical systems, electrical systems and structural design.

The photo shown is of a similar installation on HMAS *Melbourne*, completed in 2010.

Ballistic panels on HMAS *Melbourne*
(Photo courtesy BCTQ)

Inclining of ASV *Wyatt Earp* by BCTQ

BCTQ conducted an inclining experiment on Antarctic Survey Vessel *Wyatt Earp*. The experiment was conducted at McMahon's Point, Sydney. The vessel was lifted and weighed via a load cell to determine the lightship displacement. Weather conditions on the day of the inclining were optimum, with still waters, little wind and negligible current. There was a growth of approximately 30% since her last approved lightship displacement in 1992. The inclining experiment was witnessed by Richard Milne for the Directorate of Navy Platform Systems. The lightship particulars presented in the inclining experiment report were accepted by DNPS as the basis to be used for future stability calculations.

Lifting of ASV *Wyatt Earp* prior to inclining
(Photo courtesy BCTQ)

Pacific Dawn Structural Analysis

BCTQ conducted a structural analysis for Carnival Australia on a new movie screen structure and Sea Tel dome pedestals on board their passenger cruise liner, *Pacific Dawn*. A 3D model of the structure was generated and a finite-element analysis was performed. A lightship comparison, FEA reports and detail design drawings were provided to the client. The sea-motion accelerations and structural design were in accordance with Lloyd's Register's rules.

Movie screen installed on *Pacific Dawn*
(Photo courtesy BCTQ)

BCTQ Analyses 27 m Barge with 23 t Lift Capacity

Waterway Construction required seven 12 m pontoons connected together to serve as a platform for drilling and heavy-equipment operations at Wingecarribee Dam. A detailed finite-element analysis was conducted on the pontoons and the structure connecting them together. A mountable dual-thruster unit as well as a 12 m high sheer-legs assembly were some of the heavy machinery that the barge supported. Lifts as heavy as 23 t were required by the sheer legs. Stability analysis, detail design drawings and FEA reports were provided by BCTQ in support of this project.

Thrusters on 27 m barge
(Photo courtesy BCTQ)

Sure Pride from Incat Crowther

Incat Crowther has announced the launch of *Sure Pride*, a 19.5 m catamaran wind-farm service vessel. Built by BLRT Marketex in Estonia, *Sure Pride* is the first in a series of four such vessels to be delivered to Sure Wind Marine. *Sure Pride* is Incat Crowther's most flexible and capable WFSV yet, with dual work decks and increased capability.

The aft cargo deck accommodates a 10 ft container, and can be serviced by the fitting of a removable crane. Two 10 ft containers are accommodated on the foredeck side by side, or one mounted on the centreline of the vessel, giving direct access to parts and equipment for transfer to turbines.

Bow docking with turbines is enhanced with the fitment of a modular bow fendering appendage. This appendage

Sheer legs on 27 m barge
(Photo courtesy BCTQ)

allows quick replacement of worn or damaged fenders, with reduced time out of service. It also allows quick and easy re-configuration for different operations.

Sure Pride also offers class-leading seakeeping and stability. Extensive seakeeping studies were performed on previous Incat Crowther wind-farm service vessels. The results of these studies have been used to take Incat Crowther's proven hullform to the next level, resulting in a vessel capable of maintaining operation in seas of over 2 m significant wave height. Vessels of this calibre are highly sought after in the market place, as the increased number of operating days directly translates to increased profitability.

The main cabin of *Sure Pride* has suspension seats for 12 technicians, with galley, mess and wet rooms located on the main deck. Workstations and a moon pool further increase the operational flexibility of the vessel. Crew cabins in the hulls accommodate four.

Powered by a pair of MTU 8V2000 engines, *Sure Pride* has a service speed of 26 kn and a maximum speed of 28 kn. The vessel is classed to DNV's Wind Farm Service Craft rules, with an R1 service restriction.. The vessel will operate under a UK MCA flag.

Incat Crowther is proudly supporting the highly-competitive

wind-farm service vessel market as it continues to evolve. Incat Crowther is committed to providing robust, stable and flexible vessels.

Principal particulars of *Sure Pride* are

Length O		19.5 m
Length WL		18.6 m
Beam OA		7.50 m
Depth		2.80 m
Draft	(hull)	1.00 m
	(skeg)	1.45 m
Technicians		12
Crew		4
Aft deck capacity		10 t
Aft deck loading		3 t/m^2
Fwd deck capacity		4 t
Fwd deck loading		3 t/m^2
Fuel oil		6000 L
Fresh water		800 L
Sullage		250 L
Main engines		2×MTU 8V2000 M93 each 895 kW @ 2450 rpm
Propulsion		2×fixed-pitch 5-bladed propellers
Generators		1×Cummins Onan MDKBP 13.5 kW
Speed	(service)	26 kn
	(maximum)	28 kn
Construction		Marine-grade aluminium
Class		DNV ✠1A1 HSLC R1 Windfarm Service 1
Survey		MCA SCV Category 2/Workboat
Flag		UK

Sure Pride designed by Incat Crowther
(Image courtesy Incat Crowther)

Refit of *Seastreak Wall Street*

Incat Crowther has announced the successful completion of the refit of the 43 m catamaran ferry *Seastreak Wall Street*. She was the third of four such vessels built by Gladding Hearn in Somerset, Massachusetts, USA, and was launched in 2003. The vessels were originally fitted with four Cummins KTA50 main engines, each producing 1424 kW. The engines drove a quartet of KaMeWa A50 water jets. The original propulsion package was chosen with emphasis on speed for the Atlantic Highlands to Manhattan service, delivering speeds in excess of 38 kn and four-engine redundancy.

Over time, the operating costs of the four-engine drive-train, changes to the vessels' schedules and the age of the main machinery led the operator to request an investigation by Incat Crowther into re-powering options. A thorough review led to the selection of a pair of MTU 16V4000M53 engines. Taking into account the operating profile of the vessel, it was deemed that in this case Servogear controllable-pitch propellers would offer a significant fuel saving at the vessel's 32 kn operating speed.

Incat Crowther provided a comprehensive design service, preparing detailed drawings and documentation including revised Coast Guard submissions. Following a competitive tender process, the contract to perform the modification was awarded to Midship Marine of Harvey, Louisiana, USA.

The engine re-power involved a considerable re-configuration of the aft end of the vessel. The topsides and the undersides of the hulls were removed from the waterline down and aft of the forward engine room bulkhead. New engine beds, longitudinal stiffeners and plating were fabricated to support the new engines, propellers and rudders.

The refit also included gutting the interior, repainting the vessel and fitting the interior with new carpet and toilets. The framed windows were also replaced with direct glazing.

As a result, *Sea Streak Wall Street* is now 15 t lighter than when originally built. She recently underwent sea-trials, recording a speed of 35 kn. At equivalent deadweights, this represents a reduction in top speed of only 3 kn, despite a significant reduction in power and half the number of main propulsion engines. Combined with an increase in passenger capacity, the refit will see per-passenger CO_2 emissions halved.

Re-construction work on the underside of the aft end of the starboard hull on *Seastreak Wall Street*
(Photo courtesy Incat Crowther)

New controllable-pitch propeller and rudder on *Seastreak Wall Street*
(Photo courtesy Incat Crowther)

New MTU engine being fitted to *Seastreak Wall Street*
(Photo courtesy Incat Crowther)

Robust, productive vessels like those in the Seastreak fleet are valuable assets, and have proven to be long-term workhorses when managed well by taking advantage of up-to-date technology and expertise.

Principal particulars of *Sea Streak Wall Street* are

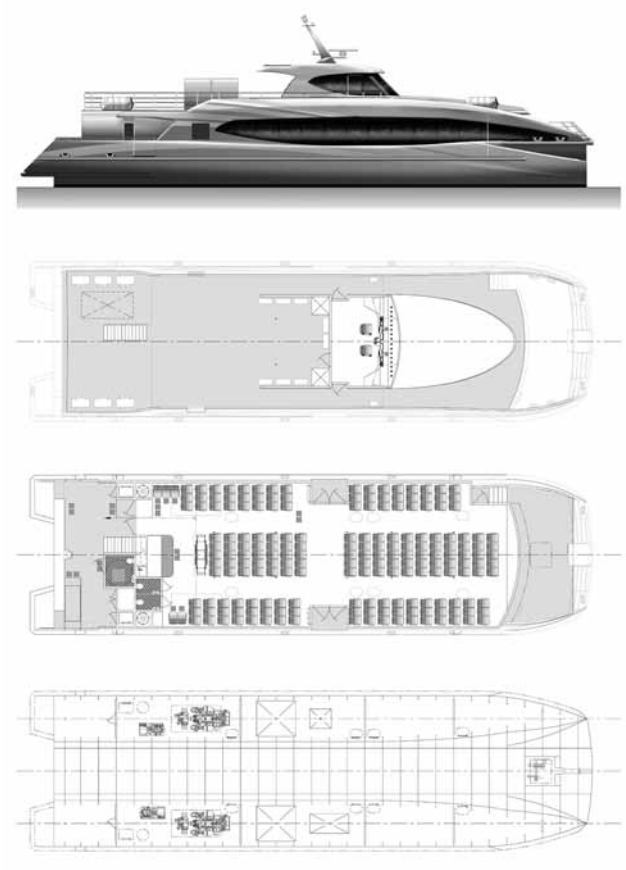
Length OA		42.90 m
Length WL		37.85 m
Beam OA		10.45 m
Depth		3.40 m
Draft	(hull)	2.02 m
	(propellers)	2.34 m
Passengers		465
Crew		5
Fuel oil		10 600 L
Fresh water		1150 L
Sullage		1900 L
Main engines		2×MTU 16V4000M53 each 1840 kW @ 1800 rpm
Propulsion		2×Servogear CP propellers
Generators		2×John Deere 6068T
Speed	(service)	32 kn
	(maximum)	35 kn
Construction		Marine-grade aluminium
Survey		USCG Subchapter K
Flag		USA

Super Dream from Incat Crowther

Incat Crowther has been awarded a contract to design a 32 m catamaran ferry for Ishigaki Dream Tours. *Super Dream* will be built by Richardson Devine Marine Costructions and will be the second Incat Crowther/RDMC vessel for the operator, after 2008's *Premium Dream*.

True to Incat Crowther's ethos of constant evolution, this new vessel will be a modern interpretation of the previous vessel, with the addition of Incat Crowther's latest hullform and a sleek, single passenger-deck superstructure. The main passenger cabin seats 197 passengers, with accessibility for disabled passengers given significant consideration, including dedicated wheelchair storage, access ramp and seats. A kiosk sits at the aft end of the main deck. Passenger comfort will be enhanced by a built-in window-washing system which ensures that windows can be quickly and easily cleaned prior to each tour.

Super Dream will have flexible boarding arrangements, primarily a pair of large doors fitted amidships. A gate and transfer steps will be fitted on the centreline at the bow, whilst the aft deck gates will be supplemented by a wheelchair ramp on the starboard side. Additionally, a gate will be fitted to the upper deck starboard, allowing for docking with higher wharves.



General arrangement of *Super Dream*
(Drawing courtesy Incat Crowther)

Super Dream will be powered by a pair of Caterpillar C32 ACERT main engines, which will drive a pair of NICO island-mounted gearboxes. Propulsion will be by 5-bladed fixed-pitch propellers. The vessel will have a service speed of 30 kn, with a maximum speed of 32 kn.

As with *Premium Dream*, the new vessel will be designed and built to JG rules, with structure designed to ClassNK. Part of Incat Crowther's expertise is working closely with government agencies and classification societies to negate any potential non-compliance issues.

Incat Crowther has a strong tradition of repeat custom, and Ishigaki Dream Tours is another example of this. *Premium Dream* has exceeded the operator's expectations, and *Super Dream* will be another successful and profitable addition to the operator's fleet.

