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AIR WARFARE DESTROYER
ALLIANCE
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THE AUSTRALIAN NAVAL ARCHITECT

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Cover Photo:

USNS *Spearhead* (JHSV 1) during her recent launching at Austal's Alabama shipyard (US Navy Photograph)

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The Editor
The Australian Naval Architect
c/o RINA
PO Box No. 462
Jamison Centre, ACT 2614
AUSTRALIA
email: jcjeremy@ozemail.com.au

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RINA Australian Division
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From the Division President

In today's economic climate, with the high cost of fuel, more and more effort is being put into increasing the efficiency of shipping goods around the world. Where possible, even larger ships are being considered and all sorts of techniques for reducing drag and improving propulsive efficiency are being investigated. Many of these are reinventions of old ideas, such as lubrication using air bubbles, and others are improvements and refinements of existing techniques such as improved coatings. I'm sure that they all will contribute to ensuring that transporting goods by sea is as efficient as it possibly can be.

In an attempt to categorise the relative efficiency of different ships, IMO has developed an Energy Efficiency Design Index, and this has been receiving some publicity recently. However, what is not explained in the general press is that it is not possible to compare the efficiency of different categories of ships using this simplistic index. For example, comparing a Ro-Ro with a VLCC using this index makes little sense at all. So, whilst it is certainly good news that the efficiency of shipping is now being taken very seriously, there is still some way to go to explain to the general public that sending goods by sea is far more efficient than any alternative.

Of course, what the public hears about shipping is usually limited to when there has been an accident, such as the recent grounding of *Rena* in New Zealand, or complaints about the levels of emissions from ships which use very low-quality fuel. First, despite the apparent high levels of emissions by shipping, the relative efficiency of ships compared to, say, trucks, needs to be stressed more often. Secondly, it needs to be understood that, in many cases, the heavy fuel oil used by shipping cannot really be used for anything else and it would otherwise be wasted.

I suppose that it is up to us in the maritime industry to attempt to make the point that shipping actually is a very efficient way of transporting goods around the globe. It is only because of the very low cost of shipping that any of us can have our high standard of living.

Final-year students at most universities in Australia will just have completed their research projects, and given the final presentations to interested audiences. As I sat through many most enjoyable presentations recently, it dawned on me that there is a wealth of information being generated by those students. Some of this will end up being published as joint papers with their supervisors, but much of it will just sit on shelves in libraries, which is a great pity. No doubt many projects will be continued by students next year under the guidance of the same supervisor and, where this occurs, some really good work can get done. Perhaps it may be possible to encourage some mini-papers for *The Australian Naval Architect*?

I know that many people from outside the universities attend these presentations and the students get great value when they act as external assessors. However, I wonder how many of those of us working in the industry realise what an enjoyable and interesting day this can be? I strongly recommend that those with the opportunity to visit their local university and attend these presentations if at all possible. After all it is a very good way of vetting potential future employees!

Many readers will be aware of the new journal which has just been started by the Institution – the *International Journal of Marine Design* (IJME). This will include early announcement of new design concepts, ideas, findings, procedures, applications, interim results, etc., which might later on form part of a full paper. IJMD will be published twice per year in electronic format only. The Institution has obtained an EU grant through the European Boat Design Innovation Group Project to cover the setup and production costs of the first year's issues. The journal will be free for the first year, and thereafter available on subscription.

The IJMD will be published as Part C of the Transactions, joining the *International Journal of Maritime Engineering* (IME) and the *International Journal of Small Craft Technology* (IJSCT) which are Parts A and B of the Transactions, respectively. I encourage all members to offer appropriate papers to all three of these journals.

Finally, I cannot let this column finish without recognising the impending retirement of Dr Kim Klaka, Director of the Centre for Marine Science and Technology (CMST) at Curtin University. I have known Kim well, over many years, and know that CMST will not be the same without him. It is also important to acknowledge that Kim was one of the inaugural editors of *The Australian Naval Architect* and that his input to RINA has been considerable over many years. I wish him well for his retirement.

Martin Renilson

Martin Renilson
President, RINA Australian Division

Editorial

The Australian merchant fleet has been in decline for many decades. The reasons for this decline are many. The high cost of Australian crews and the militant nature of Australian maritime unions are often cited as the main causes, but the reality is more complex than that. The Australian taxation system and much higher levels of government support for competing international fleets have also played a large part in the decline. In 1995 there were 55 Australian operated ships — today there are only 22 ships.

As a nation which depends for its income on merchant shipping, it is not only illogical that this essential trade is carried in foreign-flagged and -owned ships it is also a costly lost opportunity. For many years, interested parties have been lobbying Australian governments to take some action to encourage Australian ownership and operation of merchant ships, not only in international trade but also on the Australian coast, to take some of the load off the road and rail infrastructure. The latter, of course, also requires appropriate investment in ship–shore infrastructure to be competitive.

It has also been argued that losing the Australian merchant fleet poses an unacceptable defence risk, but all these arguments have fallen on deaf ears.

Finally, in September this year, the Commonwealth Government announced a package of measures designed to make Australian shipping more competitive and a more attractive investment. The package has four main elements:

- tax reforms to remove barriers to investment in Australian shipping to foster the global competitiveness of the shipping industry,
- a simplified three-tier licensing framework for participation in the coastal trade ,
- establishment of an Australian International Shipping Register to put Australian companies on a level footing with their international competitors and
- establishment of a Maritime Workforce Development Forum to progress key maritime skills and training priorities.

Shipowners will also be given an incentive to replace ships earlier, with depreciation spread over ten years instead of twenty years and there will be a tax break for companies employing Australian seafarers on international voyages.

These reforms are welcome and long overdue. It remains to be seen how effective they may be in reversing the decline of the fleet but it is a start. One might also speculate about possible favourable impact of these measures on the Australian shipbuilding and ship repair industries. Perhaps, in the long term, but I wouldn't hold your breath.

On another subject, this is the last edition of *The ANA* for 2011 — Volume 15 No. 4 — the 58th edition of our journal and the 54th produced by Phil Helmore and me over the last 14 years. How time flies! We don't aim to compete with the fine international journals produced by the RINA in London but to provide news and articles of particular interest to Australian naval architects (and others) and I hope we succeed. Above all, we would like *The ANA* to be an interesting read. We depend, of course, on our readers and contributors. This is your journal so keep the material flowing to us. We don't have a large staff — it's just us — so if you feel that we are missing something, get writing!

John Jeremy

In the 21st century one does not often see 14 gaff-rigged yachts crossing the starting line together but that happened when the Couta Boat and Ranger-class Division started during the Sydney Amateur Sailing Club's Gaffers Day on Sydney Harbour on 23 October. Held every two or three years, the event is a rally for classic and gaff-rigged yachts and a celebration of sail. This year 81 boats took part, ranging from the 14-foot (4.2 m) cat boat *Buccaneer* to the 61-foot (18.5 m) sloop *Fidelis* and everything in between
(Photo John Jeremy)

NEWS FROM THE SECTIONS

Tasmania

The September technical meeting for the Tasmanian section of RINA was held on 29 September to coincide with the annual UNSW visit to AMC. Phil Helmore gave a presentation titled *Performance of Propellers in Off-design Condition.* Phil went through the design of propellers (usually up to about 7 weeks of lectures) in about 10 minutes, then went on to show a few very interesting limiting conditions for the design of propellers and the entire propulsion system. In Phil's words:

"Marine screw propellers are usually designed for a particular operating condition. However, for a number of vessels, there is also interest in the performance of the propeller in a different operating condition."

This presentation commenced with the basics of propellers, their characteristics, and the initial design process. It then looked at the output power characteristics of diesel engines, which are necessary for analysis of off-design performance. Examples were given of off-design performance for tugs, trawlers, and high-speed craft. The presentation then looked at the influence of roughness and fouling of the hull and propeller, and how these can be analysed.

The 2011 Season

On behalf of the Tasmanian Section of RINA I would like to take this chance to publicly thank all our speakers for their presentations during 2011. They have revealed a fascinating cross spectrum of the maritime industry, truly showing what incredible work can be achieved with a truly open mind and multi-disciplinary approach. From innovative propulsion systems for fast ferries, to Antarctic adventures; from artificial wave pools to propeller design, and certainly not forgetting the analysis of the wreck HMAS *Sydney*. It has been a very interesting year of technical meetings.

Jonathan Binns

Western Australia

New Committee

The WA Section has a new committee, elected at a meeting held on 25 August, kindly hosted by Intec Sea in West Perth. Holding the meeting in Perth was a new approach for RINA WA, with the intention of attracting better attendance from the many naval architects now working in the Perth CBD, and away from the previous hubs of Fremantle and Henderson. Many of the city-based naval architects are supporting the ever-expanding oil and gas industry in the north west of Western Australia and it is great to have this broader perspective on naval architecture.

At the meeting several topics were raised, with the major focus being the provision of more technical presentations, particularly in the CBD. The meeting closed with nominations for the committee and election for all positions that had become, or were, vacant at the time. The new committee comprises

Chair	Jesse Millar
Deputy Chair	Graham Jacob
Secretary	Kris Rettke (moving to NSW shortly, leaving the slot open for nominations!)
Treasurer	Jeremy Gordonnat
Nominee to ADC	Ken McAlpine
Members	Timothy Brazier
	Malcolm Waugh
	Matthew Williamson

Should anyone wish to contact the new committee, nominate for Secretary or as a committee member, please send an email to RINA WA at rina.westaus@gmail.com.

Committee Meetings

The first meeting of the new committee was held on Thursday 20 October, in the old tram at the Albion Hotel, Cottesloe.

The main topics of discussion were upcoming technical presentations, including where best to host these. It was generally decided that there should be more presentations in the CBD. There has also been interest from Fremantle TAFE to host presentations. TAFE has excellent facilities allowing larger audiences and a better quality of presentation.

The provision of more social events was discussed and these will hopefully attract new members and provide existing members with a means to network and get some more value from their memberships.

Technical Presentations

As part of the RINA WA–IMarEST collaboration, there has been a number of interesting presentations over the course of the last few months. These include:

- *Renewable Technologies, and the Harnessing of Wave Energy in Power Production*, presented by Dr Reza Taghipour and offering an insight to Dr Taghipour's PhD studies which developed a platform with wave buoys to extract energy from ocean waves. The presentation was highly detailed and again showed the variety of projects in which naval architects are now involved.
- Marine Science Students' Presentations — these were presented by three undergraduate students and one PhD student. Whilst not specifically related to engineering, they gave attendees a chance to see some different presentations, including the absorption of toxins in sea grasses of Cockburn Sound; predicting wave data in Perth coastal waters in order to manage wave power generation; use of marine reserves and their effectiveness in regenerating fish and crustacean stocks; and a study of blue whales off the coast of Sri Lanka.
- On 10 November Austal Ships hosted a tour of their Hull Number 270, followed by a networking barbeque and light refreshments on the Austal boardwalk area.
- On 16 November, returning to the schedule of hosting a technical meeting on the third Wednesday of each month, Mal Waugh, of BAE Systems, made a presentation *Myth-busting the Stability of the Anzac-class Frigate*s.

We are always on the lookout for presentations, and can either provide facilities to host the presentation or will arrange for members to come to the location of the presenter and ensure that refreshments are provided for attendees.

Christmas Party

The committee is endeavouring to arrange a Christmas Party for members of RINA and IMarEST, as well as others involved in the WA maritime industry. This can only occur if there is financial support from within the industry, and fundraising efforts are under way. These will be progressed as a matter of priority to ensure that members are provided with social and networking events to promote themselves, their companies and the local industry as a whole.

RINA WA Technical Library

For those who are unaware, RINA WA has an agreement with Curtin University to maintain a section within their technical library at the Fremantle Sailing Club. There is a wealth of excellent information held here, including numerous transactions and valuable textbooks. Should anyone wish to access this, please contact RINA WA on the email provided earlier. [*The library holdings are catalogued online at* www.rina.org.uk/page785.html —Ed.]

Industry Involvement

RINA WA has a fairly low budget and it was noted at committee meetings that social events are key to attracting new members and ensuring that existing members maintain active involvement. The committee are therefore working hard to establish industry involvement from the ever-expanding WA maritime industry. So, if anyone is interested in offering his or her support, please drop an email to RINA WA. In return for their support, companies will be provided with means of advertising at technical presentations and social events as well as through the RINA WA website, which is shortly to be developed.

One means of achieving industry support is through meetings with companies, such as Marine WA (www.marinewa.com.au), who are working hard to establish a joint collaboration from within various parts of the Western Australian maritime community. A big thank you must go to Marine WA, who have offered a spot to RINA WA in their General Meetings and are continuing to progress with getting support from the local industry.

Goal

The new committee is working hard to invigorate RINA WA, and raise attendances at meetings and presentations, by offering better presentations, at a variety of venues, as well as access to the broader Western Australian maritime industry through various networking and social events. In order to facilitate this, we urge members to continue to be active in attending and promoting RINA WA and the events which are arranged. As a committee we are looking forward to good times ahead, and any feedback is more than welcome. Finally, our database of members is now quite outdated so, if you (or anyone you know) has recently changed addresses, or wishes to be added to the distribution list, please send through details to RINA WA at rina.westaus@gmail.com to ensure that you receive the latest information.

Jesse Millar
Chair
RINA WA Section

New South Wales

Committee Meetings

The NSW Section Committee met on 21 September and, other than routine matters, discussed:

- NSCV Section C1—Arrangement, Accommodation and Personal Safety: The Reference Group for this final section of the NSCV met a total of seven times, with the final one being on 31 August. John Fladun is now the CEO of NMSC's functions in Canberra under AMSA, and the Sydney office is closing.
- SMIX Bash 2011: Further sponsors are being sought for this year's event to cover projected costs; credit-card facilities are again available and registrations have opened, but are away to a slow start this year.
- Database of Consulting Naval Architects: The country search facility is up and running on the RINA database of consultant members, and a short email reminder has been prepared.
- Technical Meeting Program 2012: Topics for presentations in 2012 were proposed and a number of authors will be approached.

The next meeting of the NSW Section Committee is scheduled for 9 November.

Mooring Design for Wave-energy Systems

Fraser Johnson, Renewal Energy Manager for Oceanlinx Ltd, gave a presentation on *Marine Renewables — Mooring Design for Wave-energy Systems* to a joint meeting with the IMarEST attended by 18 on 7 September in the Harricks Auditorium at Engineers Australia, Chatswood.

Introduction

Fraser began his presentation by saying that, while he has been in Australia with Oceanlinx for a year, he has been involved with renewable energies since 1999 and, before that, in the merchant navy. Renewable energy has gone from an idea to an industry, and some companies have invested $100 million in putting kit into the water.

How do wave-energy systems work? There are various types, and here Fraser showed a slide of the principal methods used. These include:

- Pressure and/or surge motion types, e.g. oscillating water columns.
- Low-head hydrodynamic types which operate on wave overtopping to fill a holding tank and use the outflow.
- Hydraulic types which use pitch, heave, pitch/surge or pitch/yaw motions.

Oceanlinx have used oscillating water column (OWC) types at Port Kembla since 1997. The initial Mk 1 500 kW system has now been decommissioned, and replaced by the Mk 2 1.5 MW system in 2005 and then, in 2010, the Mk 3, a cluster of eight chambers in a space-frame structure which validated the output of their blueWAVE commercial package at 2.5 MW. Wavejet in northern Scotland have also operated a 100 kW OWC for six years.

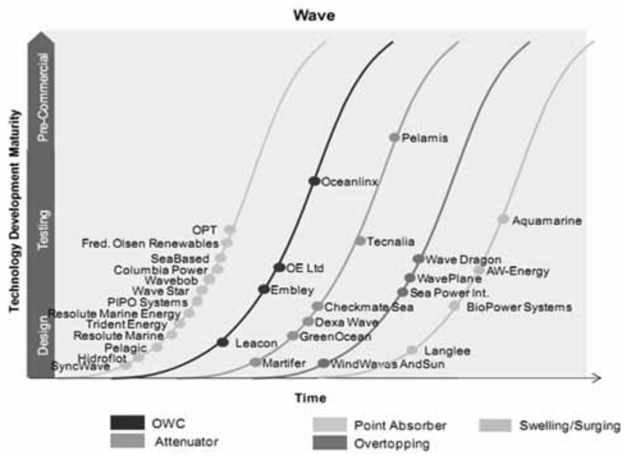
Point-absorbers operating on heave motions include those by Ocean Power Technologies and Carnegie. Installations have included a 40 kW system in Spain, and a 150 kW system in the Orkneys. These types are suitable for putting in farms.

Attenuator types operating on pitch and yaw motions, such as that of ocean Power Delivery, have been installed on a test project in the Orkneys and then in an application in Portugal, but there has been little further development.

The surging type has been adopted by Aquamarine Power using a hinged flap on the sea bed in 8–10 m of water and has been deployed in the Orkneys to generate 820 kW. Langlee Wave Power has also used this type with four articulated flaps, but in a floating structure.

Global Developers

Here Fraser showed a slide depicting the principal developers of wave-energy technology and the maturity of each type.



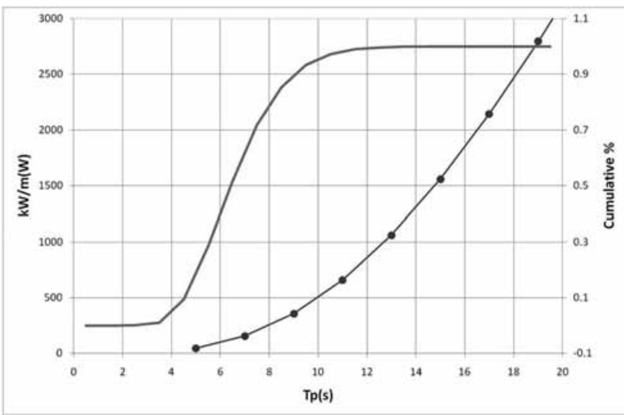
Global developers of wave-energy technologies
(Diagram courtesy Fraser Johnson)

This was followed by a comparison of the mooring requirements and operation of oil-and-gas operations and the wave-energy conversion industry.

Item	Oil and Gas	Wave-energy Conversion
Operational intent		
Catenary	Retain a specified watch circle	Limit loads and promote energy extraction
Tension mooring	Distance between drill floor and seabed	Limit loads and promote energy extraction
Human monitoring	Continual – onboard	None – load cells
Maintenance intervals	Annual (DNV)	Limited (3-5 years)
Environmental risks	High (Hydrocarbons)	Low (commercial)
Comparative mass	<=5%	>=25%
Materials	Chain/wire/synthetic	Chain/wire/synthetic
Storm survival	Rise up/cut and run	Remain and survive
CAPEX (% Project cost)	>5%	<50%
Revenues	~$billions	~$20m over 25 years

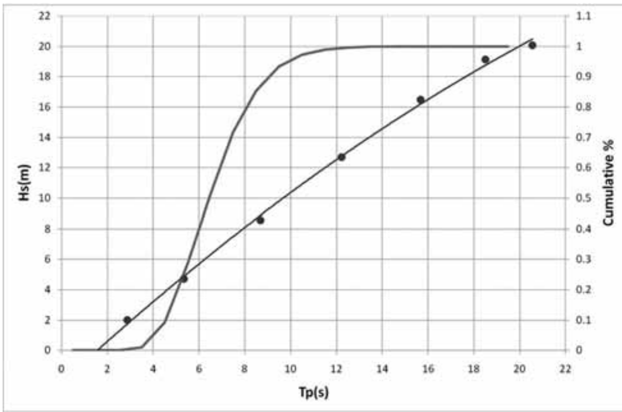
Challenges

Challenges faced by wave-energy conversion companies include the fact that they are often first of class; they have additional degrees of freedom, there is a non-linear response of the power take-off, the OWC chambers vary the system response, and the relative unit size and mass compared to wavelength. In addition, they are following the cash-rich oil and gas industry, but without the cash reserves. There has been a history of perceived failure of wave-energy systems, and the operational range and survival peak is high.