Profile of *Super Dream*
(Image courtesy Incat Crowther)

Principal particulars of *Super Dream* are

Length OA		31.65 m
Length WL		30.00 m
Beam OA		8.50 m
Depth		3.05 m
Draft	(hull)	1.20 m
	(skeg)	1.75 m
Passengers		197
Crew		4
Fuel oil		7000 L
Fresh water		500 L
Sullage		2000 L
Main engines		2×Caterpillar C32 ACERT each 1081 kW @ 2300 rpm
Propulsion		25-bladed fixed-pitch propellers
Generators		2×Caterpillar C4.4 76 kW
Speed	(service)	30 kn
	(maximum)	32 kn
Construction		Marine-grade aluminium
Class/Survey		Equivalent to USL Code/ NSCV Class 1D
Flag		Japan

56 m Catamaran Dive-support Vessel from Incat Crowther

Incat Crowther has been contracted to design a 56 m catamaran dive-support vessel for Bhagwan Marine, to be operated by dive specialists Neptune Marine Services. Incat Crowther has worked in collaboration with Bhagwan Marine and Neptune Marine Services to develop a first-of-type fully-integrated catamaran dive-support vessel. The vessel has been designed from the keel up to perform six key roles: dive support, geophysical survey, geotechnical survey, cargo transport, hyperbaric rescue, and safety standby. With such a varied array of operational roles, unique solutions were required, not only in the allocation of spaces but also with the specification of a flexible high-redundancy propulsion system.

The result is an advanced propulsion and powering package which will integrate a pair of Schottel STP 550 azimuthing drives. She will be fitted with four generator sets made up of two Cummins QSK38-Ms and two QSK19-Ms. An advanced power-management system will make optimal use of the four generators and a battery bank to ensure that each power source is used in the most effective way. The battery bank will store enough power to propel the ship for short periods. The vessel will have a top speed of 13.5 kn. The QSK-38-M generator sets are also directly coupled to fire pumps, which drive full-immersion fire monitors whilst a separate pump will power a complete deluge system.

The Schottel drives combine with a pair of drop-down azimuthing bow thrusters and a Kongsberg control system to give the vessel DPS-2 manoeuvrability. This innovative system lends itself to the shallow-draft dive operations in which the vessel will specialise, as the forward azimuthing thrusters are able to maintain operation as tunnel thrusters when retracted. Further positioning capability is provided by a HIPAP 501 acoustic-positioning system, which allows the vessel to maintain station relative to undersea reference points.

In addition, the vessel will be fitted with a 100 t four-point mooring system featuring four deck winches and diagonally-oriented fairleads on all four corners of the vessel.

Unlike any other vessel of its size and type, this vessel will have all dive equipment designed and built in from the outset. A dedicated dive-control room will be fitted with a pair of decompression chambers, with a hull compartment directly below dedicated to support equipment such as compressors and dive gas storage tanks.

A pair of diver launch-and-recovery systems is to be fitted to the starboard side, whilst a separate launch-and-recovery system is to be fitted to port for ROV operations. The vessel will also have the capacity to launch, retrieve and store a hyperbaric lifeboat.

The aft main deck's 160 m^2 of cargo space is supplemented by a multitude of purpose-fitted deck equipment, including launch-and-recovery systems, tow pins, waterfall winches, stern roller, A-Frame and container-securing lugs.

Accommodation cabins for a complement of 44 are situated in the hull and on the mid deck. The hull also houses laundry facilities and a gymnasium. The mid deck features an aft-facing survey room which is linked to the wheelhouse by wireways, allowing operational flexibility.

The wheelhouse features complete all-round visibility, including aft-facing DP control stations.

The main deck of the vessel will house service spaces including an ROV control room and three workshops, as well as crew spaces such as a change room, cinema, dining mess and lounges, and a commercial-standard galley adjacent to dry- and cold-food storage spaces.

Offshore vessels such as this 56 m catamaran dive-support vessel are fine examples of Incat Crowther's ability to evolve new technologies. Incat Crowther's flexibility and expertise gives it the ability to develop a vessel balancing the requirements of a fuel-efficient vessel which is able to be repositioned quickly with the requirements of manoeuvrability and stability in shallow-water dive operations.

Principal particulars of the new vessel are

Length OA		56.8 m
Length WL		55.8 m
Beam OA		16.0 m
Depth		6.25 m
Draft (hull)		2.50 m
Crew		12
Personnel		32
Aft deck area		160 m^2
Aft deck load		10 t/m^2
Aft deck capacity		150 t
Fuel	(long range)	132 000 L
	(day tanks)	5000 L
Fresh water		46 000L
Sullage		23 000 L
Black water		12 000 L
Speed	(service)	12 kn
	(maximum)	13.5 kn
Propulsion		2×Schottel STP 550
Generators (prime)		2×Cummins QSK38-M Tier 2 950 ekW

	2×Cummins QSK19-M Tier 2 400ekW
Generator (emerg'y)	1 x Kohler 125kW
Construction	Marine steel
Flag	AMSA Unrestricted Service
Survey	ABS ✠ A1, ⓔOffshore Support Vessel (DSV AIR, SPS, FFUI) ✠ AMS ✠ ACCU, ✠ DPS-2, GP, ENVIRO, RRDA

Port quarter of 56 m catamaran dive-support vessel
(Image courtesy Incat Crowther)

Two 25 m Catamaran Passenger Ferries from Incat Crowther

Incat Crowther has been awarded a contract to design a pair of 25 m catamaran passenger ferries to operate from St Thomas in the US Virgin Islands. Under construction at Midship Marine in Louisiana, these vessels will follow on from the successful quartet of UltraJet boats built by the yard. The new vessels will have a similar configuration, with a half-height wheelhouse allowing a completely-open upper passenger deck.

First of the 25 m catamaran passenger ferries under construction at Midship Marine
(Photo courtesy Incat Crowther)

72 seats will be fitted to the upper deck, whilst the main-deck passenger cabin will be fitted with seats for 131, plus a pair of wheelchair spaces.

The aft deck houses an ADA-compliant toilet and luggage racks. As with the UltraJet boats, boarding will be via fold-down ramps situated on all four corners of the vessel.

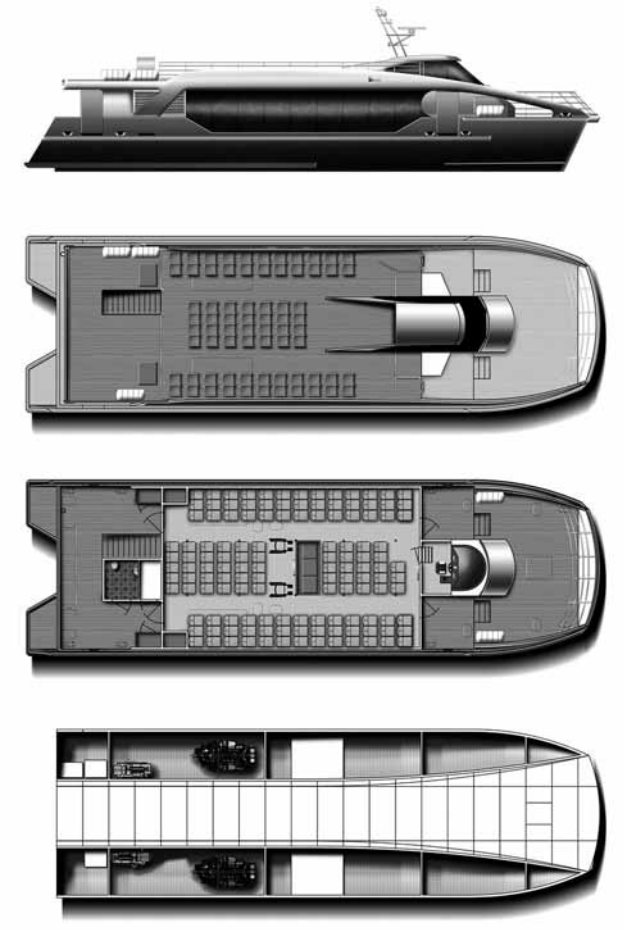
Designed and built to USCG Subchapter K, these boats will meet the recent updates to fire and safety regulations (NVIC 9-97 Change 1). Compliance with these most-recent regulations requires the protection of the embarkation and muster stations from the effects of fire and flooding. To meet these regulations, these vessels will be fitted with

A-class structural fire protection and fire doors to the main passenger cabin.

The vessels will be powered by a pair of Caterpillar C32 ACERT main engines, each producing 969 kW. The vessels will have a loaded service speed of 27 kn, and a maximum speed in excess of 30 kn. The vessels' required speed of 30 knots will be achieved at 75% MCR.

Principal particulars of the new vessels are

Length OA		26.4 m
Length WL		23.3 m
Beam OA		7.75 m
Depth		2.95 m
Draft	(hull)	1.30 m
	(propeller)	2.05 m
Passengers		200
Crew		4
Fuel oil		3800 L
Fresh water		750 L
Sullage		750 L
Main engines		2×Caterpillar C32 ACERT each 969 kW @ 2100 rpm
Propulsion		2×propellers
Generators		2×NL M6502.25 65 kW
Speed	(service)	27 kn
	(maximum)	30 kn +
Construction		Marine-grade aluminium
Class/Survey		USCG Subchapter K
Flag		US Virgin Islands



General Arrangement of 25 m catamaran passenger ferry
(Drawing courtesy Incat Crowther)

Yankee Freedom III from Incat Crowther

Yankee Freedom III, a 34 m catamaran ferry, was developed by Incat Crowther in partnership with owner Yankee Fleet and builder Gladding Hearn Shipbuilding to provide exceptional passenger comfort and minimal impact on the local environment (emissions, noise and wake wash). To achieve the required environmental and passenger comfort criteria, the team packaged the latest evolution in catamaran technology below the main deck with the exterior superstructure shape compliant with the established Yankee Fleet branding and identity. *Yankee Freedom III* will take over the company's daily run from Key West to Dry Tortugas National Park and Fort Jefferson, previously serviced by the Incat Crowther-designed *Yankee Freedom II*.

To reduce the transmission of noise and improve comfort, the vessel features an isolated superstructure. Comfort is enhanced by an active interceptor. The wheelchair-accessible main deck features 140 seats and 4 wheelchair spaces, all with tables. There is a large bar and shop aft, with an additional serving counter. Aft of the bar are 4 toilets, one of which is wheelchair accessible. There are exterior seats on the aft main deck, allowing passengers to enjoy the sunset on return journeys. The main-deck cabin features forward doors with direct access to the foredeck, which is optimised for aquatic wildlife viewing.

The upper deck features 54 exterior seats. Inside, there are 56 seats, some with tables, and a small additional bar. Efficient LED lighting is used throughout, allowing the selection of smaller generators, whilst vinyl laminate is used in lieu of exterior paint to reduce weight and VOC emissions.

Yankee Freedom III is powered by a pair of Caterpillar 3512C engines, which are Tier 2 emissions compliant. These engines each produce 1230 kW at 1800 rpm. On sea trials, *Yankee Freedom III* achieved speeds in excess of 30 kn, and will operate at a service speed of 28 kn.

Yankee Freedom III is an example of Incat Crowther's ability to strategically partner with its clients as they bid for operations. By working in partnership, Incat Crowther ensures that its clients can offer the optimum technical package and thereby increase the chance of success.

Yankee Freedom III on trials
(Photo courtesy Incat Crowther)

Principal particulars of *Yankee Freedom III* are

Length OA		33.5 m
Length WL		32.5 m
Beam OA		9.65 m
Depth		3.80 m
Draft	(hull)	1.50 m
	(propellers)	2.00 m
Passengers		250
Crew		10
Fuel oil		7570 L
Fresh water		1515 L
Grey water		1515 L
Sullage		3030 L
Main engines		2×Caterpillar 3512C EPA Tier 2 each 1230 kW @ 1800 rpm
Propulsion		2×fixed-pitch propellers
Generators		2×Caterpillar C4.4 58 kW EPA Tier 2
Speed	(service)	28 kn
	(maximum)	31 kn
Construction		Marine-grade aluminium
Class/Survey		USCG Subchapter K
Flag		USA

Stewart Marler

Cruising from Sydney

After the winter quiet, with only *Pacific Jewel* and *Pacific Pearl* working out of Sydney, the summer cruise season got under way in October with visits to Sydney by these vessels plus *Radiance of the Seas, Rhapsody of the Seas, Carnival Spirit, Dawn Princess, Sea Princess, Sun Princess, Volendam,* and *Oosterdam*. November moved into a higher gear, with visits by these vessels plus *Amsterdam*. Vessels berthing regularly at the Overseas Passenger Terminal at Circular Quay is a sure sign that the summer cruise season is under way.

Phil Helmore

Carnival Spirit sailing from Sydney for an overnight cruise
(Photo John Jeremy)

EDUCATION NEWS

University of Tasmania — Australian Maritime College

Review of Engineering at the University of Tasmania

The University of Tasmania has begun a review of its activities in the discipline of engineering with respect to learning and teaching, research and community engagement.

The review, which encompasses both the AMC's National Centre for Maritime Engineering and Hydrodynamics as well as the UTas School of Engineering, will inform the University's plans for engineering into the future.

Details of the review, including the terms of reference can be found at: www.utas.edu.au/provost/engineering-review

Submissions to the review were invited from all interested persons and groups for receipt no later than close of business on Monday 12 November 2012.

Rat Trap Boat Design Continues to Impress

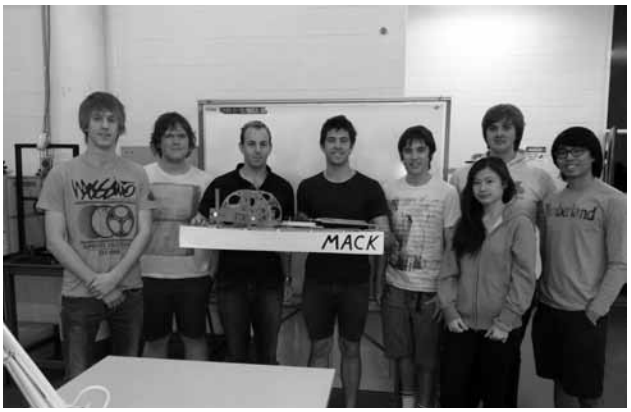
While no records were smashed at this year's AMC Rat Trap Boat Race, students continued to impress judges with the calibre of their designs.

The annual event is for first-year engineering students enrolled in Dynamics. This year 16 teams vied for the title of the fastest rat-trap-powered vessel over a course of 10 m in the model test basin.

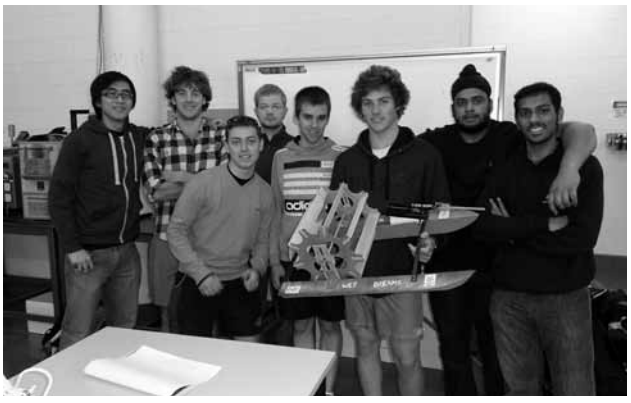
Dynamics lecturer, Dr Christopher Chin, said that this year's designs were of a particularly high quality.

The best boat design prize went to Andrew MacAskill, Michael Kaczmarek, Alex Walter, Samuel Smith, Hamish Lyons, Wei Li Chan, Angus Barton and Christopher Wong.

The fastest boat (which completed the course in 23.53 s) was created by Yue Hern Tong, James Bell, Daniel King, Sam Hach, Simon Hamilton, Ryan Beecroft, Munraj Singh and Levenesh Athavan.



The rat-trap powered boat best design with its designers
(Photo courtesy AMC)



The fastest rat-trap powered boat winners
(Photo courtesy AMC)

AMC Lecturer Awarded Prestigious Fulbright Scholarship

Dr Jessica Walker, a lecturer at the Australian Maritime College, was recently awarded the prestigious 2012 Fulbright Tasmania Scholarship.

Established in 1946, the Fulbright Scholarship is the largest educational scholarship of its kind. Aimed at promoting mutual understanding through educational exchange, it operates between the US and 155 countries. Dr Walker is one of 25 talented Australians to be recognised as a Fulbright Scholar in 2012.

The Fulbright Scholarship has taken Dr Walker to the United States Naval Academy Annapolis, Maryland, for 12 months to undertake research into the renewable energy technology, tidal power.

"Unlike other renewable sources such as solar, wind and wave, tidal power is predictable as it relies on lunar gravitational forces rather than the weather. This makes it easier to integrate into the electricity grid," she said.

"However, there are two potential performance issues in the operation of tidal turbines: the roughening of the turbine blades due to impact, cavitation or scour due to particulates, and the fouling of the turbine blades by marine growth."

In Maryland, Dr Walker is carrying out detailed testing of a prototype horizontal-axis tidal turbine to obtain performance curves and flow-field maps under roughened and biofouled conditions.

"This data will be invaluable to turbine designers in predicting long-term performance of turbines in actual marine environments, and researchers who can utilise the data in validating models of turbines for ongoing design optimisation," Jessica said.

Dr Walker will return to her lecturer's post at AMC's National Centre of Maritime Engineering and Hydrodynamics in August 2014.

Dr Jessica Walker
(Photo courtesy AMC)

High Achieving Researchers Rewarded

The recent Graduate Research Conference — Sharing Excellence in Research (SEiR) 2012 was recently held in Hobart. The conference gave the Australian Maritime College a great chance to highlight the achievements of its maritime engineering postgraduate students over recent months.

AMC student Max Haase was awarded the inaugural Publication Bonus Prize for an article he published in the *International Journal of Maritime Engineering*. The Publication Bonus Prize is given to any student who publishes in a journal deemed by the centre director to give maximum benefit.

"The bonus prize is specifically designed to reward publishing by students in high-quality journals. I'm sure this will be the first of many", said Dr Jonathan Binns, Acting Head Maritime Engineering.

"Our increased research by higher-degree numbers and involvement of undergraduate students in research has had an extremely positive effect right across all areas of the centre.

"The introduction of this scheme will ensure that all of our students' hard work gets acknowledged, not only by the centre but also by the international research community by getting published."

Nine students from AMC's National Centre for Maritime Engineering and Hydrodynamics attended the SEiR Conference, contributing five posters and two presentations.

"It was extremely pleasing to have so many engineering students actively participate in this event. But even better was that two of the students won the best poster and Rapid Research presentation prizes, judged to be the best presentations out of over 100 across all of UTAS," Dr Binns said.

Max Haase
(Photo courtesy AMC)

Visit by RADM Rowan Moffitt AO RAN

On 10 October Rear Admiral Moffitt, Head, Future Submarine program, Department of Defence, visited Northern Tasmania to deliver his Engineers Australia Eminent Speaker Series presentation *Future Submarines — Few Easy Choices*.

A summary of RADM Moffitt's address is given in the NSW Section news on Page 8.

Prior to the talk, RADM Moffitt went for a quick tour around AMC starting at the Second Year Build Studio. By great coincidence, the studio was full of Second Year Fluid Mechanics students giving final touches to their major project, the Submarine and Underwater Vehicle Design and Build Project. Afterwards RADM Moffitt was able to view the students testing these delicately balanced designs. In addition, experiments on a novel collective and cyclic pitch propulsor for AUV use by PhD student Poowadol Niyomka were inspected in the towing tank. To top off the display of underwater technology education and research, the Cavitation Research Laboratory was visited. This state-of-the-art facility has been designed specifically to serve the needs of future undersea research.

Mark Symes

University of New South Wales

Undergraduate News

Graduation Ceremony

At the graduation ceremony on 17 August, the following graduated with degrees in naval architecture:

Alexander Conway	Honours Class 1
Dane Fowler	Honours Class 2, Division 2

Graduates Employed

They are now employed as follows:

Alexander Conway	PhD program at the Australian Maritime College, Launceston
Dane Fowler	Naval Architect, Roads and Maritime Services, Sydney

Congratulations, all!

Dane Fowler (L) with Naval Architecture Plan Coordinator Phil Helmore and Alexander Conway (R) at the UNSW Graduation Ceremony on 17 August

(Photo courtesy Trish Conway)

Thesis Topics

Among the interesting undergraduate thesis projects under way this year is the following:

CFD Analysis of Ship Squat

There are methods around for the basic prediction of ship squat, which is the loss of under-keel clearance when under way in shallow water or a channel. Matthew Laverty has investigated the application of computational fluid dynamics to the prediction of ship squat and comparing the results to experimental data, numerical prediction methods, and to the results of a slender-body prediction program written by Em/Prof. Lawry Doctors. CFD gives god results and has the advantage that it can take into account all the factors which affect the squat, but is considerably more complex to model and apply and, hence, more labour intensive and time consuming.

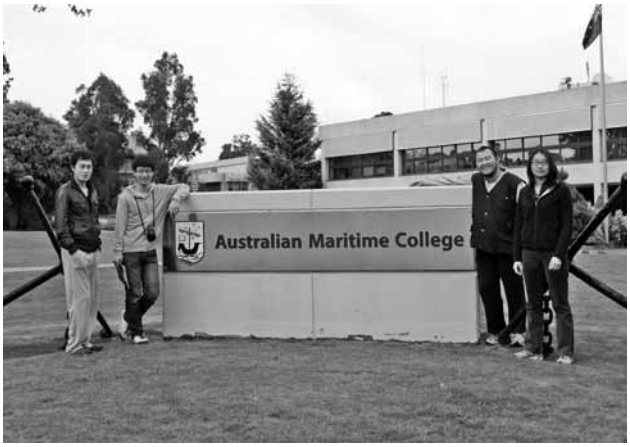
Visit to AMC

On 27 and 28 October the Year 3 students studying Ship Hydrodynamics visited the Australian Maritime College accompanied by lecturer Dr Rozetta Payne. The visit was organised by Dr Gregor Macfarlane, and UNSW is grateful for AMC's hospitality.

The group were introduced to the towing tank by Dr Tim Lilienthal and ran resistance tests on a model of the AMC's research vessel, *Bluefin,* under his guidance. In the afternoon they were given a presentation on research activities and opportunities at AMC by Dr Jonathan Binns, followed by a tour of the model test basin and an explanation of its capabilities by Dr Gregor Macfarlane. Dr Rozetta Payne then made a presentation on *Inclining Experiments* as part of the RINA/IMarEST Technical Presentation Series. The students and staff all then adjourned to the Royal Oak for a counter meal.

Next day they were given a presentation on cavitation by Dr Bryce Pearce, who then brought it to life with a demonstration on a surfboard fin in the tunnel at varying water speeds. In the afternoon they conducted seakeeping tests with Dr Lilienthal on the model of *Bluefin* model in regular waves of various frequencies and heights in the towing tank.

The students all came away with a better understanding of ship model testing and how it is done in practice. It certainly helped to have naval architects talk about the various aspects of testing and research, and their explanations of the processes brought out the realities and practicalities which you don't get in the theory.



UNSW Year 3 naval architecture students Zijian Gao, Li Chen, Dauson Zhao and Lucy Xu at the Australian Maritime College

(Photo courtesy Zijian Gao)

Tim Lilienthal showing Dauson Zhao how to operate the carriage
(Photo courtesy Zijian Gao)

Lucy Xu (L) and Georgia McLinden at the controls during a run
(Photo courtesy Zijian Gao)

Gregor Macfarlane (R) explaining the operation of the manoeuvring basin to students
Sam Henson (L), Lucy Xu and Thomas van Peteghem
(Photo courtesy Zijian Gao)

The Tom Fink cavitation tunnel
(Photo courtesy Zijian Gao)

UNSW students Zijian Gao (L), Georgia McLinden, Lucy Xu and Thomas van Peteghem, with lecturer Rozetta Payne
and students Sam Henson, Dauson Zhao, Raymond Fagerli and Li Chen at Cataract Gorge, Launceston
(Photo courtesy Zijian Gao)

Vist to RDMC

The students took the opportunity, while in Tasmania, to visit Hobart, where they were shown over the vessel under construction at Richardson Devine Marine Constructions at Goodwood by Mr Toby Richardson. UNSW is grateful for the hospitality shown by RDMC.

Toby Richardson (centre) explaining details of construction to students Raymond Fagerli (L), Sam Henson, Lucy Xu (with headband), Li Chen and Dauson Zhao
(Photo courtesy Zijian Gao)

At the time of the visit, there was the Incat Crowther-designed 46 m high-speed ferry *Kilimanjaro IV* under construction, with the hull framed and fully plated, and two of the three superstructure decks at an advanced stage, but with the machinery yet to be fitted. It was instructive for the students to see the details of construction, from the engine and gearbox foundations, to the aluminium sections used for construction, the structural fire-protection arrangements, the shape of the hulls, and the arrangements for access and egress. The theory is interesting, but seeing construction under way and having the whys and wherefores explained by an engineer brings it all alive!