Operating range of design waves
(Diagram courtesy Fraser Johnson)

The curved line for design waves shows the cumulative percentage of occurrence for a specific location in the UK, and the diagonal line shows the DNV requirement.



Operating range of wave power
(Diagram courtesy Fraser Johnson)

The curved line for wave power shows the cumulative percentage of occurrence for a specific location in the UK, and the diagonal line shows the DNV requirement.

Mooring Process

After checking the site parameters and deciding a physical design, the mooring process includes the following steps:

1. Quasi static analysis and concept design.
2. Uncoupled motion analysis (software).
3. Model testing, structure and mooring (physical).
4. Coupled analysis (software).
5. Final design, bill of materials and mooring manual.

There is feedback from Step 3 to Step 1, and from Step 4 to Step 3.

Input data for the mooring process includes information for the concept design including geometry and hydrostatic parameters, site data including bathymetry, met-ocean data including DNV-RP-C205, wave climate (significant wave height vs period and direction), the design wave contour, wind and current.

Analysis

Input data for Step 1, the quasi-static analysis, includes the mooring stiffness characteristic, the mooring length and bearing, the total mean steady forces provided by wind, wave and current, and the vessel excursion. The output of this analysis gives the fairlead mooring-line tension.

In Step 2, the uncoupled analysis, hydrodynamic modelling of the structure is done by HydroStar or SESAM. Inputs include vessel geometry and hydrostatic properties, and the output gives the hydrodynamic motions.

The output of Step 3, the scale model trials, gives the motions, loads and a high-speed video recording.

Step 4, the coupled analysis, includes a parametric analysis and design sensitivities, and output gives the loads.

In Step 5 the design is finalised and a bill of materials produced.

Mooring Designs

What do the moorings look like? Fraser showed diagrams of the principal types of moorings. These included the

OPT-PB150 with a three-point taut float for a 300 t unit, the Orecon-MRC quasi-tension mooring for a 1750 t unit, and the Orcaflex for a design wave with a return period of 100 years. A video of the Orcaflex unit showed the scope of oscillations of the unit and the mooring lines due to motions.

Five hull model mooring variations were tried. These included

A	a standard 100 m two-bridle mooring;
B	up-weather, with Legs 1 and 2 of 140 m, and Leg 3 of 60 m;
C	as B but with mooring attached to float only;
D1	lengths as in B but with long up-weather bridles to spar and float, and down-weather to spar only;
D2	as in D1 but with lower pre-tension; and
E	as in D1 but with all moorings attached to the spar.

The mooring problem for the Orecon-MRC unit is that the mooring load is provided by both the cross-sectional area of the unit and the cross-sectional area of the chambers themselves. Fraser showed a video of a model of the unit in Toulon, France, in operational conditions, and then in storm conditions. In storm conditions the structure bobs and nosedives, not due to the mooring system, but due to the air pressure in the chambers. The mooring loads go through the roof, and a gravity mooring is not possible. This is because the equation for the natural heave period is dominated by the term for the chamber stiffness on the bottom line.

The MRC pre-tension (900 t) acts to oppose the negative pressure within the chambers, thus drawing air through the turbine. The anchors act as a reaction mass to oppose positive pressure within the chambers, thus forcing air out through the turbine. The final mooring system uses a combination of forward and aft moorings, together with vertical tension moorings to the sea bed.

Fraser then showed videos of the sonton wave and the Orcaflex model.

Conclusion

Wave-energy conversion systems have developed from an idea to an industry, and have come of age. The design of moorings for the various systems are also developing, based on the experiences of the various companies involved. There are various types, and these can now be designed to cope with the loads imposed by storm conditions, which is what they have to be able to survive.

Questions

Question time was lengthy, and elicited some further interesting points.

Failure mode and effect analysis comprises a large part of what mooring designers do in developing designs.

The water depth depends on the type of device; deeper water, in general, means more energy. A depth of water of about 50 m seems to be about the optimum. A distance of 50 m from shore is about the closest. In South Australia there is an installation about 1.5 km off the beach, so people don't even notice.

Erosion of the sea bed due to the converter is minimal; it cannot be measured at model scale.

Maintenance currently has to be done at least yearly to maintain class, but operators want to extend this to three years between lift-out for inspections.

Crystal balling the future, development in Australia may depend on ACRE, the Australian Cooperative Research Centre for Renewable Energy, which has released $130 million for research. In three years, we could see 3 MW in South Australia. The UK has a large number of OEM companies involved, e.g. ABB, Siemens, and Alsthom. For progress, ther have to be no failures. Young, bright people from university are needed to make it happen. We will see more-rigorous energy regulation, and no failures will see it go ahead, e.g. 20 MW within five years, and then it will explode.

The vote of thanks was proposed, and the "thank you" bottle of wine presented, by Syd Cullen.

Hullforms of Yesterday's Timber Vessels

Noel Riley, Principal of Commercial Marine Design, gave a presentation on *Developing the Hullforms of Yesterday's Timber Vessels* to a joint meeting with the IMarEST attended by 21 on 5 October in the Harricks Auditorium at Engineers Australia, Chatswood.

Noel's presentation appears elsewhere in this issue.

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

Phil Helmore

COMING EVENTS

SMIX Bash 2011

The twelfth SMIX (Sydney Marine Industry Christmas) Bash will be held on Thursday 1 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)

Gold+

- Svitzer Australasia

Gold

- ABS Pacific
- AMC Search
- Ausbarge Marine Services
- Det Norske Veritas
- Electrotech Australia
- Energy Power Systems (Caterpillar)
- International Paints
- Lloyd's Register Asia
- PB Towage
- Rolls-Royce Marine Australia
- Thales Australia
- Wartsila Australia
- Waterway Constructions

Silver

- ASO Marine Consultants
- Burness Corlett Three Quays
- Cummins South Pacific
- Germanischer Lloyd
- Hanson Construction
- Inco Ships
- Jotun Australia
- MTU Detroit Diesel Australia
- Polaris Marine
- ZF Services Australia

Bronze

- Ayres Composite Panels
- Botany Bay Shipping Group
- Composite Consulting Group (DIAB Australia)
- Edwards Marine
- Formation Design Systems
- One2three Naval Architects
- Shearforce Maritime Services
- Twin Disc (Pacific)

Our thanks to them for their generosity and support of SMIX Bash 2011, without which it could not happen.

The response to SMIX Bash 2011 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!

Pacific 2012

The Pacific 2012 International Maritime Exposition and Congress will be held at the Sydney Convention and Exhibition Centre, Darling Harbour, Sydney, from Tuesday 31 January Friday 3 February 2012. It will include:

- The International Maritime and Naval Exposition, organised by Maritime Australia Ltd, to be held from Tuesday 31 January to Friday 3 February. Further information on the exposition can be obtained from the exposition website www.pacific2012.com.au/content-exposition or by contacting the exposition organisers, Maritime Australia Ltd, PO Box 4095, Geelong Vic 3220, phone (03) 5282 0500, fax (03) 5282 4455 or email expo@amda.com.au.
- The Royal Australian Navy Sea Power Conference 2012, on the theme of *The Naval Contribution to National Security and Prosperity*, organised by the Royal Australian Navy and the Sea Power Centre Australia, to be held from Tuesday 31 January to Thursday 2 February. The conference program is now available on the conference website www.seapower-conference.com.au/program. Further information on the conference can be obtained from the conference website http://www.seapowerconference.com.au.
- 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 Tuesday 31 January to Thursday 2 February. The conference program is now available on the conference website at www.pacific2012imc.com/docs/Pacific2012IMC_Program.pdf. Further information on the conference can be obtained from the conference website www.pacific2012imc.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 pacific2012imc@arinex.com.au.
- The Pacific 2012 IMC Welcome Cocktail Party will be held at the Australian Maritime Museum on Wednesday 1 February 2012. This relaxed evening will give delegates a chance to catch up with old friends and meet new ones.

Fourth High Performance Yacht Design Conference

The fourth High Performance Yacht Design Conference (HPYD4) will be hosted by the Royal Institution of Naval Architects and the University of Auckland in Auckland, New Zealand. It will take place on 12–14 March 2012, during the Auckland stopover of the Volvo Ocean Race. The boats are scheduled to arrive on 8 March, with in-port racing on 16–17 March and a re-start on 18 March.

The conference venue will be in the heart of the Viaduct Basin in the purpose-built Marine Events centre. The HPYD conference will be a fully-refereed technical conference of the highest standard. A full social program will be provided. Meet the sailors, see the yachts and attend this highly acclaimed, world-class technical conference. The focus is on the design, analysis, testing and performance of cutting-edge racing and super yachts. Abstracts were invited on a range of topics, including:

- Performance prediction and measurement
- Computational methods
- Wind tunnel and towing tank technology
- Materials and structural analysis
- Regulations and rating rules
- Hull and appendage design

The conference now has a group on Linkedin which you can join at www.linkedin.com/groups?home=&gid=3918059&trk=anet_ug_hm. The organisers expect that this will become a resource where delegates can find out what's being presented, swap contact details and share information about accommodation, travel, etc.

For further details please see www.hpyd.org.nz or email the conference Chair, David Le Pelley, at info@hpyd.org.nz.

CLASSIFICATION SOCIETY NEWS

Meeting of LR's Australian Technical Committee

The Australian Technical Committee of Lloyd's Register met on 8 September to consider proposed changes to Lloyd's *Rules for Ships* and *Rules for Special Service Craft*. Comments from the Australian Technical Committee will be considered, along with comments from other LR Technical Committees around the world, by Lloyd's Technical Committee in London in November, and the changes will be promulgated in 2012.

Phil Helmore

In-water Surveys in Lieu of Docking

During some recent in-water surveys, defects requiring repair have been noted in way of the underwater appendages. As the ships were undergoing in-water surveys in lieu of a dry docking, some operators have requested that permanent repair of these defects be deferred and a suitable condition of class be imposed. Had the ship been undertaking a dry docking these defects would ordinarily have been rectified at that time.

Operators are reminded that a condition of class can only be imposed where it is technically justifiable. Additionally, a condition of class may only be imposed for a limited period of time and subsequent permanent repairs may require the ship to dry dock at an earlier date than the next scheduled dry docking due date.

Consequently, operators may wish to consider undertaking their own initial assessment of the overall condition of the underwater portion of the ship's hull and appendages in advance of the due date for the in-water survey. If defects are found at this initial assessment, then it is recommended that they be discussed with Lloyd's Register to determine the best course of action before an in-water survey is undertaken.

Lloyd's Register, *Classification News,* No. 18/2011

Guidelines for the Control and Management of Ships' Biofouling to Minimise the Transfer of Invasive Aquatic Species

Biofouling on ships has been shown to be an important vector for the transfer of invasive aquatic species which, if established in new ecosystems, can pose threats to the environment, human health, property and resources.

As part of its commitment to minimising the transfer of invasive aquatic species, the International Maritime Organization has developed Guidelines for the Control and Management of Ships' Biofouling to Minimise the Transfer of Invasive Aquatic Species (resolution MEPC.207(62)) to provide a consistent approach to the management of biofouling on ships. The Guidelines are non-mandatory and therefore do not require any surveys, certification or plan approval.

The Guidelines provide practical guidance on measures to minimise the risks of transferring invasive aquatic species from biofouling on ships.

They include considerations for ship design including:

- designing the hull area so that niches, sheltered areas, fittings and sea chests are minimised or can easily be inspected and cleaned;
- use of biofouling-resistant materials; and
- installation of effective anti-fouling coatings on the hull, niche areas, fittings and within sea water systems, or the use of growth-prevention systems as appropriate.

They also contain guidance on developing biofouling management procedures which could be implemented through a biofouling management plan and a biofouling record book. Items to consider include:

- maintenance of anti-fouling systems;
- planned regular inspection of the hull, and niche and other areas, for signs of biofouling, and cleaning of these areas in a controlled manner;
- planning dry dockings so that, where possible, blocks are not in the same area every docking, to allow the maximum area to be coated with the antifouling system; and
- using cleaning systems during in-water hull cleaning that prevent or minimise the release to the sea of removed fouling.

The management plan should also include a training programme for ships' crews on the impacts of biofouling and implementation of the management plan.

Additionally, the Guidelines include a recommended format for a biofouling record book which is intended to record items such as details of the anti-fouling systems applied to the ship and operational practices to be implemented, dates of dry docking and in-water inspections, inspection and maintenance of internal seawater cooling systems and the results of inspections.

Lloyd's Register, *Classification News,* No. 21/2011

Withdrawal of the LR Class Notation *IWS for aging ESP Ships

The IACS UR Z10 series of documents and Lloyd's Register's Rules and Regulations, Part 1 Chapter 2 Section 3.5.3, state that an in-water survey (IWS) is not permissible on ships over 15 years of age which are subject

to the Enhanced Survey Programme (ESP).

Consequently, the class notation *IWS will be withdrawn for ESP ships following their third Special Survey. This is in the interests of clarity and to avoid any confusion which might result from maintaining the notation in contradiction of the ESP requirements.

The renewed Certificate of Class following the third Special Survey will not contain the notation. However, a Memorandum will be added to the ship's status by Lloyd's Register on receipt of the survey report. This will state that the *IWS Notation has been withdrawn upon the ship completing the third Special Survey due to ESP requirements.

In cases where a ship subsequently changes type and the notation ESP no longer applies, consideration will be given to reinstating the *IWS notation.

Lloyd's Register, *Classification News,* No. 29/2011

ABS Provides First Approval in Principle for Floating Renewable Energy Plant Advanced Thermal Energy Conversion

ABS has issued its first Approval in Principle (AIP) for a new concept renewable energy design, in which a moored spar uses ammonia in a closed-cycle process to produce electrical power for a commercial utility grid. Unlike wind, tidal or solar power, the advanced design for this Ocean Thermal Energy Conversion (OTEC) system can deliver constant output 24 hours a day.

"This concept combines proven offshore principles with off-the-shelf power, technology and proprietary innovations, all assembled in a unique way," says Ian Simpson, ABS Director of Offshore Technology and Business Development, Americas Division. "The design application illustrates how ABS is able to use its novel-concept approach and guidance to provide review of a concept within the framework of established safety standards."

Developed by OTEC International (OTI) LLC of Baltimore, Maryland, the approach converts liquid ammonia into gas in a heat exchanger using warm ocean-surface water. The ammonia gas then drives turbines which turn generators to produce electricity which is then exported through a submarine power cable to a land-based utility company. The ammonia is condensed back into a liquid phase using cold ocean water pumped from 914 m below the water's surface and the process begins again. The process is based upon the well-established thermodynamic Rankine cycle.

"OTI has integrated the OTEC power block into a large floating vessel, in this case a spar, for an economically- and environmentally-efficient means of converting solar energy from the tropical oceans into affordable electricity," explains Barry Cole, OTI's Executive Vice President and Director of Technology Development.

Key elements evaluated by ABS include spar hull sizing for the deep-draft spar design; energy-conversion equipment located in the spar; handling and storage of hazardous materials; deepwater mooring system; cold-water pipe conduit suspended from the base of the spar; construction and attachment of the cold-water pipe conduit; and power transmission cable with its securing, anchoring and suspension arrangements. ABS reviewed the design for an extended 30-year facility on-station life.

ABS has issued Approval in Principle for both the 25 MW and 100 MW designs; OTI could be eligible for ABS' class notation A1, Floating Offshore Installation (FOI) Spar, SFA(30).

Craig Hughes

DNV and Triality Wins Lloyd's List Innovation Award

DNV and its Triality concept has won the 2011 Lloyd's List Global Award for the shipping industry's best innovation project. Triality is a crude-oil tanker concept which is fuelled by liquefied natural gas, has a hull shape that removes the need for ballast water and will reduce considerably emission to air.

For Triality a group of some 30, mostly young, people representing a wide set of disciplines in DNV, were selected to participate in the project. Their results were presented externally by DNV's CEO, Henrik Madsen, to customers and the media in London in early December last year. Since then, Triality has been widely communicated and has generated a lot of interest from numerous customers and stakeholders.

London-based Lloyd's List is the only global shipping newspaper with a daily circulation and is the world's oldest continuously-published newspaper. Its first issue was released in 277 years ago. Winning one of its global awards is ranked high.

DNV Support for Local Newbuilding Projects

DNV was the first class society to publish specific classification rules for patrol craft, which have been used worldwide and has allowed DNV to have unmatched experience in this segment. In Australia, the DNV Rules have been applied to patrol craft such as the Australian Customs Service's Bay-class vessels and the RAN's Armidale-class vessels. Recently DNV has been selected by Austal to provide classification and statutory services for the eight Cape-class patrol boats which Austal will provide to the Australian Customs and Border Protection Service.

Earlier in the year, DNV issued the first set of classification rules for wind-farm service vessels in order to improve safety and promote uniform standards. These standards have been well received and specified on numerous newbuildings around the world. DNV is pleased that local designers and yards have also been able to secure business using the DNV Rules as a design basis. Most recently, DNV has been contracted for the classification of three 21 m offshore service vessels being built by Austal Ships for the UK-based Turbine Transfers Limited.

DNV Ecore: a Step Change in VLOC Design

Together with FKAB, TGE Marine, Cargotec and MAN Diesel & Turbo, DNV has participated in a joint industry project to develop Ecore, a Very Large Ore Carrier concept designed to lower fuel costs and improve loading efficiency. Based on existing technology, the Ecore concept represents a step change in VLOC design. Powered by two-stroke dual-fuel ME-GI engines, this concept features a more ballast-friendly hull shape, a large centre cargo-hold layout and introduces a highly-efficient self-loading system.

According to DNV Project Manager, Pål Wold, these elements will not only improve the VLOC's performance but also help lower fuel costs and corresponding emissions. "Working closely with our partners, we recognised that significant improvements can be achieved on both the machinery and hull side by using existing technology," he says. "Our goal was to combine proven systems and design concepts to demonstrate how fuel costs can be reduced and loading efficiency improved."

Pål Wold notes that while Ecore may challenge existing ideas on the design of VLOCs, the concept is built on real data. The project team sent out a survey to shipowners, cargo owners and brokers to ensure that the project was consistent with market demand, and designed the vessel for a recognised trade—iron ore between Australia and China. "Ecore is grounded in market reality and applies existing technology to real-world issues," he says. For example, the centre ccargo-hold layout and midship form was developed to minimise the need for ballast, enable more efficient cargo handling, and allow space for LNG tanks to be stored below the main deck. The self-loading system enables the shore-based loader to operate at a single point along the vessel, which is safer and reduces the time spent in port. At the same time, the ME-GI gas engines developed by MAN Diesel & Turbo make it possible to utilise both conventional fuels and LNG, thus providing a solution which will be robust in a range of fuel-price scenarios.