Toby Richardson (second from left) and students at the stern of *Kilimanjaro IV*
(Photo courtesy Zijian Gao)

Thesis Conference

The school's annual Thesis Conference is no more. CATS (Centrally-Allocated Teaching Space), since they took over allocation of classrooms, has claimed that it is progressively more difficult to re-schedule classes so that the conference can take place in the Mechanical Engineering tutorial building, and has now refused to do so. Instead, presentations this year were scheduled for Friday afternoons in Weeks 9–12, and were held in the tutorial rooms for MMAN4000 which are mostly in the Mechanical Engineering tutorial building.

On 28 September the following presentations on naval architecture student projects were made:

William Birdsall *Investigation of Historic Vessel* Bergalia

Braden Holgate *Prediction of Accelerations of Catamarans in a Seaway*

Matthew Laverty *Prediction of Ship Squat using CFD and Slender-body Theory*

Elliot Thompson *Analysis of Ship Emissions from Naval Vessels*

RINA–Austal Ships Award

RINA and Austal Ships jointly offered an award and a certificate for the best presentation by a student member on a naval architectural project. Assessment was made on the basis of marks awarded by School staff, with marks being standardised to remove the effects of marker variability. The award went to Braden Holgate for his presentation on *Prediction of Accelerations of Catamarans in a Seaway*. The award was announced by Naval Architecture Stream Coordinator, Mr Phil Helmore, at the Naval Architects' Dinner on 9 November. Congratulations, Braden!

Phil Helmore (L) presenting Braden Holgate with the RINA–Austal Ships Award for 2012
(Photo courtesy Julie-anne Abdilla)

Naval Architects' Dinner

The demise of the School's annual Thesis Conference has also meant the demise of the annual Thesis Conference Dinner, where the final-year students and staff get together to celebrate the conclusion of the students' time at university and the start of their careers. As an alternative, the final-year naval architecture students and staff held the inaugural Naval Architects' Annual Dinner to celebrate. The dinner was held at Giovanna's Italian restaurant in Kingsford, included partners, and many tall tales and true were told over the course of an enjoyable evening.

Phil Helmore

William Birdsall, Phil Helmore, Elliot Thompson, Matthew Laverty, Braden Holgate and Bradley Abdilla
(L to R) at the inaugural Naval Architects' Annual Dinner
(Photo courtesy Julianne Abdilla)

Postgraduate and Other News

Twenty-Ninth Symposium on Naval Hydrodynamics

This conference is run under the auspices of the Office of Naval Research (ONR) in Washington and takes place every two years. On this occasion, the symposium was held in Göteborg, Sweden, on 26 to 31 August 2012, following the standard five-day format. In addition to the ONR, Chalmers University of Technology and SSPA Sweden AB participated in the organisation. The local organising committee consisted of a number of researchers from Chalmers and SSPA. Additional sponsors were Berg Propulsion, Rolls-Royce, Stena Rederi, and Göteborg Stad (the local township).

A total of 81 papers on all aspects of ship hydrodynamics was presented. This total included four keynote lectures and the Weinblum Lecture. On this occasion, there were just two Australian contributions. The number of registered attendees was 156.

Em/Prof. Lawrence Doctors (UNSW), together with co-authors (principally from the University of Michigan), Mr Andrew Wiggins, Dr Steven Zalek, Prof. Marc Perlin, Prof. Steven Ceccio, Dr Robert Etter, and Mr Robert Wilson, presented their research *Surface-Effect-Ship Bow-Seal High-Reynolds-Number Experiments*, which has been conducted at the Large Cavitation Channel in Memphis, Tennessee. The work covered in their paper included the documentation of the various bending modes of bow-seal finger elements of a surface-effect ship, due to the incoming water flow. Additional effort illustrated that the shape of the deformed water surface, due to the action of the cushion pressure, could be predicted through the use of traditional potential-flow techniques. This work is continuing.

The second Australian presentation, *Experimental and Computational Investigation of a Generic Conventional Submarine Hull Form*, was authored by B. Anderson, M. Chapuis, L. Erm, C. Fureby, M. Giacobello, S. Henbest, D. Jones, M. Jones, C. Kumar, M. Liefvendahl, P. Manovski, D. Norrison, H. Quick, A. Snowden, A. Valyiff, R. Widjaja and B. Woodyatt, from the Defence Science and Technology Organisation, in Victoria. Their work entailed a computational fluid dynamics (CFD) study of the hydrodynamics of a deeply-submerged submarine.

ONR conference visitors to Berg Propulsion (L to R): Prof. Masashi Kashiwagi (Presenter of Weinblum Lecture and Chairman), Mrs Marine Larsson, Prof. Lars Larsson (Organiser, Chairman and Presenter), Prof. Lawrence Doctors (Chairman and Presenter), Mrs Helen Doctors and Mrs Fumika Kashiwagi (Photo courtesy Lawrence Doctors)

An interesting technical industrial visit was made on 29 August to Berg Propulsion on the island of Öckerö in the Göteborg archipelago. This company is one of the world's leading designers and producers of controllable-pitch propellers.

Further information on this conference can be obtained fromEm/Prof. Doctors at L.Doctors@unsw.edu.au. The next conference in the series, namely the Thirtieth Symposium on Naval Hydrodynamics, will be organised by the Australian Maritime College, on 5 to 10 October 2014, in Hobart, Tasmania. Further information can be obtained from the chief organiser, Dr Paul Brandner, at P.Brandner@amc.edu.au or (03) 6324 9832.

Lawrence Doctors

Navigation Safety Advisory Group meets in Canberra

On 28 August 2012 the third meeting of the Navigation Safety Advisory Group (NSAG) was held at AMSA's Canberra office. NSAG is the peak consultative body for matters relating to AMSA's responsibilities for the safety of navigation in Australian waters.

The meeting attracted 24 navigation practitioners and representatives from the Australian Hydrographic Service, port and state marine authorities, industry peak bodies, shipping companies and marine pilots.

During the day-long meeting, the group dealt with safety of navigation matters in two sessions. The morning session focused on shipboard navigation issues, including progress with the IMO-led development of e-navigation, outcomes from the 58th session of the IMO's Sub-Committee on Safety of Navigation, discussion on vulnerabilities of the Global Positioning System, concerns with regard to the carriage of Electronic Chart Display and Information System (ECDIS), hydrographic matters, the North East Shipping Management Plan, and AMSA's on-going technical cooperation program.

The afternoon discussion focussed on AMSA's management of its aids-to-navigation network, including the next maintenance tender, new and altered aids, vessel tracking and pilotage matters, Navigation Symposium 2013, highlights from relevant IALA meetings, the upcoming IALA training seminars, and the Aids to Navigation Management Committee meeting in Australia in November.

One of the developments discussed at the meeting was the newly-established network of shipping fairways in the north-west region. After extensive consultation with industry, and in collaboration with the Western Australian Department of Transport, a network of shipping fairways is being established off the north-west coast of Australia. The fairways aim to reduce the risk of collision between transiting vessels and offshore infrastructure. They are intended to direct larger vessels along pre-defined routes which will keep them clear of existing and planned offshore infrastructure.

The next NSAG meeting is scheduled to be held in Sydney in February 2013.

Public Consultation on Draft Regulations and Marine Orders under the National Law

Draft Regulations and Marine Orders under the Marine Safety (Domestic Commercial Vessel) National Law Act 2012 (National Law) became available for public comment at www.nationalsystem.amsa.gov.au in September. In addition, a guide to the proposed regulations and Marine Orders under the National Law has been prepared to explain the instruments. It should be read in conjunction with the revised Regulatory Plan (September 2012). All documents are available on the above website.

Regulations under the National Law provide more details about key definitions and transitional arrangements. Key definitions explain what vessels and structures are covered or are excluded under the national law. Transitional arrangements help the domestic commercial vessel industry move to the new National System and ensure that people

and vessels operating safely under current State or Territory legislation can continue doing what they are doing, once the National Law commences.

Marine Orders under the National Law set out the processes and requirements for national certificates, vessel identification, approved training organisations and administrative requirements. Marine Orders are a type of regulation which allows our laws to keep pace with rapid technical and technological change in marine safety, and to implement Australia's international maritime obligations.

The consultation period closed on 8 October 2012.

National System Website

In preparation for commencement of the National System, which comes into force in Jnuary 2013, AMSA has been improving and upgrading the National System Website. The aim is to create a more dynamic and user-friendly site which will be a more-effective tool for reaching stakeholders and the general public. The improved website includes a large range of online applications, such as video, bulletin boards, photo galleries, downloadable fact sheets, guides and general contact information. Visit www.nationalsystem.amsa.gov.au.

National System Industry Guidebook and Fact Sheets

To guide industry through the key requirements of the new National System, an Industry Guide to the National System and accompanying Fact Sheets became available from October 2012.

Copies of the Guidebook and Fact Sheets can be obtained by visiting any State and Territory maritime safety office; by downloading the material from the National System website; or by calling the toll-free number 1300 517 246.

AMSA Community Information Days

In November, AMSA announced a greater emphasis on regular consultation and engagement with maritime communities. In practical terms, this means enhancing the methods which AMSA uses to consult and engage with stakeholders on subjects such as maritime reform, search and rescue, and the marine environment.

One outcome of this initiative which will affect National System stakeholders occurred between October and November of this year when AMSA conducted a series of Community Information Days in all capital cities, as well as regional areas like Port Lincoln, Cairns and Coffs Harbour. These information days covered the full range of maritime reforms, including the interplay between the new Navigation Act 2012 and the National Law.

A national advertising campaign was implemented in mid-October to:

- promote awareness of the Community Information Days among maritime communities;
- identify the subject matter to be shared on the days; and
- highlight details on locations, times, dates, venues and background information available on the AMSA website.

The campaign utilised national trade publications and national, metropolitan and regional newspapers identified as being read by the majority of stakeholders. A series of targeted quarter-page advertisements were placed in the week preceding each event, providing details about when and where.

September Stakeholder Bulletin, National System for Commercial Vessel Safety

AMSA Community Information Day in Sydney

AMSA's Community Information Day was held in Doltone House, Jones Bay Wharf, Pyrmont, in Sydney on 9 November 2012, and was attended by about 200 naval architects, ship owners, ship operators, classification societies, Royal Australian Navy personnel, Department of Defence personnel, and others.

AMSA had copies of the Guidebook and fact sheets for distribution, and experts on each of the various aspects of the new system, including the Navigation Act 2012, the Marine Safety (Domestic Commercial Vessel) National Law Act 2012, and the application of the Maritime Labour Convention 2006 which comes into force internationally on 20 August 2013.

The presentations were chaired by John Fladun, Commercial Vessels Manager for AMSA, who gave an overview of proceedings.

Michael Kinley, Deputy CEO of AMSA, then gave a presentation on the National System for Commercial vessel Safety. The main change will be that there will be one regulator (AMSA), one law (the National Law Act) and one system of implementing the agreed national standards, thus removing the barriers to vessels moving around Australia. There will be transition arrangements in place between 2013 and 2016. His presentation included the role of the State/NT survey authorities in service delivery, the definition of a vessel, the necessity for certificates of survey, operation and competency, vessel identification, arrangements for existing vessels and operations, and arrangements for new vessels and operations.

Alan Schwarz, General Manager of the Ship Safety Division of AMSA, then gave a presentation on the big-ticket items contained in the Navigation Act 2012, the Marine Safety (Domestic Commercial Vessel) National Law Act 2012, and the Maritime Labour Convention 2006. Australia's Navigation Act 1912 is now 100 years old, and needed review and modernisation to catch up with what the shipping industry had evolved into. The Guidebook contains two flow charts which indicate clearly whether a vessel falls under the Navigation Act or under the National Law Act. His presentation included improved compliance and enforcement measures, transition arrangements, the details of the ILO's Maritime labour Convention which provides comprehensive rights and protection at work for the world's more than 1.2 million seafarers, the definition of a seafarer, application to Australian vessels, flag-state compliance, the new Australian International Shipping Register which has been set up to provide incentives for Australian registry competitive with registry overseas, conditions for registry, and certificates of equivalent competency.

The presentations were followed by a lunch of rolls and open-face sandwiches, consultations with the experts, and much networking and discussions with friends and associates in the industry.

Phil Helmore

Michael Kinley presenting to the Community Information Day in Sydney
(Photo Phil Helmore)

Revised MARPOL Annex V to Enter Force on 1 January 2013

The revised MARPOL Annex V will enter into force on 1 January 2013, and will introduce stricter controls on the disposal of garbage from ships at sea.

The main revisions to the Annex are as follows:

1. New definitions have been introduced, including for animal carcasses, cooking oil, cargo residue and domestic waste.
2. All ships of 100 GT and above or certified to carry more than 15 people are required to have on board a garbage management plan (Note: there is no requirement for the plan to be approved).
3. Ships 12 m in length or more and fixed or floating platforms are to display placards notifying crew and passengers of the MARPOL Annex V requirements.
4. Ships of 400 GT and above and all fixed or floating platforms are to have on board and maintain a garbage record book in the format specified in MARPOL Annex V.
5. Discharges of any garbage from fixed or floating platforms and from any ship alongside or within 500 m of a fixed or floating platform are prohibited. Food waste may be discharged from a fixed or floating platform provided that it is more than 12 n miles from land and the waste has been passed through a comminuter or grinder so that it can pass through a screen with openings no greater than 25 mm.
6. The discharge of garbage into the sea is prohibited except under certain circumstances when a ship is en route, as follows:

Outside special areas

- Food waste may be discharged more than 3 n miles from land if passed through a comminuter or grinder, such waste is to be capable of passing through a screen no greater than 25 mm or may be discharged more than 12 n miles from land if not passed through a comminuter or grinder.
- Cargo residues that do not contain substances classified as harmful to the marine environment may be discharged more than 12 n miles from land.
- Cleaning agents in cargo hold, deck and external surfaces' wash water may be discharged to sea provided they are not harmful to the marine environment.
- Animal carcasses may be discharged as far from land as possible in accordance with IMO guidelines.

Inside special areas

- Food wastes may be discharged as far as practical from land but not less than 12 n miles from land or the nearest ice shelf.
- Cargo residues may be discharged provided that:
    - cleaning agents in cargo hold, deck and external surface wash water are not harmful to the marine environment;
    - both the port of departure and the next port of destination are within the special area and the ship will not transit outside the special area between those ports;
    - no adequate reception facilities are available at those ports; and
    - discharge of cargo hold washing water containing residues is made as far as practicable from the nearest land or ice shelf and not less than 12 nautical miles from the nearest land or the nearest ice shelf.
- Cleaning agents in cargo hold, deck and external surface wash water may be discharged to sea provided they are not harmful to the marine environment.

IMO is developing guidelines for determining which cargo residues and cleaning agents are harmful to the marine environment.

Lloyd's Register, *Classification News*, 1 October 2012

International Ship and Offshore Structures Congress

The 18th International Ship and Offshore Structures Congress (ISSC) was recently held in Rostock, Germany between 9 and 13 September. This forum provides a mechanism for the exchange of information by experts undertaking and applying marine structural research. Its aim is to further the understanding in the various disciplines underpinning marine structural design, production and operation through international endeavours. To achieve this aim the ISSC has the following specific objectives:

- to make recommendations for improvements in design, production and operations procedures;
- to review research in progress and to facilitate the evaluation and dissemination of results from recent investigations; and
- to identify areas requiring further research.

Members of the ISSC form eight Technical Committees and eight Specialist Committees and, during the congress, the

committee chairs present the findings of the committee's work over the last three years. The papers presented by the committees can be found on the ISSC website www.issc2012.org under the Proceedings tab and are well worth reading, as they give an excellent review of the work.

This year the Australian participation was the largest it has been for many years. During the next term there are five Australian members as follows:

- Dr Stuart Cannon (DSTO) — Australian Corresponding member and member of specialist committee V.5 Naval Vessels.
- Dr Seref Aksu (DSTO) — Member of specialist committee V.7 Structural Longevity.
- Mr Tauhid Rahman (DNV) — Member of specialist committee V.2 Natural Gas Storage and Transportation.
- Dr Roberto Ojeda (AMC) — Member of technical committee III.1 Ultimate Strength.
- Dr Shuhong Chai (AMC) – member of specialist committee V.8 Risers and Pipelines.

Participation in the congress is conditional upon invitation only, and is restricted to people qualified by reason of professional responsibility or published work to contribute usefully to the discussions at the congress. Membership comes from academia and research organisations as well as industry, such as shipbuilders, classification societies and design organisations. If anyone is interested in participating in the next ISSC congress (to be held in Lisbon, Portugal in 2015) then please contact Stuart Cannon.

Australian members of the 2012 ISSC
(Photo Helena Cannon)

Stuart Cannon

INDUSTRY NEWS

ShipConstructor 2013 Released

Available in October, ShipConstructor 2013 offers 33 new features and 194 fixes including an innovative solution for design reuse as well as a dramatic extension of ShipConstructor's associative DWG technology regarding bill of material (BOM) revision.

"ShipConstructor 2013 is our most significant release in years," said Darren Larkins, CEO of ShipConstructor Software Inc. "Our focus groups have told us that just one of the new features alone could save hundreds of hours of work."

AutoCAD 2013 Compatibility

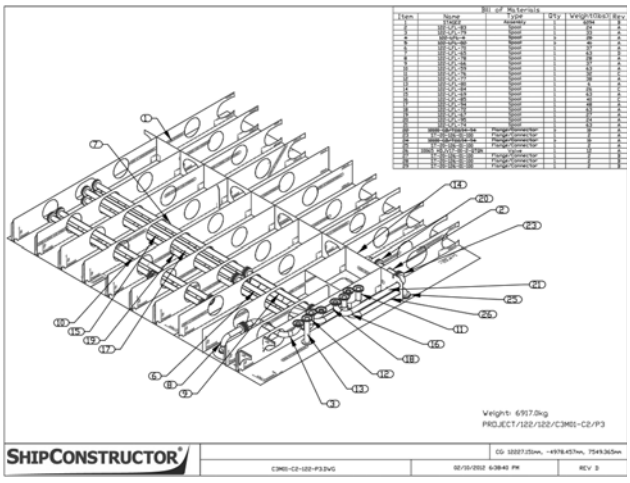
The number "2013" denotes the fact that ShipConstructor 2013 is compatible with AutoCAD 2013, allowing users to work in the most advanced CAD environment of the world's most-widely-used CAD application. Since ShipConstructor has an AutoCAD platform and is an Autodesk partner product, this means that the latest feature set in AutoCAD is now available within ShipConstructor itself.

Enhanced BOM Revision

More noteworthy is the fact that there has been a significant enhancement to ShipConstructor's unique Associative DWG change-management technology for updating DWG-based production drawings to reflect changes in the 3D model. Now, a clear revision history can be shown on Bills of Materials within a production drawing.

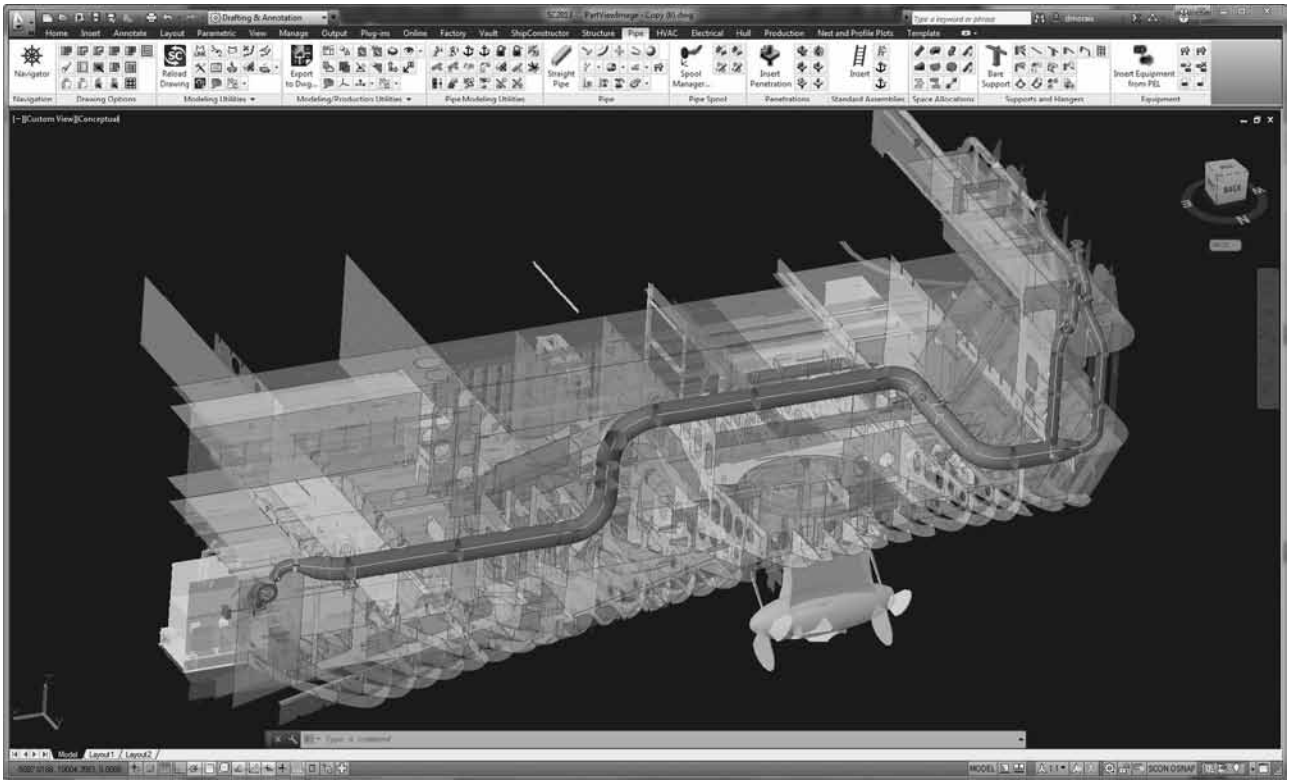
When dealing with the scope of change which is common in today's marine construction programs, where a single change to the vessel or platform can affect hundreds if not thousands of drawings of various types, this level of drawing management and control within engineering is of significant benefit across an entire shipbuilding organisation.

Prior versions of ShipConstructor already led the market in being the only software suite allowing DWG-based production drawings to be updated when the 3D product model changed. However there was still a challenge if other departments, such as production or purchasing, had already taken action based upon the previously-issued drawing. Someone would have to visually compare both drawings to determine what in the BOM had changed. This could be done using native AutoCAD capability but it could be a painstaking and laborious process.



Bill of Material screen
(Image courtesy ShipConstructor)

Fortunately, ShipConstructor 2013 solves this problem. Now, when a drawing is updated, items that no longer exist in the drawing are struck through in the Bill of Materials on the production drawing. The corresponding row number is also struck through and subsequent annotations in the drawing will not reuse that row number. Additionally,



The Part View screen
(Image courtesy ShipConstructor)

new items are always appended to the bottom of the BOM, ensuring that items that existed prior to the update maintain the same row number and drawing annotation. Correspondingly, updated parts will indicate that there has been a revision performed on the BOM row representing that part. This combination of capabilities ensures that the BOM information in a drawing received prior to a new revision being released is consistent from revision to revision and everything required to determine what has changed exists in the new drawing.

WorkShare Design

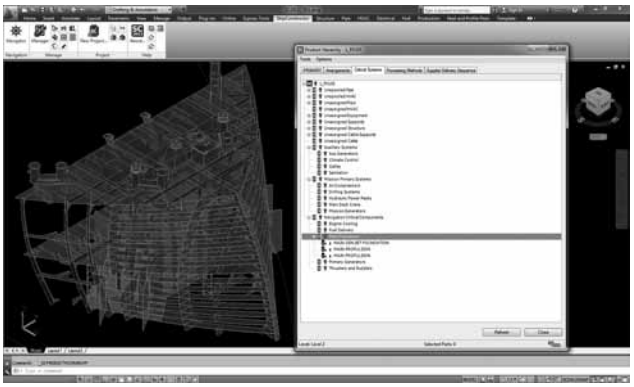
Another advantage of ShipConstructor 2013 is its new WorkShare Design product which opens up new possibilities for parallel design and engineering amongst distributed teams. WorkShare Design allows users of ShipConstructor's CAD/CAM application to intelligently capture, reuse, change and then sync back portions of a design along with the associated production documentation. This new functionality has numerous practical applications, including increased capabilities when working with follow-on ships, design tests, recovery from errors, and for general reuse of design data to increase efficiency.

Part View

An additional new feature of the software is Part View. First unveiled in the Subscription Advantage Pack for ShipConstructor 2011 R2, Part View has now been promoted into the regular release for ShipConstructor 2013. This feature allows a user working in a drawing to view ShipConstructor parts which are external to that drawing without having to include an entire MLink; only pertinent parts are shown. This dramatically improves clarity in design in applications such as the construction of secondary product hierarchies for use in arrangement drawing creation.