While Pål Wold acknowledges that LNG fuel creates challenges with regard to bunkering and re-training onboard personnel, Ecore's analysis of the competence issue has revealed that solutions are being developed. "Engine makers—including MAN Diesel & Turbo—are already developing training modules to build competence," he says.

The Ecore project demonstrates that significant savings can be achieved, with regard to reducing fuel cost and increasing loading efficiency, when existing technology is used in an innovative way.

DNV *Technology Outlook 2020* Released

DNV's Research and Innovation unit has a long tradition of publishing *Technology Outlook*, where DNV looks into the crystal ball for selected industry sectors. Last time was in 2008, looking towards 2015. DNV has now completed a study for 2020.

Technology Outlook 2020 looks at future technologies in four main areas: shipping, fossil energy, renewable and nuclear energy, and power systems. A supplement covering technologies related to healthcare will be published at a later stage.

The objective of *Technology Outlook 2020* is to share DNV's views and to stimulate discussion about future technologies towards 2020. The views and analyses have been formed by the Research and Innovation unit and might not be shared by all parts of the DNV organisation.

Already DNV can see that many of the predictions were correct, but some have proven to be wrong in a few areas. For example, the development of wind energy has been much more rapid than originally anticipated.

In addition to reviewing close to 100 technologies, *Technology Outlook 2020* also summarises the most-important global trends impacting on these technologies and, at the end, DNV has made a visualisation of how a sustainable coastal community of the future might look.

Copies of *Technology Outlook 2020* can be accessed at www.dnv.com/moreondnv/research_innovation/foresight/outlook/index.asp

DNV to Class the World's Most-efficient Container Vessels

DNV has assisted in the design of the new generation of 10 000 TEU container vessels contracted in China by Seaspan, achieving major improvements in energy efficiency, cargo capacity, operational efficiency and emission reductions. The vessels will be built to DNV class.

The new features have been developed in a collaboration between Seaspan, the Yangzijiang Shipbuilding Group, the Marine Design and Research Institute of China (MARIC) and DNV. The order for 10 000 TEU container vessels plus 18 options, which was signed in Shanghai on 8 June, is the biggest-ever container contract entered into in China.

Compared with current 10 000 TEU container vessels in operation or presently being built, the improvements due to new design features are substantial. The cargo capacity is increased by 10% while the fuel consumption is reduced by 20%. The new hull design enables the vessels to carry minimum amounts of ballast water while in operation. The vessels are designed to reduce the emissions to air by approximately 20% in order to meet the future regulatory emission requirements. This follows Seaspan's three-year SAVER (Seaspan Action on Vessel Energy Reduction) programme aimed at improving cargo uplift, reducing fuel consumption and improving operational performance.

"The SAVER 10 000 TEU vessels embody Seaspan's long-term focus on and philosophy of providing the market with increasingly-efficient vessels and retaining Seaspan's leadership in this area. We were leaders in introducing post-8000 TEU vessels, we promoted slow steaming back in 2006, and we are now presenting a next-generation product that provides for a paradigm shift in the performance of the larger-size container ships," says Peter Curtis, Vice President of Seaspan Ship Management Ltd. "In this economic climate, where it really is a buyer's market, the time is ripe to push for technological improvements. We are fortunate to have found a like-minded shipyard and design partners in MARIC and DNV," says Mr Curtis.

The ship hull lines have been optimised for a speed range of 18–22 kn. In this range, the fuel consumption has been reduced by 16–27% compared to contemporary similar-size ship series presently operated by the industry. The new SAVER design is also capable of reaching 25 kn as the focus on schedule reliability is expected to increase.

The new trend reflects the operational profile of the liner companies. Slow steaming will continue, depending on the market situation and the value of goods carried on board. Most container vessels will operate at a range of speeds and must do so using as little fuel as possible.

"These new container vessels have exciting new features which make them efficient, cost effective and more environmentally friendly. We're proud to have been involved in developing this new generation of container vessels," says Remi Eriksen, Head of DNV's Division Asia, Pacific and the Middle East. He adds that DNV will do its utmost to provide quality and professional class services to this project.

Rod Humphrey

DSME and GL offer First-ever Solution to LNG-fuelled Large Container Vessels

LNG, as a promising fuel alternative, has not been used for container vessels. DSME and Germanischer Lloyd (GL) have proved the feasibility of running large container vessels on LNG in a recently-completed joint project. At a press conference held during the Kormarine Trade Fair in Busan, Korea, both parties announced the progress they have made towards developing LNG-fuelled large container vessels. GL has recently finished approval-in-principle of a 14 000 TEU LNG-fuelled container vessel for DSME.

"New technology is needed as cleaner transport is increasingly demanded and maritime environmental regulations are becoming ever stricter," said Mr Frederick Ebers, Vice President and Area Manager for North East Asia, GL, when he kicked off the press conference. "DSME and GL have acknowledged this challenge and agreed in 2010 to jointly start exploring technology options and safety concepts for large LNG-fuelled container vessels."

Following Mr Seo from DSME, who demonstrated the design concept of this LNG-fuelled container vessel, Dr Gerd-Michael Wuersig elaborated on the safety concepts involved. Dr Wuersig is Deputy Head of Environmental Research Department of GL and a member of the IMO Correspondence Group for the development of the Code for Gas as Ship Fuel (IGF-Code). He pointed out that most technical systems have been developed and examined, and the major challenge lies in how to apply these technologies, especially the one ensuring safe bunkering procedures. "You have to guarantee that there is no gas spill, and protection measures against incidents and collisions are sufficient. Relevant solutions are under evaluation and will be available soon," he said.

In addition, he mentioned that there is no restriction for people to hesitate to build these vessels on the basis of the interim guidelines, because LNG-fuelled vessels built according to the interim guidelines MSC. 285(86) will certainly be allowed to operate even when the IGF-Code is enforced.

The IMO has agreed to reduce SOx emissions by controlling the sulphur content in marine fuels from 2015 onwards, and for new vessels operating in ECAs (emission control areas), 80% reduction of NOx emissions versus the 2010 level is required, starting from 2016. "This will make conventional fuel unattractive. But LNG can be an environmentally- and economically-sound option due to its high efficiency and lower impact on environment," said Dr Wuersig.

Dr Wuersig is convinced that a new era of LNG vessels is set to come. "LNG-fuelled cargo ships will be emerging on a large scale in the latter half of this decade," he predicted. "There is a great potential for container ships to become one of the first cargo vessels using LNG as ship fuel."

GL has been seeking a step ahead in developing relevant rules and pushing forward the use of LNG as ship fuel. Under the assistance of GL, the IMO Committee on Maritime Safety developed and adopted "Interim Guidelines on Safety for Natural Gas-fuelled Engine Installations in Ships". GL has also published guidelines for gas used as ship fuel. Currently, GL is involved in converting a 25 000 dwt product tanker, *Bit Viking,* into the first GL-classed gas-fuelled ship.

Hamburg Süd and Germanischer Lloyd join Forces to Develop Emission Management System

Hamburg Süd and the classification society Germanischer Lloyd are jointly developing an innovative data-management system for systematically capturing all environmentally-relevant ship-operation information. The future "GL Emission Manager" will permit detailed evaluation and analysis of all relevant data for an entire fleet. Hamburg Süd has set itself the goal of creating a valid basis for further reducing the emission of contaminants by its deployed fleet.

"There is as yet no comparable way of systematically collecting and analysing all environmentally-relevant information from vessels in service," says Arnt Vespermann, Member of the Executive Board of Hamburg Süd, about the new GL Emission Manager. "It gives us the capability to satisfy the most diverse reporting requirements quickly and easily."

The system is to be used throughout Hamburg Süd's entire fleet from December 2012 and, in addition to environmentally-relevant details, will make other operational information, such as current vessel position, cargo mix, or weather conditions, available on demand.

On the data-capture side, the GL Emission Manager will consist of two separate but directly linked parts: the data recorder will be installed on board the vessels to collect all relevant information on the spot. The central "Green Server" will be located at Germanischer Lloyd and fed with data from the respective data recorders fully automatically. The server makes it possible to prepare a wide variety of queries and reports required at any time. Automatic plausibility checks of the information held in the system will additionally guarantee high data quality.

Mike Mechanicos

Largs Bay now an Australian Ship

On 19 October 2011, the Minister for Defence, Stephen Smith, and the Minister for Defence Materiel, Jason Clare, announced that the *Largs Bay*, now ADF Ship *Choules*, had been formally handed to the Australian Defence Force at Falmouth Dockyard in the United Kingdom.

ADF Ship *Choules* will set sail for Australia next month, arriving in Western Australia in mid-December where she will be officially commissioned as HMAS *Choules.*

ADF Ship *Choules* is a Landing Ship Dock (LSD) which was commissioned into service in 2006. The Government announced that it had been successful in purchasing the ship, formally RFA *Largs Bay,* in April this year for £65 million (approximately $100 million).

Choules displaces 16 000 t. She is 176 m long with a beam of 26 m. Her flight deck has room for two large helicopters and can also carry around 150 light trucks and 350 troops. Her cargo capacity is the equivalent of the HMA Ships *Manoora, Kanimbla* and *Tobruk* combined.

ADF Ship *Choules* has a proven capability, having provided humanitarian relief as part of the international response to the Haiti earthquake in 2010.

The acquisition of this ship will help ensure that the Royal Australian Navy has the amphibious capability it needs for operation and humanitarian support in our region in the period leading up to the arrival of the LHDs *Canberra* and *Adelaide*.

Mr Smith and Mr Clare paid tribute to the Officers and Ship's Company of ADF Ship *Choules* who have worked very hard to learn new skills and procedures in a relatively short timeframe to operate the ship safely and be ready for the handover.

The ship has been named after the former Chief Petty Officer Claude Choules, who passed away in May this year at the age of 110. Claude Choules saw service in World War I and World War II, as a member of both the Royal Navy and later the Royal Australian Navy. He was Australia's last living link to those who served in World War I.

ADF Ship *Choules* in UK waters after her refit at Falmouth. Although now wearing her Australian pennant number she is still painted in RN grey which will make her a distinctive addition to the RAN when she is commissioned in December
(Department of Defence photograph)

Strategic Marine Expanding in Western Australia

Western Australian shipbuilder, Strategic Marine, is planning to expand its presence in the state's North West, establishing a new facility at the SINWA site in Karratha.

The operation has been established to meet the demands of Strategic Marine's growing number of clients in the offshore oil and gas sector for fast and reliable marine services. Strategic Marine's Chief Operating Officer, Scott Nicholls, said the company had built and delivered a number of vessels now operating in the North West, so the timing was right to establish a permanent base in the region. "This new facility will provide rapid-response marine services for the oil and gas sector, fabrication facilities and through-life support for all vessels operating in the region," Mr Nicholls said.

"We are also developing a facility in Queensland to provide fabrication, engineering and marine services to the emerging gas industry, as well as oil and gas operations throughout neighbouring regions such as Papua New Guinea.

"This is part of our commitment to diversify global operations by expanding our service offering and product support to complement and build on the success of our traditional shipbuilding and fabrication businesses in Henderson WA, Vietnam, Singapore and Mexico."

Mr Nicholls said that Strategic Marine planned to create a global marine service network providing clients with the option of local support for immediate service requirements, as well as providing support in South East Asia for long-term planned maintenance, major modifications and surveys requirements. "This will reduce costs for clients through the efficiencies of our Vietnam and Singapore shipyards, backed by the quality assurance provided by our Australian management team," he said. Strategic Marine celebrates its 10th anniversary this year, growing from a Geraldton-based crayfishing boat builder to a multi-million dollar Australian marine vessels manufacturer with global operations spanning four countries. During this time the company has consistently delivered cost-effective projects from its offshore shipyards, while maintaining high levels of Australian input and expertise.

USNS *Spearhead* (JHSV 1) shortly after her launching at Austal's US shipyard
(Photo courtesy Austal)

US Navy's First JHSV Christened

USNS *Spearhead*, the first of 10 US Navy Joint High Speed Vessels (JHSV) designed for rapid intra-theatre transport of troops and military equipment, was christened on Saturday 17 September during a ceremony at Austal's USA shipyard in Mobile, Alabama.

The Military Sealift Command (MSC) will own and operate *Spearhead* which will be crewed by 22 civilian sailors working for MSC who will operate, navigate and maintain the ship. The JHSVs, 103 m aluminium catamarans, were designed to be fast, flexible and manoeuvrable even in shallow waters, making them ideal for transporting troops and equipment quickly within a theatre of operations. The ship has the ability to support operations of all sorts, supporting the war fighter through traditional logistics missions, humanitarian support projects, disaster response or by supporting maritime law-enforcement activities.

The JHSVs are capable of transporting 600 t of military troops, vehicles, supplies and equipment 1200 n miles at an average speed of 35 kn and can operate in shallow-draft, austere ports and waterways, providing U.S. forces with added mobility and flexibility. The JHSV aviation flight decks can support day- and night-flight operations. Each JHSV also has sleeping accommodations for up to 146 personnel and airline-style seating for up to 312.

Austal Lays Keel for JHSV2

On 8 November Austal held a keel-laying ceremony for its second Joint High Speed Vessel (JHSV), *Choctaw County* (JHSV 2), one of seven Austal-designed 103 m JHSVs to be built for the US Department of Defense.

Captain Henry W. Stevens III (USN), Strategic and Theatre Sealift Program Manager PMS 385, served as the Authenticator at the ceremony, and was assisted by Brandon Mims. Brandon is an "A" Class welder who has been part of the Austal team since June 2007.

Whilst the keel-laying ceremony is a significant milestone in the construction of the ship, the ship is actually over 50% complete, with every one of the over 40 modules used to form this aluminium catamaran already being assembled. For Austal, keel-laying marks the beginning of final assembly. Two super modules have been moved from Austal's Module Manufacturing Facility (MMF) and erected in the final assembly bay in their pre-launch position. The rest will follow over the coming months.

"We have worked through our first-of-class issues and are moving into serial production," said Joe Rella, Chief Operating Officer and President of Austal USA. "With the fabrication of *Choctaw County*, we are over 30% percent more efficient at this point than we were with USNS *Spearhead*. By building pieces of the ship in a separate facility, fabricators can install and test generators, propulsion equipment, electrical, piping and ventilation systems and other critical components in a controlled, efficient manufacturing environment.

Austal was selected as prime contractor in November 2008 to design and build the first JHSV, with options for nine additional vessels expected to be exercised between FY09 and FY13 as part of a program potentially worth over $US1.6 billion.

The JHSV is a relatively new asset in the American arsenal, capable of transporting medium-sized operational units with their vehicles, allowing troops to transit long distances while maintaining unit integrity. Each JHSV also supports helicopter operations and has a slewing vehicle ramp on the starboard quarter which enables use of austere piers and quay walls, common in developing countries. A shallow draft (under 4 m) will further enhance theatre-port access.

USNS *Spearhead* (JHSV 1) was christened on 17 September and is preparing for builders' trials in the near future. Alabama Congressman, Jo Bonner, recently joined Austal officials in commemorating the official start of fabrication for JHSV 3 which is scheduled for delivery in 2013. JHSV 3 is the fourth naval vessel to be constructed at Austal using the new procedures and processes developed in conjunction with Austal's MMF. The MMF provides Austal with assembly-line efficiency, which has resulted in significant cost savings and reduced lead times for both of our Navy programs.

Austal USA is also currently preparing to launch a second Independence-variant 127 m Littoral Combat Ship (LCS) for the US Navy, *Coronado* (LCS 4). USS *Independence* (LCS 2) is currently being put through trials by her crew. As prime contractor for the next LCS 10-ship contract, awarded by the US Navy at the end of 2010, Austal has also begun work on the first ship of that contract, *Jackson* (LCS 6), with *Montgomery* (LCS 8) also under contract.

For the LCS and JHSV programs, Austal is teamed with General Dynamics Advanced Information Systems, a business unit of General Dynamics. As the ship-systems integrator, General Dynamics is responsible for the design, integration and testing of the ship's electronic systems including the combat system, networks, and seaframe control. General Dynamics' proven open-architecture approach provides affordable capabilities to the fleet quickly and efficiently.

With its 13th anniversary approaching, Austal has grown into one of southern Alabama's largest employers with over 2400 employees on staff hailing from the Mobile area, Mississippi, Florida, and beyond. With the current workload, Austal expects to employ over 4000 Americans by the end of 2013.

Submarine Sustainment Review

In August the Minister for Defence, Stephen Smith, and the Minister for Defence Materiel, Jason Clare, today released the terms of reference for the Review of the Sustainment of Australia's Collins-class submarines.

The review is being led by Mr John Coles, an independent expert from BMT Defence Services in the UK.

Mr Coles has more than 30 years experience in the design, acquisition and sustainment of ships and submarines, principally in the United Kingdom. Between 1997 and 2005 he was the Chief Executive of the United Kingdom's Warship Support Agency (previously the Ships Support Agency), which is responsible for the maintenance and repair of all Royal Navy submarines, ships, and auxiliaries. Between 2005 and 2007 Mr Coles was head of the British Future Aircraft Carrier Project.

The sustainment of the submarine fleet is vital to Australia's national security. It is a complex task that has proven challenging for Defence and for ASC, the prime contractor, for a lengthy period of time. Sustainment of the Collins Class submarines is at the top of the Government's Projects of Concern list.

Just as the Rizzo Report, released on July 18, provides a plan to improve the repair and management of the Navy's amphibious fleet, Mr Coles will provide a plan to improve the repair and management of our submarine fleet.

This Review will involve a detailed examination of complex engineering issues associated with submarine sustainment and is likely to involve support from international experts and companies in this field.

Mr Coles' terms of reference are to examine, report and provide recommendations on:

- the optimal commercial arrangements for conduct of submarine sustainment;
- appropriate performance goals for sustainment activity, based on world's best practice efficiency and effectiveness benchmarks;
- options for demonstrating value for money in sustainment activity and the supply chain;
- opportunities for improvements in management arrangements between ASC, DMO and the Navy to achieve efficiencies;
- future infrastructure needs to support the submarine sustainment activity;
- measures to be implemented by DMO and the Navy to ensure that ASC is able to operate under a performance-based contract; and
- the subsequent priorities for ASC and Defence reform to effect greatest improvement, given time, budget and system constraints.

An interim report will be provided to Government by December 2011 and the final report by April 2012.

Australian-made Radar Success

The Royal Australian Navy's new anti-ship missile defence radar system was released for initial operational use in September after achieving outstanding results from the trial of the system off the coasts of Australia and Hawaii.

The new multi-phased array radar system has been installed on the Anzac-class frigate HMAS *Perth*. The radar identifies, tracks and guides missiles to multiple targets at the same time.

Minister for Defence Materiel, Jason Clare, inspected the radar at work on-board HMAS *Perth* while she was conducting training exercises off the coast of Western Australia.