Product Hierarchies

Meanwhile, Product Hierarchy, one of the most highly-rated products in the ShipConstructor product suite, has now become even more powerful in the ShipConstructor 2013 release. This product has new tools and usability enhancements in product hierarchies which are helpful for re-use of work on follow-on ship design, along with other applications such as critical-path system analysis, organising parts by processing methods and other applications.



Product Hierarchies
(Image courtesy ShipConstructor)

More Information

More information along with videos of these new features can be found in the "What's New" section on the ShipConstructor website.

Wärtsilä Gas Engine Technology

Wärtsilä has now sold more than 2000 of its gas-fuelled engines which, together, have accumulated more than 7 million operational running hours in both land-based and marine applications. These milestone achievements emphasise the leading global position that Wärtsilä has achieved in gas and dual-fuel (DF) engine technology.

"Wärtsilä's gas and dual-fuel engine technology can be used in all vessel types, and installed both in new construction ships and as conversion projects in existing ships. With fuel costs and environmental compliance being the key issues currently facing owners and operators throughout the marine sector, the use of gas as fuel makes a lot of sense. Wärtsilä has been involved in a number of feasibility studies to evaluate the total cost of ownership using gas as a fuel alternative. LNG has consistently been shown to be a viable and attractive alternative to marine diesel and low-sulphur fuel oils. These milestone achievements in the number of gas and DF engines sold, and the running hours accumulated, provide even more evidence of this viability," said Alexandre Eykerman, Sales Director, Wärtsilä Ship Power.

Wärtsilä began development work with dual-fuel gas engines in 1987, the first concept being the gas-diesel (GD) engine with high-pressure gas injection. This was followed by the second generation of gas engines in the early 1990s, when the company introduced spark-ignited (SG) pure gas engines utilising low-pressure gas. The real breakthrough, however, came when the dual-fuel (DF) engine was introduced by Wärtsilä in 1995. This third generation of gas engine development resulted in the ability to combine fuel flexibility and efficiency with environmental performance.

The DF technology enables the engine to be operated on either natural gas, light fuel oil (LFO), or heavy fuel oil (HFO). Switching between fuels can take place seamlessly during operation, without loss of power or speed. The engine is designed to have the same output regardless of the fuel used.

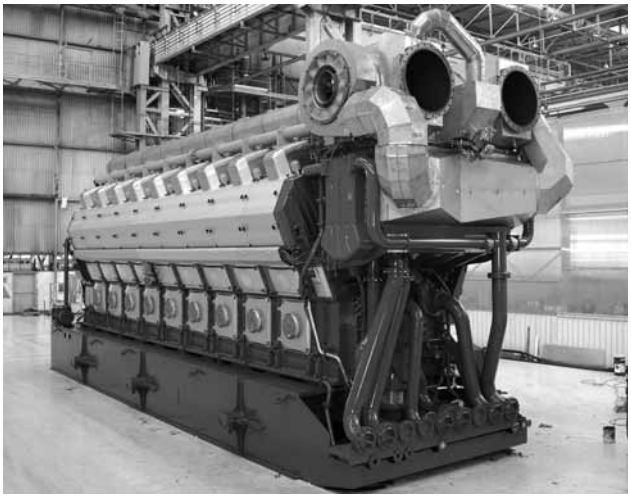
Two-stroke Dual-fuel Engine Development

In late 2010, Wärtsilä initiated a major project to extend its leadership in dual-fuel engines by adapting its low pressure gas engine technology for use in its low-speed engine portfolio. Subsequently, a new test engine, the RTX-5, based on a commercially available 6-cylinder RT-flex50 engine, was installed in the Trieste engine laboratory in Italy in March 2011. The resulting tests with the low pressure 2-stroke dual-fuel engine have successfully demonstrated that, for the first time ever, low-speed engine performance can fully comply with the IMO Tier III nitrogen oxide (NOx) limits when operating on gas.

Wärtsilä's low-pressure 2-stroke gas engine is scheduled for release during 2013 and will be available for commercial use in 2014. It will be incorporated into the full portfolio of engine types during 2015–16 to provide customers with a solution of their choice.

Cost-effective Compliance

Natural gas is the alternative fuel which offers the greatest potential for complying cost-effectively with the International Maritime Organisation's (IMO) upcoming environmental regulations. In particular, dual-fuel engine



The Wärtsilä 50DF engine
(Image courtesy Wärtsilä)

installations offer the flexibility to use clean natural gas when operating in Emission Control Areas (ECAs) and conventional fuels when not. While running on gas, Wärtsilä's dual-fuel low-pressure engines require no additional equipment, such as exhaust gas after treatment, to meet the IMO's Tier III NOx regulations.

Since the first Wärtsilä 50DF engines were fitted onboard LNG carriers some ten years ago, approximately 65% of all new LNG carriers have been fitted with Wärtsilä dual-fuel engines. At the beginning of this year, a key milestone was reached when the Wärtsilä 50DF engine was supplied to the 100th LNG carrier vessel. In addition to this success, Wärtsilä gas and dual-fuel engines are becoming the propulsion choice throughout all segments of the shipping industry. This is particularly the case where ships such as tugs, ferries and cruise liners, are frequently operating in ECAs. Also, offshore oil and gas industry vessels such as Floating Production Storage and Offloading (FPSO) ships and Platform Supply Vessels (PSVs), which have a need for flexibility, fuel efficiency, and compliance with stricter environmental legislation, are increasingly being fitted with Wärtsilä dual-fuel engines.

With the acquisition of Hamworthy, Wärtsilä's offering now includes small-scale LNG liquefaction, regasification and LNG fuel systems. Combined with Wärtsilä's gas and dual-fuel engine technologies, this expanded scope of supply further promotes the benefits of LNG use and creates added operational flexibility.

Wärtsilä RT-flex 1000th Order Milestone

Wärtsilä has received its 1000th order for its 2-stroke low-speed diesel, electronically-controlled, common-rail RT-flex engines.

This important milestone was passed in August with the placing of an order for a 7-cylinder Wärtsilä RT-flex82T version B main engine. This engine will power an efficient very large crude carrier (VLCC) being built for JX Tanker Company Limited, the Yokohama, Japan based major tanker company.

The 310 000 dwt vessel is being built at the IHI Marine United Inc., Kure shipyard, and is scheduled for delivery in 2014. The engine will be manufactured by Diesel United, Ltd, a Wärtsilä licensee in Japan.

First Nuclear-powered Aircraft Carrier to be Decommissioned

On 1 December 2012, after 51 years of distinguished service, the aircraft carrier USS *Enterprise* (CVN 65) will be decommissioned at a ceremony at the Norfolk Naval Station, in Norfolk, Virginia. The decommissioning ceremony will be the last official public event for the ship and will serve as a celebration of life for the ship and the more than 100,000 sailors who served aboard.

USS *Enterprise* refuelling the destroyer USS *McFaul* (DDG 74)
(US Navy photograph)

USS *Enterprise* was the world's first nuclear-powered aircraft carrier and was commissioned on 25 November 1961. She is the eighth ship to bear the name *Enterprise* and is commonly known as the "Big E".

USS *Enterprise* is a veteran of 25 deployments to the Mediterranean Sea, Pacific Ocean, and the Middle East, She has served in nearly every major conflict to take place during her history. From the Cuban missile crisis in 1962 to six deployments in support of the Vietnam conflict through the Cold War and the Gulf Wars, *Enterprise* was there. On 11 September 2001, after the terrorist attacks on the World Trade Centre in New York, *Enterprise* aborted her transit home from a long deployment and steamed overnight to the North Arabian Sea. Big 'E' once again took her place in history when she launched the first strikes in direct support of Operation Enduring Freedom.

USS *Enterprise* has a full load displacement of 91 038 t and is 342.3 m long overall. She is powered by eight nuclear reactors with steam turbines providing 209 MW for a speed of 33 kn. Her complement is about 5900 officers, sailors and air crew. She has been refueled twice during her long life.

General Dynamics NASSCO Earl Industries, Norfolk, VA., has recently been awarded a $US25 072 533 extension to a contract for the Ship Terminal Operation Program in support of the deactivation of the ship. That work is expected to be completed by June 2013. De-fuelling and decommissioning of the ship's eight reactors is expected to be completed by the end of 2015.

The first of a new generation of US carrier, USS *Gerald Ford* (CVN 78) is due to be completed in 2016. She will displace 101 605 t at full load and will be powered by two reactors which will require only one mid-life refueling during her expected life of 50 years. Her complement will be about 1000 less than that of *Enterprise*.

USS *Enterprise* moored in Athol Bight in September 1964 during her only visit to Sydney
(Photo John Jeremy)

MEMBERSHIP

Australian Division Council Meeting

The Council of the Australian Division of RINA met on Wednesday 19 September 2012 by teleconference based in Fremantle. The President, Mr Jim Black chaired the meeting.

Some of the matters raised or discussed during the meeting are outlined below.

Membership of Division Council

Council discussed the issues to be considered in terms of representing industry and geographic sectors in filling a vacancy, and decided to attempt to find an appropriate appointee inter-sessionally.

The Walter Atkinson Award

Council approved a committee report in relation to the re-activation of this Award, which will initially be for the best written paper presented under the Division's auspices during the 18 month period ending 30 June 2013. Details of the award appear in this edition of *The ANA*.

Breakdown of Membership

In reviewing the latest summary of Division membership, Council noted that the statistics indicated many members appeared not to have upgraded their membership grade commensurate with their experience. In some cases, such as experienced naval architects who had not yet upgraded from AMRINA to MRINA, this can be achieved at negligible cost. Council urged members to ensure that their membership grade corresponds with their experience and professional status, especially by upgrading as appropriate to MRINA, FRINA or registering as CEng.

Commercial Vessels Single National Jurisdiction

Council noted that the new *Navigation* and *Maritime Safety (National Law)* Bills had completed passage through Federal Parliament.

Council was advised that the Division was about to send a letter to AMSA, seeking to improve consultation with the Division in relation to measures being implemented on this subject. A positive informal response was received subsequent to the Council meeting.

It should be noted that AMSA has since issued for public comment draft regulations and Marine Orders, on which the Division had commented in writing that they contained no provisions to pro-actively ensure uniformity of standards. The Division is in contact with AMSA on this matter, for which the Division's input is likely to be sought on revision of the NSCV — a notice seeking interested members to participate in this work appears in this issue.

On a related subject, Council noted that Dr Armstrong had authored an article on registration of engineers in the August issue of *The ANA*.

Advertising in *The Australian Naval Architect*

Members are urged to maximise published references to this journal in order to maximise such revenue. For the time being, the Secretary remains the contact point for coordination of advertising.

Naval Architecture Course at Flinders University

The Division has been advised by Headquarters that RINA recognition had been requested for a naval architecture course under the auspices of Flinders in which the naval architecture elements were taught at AMC. Subsequent to the Council meeting, it emerged that a similar arrangement applies to a course offered by Edith Cowan University.

Next Meeting

The next meeting of the Australian Division Council will be held on Thursday 6 December.

National System for Domestic Commercial Vessel Safety

The Division President recently wrote to the General Manager, Regulatory Affairs and Reform, of the Australian Maritime Safety Authority regarding the implementation of the National System for Domestic Commercial Vessel Safety. The text of that letter is set out below.

"We refer to the Public Consultation process on proposed Regulations, Marine Orders and Exemptions under the National Law, covering the following exposure drafts:

- Marine Safety (DCV) National Law Regulation
- MO 501 - Administration
- MO 502 - Vessel identifiers
- MO 503 - Certificates of Survey
- MO 504 - Certificates of Operation
- MO 505 - Certificates of Competency
- MO 506 - Approval of training organisations

"In commenting on these draft instruments, it is noted that no request was made for responses to the revised Regulatory Plan that was circulated as part of this package.

"We are pleased to advise that the draft documents were forwarded to the members of The Royal Institution of Naval Architects (Australian Division) with a request to make comments directly to you, given that a coordinated response from the Division could not be prepared in the available time. As office-bearers of the Division, we are unaware of any individual submissions being lodged, and therefore have to rely on informal input from members to provide this response to your request for comment on the documents of the package.

"It is noted that both the national system website and the letter from AMSA to National System Stakeholders of 20 September 2012 refer to the need for the above exposure drafts to be read in conjunction with the revised Regulatory Plan (September 2012). This document contains a number of additions and alterations to the 2011 exposure draft of the Regulatory Plan and, whilst you do not specifically invite comment on the new Regulatory Plan (2012), it does contain some new provisions which are of concern to our members and which we would like to draw to your attention.