"This is the latest weapon in Navy's arsenal. It means our Anzac frigates will be a lot more capable," Mr Clare said.

"At the moment our Anzac frigates can track and destroy one target at a time. This new radar means they will now be able to track and destroy multiple targets at the same time.

"This is also a great Australian success story. Its cutting-edge technology was developed right here in Australia by CEA Technologies."

Chief of Navy, Vice Admiral Ray Griggs, said HMAS *Perth* had just returned from testing the system on the United States Navy Pacific Missile Range Facility in Hawaii with tremendous results.

"The tests proved that the new system can defend the ship from modern cruise missile attack. This is a significant enhancement for the Anzac-class frigates."

HMAS *Perth* is the lead ship in this project. Following the successful testing of the system on this ship, the Government will soon make a decision about upgrading the other seven Anzac-class frigates.

Austal Acquires Philippines Shipyard

Austal has acquired a shipyard in the Philippines as part of its strategy to regionalise its manufacturing base for commercial vessels.

The $7 million acquisition of the former FBMA Marine shipyard enables Austal to establish shipbuilding operations at the West Cebu Industrial Park at Balamban, in the province of Cebu. Austal will invest a further $5 million to enhance the shipyard's existing facilities.

Austal plans to commence vessel construction in the first quarter of 2012, dependent on orders, and expects to employ about 30 workers during the start-up phase. Future workforce growth is expected in line with market demand, and the site allows for efficient expansion of the facility when future operational and market conditions require.

Austal's Chief Executive Officer, Andrew Bellamy, said the acquisition of the former FBMA shipyard is an important milestone in Austal's corporate strategy to meet the requirements of key commercial vessel markets by further regionalising its shipbuilding operations.

"Our strategic review earlier this year found that there is strong demand in specific segments of the international commercial vessel market, such as fast crew-transfer boats, work boats and 30 m to 50 m ferries," he said.

"With our Australian and United States manufacturing operations increasingly defence focussed, we identified the need to regionalise our manufacturing base in order to be successful in those commercial vessel markets."

Austal will primarily construct small and medium-sized aluminium passenger ferries, work boats and transfer vessels, such as Austal's Wind Express series of wind-farm support vessels, at the Philippines shipyard. The shipyard is purpose-designed and built for building aluminium vessels of that size and type, and will have the skilled workforce and facilities to be able to undertake service and maintenance work. Austal is retaining its large commercial vessel manufacturing capability in Australia.

The Philippines shipyard has a history of aluminium vessel fabrication, and has previously delivered medium- and high-speed ferries, patrol boats and specialist workboats to operators based in Europe, Mexico, Australia and Asia.

Austal's significant intellectual property in the design and construction of commercial vessels will be utilised in its Philippines operations, which will help ensure that Austal's quality and performance standards are maintained.

"Our planned infrastructure enhancements combined with the existing pool of skilled local tradespeople and ancillary industries, will support the same safe, efficient, high-quality production we achieve in our other shipyards," said Mr Bellamy.

"Austal now has an order book of approximately $1.8 billion, nearly all of it related to defence work and over 80 per cent attributable to our US operations. The new shipyard in the Philippines provides the right foundation to grow that order book further through increased commercial vessel sales," he said.

The acquisition of the Asian shipyard will have no adverse effects on Austal's Australian and US operations, with both manufacturing facilities currently under contract for several significant multi-vessel, multi-year defence programs.

Austal's recently acquired shipyard at Balamban in the Phillipines
(Photo courtesy Austal)

Leased Ships Providing Capacity for RAN

The problems which have resulted in the paying off of, first, HMAS *Manoora* and, shortly, HMAS *Kanimbla* have left the RAN short of capacity to respond to humanitarian and natural disasters during the coming cyclone season. The extended refit work required on HMAS *Tobruk* has kept her confined to Garden Island for the time being and the landing ship dock HMAS *Choules* (ex-*Largs Bay*) will not arrive in Australia until December.

To provide capability to meet contingencies during the intervening period until *Tobruk* and *Choules* are fully operational, the P&O Antarctic supply ship and icebreaker *Aurora Australis* was chartered from May to 12 August. She was replaced by the Australian Customs vessel *Ocean Protector* from 12 August to 14 October.

In September the Government announced that the 80 m Hallin offshore supply and support ship *Windemere* had been leased through P&O Maritime Services for the period 14 October 2011 to 31 January 2012 at a cost of $9.4 million. She is capable of supporting around 100 passengers and can carry 1000 tonnes of cargo.

The offshore supply and support ship *Windemere*, chartered for the RAN until 31 January 2012
(Photo courtesy Department of Defence)

Austal Delivery to Guadaloupe

In June 2010 Austal was selected by L'Express des Iles for the design and construction of two vessels — one vehicle-passenger ferry and one passenger ferry, marking the company's third contract with Austal since 1997.

L'Express des Iles previously operated the Austal-built fast ferries *Opale Express* and *Jade Express*, delivered in 1998, which in 2005 were replaced by the vessels currently in operation, *Gold Express* and *Silver Express*.

The two new vessels commenced operations in October 2011 from Guadeloupe to the Caribbean islands of Marie-Galante, Les Saintes, Dominica and Martinique, where they will provide an important inter-island link for tourism and trade.

Austal's Chief Executive Officer, Andrew Bellamy, commented that Austal was pleased to once again deliver a high-quality, innovative product to a repeat customer.

"Maintaining and supporting existing customer relationships is a core focus of Austal. We are very pleased that a leading commercial operator such as L'Express des Iles has again returned to Austal for new-build ferries, and we hope to continue this relationship well into the future."

The vehicle-passenger ferry, *Perle Express*, has the capacity for 364 passengers spread over two decks, as well as room for 10 vehicles and extra cargo. Continuing the design theme of the earlier L'Express des Iles vessels, the bright and spacious interiors include comfortable reclining chairs, a children's area, and flat screen TV's throughout, as well as considerable space for luggage storage.

The passenger ferry, *Liberty*, will be operated by SAS Jeans, a subsidiary of L'Express des Iles, and will operate regular services between Guadeloupe, Marie-Galante, Les Saintes, Dominica and Martinique, as well as providing day or weekend excursions to other nearby Caribbean islands including Montserrat, Antigua, Saint-Kitts and Saint-Vincent. With seating for the vessel's 437 passengers spread over two decks, *Liberty* will serve as a functional yet comfortable low-cost alternative for holiday-makers in the Caribbean.

Each vessel was customised to cater for the operator's route requirements, with both *Perle Express* and *Liberty* able to operate at speeds of up to 32 kn, each powered by two MTU 16V4000 M71 diesel engines driving KaMeWa 71 SIII waterjets. This combines with Austal's expertise in producing durable, lightweight and efficient structures to deliver economical operation with reduced environmental impact, while still providing commuters with short transit times, comfort and service reliability. *Liberty* is also the first passenger vessel to ever be registered under the new French Registry — Registre International Français.

Liberty
(Photo courtesy Austal)

Perle Express
(Photo courtesy Austal)

Principal Particulars of *Perle Express* are

Length OA	47.0 m
Length WL	41.2 m
Beam (moulded)	11.1 m
Hull depth (moulded)	4.0 m
Hull draft (maximum)	1.82 m
Passengers	364
Crew	8
Vehicles	10
Maximum deadweight	63.6 t
Fuel oil (approx)	15 500 L
Main engines	2 × MTU 16V 4000 M71, each 2465 kW at 1970 rpm
Gearbox	2 × ZF 7650 NR2H
Waterjets	2 × Kamewa 71 SIII
Speed (100% MCR)	32.8 kn
Range Approx.	300 n miles with 20% reserve
Classification	Bureau Veritas 1 HULL MACH AUT-CCS, HSC-Cat A

Principal particulars of *Liberty* are

Length OA	47.0 m
Length WL	41.2 m
Beam (moulded)	11.1 m
Hull depth (moulded)	4.0 m
Hull draft (maximum)	1.82 m
Passengers	437
Crew	7
Maximum deadweight	57.8 t
Fuel oil (approx)	15 500 L
Main engines	2 × MTU 16V 4000 M71, each 2465 kW at 1970 rpm
Gearbox	2 × ZF 7650 NR2H
Waterjets	2 × Kamewa 71 SIII
Speed (100% MCR)	32.5 kn
Range Approx.	295 n miles with 20% reserve
Classification	Bureau Veritas 1 HULL MACH AUT-CCS, HSC-Cat A

The bridge in *Liberty*
(Photo courtesy Austal)

Passenger space in *Liberty*
(Photo courtesy Austal)

An engine room in *Perle Express*
(Photo courtesy Austal)

On board *Perle Express*
(Photo courtesy Austal)

Passenger accommodation in *Perle Express*
(Photo courtesy Austal)

Forgacs Workload Grows

In October the Minister for Defence Materiel, Jason Clare, and the Member for Newcastle, Sharon Grierson, announced more work and more jobs for the Hunter on the new air-warfare destroyer project.

When the project began in 2009, Hunter company Forgacs were contracted to build 29 steel blocks. This has now increased to 40 blocks. In February Forgacs were awarded nine more blocks and, following a re-allocation of work announced in May this year, Forgacs has been awarded another two blocks.

This additional work is worth around $80 million and will create approximately 200 more jobs. It has also meant opening an additional facility for the project at Carrington.

Mr Clare and Ms Grierson made the announcement while visiting Forgac's Tomago worksite.

"This is terrific news for the Hunter and a tribute to the quality of work being done here at Forgacs," Mr Clare said.

"Forgacs will now build about half of the first two air-warfare destroyers. They will build 14 of the 31 blocks which make up the first ship, HMAS *Hobart,* and 13 of the 31 blocks which make up the second ship, HMAS *Brisbane*.

"They have started work on all of the 14 blocks for ship one and on two of the 13 blocks which they will build for ship two."

While at the Tomago facility, Mr Clare and Ms Grierson inspected a block undergoing its final stages of work, including the installation of mechanical and electrical equipment, electrical cabling and completion of pipework installation.

"There are now 50 workers working on the AWD project at Carrington and 450 workers working on the project at Tomago," Ms Grierson said.

"At peak production, 650 people are expected to be working on this project across both yards."

The first air-warfare destroyer (AWD) block to be shipped by sea from interstate arrived at the Government of South Australia's Common User Facility wharf on 15 August. AWD block 109, built by BAE Systems at Williamstown, was successfully rolled off the barge and into ASC's AWD shipyard where it will be housed until the consolidation process begins in 2012
(Photo Department of Defence)

Amrose Directions from Greg Cox

Marlin Marine (Malaysia) has launched a Greg Cox-designed 13 m aluminium passenger ferry which entered service on the East Coast of Malaysia, operating from Kuala Besut to Perhentian Island.

The vessel was fitted with an aluminium collar to give it a RIB look, but without the cost and maintenance. It seats six passengers in the air-conditioned main cabin and 20 passengers in the semi-open mid-deck area. The customer wanted an open boat to take in the cool sea breeze, but enclosed to keep out the rain and spray, resulting in polycarbonate side screens creating a noise and heat trap.

A notable feature of the design is the V-drive shaft installation with propeller tunnels and hull extended past the transom to form trim tabs and allowing the rudders to move aft, resulting in an engine room only 2.8 metres long. This is not dissimilar to that expected for a waterjet installation. It was made easy by the old-style ZF V-drive gearboxes with the shaft passing through the gearbox and the coupling on the forward side of the gearbox (which is not a good engineering-look, but acceptable for small gearboxes). The shaftlines have other notable features, such as welded aluminium P-brackets bolted and grouted inside boxes in the hull (dead easy when everything is aluminium) and no intermediate shaft bearing (P-bracket and gearbox only, a-la old style). All cheap, all simple and all so easy to install and align!

As with previous vessels, this one was launched about 8% under the lightship weight estimate, causing the propellers to run out of legs at the top end. The contract speed of 29 kn at full load was achieved (but with the engines running on the governor) and the cruise speed of 25 kn at full load was achieved at only 63% power. The coastal delivery voyage of 420 n miles was completed carrying additional fuel, with the consumption calculation done with the same zeal as the weight schedule and resulting in one engine starved of fuel on arrival at the jetty.

Principal particulars of *Amrose Directions* are

Length OA		13.00 m
Length WL		11.70 m
Beam OA		3.60 m (including collar)
Depth		0.90 m
Draft	hull	0.60 m
	propellers	0.90 m
Displacement		7.0 t lightship
		9.3 t loaded
Crew		2
Passengers		26
Luggage		300 kg
Fuel oil		800 L
Fresh water		100 L
Main engines		2×Volvo D6-310
		each 228 kW at 3500 rpm
Gearboxes		2×ZF HS 80 IVE V-drive
		Reduction ratio 1.996:1
Propellers		2×ZF 533×584 mm
		0.8 BAR high-skew nibral
Speed	maximum	29 kn @ full load
	cruise	25 kn @ at full load
Range		230 n miles at 25 kn

Amrose Directions on launch day
(Photo courtesy Greg Cox)

Sri Perkasa 82 from Greg Cox

In July Marlin Marine (Malaysia) completed a 16.8 m cargo boat, designed by Greg Cox and similar to the 16 m workboat launched the previous year.

The two designs are similar, one being simply one frame-space longer than the other, but with dedicated cargo holds forward and aft of the engine room. It also has a hinged, recessed dive platform built into the transom, heavy-duty bollards, and bow fendering for pushing and pulling steel barges.

An occasional requirement is for the transport of drums of oil, and this required a bunded deck. All deck drains (hatch and scuppers) have shut-off devices for use when transporting oil.

This vessel is fitted with Doosan L126TIH engines, which are a Korean version of the MAN 2866 (built under a technology-transfer agreement). This 11.1 litre engine has both low capital and maintenance costs, and is extremely reliable in service.

Principal particulars of *Sri Perkasa 82* are

Length OA	16.80 m
Length WL	16.00 m
Breadth moulded	4.50 m
Depth moulded	1.65 m
Draft hull	0.85 m
overall	1.40 m
Displacement	13.0 t lightship
	21.8 t full load
Passengers	12 seated
Crew	2
Cargo	1 t/m^2 deck loading
	10 t maximum
Fuel oil	2780 L
Fresh water	500 L
Main engines	2×Doosan L126 TIH
	each 265 kW at 2000 rpm
Gearboxes	2×ZF 305-2A
	Reduction ratio 1.733:1
Propellers	2×ZF Marine 3 blade
	711 mm diameter
Speed maximum	22 kn

Greg Cox

Sri Perkasa 82 on launch day
(Photo courtesy Greg Cox)

Kilimanjaro III from Incat Crowther

Incat Crowther has announced the launch of the 37 m catamaran passenger ferry *Kilimanjaro III*. Built by Richardson Devine Marine Constructions in Hobart, *Kilimanjaro III* is the third vessel from the designer–builder partnership for Coastal Fast Ferries in Tanzania, Africa.

Kilimanjaro III was developed following the success of *Kilimanjaro I* and *Kilimanjaro II*. Incat Crowther and RDMC were approached by the operator to develop a larger, faster and more-versatile vessel. The result is a 558 passenger vessel which is larger than any other vessel on the Zanzibar–Dar Es Salaam route, in addition to being capable of the more-rugged offshore route to the Island of Pemba. Furthermore, *Kilimanjaro III* carries more passengers at less cost per passenger to the operator, taking further advantage of the operation's revenue-making potential.

Taking advantage of an increased beam, *Kilimanjaro III*'s passengers are accommodated in a mix of seating levels and styles. The main passenger deck features 249 economy-class seats, with those nearest the aft kiosk equipped with tables. The aft end of the main deck has been reconfigured with a larger luggage room, located directly adjacent to the side crew ramps to speed up turn-around.

The upper deck has outdoor seats for 107 passengers. Amidships there is a first-class cabin with 74 seats. The sundeck has seats for a further 60 passengers.

Kilimanjaro III features Incat Crowther's new-generation hullform, which offers increased efficiency and improved seakeeping. She is powered by a pair of Cummins KTA50 engines, each producing 1340 kW. Excellent performance on sea trials proved the virtues of the hullform. Loaded performance was recorded at over 31 kn, and the vessel will operate at 29 kn at 77% MCR.

Incat Crowther is pleased to continue its relationship with Coastal Fast Ferries and believes that the growth in business is in no small part due to Incat Crowther's attention to client service and its ability to add value to the client's operation.

Principal particulars of *Kilimanjaro III* are

Length OA	38.1 m
Length WL	37.3 m
Beam OA	10.5 m
Depth	3.65 m
Draft (hull)	1.1 m
(propeller)	1.8 m
Passengers	558
Fuel oil	6000 L
Fresh water	1500 L
Sullage	1500 L
Main Engines	2×Cummins KTA50 each 1340 kW @ 1900 rpm
Propulsion	Propellers
Generators	2×Cummins 170 kVA 50 Hz 1×Cummins 17 kVA 50 Hz
Speed (maximum)	31 kn loaded
(service)	29 kn at 77% MCR
Construction	Marine-grade aluminium
Flag	Australia
Survey	USL Code/NSCV Class 1C

Kilimanjaro III on trials
(Photo courtesy Incat Crowther)

Kilimanjaro III shows her fine entry and clean wake
(Photo courtesy Incat Crowther)

Main cabin on *Kilimanjaro* III
(Photo courtesy Incat Crowther)

Engine room on *Kilimanjaro* III
(Photo courtesy Incat Crowther)

Fantasea Sunrise from Incat Crowther

Incat Crowther has announced the launch, trials and delivery of the 24 m catamaran ferry, *Fantasea Sunrise*. In June, Incat Crowther announced the sale of the vessel to prominent Great Barrier Reef operator, Fantasea Cruises. Since that announcement, Brisbane shipyard Aluminium Marine has tailored the vessel for Fantasea's operation, including interior lounges and the application of striking graphics inside and out.

Fantasea Sunrise is fitted with 119 seats in the main-deck cabin and 38 lounge seats in the upper-deck cabin. A large bar/kiosk has been installed aft in the main-deck cabin. Three toilets, one of which is wheelchair accessible, are located on the aft main deck, whilst an additional toilet is located on the upper deck.

The vessel has undergone successful sea trials which proved the virtues of Incat Crowther's highly-efficient and stable hull form. Powered by a pair of Yanmar 6AYM-GTE main engines, the vessel sets new standards for fuel efficiency, providing good cruising speed with low capital costs and modest running expenses.

Fantasea Sunrise comfortably exceeded her contracted fully-loaded service speed of 25 kn, and achieved a top speed in excess of 28 kn.

As well as being efficient, the latest-generation hull form provides a very stable platform, offering greater passenger comfort and improved seakeeping, which is ideal for the offshore route on which the vessel will be utilised.

Starboard bow of *Fantasea Sunrise*
(Photo courtesy Incat Crowther)

Principal particulars of *Fantasea Sunrise* are

Length OA	24.0 m
Length WL	23.8 m
Beam OA	8.5 m
Depth	2.75m
Draft (hull)	1.1 m
(propeller)	1.7 m
Passengers	157 internal 40 external
Crew	5
Fuel oil	4000 L
Fresh water	1000 L
Sullage	1000 L
Main engines	2×Yanmar 6AYM-GTE each 618 kW @ 1900 rpm
Propulsion	Propellers
Generators	2×Izuzu 6BG1 each 72 kVA
Speed (service)	25 kn
(maximum)	28 kn
Construction	Marine-grade aluminium
Flag	Australia
Class/Survey	NSCV/USL Code Class 1C

Lounge seating in upper-deck cabin on *Fantasea Sunrise*
(Photo courtesy Incat Crowther)

Seating in main-deck cabin on *Fantasea Sunrise*
(Photo courtesy Incat Crowther)

20 m Catamaran Ferry for Cocos-Keeling Islands from Incat Crowther

Incat Crowther has been awarded a contract to design a 20 m catamaran ferry to operate in the Cocos-Keeling Islands. The 34th vessel constructed out of the partnership between Richardson Devine Marine Constructions and

Incat Crowther, the vessel has been commissioned by the Commonwealth Government of Australia. The partnership beat strong competition in a competitive tender process to be awarded the contract.

The vessel has been optimised to transit between the islands of the Cocos-Keeling group, which is located in the Indian Ocean. The remote location calls for reliability, ruggedness and ease of maintenance.

The vessel's air conditioned main-deck cabin has seating for 70 passengers in forward-facing seats. Aft of the main passenger cabin are a pair of toilets, one of which is wheelchair accessible.

The aft deck features a cargo area for transferring supplies and luggage between the islands. This cargo space has a capacity of 2 t, with a deck-load capacity of 1 t/m^2. A wide boarding zone facilitates rapid transfer for both passengers and freight. Also located in the aft deck area is a pair of large engine-maintenance and machinery-removal hatches.

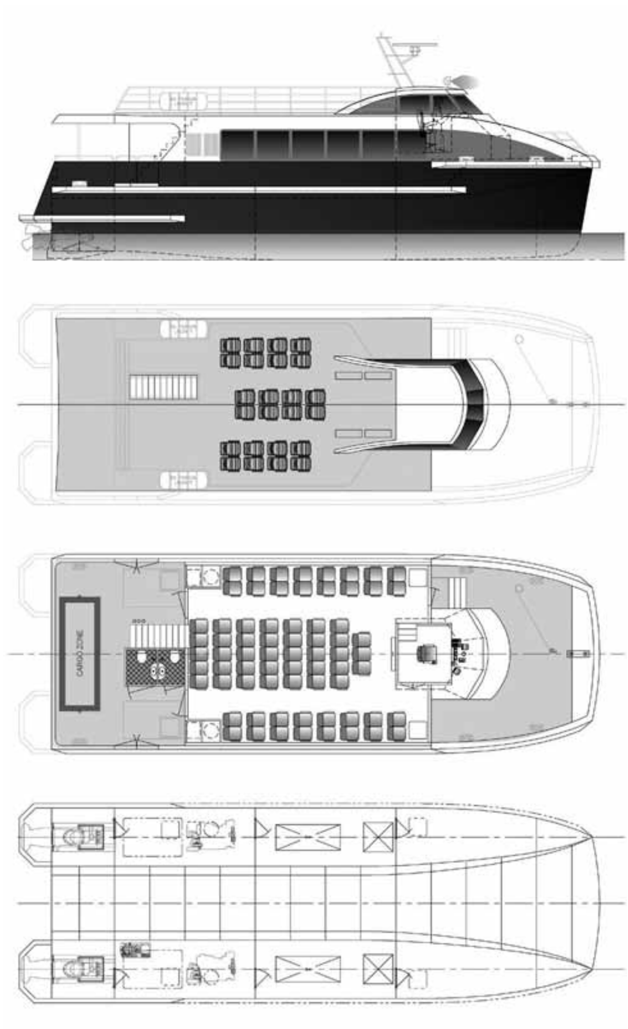
From the aft deck, stairs lead up to the upper deck, where there are seats for a further 24 passengers. Forward of this is a half-height wheelhouse which affords 360 degree visibility from the central helm position.

The vessel will be powered by a pair of Cummins QSM11 main engines, each rated at 455 kW at 2300 rpm. Power is transmitted via ZF360 gearboxes to a pair of Hamilton HM422 waterjets. A cruising speed of 22 kn will be achieved at 85% MCR, with a top speed of 24 kn and a service speed of 20 kn. Waterjet propulsion was selected to meet the draft requirement of the operation.

The vessel is due to be delivered in the second quarter of 2012.

Principal particulars of the new vessel are

Length OA	19.8 m
Length WL	18.1 m
Beam OA	6.5 m
Depth	2.5 m
Draft	0.9 m
Crew	3
Passengers	94
Fuel oil	2400 L
Fresh water	500 L
Sullage	500 L
Main Engines	2×Cummins QSM11HX each 455 kW @ 2300 rpm
Propulsors	2×Hamilton HM422 waterjets
Generators	1×Onan 17.5 MDKBR/96118 17.5kW
Speed (maximum)	24 kn @ MCR
(cruising)	22 kn @ 85% MCR
(service)	20 kn
Construction	Marine grade aluminium
Flag	Cocos-Keeling Islands
Notation	USL Code Class 1D



General arrangement of 20 m catamaran for Cocos-Keeling Islands
(Drawing courtesy Incat Crowther)

Three Catamaran Ferries from Incat Crowther

Construction is now well advanced on three new catamaran ferries to Incat Crowther designs. Two 32 m ferries and one 24 m ferry will be operated by Riverside Marine to transport workers between Gladstone, Qld, and the new LNG plant on Curtis Island.

By focussing on passenger accommodation, seakeeping, efficiency and range, Riverside Marine and Incat Crowther have developed a three-vessel fleet which offers maximum capacity combined with maximum flexibility.

32 m vessels

Construction of the first of a pair of 32 m ferries is well advanced at Brisbane Ship Constructions. These vessels will be configured to carry 399 passengers for the Curtis Island operation. The layout of the vessels has been developed to allow them to be converted to a more-spacious cabin layout in a second life, making them suitable for longer-duration transfers and tours.

The vessels will feature a large main-deck cabin with forward and midship boarding doors and ramps. The cabin accommodates 268 passengers in forward-facing seats.

The aft deck will be configured with a cargo zone for carrying items such as tool boxes and supplies. Five toilets are also located on the aft deck, one of which is wheelchair-accessible.

The upper deck is accessible via both internal and external stairs, and will feature a cabin with 132 seats. Outdoor seats are also to be fitted to the aft end of this deck and will be protected from the sun by a large roof overhang.

The vessels will be powered by a pair of Caterpillar C32 main engines, each rated at 970 kW at 2100 rpm. Power is transmitted via ZF3050 gearboxes to a pair of five-bladed propellers. The vessel will have a service speed of 25 knots at 85% MCR.

Principal particulars of the 32 m vessels are

Length OA	33.4 m
Length WL	31.6 m
Beam OA	9.5 m
Depth	2.75 m
Draft (hull)	1.25 m
(propeller)	2.05 m
Crew	3
Passengers	399
Fuel oil	8000 L
Fresh water	1000 L
Sullage	1000 L
Main Engines	2×Caterpillar C32
	each 970 kW @ 2100 rpm
Propulsors	2×5-bladed propellers
Generators	2×Caterpillar C4.4
Speed (maximum)	28 kn
(service)	25 kn
Construction	Marine-grade aluminium
Flag	Australia
Notation (original)	USL Code/NSCV Class 1D
(2nd life)	USL Code/NSCV Class 1C

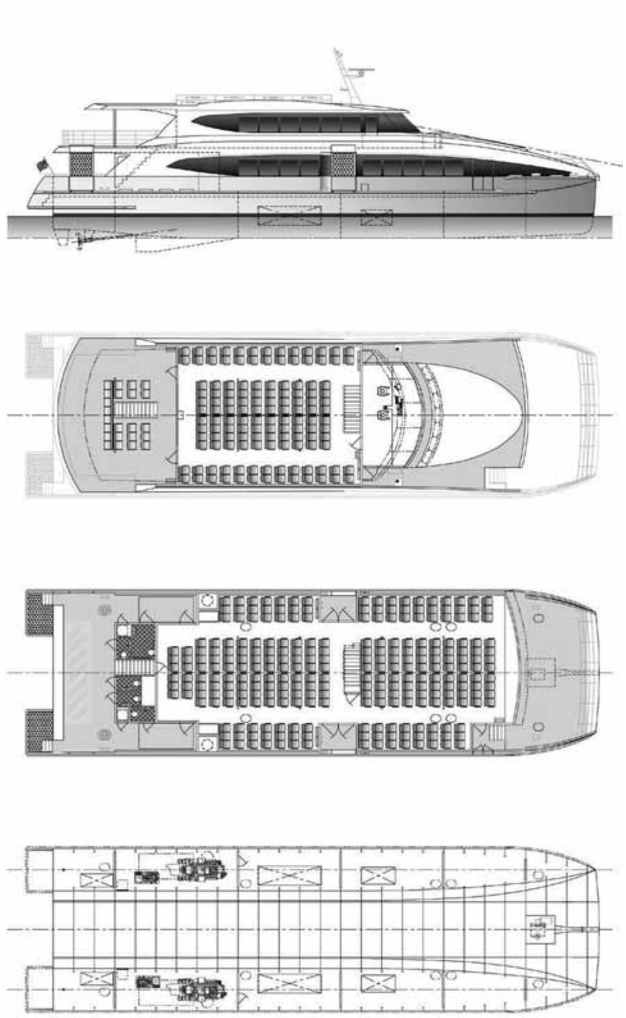
24 m Vessel

Meanwhile, construction is underway at Marine Engineering Consultants on a 24 m vessel, similar to *Fantasea Sunrise*, delivered earlier this year. By utilising this vessel in conjunction with the large vessel, Riverside Marine can minimise operating costs when passenger numbers fluctuate. The vessel is a high-capacity variant of *Fantasea Sunrise*, and can be converted to operate on any of Riverside Marine's routes, both on the Great Barrier Reef and in Sydney.

This vessel will have seats for 180 passengers in the main-deck cabin and 46 passengers in the upper-deck cabin, with an additional 20 outdoor passenger seats on the upper deck. A total of four toilets will be fitted, with one being located on the upper deck. Like the 32 m vessels, midship boarding doors will be fitted, as well as boarding ramps.

The 24 m vessel will be powered by a pair of Yanmar 6AYM-WET main engines each producing 610 kW at 1900 rpm, giving the vessel a service speed of 25 knots at 85% MCR.

The three vessels are due to be delivered throughout 2012. Incat Crowther believes the work performed with Riverside Marine creates operational flexibility and adds commercial value to these products.

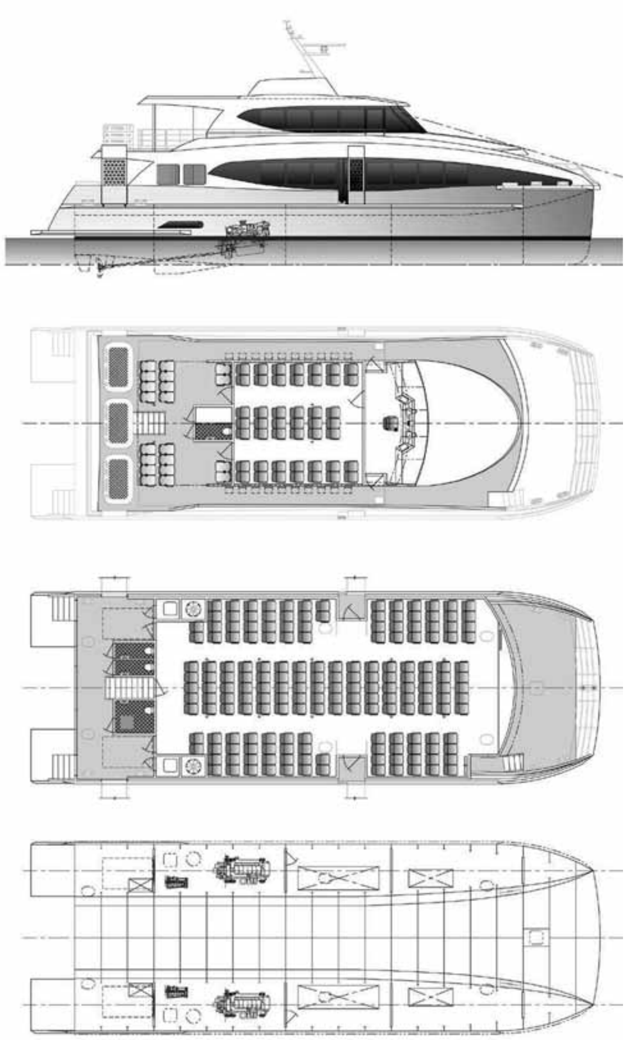


General arrangement of two 32 m catamarans
for Riverside Marine
(Drawing courtesy Incat Crowther)

Principal particulars of the 24 m vessel are

Length OA	23.9 m
Length WL	23.5 m
Beam OA	8.5 m
Depth	2.75 m
Draft (hull)	1.2 m
(propeller)	1.8 m
Crew	3
Passengers	226
Fuel oil	6000 L
Fresh water	500 L
Sullage	500 L
Additional sullage	2000 L (2nd life)
Main Engines	2×Yanmar 6AYM-WET
	each 610 kW @ 1900 rpm
Propulsors	2×5-bladed propellers
Generators	2×TBD
Speed (maximum)	27 kn
(service)	25 kn
Construction	Marine-grade aluminium
Flag	Australia
Notation (original)	USL Code/NSCV Class 1D
(2nd life)	USL Code/NSCV Class 1C

Stewart Marler



General arrangement of 24 m catamaran for Riverside Marine
(Drawing courtesy Incat Crowther)

Topaz Zephyr from Incat Crowther

Incat Crowther has announced the launch of a second 27.6 m wave-piercing catamaran crewboat, *Topaz Zephyr*. Based on the innovative *Topaz Zenith*, launched in June, *Topaz Zephyr* has been optimised to provide 24 h support to offshore oil and gas operations. The vessel differs from the earlier design by having a full-width superstructure, allowing greater accommodation space. Together with increased fuel capacity, this allows the vessel to operate uninterrupted over a 24 h service pattern.

The accommodation-friendly vessel adds a bathroom to each of the two hull crew cabins. There is also an additional officer's cabin on the main deck. The hull, machinery and control stations are common to both vessels.

As with *Topaz Zenith*, *Topaz Zephyr* is fitted with a FFS 250×350HD FiFi and foredeck-mounted fire monitor as well as a Sormec M18/FB/4S deck crane. The aft deck has over 50 m^2 of usable deck space, forward of which is a protected passenger boarding area.

The vessel is powered by a pair of Caterpillar C32 ACERT engines, each producing 1193 kW at 2100 rpm. The use of the same engines gives the operator commonality between the two different vessels, streamlining maintenance operations and parts inventory. At the time of going to press, *Topaz Zephyr* is completing sea trials before being handed over to its operator, RAK Petroleum.

Incat Crowther believes *Topaz Zephyr* demonstrates the company's ability to create innovative, vessels which are founded on the principles of ruggedness and efficiency.

Principal particulars of *Topaz Zephry* are

Length OA	27.6 m
Length WL	23.0 m
Beam OA	7.5 m
Depth	3.2 m
Draft (hull)	1.4m
Passengers	39
Crew	8
Deck area	54 m^2
Cargo capacity	25 t
Maximum deck load	3 t/m^2
Deck crane	Sormec M18/FB/4S
Fire-fighting fitout	FFS 250×350HD 600 m^3/h
Fuel oil	13 930 L
Fresh water	5000 L
Sullage	500 L
Main Engines	2×Caterpillar C32 ACERT D rating each 1193 kW @ 2100 rpm
Propulsion	2× Hamilton HM651 waterjets
Generators	2×Caterpillar C4.4
Speed (maximum)	32 kn
(service)	28 kn
Construction	Marine-grade aluminium
Flag	United Arab Emirates
Class/Survey	DNV ✠1A1 HSLC R3 Crew

Stewart Marler

Topaz Zephyr departing for initial trials
(Photo courtesy Incat Crowther)

Cruising

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

Phil Helmore

FROM THE CROW'S NEST

Lawhill by Neil Cormack

Neil Cormack has recently completed his latest book, *Lawhill*, about the steel-hulled four-masted barque of that name which was built at the Caledon Shipbuilding & Engineering Company yard of W. B. Thompson in Dundee and launched in 1892 for Charles Barrie, also of Dundee. She was rigged in "jubilee" or "bald-headed" fashion, i.e. without royal sails over the topgallant sails, and was ordered for the jute trade, but only made two voyages carrying jute before the business became unprofitable, and she was sold and shifted to other cargoes.

Neil has traced the history of the vessel through her succession of owners and voyages, to her eventual sale to Marcio da Silva of Lorenco Marques, where she was finally broken up for scrap. For details of her voyages, Neil has gone to the trouble of unearthing drafts of the vessel when leaving various ports in various conditions of loading, carrying grain, nitrates, ballast, etc. For example, when outward bound from Le Havre on 16 June 1913, the drafts were recorded as 12.18 ft (3.71 m) forward and 11.18 ft (3.41 m) aft, i.e. trimmed 1.0 ft (0.3 m) by the bow but, by all accounts, she was able to steer docilely when trimmed that way!

Principal particulars of the vessel were

Length BP	307.0 ft	93.57 m
Beam	44.8 ft	13.66 m
Depth	25.1 ft	7.65 m
Draft to summer load line	23.67 ft	7.21 m
Displacement to summer load line	6560 tons	6665 t
Deadweight to summer load line	4600 tons	4572 t

Neil has provided a scantling specification for the vessel and, from a lines plan, has derived the hydrostatic and KN data. He has then taken an assumed condition for the lightship displacement of 1960 tons (1991 t) with a GM of 3.00 ft (0.91 m) and has then worked out six complete stability conditions.

As a matter of interest, he has included an extract from Captain Alan Villiers' book, *The Set of the Sails*, with an account of *Lawhill* leaving Bordeaux in 1921 bound for Port Lincoln, SA. Villiers had just signed on rated as AB (able-bodied seaman) and was 17 years old. [The Set of the Sails *is a cracking good yarn for square-rig aficionados* — Ed.]

If you are interested in a copy of the book, then please contact Phil Helmore on (02) 9385 5215 or p.helmore@unsw.edu.au.

Phil Helmore

[*The half-deck bell of* Lawhill *now hangs in the clubhouse of the Sydney Amateur Sailing Club in Sydney* — Ed.]

Developing the Hullforms of Yesterday's Timber Vessels

Noel Riley

Abstract

The abundant supply of good-quality timber available on the NSW coast supported a vibrant wooden shipbuilding industry from the middle of the nineteenth century until the early twentieth century. The hullforms of the vessels built during this period were usually designed by master shipwrights who carved bread-and-butter half models, to scale. The lines were then lofted from the individual half model and full-size moulds were prepared to build the vessel.

With the passage of time, most of the vessels and their half models have disappeared. However, sufficient information exists in the National Archives to permit some of the hullforms to be re-created. This paper describes a method of developing a set of lines for a particular vessel using the information available.

Introduction

Now that that the author is one of yesterday's men, he considered it was appropriate that he should address one of yesterday's topics.