"As naval architects, our members are often the persons responsible for design approval and the supply of documentation necessary for the Certificate of Survey. Additionally, some of our members act as surveyors, within the individual State and Northern Territory marine safety

agencies *(the agencies),* for classification societies and as existing accredited surveyors. Very little has been published previously on how these functions are to work cohesively under the National System, and the new Section 3.2 of the Regulatory Plan (2012) is the first public exposure of the administrative arrangements. Essentially this appears to identify a continuation of the existing system with the agencies being responsible for issuing Certificates of Survey, but with overall responsibility lying with the National Regulator. Based on the final paragraph of Section 3.2.6, this appears to be a transitional plan whilst surveyor accreditation arrangements are developed, but there is no timeline given for this transitional stage.

"It is of concern to us that, under this arrangement, there will remain problems of commonality of interpretation of the NSCV requirements between the agencies, which has been an issue to date for our members attempting to best utilise the non-prescriptive nature of the NSCV. There have been cases where proposals have been accepted by one agency but not by another. This is compounded by the penultimate paragraph of Sections 3.2.6 and 5.5.1 which both state that "Responsibility for completeness and accuracy of Certificates of Survey will rest with the agency", which might imply that each agency is able to make their own individual interpretation. We suggest that there should be an over-arching authority or arbiter who might be able to make a ruling or take responsibility in case of disagreement between agencies, especially where a new application for survey reveals inadequacies in the same design accepted by another agency. We would have anticipated that this would be the responsibility of the National Regulator. At the same time it is necessary to ensure that new design developments are not blocked and safety remains a performance-based issue.

"We also suggest that the best way to ensure that standards are maintained equally across the nation would be to establish some sort of audit regime to sample the quality of the end product, at least up until such time as surveyor accreditation arrangements are in force.

"We note that the absence of such arrangements from the Regulatory Plan and, consequently, from the draft statutory instruments of the package would appear to be a significant shortcoming of the "national system" and would appreciate information on whether and how the assurance of consistent standards and interpretations will be achieved.

"We remain committed to the safe and speedy implementation of a truly National System."

Rob Gehling
Secretary

Changed contact Details?

Have you changed your contact details within the last three months? If so, then now would be a good time to advise RINA of the change, so that you don't miss out on any of the Head Office publications, *The Australian Naval Architect*, or Section notices.

Please advise RINA London, *and* the Australian Division, *and* your local section:

RINA London		hq@rina.org.uk
Australian Division		rina.austdiv@optusnet.com.au
Section	ACT	rinaact@gmail.com
	NSW	rinansw@gmail.com
	Qld	peter@directmarinesolutions.com.au
	SA/NT	danielle.hodge@defence.gov.au
	Tas	mfsymes@amc.edu.au
	Vic	srkelly@globalskm.com
	WA	rina.westaus@gmail.com

Phil Helmore

THE INTERNET

Webcasts of NSW Section Technical Presentations

Engineers Australia records technical presentations made to RINA (NSW Section) and IMarEST (Sydney Branch) for webcasting. The webcasts are placed on the Engineers Australia website, usually within a few days of the presentation, and the URLs of recent presentations are as follows.

Rodney Humphrey of Det Norske gave a presentation on *Towards More Sustainable Shipping: Results and Lessons Learned from the FellowSHIP Project* on 5 September. The webcast of Rodney's presentation is available at www.mediavisionz.com/ea/2012/easyd/120905-easyd/index.htm#.

RADM Rowan Moffitt, Head Future Submarines Program, gave a presentation on *Future Submarines — Few Easy Choices* on 2 October. The webcast of Rowan's presentation in Melbourne is available at www.mediavisionz.com/ea/2012/eav/120904-eav/index.htm.

Aslak Suopanki of Wärtsilä Environmental Solutions gave a presentation on *Wärtsilä After treatment Solutions for NOx and SOx Emissions from Shipping* on 3 October. The webcast of Aslak's presentation is available at www.mediavisionz.com/ea/2012/easyd/121003-easyd/index.htm.

Phil Helmore

RINA AUSTRALIAN DIVISION NOTICES

NOMINATIONS FOR DIVISION COUNCIL

Nominations are invited from Corporate Members (MRINA or FRINA) and Associate Members (AMRINA) for election to Division Council for a term of two years from March 2013. The majority of these elected members must be Corporate Members. Nominations, which must be in writing and include the signatures of the proposer, seconder and nominee, should be received by the Secretary no later than Friday 21 December 2012.

SINGLE NATIONAL JURISDICTION – RINA EMAIL GROUP

Members interested in providing input to the development of revised NSCV standards are invited to notify the Secretary of their interest in joining a RINA email group to be established for this purpose. Only members of this group will be invited to participate in this work, as contacting all members in relation to individual tasks/documents would be impractical. Volunteers for this group should notify the Secretary by 21 December 2012.

WALTER ATKINSON AWARD - PRIZE FOR THE BEST WRITTEN PAPER PRESENTED TO A RINA FORUM IN AUSTRALIA

Are you thinking of presenting a paper at a conference in Australia or a RINA Section meeting? Have you already presented one this year? If it is a really good paper then you may be eligible for the highly-prestigious Walter Atkinson Award.

The Walter Atkinson Award was established in 1971 and its aim is to raise the standard of technical papers presented to the naval architecture community in Australia.

The Award comprises three components:

- An engraved trophy or medal.
- A framed certificate for each author.
- Free entry to the event at which the award is to be presented.

The Award will be presented by the President of the Australian Division (or his nominee).

A nomination must be for a written paper, first presented either at a RINA Section meeting or RINA-supported conference in Australia, or first published in a RINA-supported publication in Australia.

All authors are eligible — Australian or overseas, members or non-members. Papers by multiple authors are eligible.

Nominations will be received for papers published in the period 1 January 2012 to 30 June 2013. Nominations close on 15 July 2013.

Nominations may be made by your Section committee or by the organising committees of RINA supported conferences held in Australia. If you would like your paper to be considered, please let them know.

For further information contact the Secretary.

Rob Gehling
Secretary, RINA Australian Division
Mail: PO Box 462, Jamison Centre, ACT 2614
email: rina.austdiv@optusnet.com.au
Phone: 0403 221 631

NAVAL ARCHITECTS ON THE MOVE

The recent moves of which we are aware are as follows:

John Butler has moved on in the Burness Corlett Three Quays organisation and has taken up the position of Assistant General Manager and Senior Naval Architect in the Sydney office.

Yew Jinn Chieng moved on from ASO Marine Consultants more than a year ago and took up a position as a naval architect with International Maritime Consultants in Fremantle. The company is involved in the oil and gas industry, specialising in new-vessel design, cyclone-mooring

design, and marine and structural engineering.

Alexander Conway, a recent graduate of the University of New South Wales, has completed his 470 world championship campaign in Europe, and has enrolled in a PhD program researching *Development of RANS Models Dedicated to Underwater Vehicles within OpenFoam* under the supervision of Dr Dev Ranmuthugala and Dr Jonathan Binns at the Australian Maritime College in Launceston.

Dan Curtis has moved on within the Defence Materiel Organisation and has taken up the position of Chief Engineer in the FFG System Program Office at Garden Island in Sydney on a part-time (3 days per week) basis until a permanent Chief Engineer can be appointed. He continues as the Project Director for JP3033 Interim Maritime Humanitarian Assistance and Disaster Relief Capability which is now winding down.

Chris da Roza has moved on from Thales Australia and has taken up the position of General Manager with Burness Corlett Three Quays in Sydney.

Scott Davenport continues as a senior naval architect with Austal Ships in Fremantle after the closure of Austal Image last year.

Jan de Kat has moved on from A.P. Moller-Maersk and has taken up the position of Director of Energy Efficiency at the American Bureau of Shipping in Copenhagen.

Lindsay Emmett retired from the Australian Maritime Safety Authority about 18 months ago, and is now a naval architect of leisure.

Dane Fowler, a recent graduate of the University of New South Wales, has taken up a position as a naval architect with the Maritime Operations Branch of Roads and Maritime Services in Sydney.

Stuart Friezer moved to Arhus, Denmark, in mid-2009, and continues consulting as Stuart Friezer Marine in Australia and Stuart Friezer Consulting in Denmark.

Peter Holmes moved on from consulting a year ago and took up a position as a naval architect with Riviera Marine. However, he has now returned to full-time consulting as Direct Marine Solutions in Brisbane.

Tim Holt moved on within the Det Norske Veritas organisation many moons ago, and has taken up the position of Ship Marine Manager in Sydney.

Jamie Howden has moved on and has taken up a position as Project Manager for Maintenance Availabilities in the Anzac System Program Office of the Defence Materiel Organisation at Garden Island in Sydney.

Ruth Jago has moved on within Petrofac and has taken up the position of Package Manager for the turret, risers and umbilical for an FPSO for Petrovietnam, based in Singapore.

Claire Johnson has returned from her posting to G.A. Glanville and Co. (Naval Architects), and has taken up the position of Assistant Stability Technology Manager in the Directorate of Navy Platform Systems in the Department of Defence in Canberra.

Tim Lilienthal completed his PhD in ship stability at the Australian Maritime College many moons ago and has taken up the position of Engineer at the Australian Maritime College in Launceston.

Anthony Livanos continues as a naval architect with Austal Ships in Fremantle after the closure of Austal Image last year.

Robert McConachie has completed his extended tour of Europe and has taken up a position with Rio Tinto in London, working on copper business development.

Campbell McLaren, a recent graduate of the University of New South Wales, has taken up a position with Core Builders Composites in Warkworth, New Zealand. CBC built the AC45 catamarans for the inaugural America's Cup World Series and is currently building the AC72 catamarans which will defend the America's Cup in San Francisco in September 2013. In addition, CBC is Oracle Team USA's official boatbuilding facility.

Shinsuke Matsubara was awarded his PhD at the Australian Maritime College in August 2011 and has taken up a position as a casual lecturer at the Australian Maritime College in Launceston.

Somon Orr has moved on from Lightning Naval Architecture and, after a time working in the Installations Department with Petrofac, has now taken up a position as Engineering Manager for the Marine and Subsea Division of installation contractor Daya OCI in Malaysia.

Roger Ramsey has moved on and, in addition to the position of Chief Naval Architect, is also the Platform Systems Functional Manager at BAE Systems in Williamstown, Vic.

Robert Skerman has moved on from Al Masaood Bergum in Dubai and has returned to Australia, where he has taken up a position as a naval architect working on the submarines with ASC in Adelaide.

Jan Verdaasdonk has moved on from the Air-warfare Destroyer Alliance and has taken up the position of Project Manager/Maritime Engineer with QinetiQ Australia in Melbourne.

Dominic Worthington moved on from the Royal Australian Navy many moons ago, and took up the position of First Engineer on the anchor-handling offshore supply vessel *Mermaid Vision*. He has subsequently passed his AMSA First Class motor examination, and has taken up the position of First Engineer on the offshore supply vessel *Mermaid Leveque*, working on the north-west shelf.

This column is intended to keep everyone (and, in particular, the friends you only see occasionally) updated on where you have moved to. It consequently relies on input from everyone. Please advise the editors when you up-anchor and move on to bigger, better or brighter things, or if you know of a move anyone else has made in the last three months. It would also help if you would advise Robin Gehling when your mailing address changes to reduce the number of copies of *The Australian Naval Architect* emulating boomerangs.

Phil Helmore
Martin Grimm

FROM THE ARCHIVES

The State Dockyard — Newcastle

Lindsay Emmett

In response to Winston Churchill's call at the beginning of World War II for '*ships, more ships, and still more ships'* the New South Wales State Government decided to re-establish shipbuilding as a state enterprise at Newcastle. Under the NSW Government Engineering and Shipbuilding Undertaking Act, 1943 (Act No. 19, 1943), work on the shipyard had begun in early1942.

The new enterprise was officially known as the New South Wales Government Engineering and Shipbuilding Undertaking, but was generally referred to as the State Dockyard. Given the wartime necessities, apart from shipbuilding, the dockyard had to also undertake all types of general and marine engineering work, along with ship repair and dockings.

At the time the NSW government had other facilities for the repair and maintenance of floating plant, Goat Island in Sydney Harbour being one. Additionally, there were small boat yards to service government craft located on the NSW North Coast. The NSW State Government's Walsh Island Dockyard, also located at Newcastle, had ceased operations approximately nine years prior to the establishment of the State Dockyard.