Oral history told that the family had been involved in wooden shipbuilding in the Brisbane Water district from the 1840s until the early 1900s. The author had inherited a water-colour painting and two half models of vessels which were said to have been built by his grandfather. These had been handed down through the family and they were quite damaged when he inherited them. He had no information on their antecedents and had carried the half models around for about fifty-five years with the intention of restoring them to be used as wall ornaments. However, the priority for this project was not very high and was kept on the back burner until he stopped the world and got off about 2004.

A local Brisbane Water resident and historian, Gwen Dundon, had carried out a very comprehensive research project on the shipbuilding activities in the district and she wrote the book, *The Shipbuilders of Brisbane Water* [1]. The author obtained a copy and found that about 500 timber vessels had been built in the district in the last half of the nineteenth century and in the early part of the twentieth century. Mrs Dundon had researched the National Archives and found the official number, tonnage and principal dimensions of the vessels which had been measured for tonnage. Along with photographs and notes on the various shipbuilders, she drew a very comprehensive picture of the shipbuilding industry in the district. From the information provided in the book, the author was able to trace his family's involvement. The vessels built by his immediate family are shown in Table 1.

Prior to reading Mrs Dundon's book, the author was disappointed that he had so little information on the family's wooden shipbuilding activities, other than the painting and the two half models. He thought that trying to find out more would be a constructive exercise to fill in his declining years. Mrs Dundon made mention in her book of a shipwright, Mr Ron Haug, who presently lives in Stockton. Mr Haug had

FAMILY VESSELS BUILT ON BRISBANE WATER													
No	YEAR REGISTERED	NUMBER IN YEAR	OFFICIAL NUMBER	VESSEL	BUILDER	REGISTERED MEASUREMENTS LENGTH Feet	BEAM Feet	DEPTH Feet	GROSS Tons	Tonnage Coeff	RATIOS L/B	B/D	L/D
1	1843	3		Currency Lass	James Woodward	32.4	11.2	5.6	16	0.787	2.893	2.000	5.786
2	1849	91		Favourite	James Woodward	43.0	11.9	4.2	15	0.698	3.613	2.833	10.238
3	1869	3	59521	Brothers	Giles Jenkins	43.2	13.4	4.9	18	0.635	3.224	2.735	8.816
4	1876	10	73346	Emily Ann	Giles Jenkins	61.2	16.3	6.5	39	0.601	3.755	2.508	9.415
5	1878	54	74988	Flora Bell	Giles Jenkins	64.6	17.8	5.8	42	0.630	3.629	3.069	11.138
6	1878	50	74984	Maggie Riley	James Riley	51.2	14.8	5.2	24	0.609	3.459	2.846	9.846
7	1882	24	83662	Daisy	Giles Jenkins	56.0	16.8	5.6	32	0.607	3.333	3.000	10.000
8	1883	111	83798	Integrity	Giles Jenkins	69.8	18.3	6.8	51	0.587	3.814	2.691	10.265
9	1883	55	83756	Water Lily	Giles Jenkins	67.7	16.6	5.6	38	0.604	4.078	2.964	12.089
10	1884	90	89290	Lizzie Frost	George Frost	70.0	18.2	6.6	52	0.618	3.846	2.758	10.606
11	1884	99	89294	Eliza Walker	Giles Jenkins	81.6	20.8	7.2	79	0.646	3.923	2.889	11.333
12	1884	4	89223	Bellbird	Thomas Riley	69.9	18.6	6.8	57	0.645	3.758	2.735	10.279
13	1885	80	89377	Georgina Davies	George Frost	70.4	20.7	6.7	62	0.635	3.401	3.090	10.507
14	1885	65	89368	Morning Light	Giles Jenkins	83.7	23	7.7	92	0.621	3.639	2.987	10.870
15	1886	28	93492	Emily	Giles Jenkins	66.0	15.9	6.2	34	0.523	4.151	2.565	10.645
16	1887	43	93557	May Flower	Giles Jenkins	71.6	19.0	6.0	53	0.649	3.768	3.167	11.933
17	1888	45	93584	Eliza Davies	George Frost	73.6	20.8	6.2	61	0.643	3.538	3.355	11.871
18	1889	53	93618	Jessie Riley	Giles Jenkins	44.6	13.6	4.6	17	0.609	3.279	2.957	9.696
19	1890	27	93633	Ranger	George Frost	85.2	22.8	6.5	88	0.697	3.737	3.508	13.108
20	1892	58	101046	Ede Moir	George Frost	83.4	21.4	7.2	79	0.615	3.897	2.972	11.583
21	1893	53	101094	Harriet	George Frost	90.4	23.0	7.3	99	0.652	3.930	3.151	12.384
22	1895	14	101139	Bobbie Towns	George Frost	98.2	23.3	7.5	136	0.793	4.215	3.107	13.093
23	1896	37	106124	Forster	George Frost	78.2	21.0	6.7	69	0.627	3.724	3.134	11.672
24	1896	2	101146	Defender	George Frost	82.5	22.0	6.7	67	0.551	3.750	3.284	12.313
25	1897	21	106140	Amelia White	George Frost	93.6	23.6	7.5	94	0.567	3.966	3.147	12.480
26	1898	9	106163	Mary Ellis	George Frost	81.8	23.2	7.0	89	0.670	3.526	3.314	11.686
27	1898	198	106198	Kincumber	George Frost	98.0	25.2	6.9	137	0.804	3.889	3.652	14.203
28	1899	65	112475	Hennie de Fraine	George Frost	91.8	24.4	6.8	87	0.571	3.762	3.588	13.500
29	1901	7	112520	S S Defender	George Frost	118.5	25.4	7.4	185	0.831	4.665	3.432	16.014
30	1901	41	112542	Alert	George Frost	81.3	14.0	6.7	66	0.865	5.807	2.090	12.134
31	1902	45	112575	Coronation	George Frost	83.7	22.7	7.3	94	0.678	3.687	3.110	11.466
32	1904	34	117669	Waratah	George Frost	93.2	24.4	7.2	96	0.586	3.820	3.389	12.944
34	1906	9	121126	Robbie Burns	George Frost	94.0	22.2	9.7	101	0.499	4.234	2.289	9.691
33	1906	23	121137	Rocklily	George Frost	117.7	27.9	9	218	0.738	4.219	3.100	13.078

Table 1 — Vessels Built on the Brisbane Water by the Riley Family

made a study of early shipbuilding on the east coast and in Tasmania. The author made contact with Mr Haug and found that he had an encyclopaedic knowledge of the subject. He, like Mrs Dundon, had researched the National Archives and had found the Tonnage Admeasurement Certificates (TACs), and associated calculation sheets, of many of the vessels built on the east coast. From this information he had drawn the lines plans of a number of the vessels and had made their half models. He was most helpful in sharing his information with the author and set him along the way to filling out the scanty knowledge which he had on the subject.

The author resurrected the half models that he had inherited and, from the information available to him, found that one was a model of the ketch, *Bellbird*, built by his grandfather in 1883, and the other was a model of the ketch, *Defender*. *Defender* was built in 1896 at George Frost's shipyard in Kincumber, where his grandfather was the foreman shipwright and the son-in-law of George Frost. The vessel was restored in the 1980s in Launceston and, until quite recently, was operating as a charter vessel in the Whitsunday Islands on the Queensland coast.

Information Gathered

The author visited the National Archives in Sydney, and was able to obtain copies of the TAC calculation sheets for a number of the vessels listed in Table 1. A copy of this data, for the ketch *Mary Ellis*, is shown in Fig. 1. Each calculation sheet provided the tonnage length, the deck camber and the offsets (to the inside of the ceiling) at five stations. The internal volume was then calculated on the calculation sheet, from the offsets lifted from the vessel, via a double numerical integration using Simpson's first rule. The gross tonnage was then determined from the volume calculation .

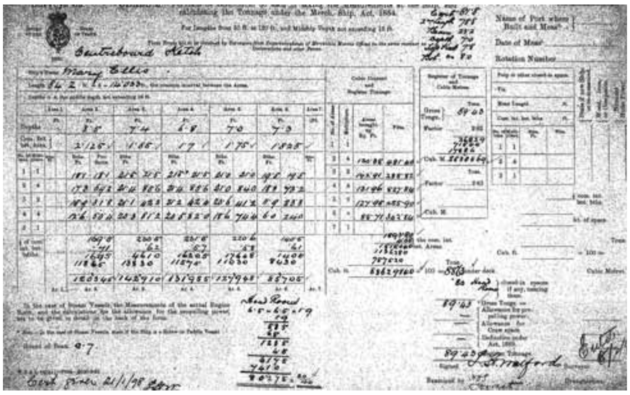


Figure 1 — Tonnage Admeasurement Certificate for *Mary Ellis*

The author found that three other sets of data were necessary to re-create the lines of each vessel. These were the Builder's Certificate, the document *Tonnage Measurement of Ships* [2], and the Australian Lloyd's Register's *Rules and Regulations with Registration Tables Applicable to the Varieties of Colonial Timbers Used in Shipbuilding* [3]. He was able to obtain a copy of [2] from the late Bob Herd, and a copy of [3] from Mr Haug. The construction rules were written specifically for vessels built of Australian timbers. Table B of the Lloyd's Rules, reproduced in Fig. 2, provided the scantlings for the vessels under consideration. These were based on the gross tonnage of the vessel concerned.

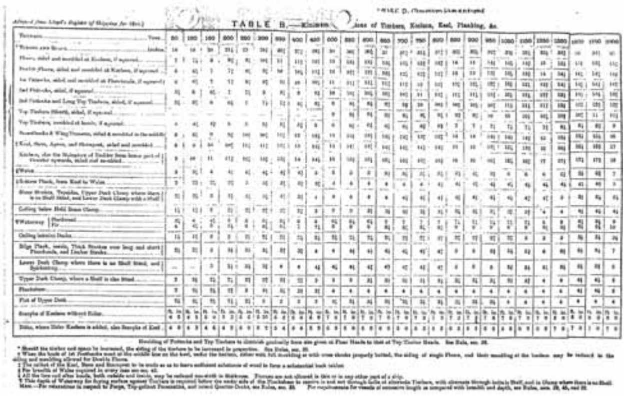
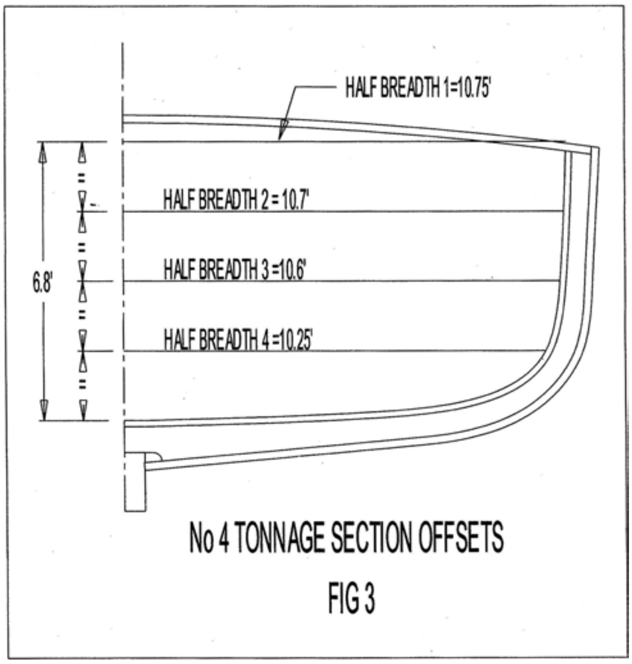


Figure 2 — Table B of the Australian Lloyd's Rules of 1884



Tonnage section offsets

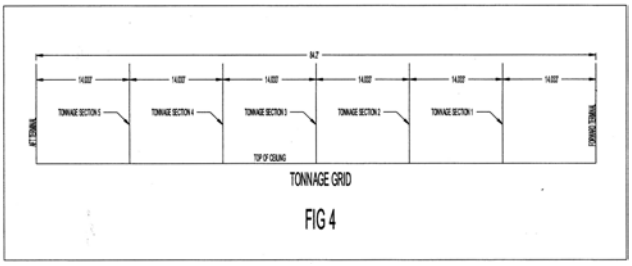
Fig 3 shows the layout of the tonnage breadths for a typical section. The offsets were taken to the inside of the ceiling.

Methodology

The method that the author used to draw up the lines, from which he made the half models, is described below. For this paper he chose the ketch, *Mary Ellis*, as an illustrative example.

The spacings of the tonnage measurement sections were laid out at equi-distant intervals along the tonnage length. Other data used were the registered length, the tonnage section offsets, the maximum beam, the moulded depth and the depth of keel. This data permitted the construction of the grid.

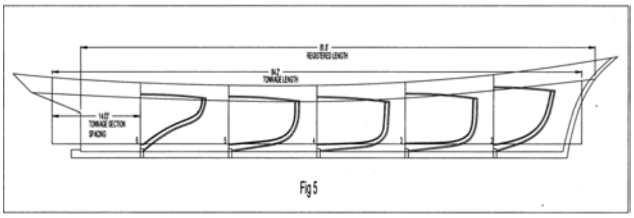
At this point it may be of interest to elaborate on the information available. The tonnage length is the distance, under the tonnage deck from the aft side of the apron to the internal aft end of the vessel. The vessel under consideration had a counter stern, so the aft terminal point was taken at the forward side of the rim piece. The registered length is the distance from the forward side of the stem, under the bowsprit, to the aft side of the sternpost. The top offset, at each section, was taken at a height above the internal point of the deck at side equal to one-third of the camber. This correction was made to include the section area contained in the deck camber. Therefore, when drawing in the hull section, a reduction in height had to be made for this correction to arrive at the height of the deck at side. The profile, showing these various longitudinal dimensions, is shown in Fig. 4.



Tonnage grid

No information was provided on the shape of the stem or aft profile in the tonnage data, and a side-on photograph, or painting, of the vessel concerned would be of use in determining the profile of the bow and the stern. If no photograph or painting is available, then a little imagination is required. Another unknown was the length of the overhang aft of the sternpost. However, a reasonable estimate may be made by reference to the position of the sternpost and the height of the aft portion of the sheer line of the deck at side. The author was interested to observe, on the information which he had, that the old shipbuilders, without much knowledge of fluid mechanics, had found that about 20 degrees was the maximum slope for the mean buttock in the run-up under the counter to avoid flow separation.

Fig. 5 shows the tonnage profile and the tonnage sections in their respective positions along the length of the vessel.



Tonnage sections and profile

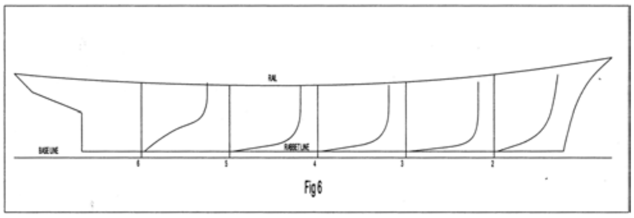
Because the tonnage sections were measured to the inside of the structure, it is not uncommon to have some unfairness in the section, when first drawn, as an offset may occur in way of a stringer, or some other piece of local structure. Some adjustment then has to be made to arrive at a fair section.

Once the tonnage sections were constructed, the next step was to draw in the structure to arrive at the external hull shape at each of the tonnage sections. These were extracted from Fig. 2 and the scantlings in this instance were:

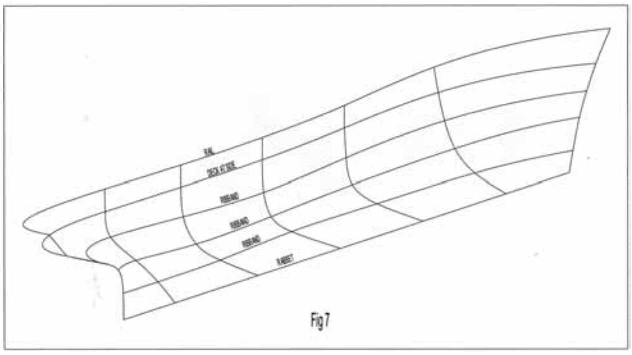
Item	Siding		Moulding	
	Inches	mm	Inches	mm
Ceiling	1¾	44		
Floor at keelson	7½	191	7½	191
Double floors	6½	165	6½	165
First futtock at floor head	6	152	6	152
Second futtock	6	152	6	152
Third futtock	5¾	146	5½	146
Keel and sternpost	9	229	9	229
Stem and apron	9	229	9	229
Planking	2¼	57		

The author took the scantlings from the nearest gross tonnage column, as he considered that interpolating between tonnages was a refinement which may not have been considered when the vessel was built due to the fact that the frames, floors and crooks, etc., were squared up using an adze and broad-axe. Therefore, interpolating to the nearest 1/16 in seemed to him to be an unnecessary refinement.

The thickness of the ceiling was added to the outside of each tonnage section. The mouldings of the floors and futtocks were added to the outside of the ceiling, at their respective positions around the girth of each tonnage section. Then the thickness of the planking was added to each tonnage section at the respective points of the floors and futtocks. These last points then defined the external hull at each tonnage section. Once this procedure had been completed, a sheerline and half-breadth deck at side were developed. In view of the fact that the tolerance for tonnage dimensions was ±0.1 feet, some fairing was required. A line drawn from the rabbet line to the deck at side gave the hull section to the outside of planking. The outside of the hull, at each tonnage section, is shown in Fig. 6.



Moulded sections and profile

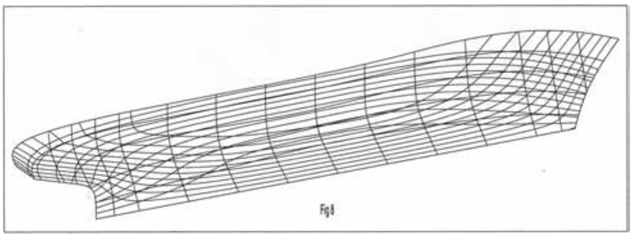


Pictorial view of final lines

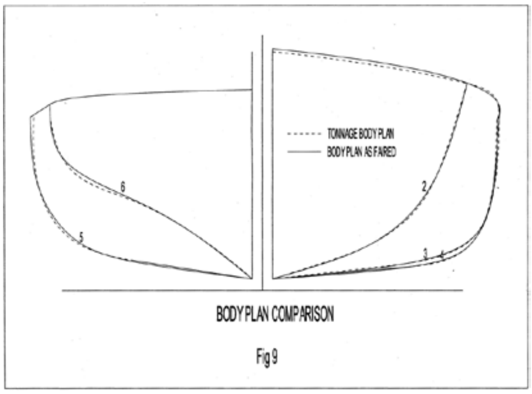
These data provided sufficient information to develop the lines of the vessel, either by hand or using a lines-fairing package. The author used the Wolfson Unit *Shipshape* program for this activity. It took some experimenting before he could optimise the time required to achieve an acceptable set of lines, and he found that inputting too much basic data added difficulty to a process that provided acceptable results.

For those of you who are not familiar with this package, it is based on the principle of splines and weights and, since the author is one of yesterday's men, he was very familiar with this principle. He has yet to come to grips with other packages which work on surfaces controlled by springs. Thus, with five transverse sections, a bow and stern profile, and six longitudinal splines which included the rabbet, three ribbands, the deck at side and the rail, he was able to get a reasonable set of lines in about two-to-three hours. Fig. 7 shows the layout of the basic curves which were used in the fairing process, while Fig. 8 shows the sections, waterlines and buttocks which were developed at the completion of the lines-fairing process.

In order to ensure that the faired lines were a reasonable replication of the body plan developed from the tonnage measurements, the author then overlaid the faired body plan on the tonnage body plan. Fig. 9 shows that a fairly close agreement was obtained.

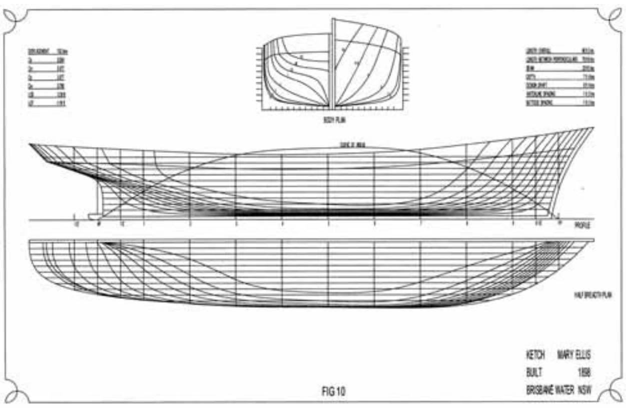


Completed sections, waterlines and buttocks



Comparison of tonnage and final body plans

Once the lines were faired, the three views were exported, using DXF files, to a drawing package. The results are shown in Fig. 10.

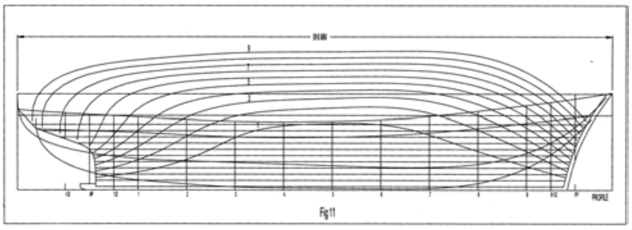


Completed lines plan for *Mary Ellis*

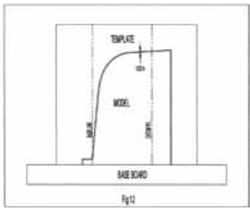
Making the Half Model

The next process was to make the half model. The author used the bread-and-butter principle, using alternate dark and light timbers. The dark timbers were either cedar, mahogany or surinam, and the light timbers were either beech, gelutong, hoop pine or huon pine.

He plotted out the half-breadth waterline for each laminate, and plotted out the displacement sections to make the templates for fairing. The latter were made 1/32 inch (0.79 mm) larger than the actual section and, for final fairing, he used a graduated wedge which was inserted between the template and the model. Fairing continued until the graduation reached the above figure. Fig. 11 is a drawing of the laminate cutting plan, while Fig. 12 is a sketch of a typical template of the sections provided for the fairing templates. The laminates were glued together and faired to fit the templates. The advantage of making the templates slightly larger than the finished sections means that one can work the model to the full extent of each template and then fair it back to the correct dimensions. If no allowance is made on the template for final fairing, then there is a risk that the model will finish under size.



Profile, buttocks and waterlines on laminate cutting plan



Template for section of model

Hullform

Since the lines-fairing program also provided hydrostatic data, the author was able to determine the form factors for the vessels investigated and their respective curves of areas.

For *Mary Ellis* the hullform particulars were:

Displacement/length ratio $\Delta/(0.01L)^3$ 370
Prismatic coefficient C_P 0.677
Longitudinal centre of buoyancy LCB 0.388 ft (0.118 m) forward of midships

If one accepts that a speed/length ratio ($V/\sqrt{L}$) of 0.7 was an acceptable estimate in this instance, then the hullform compares reasonably well with contemporary data, such as Ridgley Nevitt's trawler series.

Conclusion

While the vessels, and their half models, have all but disappeared, the information is still available to re-create some of their hullforms.

Acknowledgements

The author gratefully acknowledges the assistance provided to him by both Mrs Gwen Dundon and Mr Ron Haug. Without their assistance, he would have been unable to conduct his research on what has been a fascinating line of inquiry.

References

1. Dundon, G. (1977), *The Shipbuilders of Brisbane Water NSW*, Gwen Dundon, East Gosford.

2. H.M Stationery Office, (1959), *Tonnage Measurement of Ships*.

3. Lloyd's Register Australia, (1864), *Rules and Regulations, with Registration Tables Applicable to the Varieties of Colonial Timbers Used in Shipbuilding, Scale of Fees, &c.*, Melbourne.

EDUCATION NEWS

Australian Maritime College

PhD Graduations for 2011

This year, 2011, has seen a further three Doctor of Philosophy graduands in 2011 in the National Centre for Maritime Engineering and Hydrodynamics. As the Graduate Research Coordinator I would like offer huge congratulations on years of hard work. Following are the titles and abstracts.

Bryce Pearce — *Ventilated Supercavitating Hydrofoils for Ride Control of High-Speed Craft*

An investigation into the hydrodynamic performance and flow field characteristics of a novel high-speed super-cavitating hydrofoil concept proposed by Elms (1999) presented. The hydrofoil is wedge-shaped with a super-cavity detaching from geometric discontinuities at its trailing edges. Lift is generated by the asymmetry of the cavity/flow field created by trailing edge forward and backward-facing steps. In this way bi-directional lift can be created from a symmetric hydrofoil. To ensure establishment and maintenance of a stable super-cavity, air is introduced by external ventilation via the hydrofoil base. The formation of the trailing edge steps would be practically realised by the deflection of a trailing flap. At zero incidence and flap deflection there would be no supercavity formed and no lift produced. The cavity formation from a hydrofoil by this mechanism is analogous to the separated flow over an 'interceptor' device fitted to the transom of a high-speed hull for trim and/or steerage control. Due to this similarity the concept has been termed an 'intercepted hydrofoil'.

This hydrofoil configuration is analysed using a potential-based 2-D nonlinear boundary-element method. For a given cavity length, the resulting cavity surface velocity and shape are determined in an iterative manner under prescribed constant-pressure and flow-tangency boundary conditions. Both infinite and confined flow domain cases of the boundary element analysis are presented. The latter case is of interest in providing blockage correction information for a future companion physical experimental program.

An optimum base-ventilated super-cavitating hydrofoil profile is a compromise between limiting of the pressure minimum at the leading edge and maintaining stable cavity detachment from the trailing edges. These are both necessary to maintain the hydrofoil surfaces in a wetted condition, thereby ensuring that the generated forces remain steady and predictable. The greatest efficiency is obtained by using the smallest thickness-to-chord ratio with a sufficient margin against cavity breakdown allowing for variance in operating conditions.

Hydrodynamic performance of the 'interceptor' in isolation from the foil, i.e. cavitating flow over a wall-mounted fence, is also presented. Classical analytical, boundary-element and Reynolds-Averaged Navier-Stokes equation based computational fluid dynamics methods were used for this analysis. The 'ideal' optimum hydrodynamic performance obtained from potential-flow analysis is compared with the viscous flow numerical results.

Elms, A.R. (1999), Improved hydrofoil device, International Patent Number WO 99/57007.

Shinsuke Matsubara — *Ship Motions and Wave Loads of Large High-Speed Catamarans in Head and Oblique Seas*

Advancement in the design of large high-speed ferries demands comprehensive knowledge of ship motions and wave-induced loads to optimise their structural integrity. This investigation focussed on the fluid structure-interaction problem experimentally to obtain such information.

Motions and loads were investigated by using two different high-speed catamaran models and a full-scale ship. Firstly, a hydro-elastic segmented model (HSM) of the Incat 112 m class wave-piercing catamaran with centre bow was designed. It was tested in a towing tank for a range of head seas conditions to determine the motion responses, vertical bending moment (VBM) on the demi-hull, and slam loads on the centre bow. A second catamaran model was designed and tested in oblique seas in a model test basin (MTB) to examine the motions and asymmetric wave-induced loads. Thirdly, full scale measurements were performed during the delivery voyage of the Incat 112 m Hull 064 from Hobart in Australia to Hakodate in Japan, to measure the motions and structural load responses.

The structural dynamic behaviour of the full scale vessel was replicated by the HSM model and the slamming and subsequent whipping behaviour were successfully modelled. As wave energy was consumed in the structural vibration of the model, the heave and pitch transfer-function peaks reduced when compared to the rigid configuration. The HSM test results also showed a strong non-linear motion response, with respect to wave height for this type of vessel, mainly due to the influence of the centre bow. The peak values for the VBM and slam loads were confirmed to be proportional to the square of the wave height for large waves. The MTB test model, which was not fitted with a centrebow, provided linear pitch, heave and roll motions for varying wave heights. The pitch-connecting moment was found to dominate the asymmetric wave loads and was linear with respect to wave height. During the full-scale measurement program, slamming phenomena were clearly recorded whilst crossing Bass Strait. A reconstruction of the event, from the measured data, indicated that a slam event with subsequent whipping occurred with bow-down trim. Spectral analysis was used to detect the response frequencies of the VBM and machinery, with the frequency of the longitudinal mode increasing as the displacement reduced.

These experimental programs, encompassing model and full-scale measurements, have given valuable insights into the motion and structural dynamic behaviour of large high-speed catamarans. A comprehensive set of motion transfer functions, VBM and slam-load coefficients have been obtained, thus providing designers with important slam and wave load knowledge to aid the improved structural optimisation of these vessels.

Shinsuke would like to thank all academics, AMC towing tank officers, Incat and Revolution Design for guidance and support. "Because of their enormous effort and support, I have had a wonderful challenging experience of designing the experimental model, testing it in the towing tank and conducting full-size measurements of the same ship during the delivery voyage to Japan."

Hydro-elastic segmented model of the Incat 112 m class (Photo courtesy AMC)

Roberto Ojeda — *Non-linear Buckling and Large Deflection Analyses of Isotropic and Composite Stiffened Panels using an Arbitrarily-orientated Stiffened-element Approach*

A new approach for the non-linear buckling and large deflection analyses of isotropic and composite stiffened panels, as used in high-speed craft, is presented.

Eight-node isoparametric elements, formulated according to Marguerre's shallow-shell theory, are combined with three node beam elements, using the concept of equal displacements at the panel-stiffener interface, to represent the stiffened panels. Non-linear equilibrium equations are derived using the principle of virtual work applied to a continuum with a total Lagrangian description of motion. The arbitrarily-stiffened, shallow-shell element is capable of modelling eccentric or concentric stiffeners attached to flat or imperfect panels under in-plane or transverse loads. Special modelling considerations for the loading and boundary conditions, required in the linear and non-linear buckling analyses of stiffened panels using arbitrarily stiffened finite elements, are suggested and discussed for the first time.

The Newton-Raphson incremental-iterative solution technique is used to obtain the non-linear response path. Results obtained in this investigation are compared with those available in the open literature to demonstrate the validity and efficiency of the proposed approach. Good agreement is found in all the investigated cases.

Final Year Projects 2012

Next year's final year project group is the biggest ever. With 49 projects allocated already, the NCMEH has had to dig deep to find the resources and projects to conduct this critical capstone project. Following is a listing of all the supervisors and project names.

Jonathan Duffy — *Behaviour of a Berthed Ship in Waves* (may take two students on this project)

Irene Penesis — *Oscillating Water Columns*

Hung Nguyen — *Simulation and Control of AUVs using Labview*

Roberto Ojeda — *Comparative Structural Investigation of the Optimum Hull material/Structural arrangement for High-speed Heavy-displacement Catamarans*

Chris Chin — *Energy audit*

Rowan Frost — *VIV interaction of Subsea Risers*

Paul Brandner — *Cavitation Occurrence about a Sphere Impacting a Flat Surface*

Roberto Ojeda — *Finite Element Simulation of Blank Torpedo Impact on Submarine Hulls*

Shinsuke Matsubara — *Oscillating Foil-shape Wave Generator*

Vikram Garaniya — *Solar-powered Stirling Engine*

Dev Ranmuthugala — *Submarine Roll Motions*

Irene Penesis — *OWC Mooring Systems*

Vikram Garaniya — *Use of Pinch Technology in Offshore Design*

Paul Brandner — *Investigation of Bubble and Air-layer Drag Reduction*

Rowan Frost — *VIV Interactions of Subsea Risers*

Chris Hutchison — *Scaling of Sailing Yacht Experimental Results*

Jonathan Duffy — *Optimisation Study on the Effects of Bow Configuration of a Landing Craft Tank*

Jonathan Binns — *Speed Sailing* (may take two students on this project)

Jonathan Binns — *Webber Wavepool*

Irene Penesis — *Design and Testing of a Tidal Current Power-extraction Device*

Gregor Macfarlane — *Investigation into Ship Wave Patterns when Approaching Critical Speed*

Shuhong Chai — *Experimental Investigation of MWA Hydrodynamic Properties*

Alan Belle — *Automated and Mechanical Controls on Greenliner*

Dev Ranmuthugala — *Investigation of the Effect of Length-to-diameter Ratio for Submarines Operating near the Surface*

Zhi Quan Leong — *Hydrodynamic Interaction between two Curve-shape Bodies rigidly held Side by Side*

Shuhong Chai — *CFD Simulation of Wave Runup on Various Offshore Structures*

Dev Ranmuthugala — *Effect of Sail on Submarine operating near the Surface*

Shuhong Chai — *Computational Study of Flow Structure and Hydrodynamic Forces on Submerged Structures*

Rowan Frost — *Testing of a Spar Buoy for Current-induced VIV*

Walid Amin — *Slamming Investigation on Offshore Structures*

Konrad Zurcher — *Self-propulsion Test on Catamaran Ferry*

Chris Hutchison — *Scaling of Sailing Yacht Experimental Results*

Polly Alexander — *Near-field Noise Profiling of the vessel* Bluefin

Shuhong Chai — *Modelling of Extreme Waves in Coastal Waters*

Dev Ranmuthugala — *Development of ROV Model and Control System*

Cheslav Balash — *Floating Offshore Platform Optimisation in Respect to its Buoyancy and Mooring Configurations*

Giles Thomas — *Weather-routing Software for Cruise Ships*

Irene Penesis — *Design and Testing of a Tidal-current Power-extraction Device*. (may take two students on this project)

Roberto Ojeda — *Progressive Failure of Composite Thin-walled Girders*

Mark Symes — *Numerical Analysis of FTV* Bluefin *in Regular Beam Seas with and without Bilge Keels* (Star CCM)

Shinsuke Matsubara — *No. 3 Motion, Wave Load and Energy Extraction* (geo sim)

Walid Amin — *Slamming Loads on Offshore Structures in Severe Sea Conditions*

Jonathan Binns — *Surfing in Circles*

Gregor Macfarlane — *Development of an Empirical Prediction Technique for Ship Resistance in Shallow Water*

Cheslav Balash — *Floating Offshore Platform Optimisation in respect to its Buoyancy and Mooring Configurations*

Vikram Garaniya — *Solar Stirling Engine*

Walid Amin — *Development of a CAD Tool for a Shipyard/ design office using Artificial Intelligence*

Jonathan Binns

26th International Towing Tank Conference

The International Towing Tank Conference is a voluntary association of worldwide organisations which have responsibility for the prediction of hydrodynamic performance of ships and marine installations based on the results of physical and numerical modelling. AMC has been a member organisation since 1987 and in 2007 was accepted as a full member of the ITTC Advisory Council.

A full conference is held every three years, and the 26th such event was held in Rio de Janiero, Brasil, in late August 2011. AMC was well represented with Prof. Neil Bose, A/Prof. Giles Thomas and Mr Gregor Macfarlane all in attendance. Prof. Martin Renilson was also planning on attending as he has chaired the Specialist Committee on Stability in Waves over the past three-year term but, in the event, he was unable to attend.

As usual, each of the technical committees reported on the significant work in their field that had been conducted since the last full conference in September 2008, and made conclusions where appropriate and recommendations for future work where conclusions could not be made.

Several outcomes of the Conference will affect day-to-day operations of AMC's towing tank, model test basin and flume tank, particularly with the implementation of new and revised ITTC Recommended Procedures. Of particular interest were the newly developed *Guidelines for Hydrodynamic Testing of Renewable Energy Devices*, which has been a major focus of work conducted in our facilities over the past four years. Other examples include the implementation of revised Recommended Procedures for the manufacture of ship models, conduct and analysis of calm-water resistance tests, conduct of propulsion tests, and the conduct and analysis of seakeeping tests. The full complement of ITTC recommended procedures and guidelines are available from the SNAME website at www.sname.org/ITTC.

There were also several other discussions that will aid current research projects, such as:

- A newly-developed procedure for the numerical estimation of roll damping, which is very relevant for one of our current collaborative projects with several external organisations.
- The development of best-practice guidelines on the use of Particle Image Velocimetry (PIV) for hydrodynamic applications, which we are presently using to quantify the flows inside ocean wave energy converters.

AMC will again be very well represented within international technical committees for the current three-year term, including:

- Neil Bose — Advisory Committee;
- Giles Thomas — Seakeeping Committee;
- Jonathan Duffy — Manoeuvring Committee; and
- Irene Penesis — Specialist Committee on Hydrodynamic Testing of Marine Renewable Devices.

FAST 2011 Conference

The 11th International Conference on Fast Sea Transportation (FAST 2011) was held in Honolulu, Hawaii, USA, during September 2011. Since their inception in Trondheim, Norway in 1991, the bi-annual FAST conferences have been one of the world's leading technical conferences addressing fast sea-transportation issues. As usual, the conference was well attended with over 160 delegates from almost twenty different countries.

Academic staff within the AMC National Centre for Maritime Engineering and Hydrodynamics have been regular contributors to this series of conferences over the years as it represents a key research area. This year, there were a further three papers presented by AMC/UTas academics:

- Dr Shinsuke Matsubara presented a paper titled *Influence of Centre Bow on Motions and Loads of High Speed Catamarans*. The co-authors of the paper were A/Prof. Giles Thomas from AMC, Prof. Michael Davis and Dr Damien Holloway from University of Tasmania, and Mr Tim Roberts from Revolution Design.
- Prof. Mike Davis presented a paper titled *Maximising Efficiency and Minimising Cost in High-speed Craft*. Co-authors of the paper were Gary Davidson and Tim Roberts from Revolution Design, Giles Thomas and Jonathan Binns from AMC, Stuart Friezer from Stuart Friezer Marine and Rob Verbeek from Wartsila Netherlands.
- Gregor Macfarlane presented a paper titled *The Influence of Catamaran Hull Form on Added Resistance in Head Seas*. The paper was co-authored by Nikki Daire of the Northern Territory Department of Lands and Planning, Marine Safety Division.

Gregor Macfarlane

University of New South Wales

Undergraduate News

Graduation Ceremony

At the graduation ceremony on 23 August, the following graduated with degrees in naval architecture:

Sue-Ellen Jahshan	Honours Class 2, Division 1
Nai Wee Ling	
Campbell McLaren	Honours Class 2, Division 1
Ning Wu	

Graduates Employed

They are now employed as follows:

Sue-Ellen Jahshan	Incat Crowther, Sydney
Jonathan Ling	Berjaya Dockyard, Miri, Sarawak, Malaysia
Campbell McLaren	School of Physics, University of New South Wales
Ning Wu	ASO Marine Consultants, Sydney

Congratulations, all!