Because of the inaccessibility of the old Walsh Island Dockyard site by land, the NSW State Government decided to establish the State Dockyard on the Dyke End peninsula where a small dredge-repair plant already existed. This site was accessible by road, rail and water transportation.

Because of wartime demands, Australian manufacturers of structural steel, cranes, machine tools and all other equipment essential for shipbuilding and ship repair were fully committed to supply other wartime-related industries and sourcing similar equipment and services from overseas was out of the question.

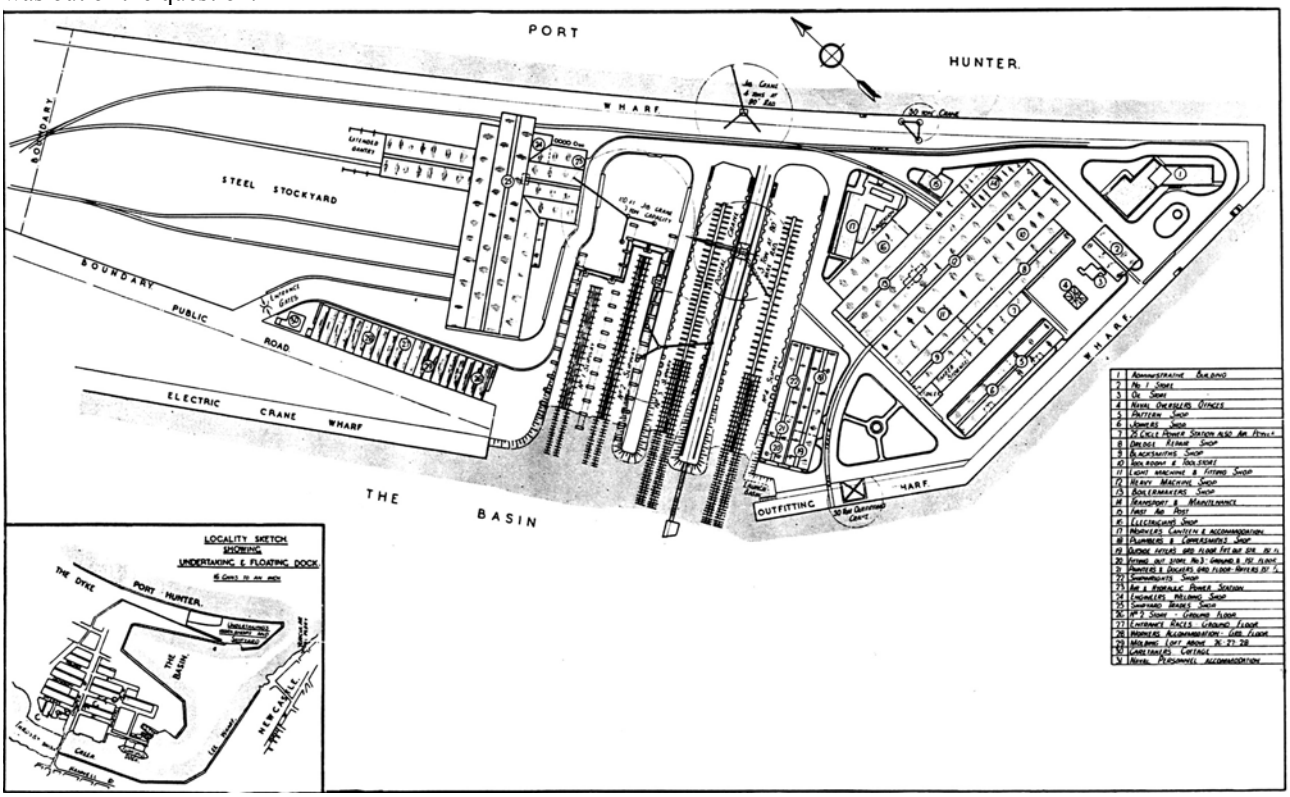
It became quickly apparent that the success of the State Dockyard rested on the facilities and equipment which could be salvaged from the old Walsh Island site. Walsh Island had made a valuable contribution to Australian shipbuilding needs during World War I.

Fortunately, much of the structural steel components of the workshops were found to be satisfactory and a number of cranes, engineering machine tools and the original ship-construction machinery only required overhauling to be made serviceable.

While many of the machine tools and buildings from Walsh Island were reused and relocated, the crane facilities on the building berths had long been disposed of. All efforts to obtain new shipbuilding cranes came to nothing. The problem of berth craneage was overcome by utilising the columns from one of the old Walsh Island engineering shops. Crane girders were placed on the top of these columns where roof trusses had originally rested. The columns were then braced to give lateral stability and spaced on each side of the building berth to suit the span of the existing ship construction shop overhead travelling cranes.

By March 1943, five months after construction commenced, the engineering shops were complete and the shipyard shops were well advanced.

A year after the establishment of the State Dockyard, the



The layout of the State Dockyard, Newcastle about 1945
(State Dockyard booklet)

15 000 t Walsh Island Floating Dock was moved from Walsh Island to a mainland site at Carrington, in close proximity to the State Dockyard.

It can be said that the State Dockyard was built on the neglected remains of the highly-successful Walsh Island complex.

Apart from facilities and equipment, one of problems which threatened the viability of the State Dockyard was the unavailability of suitably trained technical staff and it was difficult to fully man the facilities as they become available.

Newcastle industry at the time was well placed for the support the shipbuilding and general engineering activities of the State Dockyard. The dockyard could source steel plates and scantlings from the BHP Steelworks close by, and the Commonwealth Steel works could supply castings in the form of stern frames, propellers and bollards; etc. Other Newcastle industries could also supply pipe, wire and sub-contracting services; however, much of the specialised equipment needed to outfit a vessel still had to come from overseas.

Notwithstanding the wartime shortages of materials and skilled labour, by March 1943 the construction of a 180-foot (54.86 m) twin-screw minesweeper for the Royal Australian Navy was well underway on the first completed building berth. Also, the line production of 20 all-welded twin-screw 36.4 m ocean-going cargo vessels for the United States Army Transport Service had reached a stage that the first vessel was ready for launching.

The launching of the first ship — the Australian minesweeper HMAS *Strahan* on 12 July 1943
(State Dockyard booklet)

Between January 1942 and December 1945, not only were the works set up, but also the dockyard managed to complete 23 vessels, six sets of triple-expansion engines and docked and repaired 600 vessels of various types up to 16 000 t.

One advantage the State Dockyard had at the start was that it could utilise state-of-the-art shipbuilding technology, particularly in the area of electric welding. Additionally the workforce could train on, and become familiar with, the modern equipment fitted to vessels being built overseas to meet the wartime demands.

A 36.4 m cargo vessel under construction for the US Army Transportation Service; these ships were all welded
(John Jeremy Collection)

The State Dockyard had three basic divisions, Shipbuilding, Ship Repair and General Engineering. The three divisions supported each other in that the work force could flow back and forth between divisions in order to counter the peaks and troughs in work loads.

Although the State Dockyard was founded on wartime needs, the first peacetime merchant vessel, *Dorrigo,* was launched in October 1945. This was followed in the 1950s, 60s and 70s by many merchant vessels of various types, mainly for the Australian coastal trade and the dockyard was an important part of the Newcastle industrial landscape. At its peak, the yard employed over 2000 workers and helped to provide work for many more in support industries.

The maximum capacity of vessel that the State Dockyard could build was in the order of 25 000 t deadweight. The

Dorrigo entering the water in October 1945
(John Jeremy Collection)

types of vessels built ranged from dredges, to tugs, ferries, hydrographic survey ships, tankers and bulk carriers.

For a young naval architect learning his/her trade, the State Dockyard provided many design and engineering challenges due to the wide diversity of ships built. They also had the benefit of working with, and learning from, gifted naval architects like Michael Pearson and Neil Cain. These were men who only needed a piece of paper, a pencil and a slide rule to design a ship. Once the design was complete there was 'Ned' Beatty, the Forman Shipwright, to provide instruction on how to build a ship.

State Dockyard naval architects not only had to be able to develop conceptual designs and prepare basic design drawings, but also became involved in ship repair, general engineering and shipyard operational problems.

In many respects, the State Dockyard always strived to develop shipbuilding best practice by introducing such things as production planning, assembly flow lines and 1/10 scale lofting. Once the practice of riveting ceased and ships became all welded, the yard quickly introduced unit construction and early outfitting

The State Dockyard is credited with many 'firsts' in Australian shipbuilding, namely:

- *Princess of Tasmania* — vehicle deck passenger ferry (1959)
- *Bass Trader* — vehicle deck container vessel (1961)
- *William Holyman* — general cargo/container vessel (1961)
- *Kooringa* — fully-cellular purpose-built container vessel (1964)
- *Lysaght Endeavour* — vehicle deck cargo vessel (1973)

The launching of *Princess of Tasmania*
(Photo courtesy Lindsey Emmett)

Up until the late 1970s, the dockyard enjoyed a full order book which provided naval architects and the workforce with many challenges. From the beginnings in 1942 to its final closure, the State Dockyard built something in the order of 100 vessels. Today only a few still remain in service, most notably the Manly ferries, *Freshwater* and *Queenscliff*.

With the prospect of good orders into the foreseeable future, the dockyard management was instrumental in establishing a naval architecture certificate course at the local TAFE College. This was followed by the introduction of the naval architecture degree course at the University of Newcastle in the late 1960s.

The General Engineering Division also made a substantial contribution over the life of the dockyard by assembling marine diesel engines, building power-station condensers and providing engineering services for other industries. In the early 1950s the dockyard also fabricated the structural components for road bridges — the bridge at Batemans Bay, NSW, being one. Towards the end, the General Engineering Division diversified into the fabrication of demountable buildings for schools, etc. The division also undertook the fabrication of the large girders which now form the overhead road bridges next to Darling Harbour, Sydney.

The Ship Repair Division generally enjoyed prosperity during the life of the dockyard — some would say at the expense of the Shipbuilding Division. As shipbuilding activities began to decline during the 1970s, there was more reliance on the ship repair activities to keep the dockyard profitable.

Unfortunately, the floating dock (built in the 1920s) had come to the end of its working life. The arrangement by which the floating dock could dock itself was one of the prime reasons for its demise. So in 1977 the old floating dock was cut up for scrap and replaced by a new 30 000 t dock *Muloobinba* at the Carrington site in 1978. Around this time, the dockyard's 80 t lift floating crane and two marine railways were also found to be in urgent need of repair, further reducing the dockyard's profitability.

With orders for work in all divisions dwindling, the State Dockyard really needed large injections of cash in order to modernise and stay competitive. By the end of the 1970s much of the yard's equipment was basically worn out and in need of replacement. Unfortunately, at the time the NSW State Government had other commitments and the much-needed injection of money was not made available.

As a result of the downward trend in shipbuilding orders, primarily due to foreign competition, the construction of large ships ceased. Although the dockyard management diversified into small vessel construction, any profits could not support the costs of maintaining an enterprise the size of the State Dockyard. The State Dockyard was basically trying to get into the market in which Carrington Slipways, located further up the Hunter River at Tomago, was most successful. Even with the support of the NSW State Government, which provided work in the form of the construction of Sydney Harbour ferries and general engineering work, the State Dockyard was unable to return to profitable operations. With the passing of the NSW Government Engineering and Shipbuilding Undertaking (Repeal) Act, 1987, the State Dockyard closed.

So it came to pass that, with a Ministerial signature, a once vibrant dockyard which had provided good service to the Australian maritime community and the Newcastle region for 45 years ceased operation.

The dockyard's equipment was slowly sold off or scrapped and many of the buildings demolished. When you look at the dockyard site today, it's hard to imagine that a major shipbuilding enterprise once flourished there.

The State Dockyard shipyard at Dyke End, taken in 1968. The Australian National Line's roll-on, roll-off passenger vehicle ship *Australian Trader* (later HMAS *Jervis Bay*) is under construction on the slipway
(John Jeremy collection)

Completed in 1983, the Manly ferry *Queenscliff* was the last ship built by the State Dockyard
(Photo John Jeremy)

Footnote: The author was saddened to read about the passing of Frank Last in the August edition of *The ANA*. Frank was a good friend and mentor to the naval architects working at the State Dockyard. So much so that, although he worked for Lloyd's Register, Frank was considered a de-facto member of the dockyard's design department. If there was a problem with some aspect of a ship's design or rule interpretation, Frank was the 'go-to' man.