Jonathan Ling, Sue-Ellen Jahshan and Campbell McLaren
at the UNSW Graduation Ceremony on 23 August
(Photo Phil Helmore)

Thesis Conference

At the School's annual undergraduate thesis conference on 22 and 23 September the following presentations by naval architecture student projects were made:

Alexander Conway — *Optimisation of Canting Keels for Racing Yachts*

Kathryn Dawes — *Extending the life of HMAS* Vampire

Dane Fowler — *Automated Drawing of Marine Screw Propellers Using AutoCAD*

Nathan Gale — *Feasibility of a Flying Submarine*

Geordie Grant — *The Effects of Surface Roughness on Propeller Performance*

Zensho Heshiki — *Added Resistance Due to Waves for Small Semi-planing Craft*

Adrian Phua — *Determination of Submarine Hull Parasitic Drag*

Yasuhiro Hayashi — *Structural Analysis of Close-in Underwater Explosion on a Ship Hull*

Ivy Zhang —*A Reanalysis of the Stability of SY* Boomerang

Thesis Conference Dinner

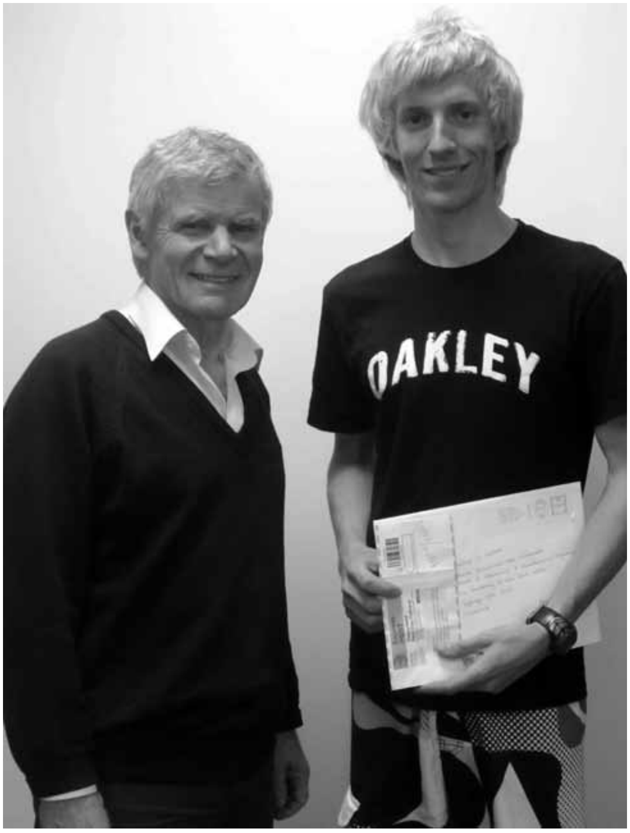
The School's annual thesis conference dinner was held on the evening of the last day of the conference, Friday 23 September, at the Bonnie Doon Golf Club. The dinner was attended by 250 students, partners and staff members, including some of the naval architects.

RINA–Austal Ships Award

RINA and Austal Ships jointly offered an award of $500 and a certificate for the best presentation at the conference by a RINA 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 Alexander Conway for his presentation on *Optimisation of Canting Keels for Racing Yachts*. The award was announced by the Deputy Head of School, A/Prof. Jayantha Katupitiya at the thesis conference dinner. The cheque has subsequently arrived and was presented to Alex by Phil Helmore.

The awards for the best presentations overall at the thesis conference went to

Adrian Phua, Ivy Zhang, Phil Helmore, Geordie Grant
and Dane Fowler at the UNSW Thesis Conference Dinner
on 23 September
(Photo courtesy Helen Wortham)



Alex Conway being presented with the RINA–Austal Ships Award
certificate and cheque by Phil Helmore
(Photo courtesy Mariana Lazevski)

First: Matthew Ellison — *Conceptual Design of a Beater-type Macadamia-nut Harvester*

Second: Alexander Conway — *Optimisation of Canting keels for Racing Yachts*

Third: Vidur Tuli — *Development of Adaptive Tutorials for Aerospace Students*

Congratulations, Alex!

Lecturer of the Year and Other Awards

Also at the thesis conference dinner, the School's final-year students made their annual award for Lecturer of the Year, inaugurated in 1995. This year the Lecturer of the Year award went to Mr John Page.

A number of light-hearted awards were also made:

For the lecturer with the best foreign accent to Dr Zoran Vulovic who, in accepting the award, said that "I speak normal English, but you all have an accent!

For the lecturer who would make the best super-hero to Dr Gangadhara Prusty.

For the lecturer who would make the best super-villain to Dr Seng Leong.

For the lecturer who would make the best ninja (being hardest to find!) to Dr Erik van Voorthuysen.

For the academic with the most unpronounceable name to Dr Sangarapillai Kanapathipillai who, in accepting the award, was able to pronounce it perfectly!

For the laboratory which had taken most of a student's life away — computer lab ME306.

For the best place for free food — MechSoc barbecues.

For the best place on campus to take a nap — the UNSW Library.

For the best place on campus to get study done — the Mechanical Engineering tutorial building.

Visit to AMC

On 29 and 30 October the Year 3 students studying Ship Hydrodynamics visited the Australian Maritime College accompanied by Mr Phil Helmore. The visit was organised by Dr Jonathan Duffy, 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 ran seakeeping tests on the same model in regular waves of various frequencies and heights in the towing tank. This was followed by a a presentation on research activities and opportunities at AMC by Dr Jonathan Binns and PhD student, Konrad Zurcher. Phil Helmore then made a presentation on *Performance of Propellers in Off-design Conditions* 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 introduced to the model basin and its capabilities by Dr Tim Lilienthal, who showed them some of the work in progress, and then gave them three three radio-controlled yacht models to sail around the basin under varying wind conditions provided by the bank of fans at one end of the basin. They were then introduced to the shiphandling simulator by Mr Wayne Schwatrz, Mr Adam Rolls and Capt. Ian Rodriques, entering Newcastle Harbour on a ship's bridge, and then seeing the operation from the bridge of one of the tugs. This was followed in the afternoon by a presentation on cavitation by Bryce Pearce and a demonstration of cavitation on a surfboard fin in the tunnel at varying water speeds.

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.

Braden Holgate checking that the model was floating at the correct draft
(Photo Phil Helmore)

The AMC towing tank, showing some of the models and the beaches
(Photo Phil Helmore)

Braden Holgate (L), Bradley Abdilla, Joshua Fang, Elliot Thompson, Phil Helmore, Matthew Laverty and William Birdsall on the towing-tank carriage
(Photo Phil Helmore)

Bradley Abdilla, Braden Holgate and Matthew Laverty at the controls
(Photo Phil Helmore)

Bluefin model, showing the forward towing post and the load cell
(Photo Phil Helmore)

William Birdsall and Matthew Laverty sailing yachts in the model basin
(Photo Phil Helmore)

Vist to Incat Tasmania

The students and Mr Helmore took the opportunity, while in Tasmania, to visit Hobart, where they were shown over the vessels under construction at Incat Tasmania's facility at Derwent Park by Mr Gary Davidson, Director Structures at Revolution Design. UNSW is grateful for the hospitality shown by Incat and Revolution Design.

Incat had four vessels at various stages of construction;

Wayne Schwarz (L) explaining the shiphandling simulator to students while Captain Joshua Fang (R) brings the ship into Newcastle harbour
(Photo Phil Helmore)

Bryce Pearce explaining details of cavitation on a surfboard fin
(Photo Phil Helmore)

a 112 m wave-piercing catamaran ferry almost complete, a 99 m LNG-powered wave-piercing catamaran ferry for Buquebus at an advanced stage of construction to run from Buenos Aires to Montevideo along the Rio de la Plata in South America [*for vessel details, see* The Naval Architect*, September 2011* — Ed.], an 85 m wave-piercing catamaran ferry under construction, and a small catamaran workboat.

It was instructive for the students to see the details of construction, from the waterjet intakes, engine and gearbox foundations, and composite shafting, to the aluminium sections used for vehicle deck and passenger deck plating, the structural fire-protection arrangements, the shape of the wave-piercing and centre bows, and the arrangements for the centre T-foil. The theory is interesting, but seeing construction under way and having the whys and wherefores explained by an engineer brings it all alive!

Aluminium sections used for passenger decks (top) and vehicle decks
(Photo Phil Helmore)

Vehicle deck on the Incat 99 m LNG-powered wave-piercing catamaran
(Photo Phil Helmore)

Waterjet intake ducting under construction for the 99 m vessel
(Photo Phil Helmore)

Engine beds, gearbox foundations and cut-out for waterjet intake on the 99 m vessel
(Photo Phil Helmore)

Centre bow and section for T-foil on the 99 m vessel
(Photo Phil Helmore)

Wave-piercing bow on the 99 m vessel
(Photo Phil Helmore)

Thesis Projects

Among the interesting undergraduate thesis projects recently competed are the following:

The Effects of Surface Roughness on Propeller Performance

Propellers in service are subjected to a number of factors which increase the roughness of the surface, including degradation due to cavitation, impact damage and the like, as well as fouling and marine growth—especially during long periods spent alongside a berth. Increasing roughness degrades the performance of the propeller, and so a number of operators are now routinely coating their propellers in an effort to reduce the long-term roughness of the propeller and increase the long-term efficiency.

Geordie Grant has carried out an investigation of the effects of surface roughness on the performance of propellers. Two methods are available for calculating the effect of roughness on the thrust and torque coefficients, and it is found that, in general, the thrust coefficient is reduced and the torque coefficient is increased by increased surface roughness. Coating has a negligible effect on the performance of a clean propeller, but has the benefit of maintaining the clean surface for much longer, hence maintaining performance. This has been applied to the trials of a number of a class of vessels, where both the full-scale trials and the numerical results showed that far larger gains in efficiency were to be had from keeping the hull clean than from keeping the propeller clean, but that both were beneficial.

Added Resistance Due to Waves for Small Semi-planing Craft

Owners often have a problem in objectively assessing the seakeeping of small craft (vessels under 24 m in length). Often these craft are an off-the-shelf item, and the manufacturer has little or no data as to the craft's performance in a seaway. A typical operational requirement for a dive launch (for example) would be: "The vessel shall have the ability the travel at 18 kn up to and including the top of Sea State 4 (2.5 m significant wave height). Currently a calm-water trial is conducted; but this may pass a design which could not meet the operational requirement on open waters. Since they can never get exactly Sea State 4, it is difficult to evaluate the contractual requirements in a cheap and easy way. Both a practicable trial method and a numerical method would have great value. While wave rider buoys and accelerometers can be used to establish motions and speeds in the sea state of the trial, it is still a grey area extrapolating this to the requirement.

Zensho Heshiki has conducted a literature search on the seakeeping of small, fast craft, and conducted trials on an outboard-powered RIB. He has investigated numerical methods which take into account a variety of hull forms (such as deep-Vee and shallow-Vee chined hulls, landing-craft type hulls, planing and displacement hulls), and which can predict the motions and reduction in speed for a given sea state.

Post-graduate and Other News

New Head of School

A/Prof. Philip Mathew resigned as Head of the School of Mechanical and Manufacturing Engineering on 26 August, but continues as an academic in the School.

The new Head of School is Prof. Anne Simmons, who was previously Head of the Graduate School of Biomedical Engineering.

Phil Helmore

Lady Nelson entering Constitution Dock
(Photo Phil Helmore)

NMSC Re-Location

The office of the National Marine Safety Committee (NMSC) relocated from Sydney to Canberra on 21 October 2011.

The new address for all NMSC correspondence is

The Manager
National Marine Safety Committee
PO Box 2181
Canberra ACT 2601

The street address is

c/o Regulation and Reform Division
Australian Maritime Safety Authority
Level 1
26 Mort Street
Braddon ACT 2612

Telephone enquiries can be directed to the Manager, NMSC, on (02) 6297 5826.

The secretariat e-mail address remains unchanged at secretariat@nmsc.gov.au.

John Henry
Standards Team Leader
National Marine Safety Committee

National System Consultation

After 14 weeks and 30 stakeholder meetings around the country, Phase 1 of the proposed National System for Commercial Vessel Safety consultation process has closed. The consultation was part of the Australian Government's wider reform agenda to improve the productivity of Australia, in this case by improving the ability of vessels and seafarers to move around the country as well as simplifying industry compliance costs through the establishment of one set of standards and one set of rules. Representatives from across AMSA and state maritime authorities travelled to locations in six states and two territories to meet with industry stakeholders and interested members of the public. The consultation aimed to make details of the proposed regulatory framework available to as many industry and community stakeholders as possible and to capture feedback through meetings and formal submissions received via the National System consultation website.

The key document informing the consultation was the Regulatory Plan which was developed with the participation of all jurisdictions. The plan aims to provide a scheme where approvals and certificates for existing vessels are recognised to the extent practicable and new vessels are compliant with the National Standard for Commercial Vessels (NSCV).

Consultation materials were also posted on the AMSA website and comprise the draft Regulatory Plan, a description of the proposed National Law Act, features of the National System, and various fact sheets explaining the elements of the Regulatory Plan.

There was a high level of support from industry regarding the concept of a National System. The idea was regarded by participants as common sense. However stakeholders said the effectiveness of the reform will depend on its practical and simple delivery. Stakeholders are pleased with the changes to the proposal that have been made since the 2009 consultations.

"The importance of this reform cannot be overstated," said AMSA Chairman, Mr Leo Zussino, at a National System consultation meeting at Central Queensland University, Gladstone. "Nationally-consistent standards and rules, reduced complexity for vessel owners and operators, greater portability of seafarer qualifications, and a reduction in costs and red tape are just some of the benefits that we expect. There will be, for the first time in Australia, one safety regulator (AMSA), one law (Commonwealth law) and one safety system for commercial vessels rather than the seven we have at the moment. The transition to a single national regulator for commercial vessels will present challenges over the coming months and years. I am very confident, however, that with cooperation from the maritime industry and our state and territory government colleagues, Australia will realise the benefits from this reform," said Mr Zussino.

Phase 2 of the consultation process will involve consultation on new near-coastal national seafarer certificates to be developed by the National Marine Safety Committee and AMSA as part of an update of NSCV Part D.

Richard Wallace
Manager Regulatory Communications and Consultation
Regulatory Affairs and Reform
Australian Maritime Safety Committee

Design and Build of Composite Patrol Boats

David Firth and Valerio Corniani
Gurit Australia

Introduction

This paper sets out to work through and discuss the design process and options a structural engineer should consider to complete the successful design of a composite patrol boat. The topics covered will range from determining the basic performance criteria for the boat through to the final design of the structural elements.

Included will be information to help support the design choices made to use composite materials and provide additional ideas for improvements and developments over existing composite design solutions. Developments will be based on actual experience of designing and engineering composite patrol boats to improve performance criteria.

Topics covered will include operational requirements, through life costs, arrangement implications, manufacturing technology, materials and efficient structures. There will be information covering the recent developments in fire safety for composite materials and additional data that can be used to influence the selection of a composite patrol boat.

Operation and Performance Requirement

The design of composite patrol boats starts with a definition of the performance criteria required of the vessel. The difficulty for the structural engineer is determining the effect and priority of each different criterion on the structural arrangement. For small patrol boats the driving performance criterion is generally high speed which will result in a requirement for light weight. High speed will mean high design accelerations which result in higher slamming loads for the hull structure which, in turn, can lead to an increase in structural weight.

The selection of the correct design acceleration is crucial as a starting point for the structural design; however, the value needs to be realistic to match the expected operational conditions. The design acceleration is a relationship between the vessel speed, displacement and expected sea state. Many patrol boats will have a maximum speed of 50 kn however, not all of them will do this speed in high sea states, as crew safety concerns will limit high accelerations. The structural engineer needs to have guidance from the naval architect and operator to correctly determine the right sea state and speed; there may have to be several iterations to determine which case develops the highest pressure loads on the structure.

The final design can be a compromise, where an accelerometer is positioned at the helm station with the validity of the structure dependent on a recorded maximum acceleration and not sea state or speed, and relying on a properly-trained crew to control the craft to suit. Performance criteria are not just limited to high speed; the boat may have a requirement for high payload capacity. A light structure will, for a given hullform; allow for greater payload capacity, this can lead to multi-role functions for a single-vessel design. If a craft has a requirement for long service range then building a lighter structure will permit a greater range at similar speeds for the same power and fuel; this argument is also valid for reduced fuel consumption.

Manufacturing Technology and Material

After determining the performance criteria for the design the structural engineer now needs to review what materials and construction processes will be used to construct the final designed vessel.

An efficient structural design will involve open dialogue between the naval architect/client, structural engineer and builder to determine the most appropriate manufacturing technology and materials. The first question to ask generally is whether the design is going to be a series production or a one-off build, as some construction process may not be best suited to one-off construction or series build. Generally, most patrol boats will be built as a series to replace an existing fleet. To save on the cost of painting and fairing a hull and deck, the builder will construct female moulds to match the technology level to be used.

Hand Lamination

Hand lamination was the first technology used when composites were introduced in the marine industry. This technology is still used for cheap and low specification constructions. Fibres are wetted with resin and hand laminated over the mould. Materials used are usually glass fibres and polyester resins, as these are the lowest-cost resin and fibre types. Sandwich panels using a structural core are usually limited to panels above the hull bottom. This type of construction is the lowest technology level requiring the simplest mould; however, to get good laminate quality the skill of all the laminators needs to be high.

Vacuum Consolidation

The composite laminate is still hand laminated with resin and dry reinforcement; however, a vacuum bag is used to cover and consolidate the laminate, this uniform pressure over the laminate helps to remove voids and improve laminate quality. Vacuum consolidation is also used for bonding of the core to ensure an accurate fit against the first skin. Using a vacuum bag will allow excess resin to be drawn off-reducing the weight of the laminate. This level of lamination will require a better-quality mould to ensure that it is air tight; the skill of the laminators will still have to be high to ensure good-quality laminates are created before the vacuum bag is applied.

Resin Infusion

With resin infusion, developed more than 15 years ago, all dry materials (including the core of a sandwich panel) are placed in a mould and then vacuum consolidated. Once the dry laminate has been properly consolidated and inspected for air leaks, resin is introduced into the bag directly on to the laminate and pulled through the dry material by vacuum lines on the edges of the mould. This process wets out the fabric and core surfaces, producing a high-quality lightweight laminate. It is critical for this process that the mould is of high quality and air tight as the vacuum will pull any air leaks into the laminate rather than the resin. The skill level required for infusion is lower, as the laminate is assembled rather than laminated.

Pre-Preg

This method was initially developed for the aerospace industry to produce the lightest and highest quality laminates. Dry fibres are pre-impregnated with a temperature-dependent catalysed resin before they are laid into the mould. This process gives the laminate the ideal fibre/resin ratio to achieve the optimum laminate properties. The fibres combined with the resin are laminated into a mould and vacuum consolidated before the mould is placed in an oven which has to be heated at the required temperature to start the cure process of the resin, typically 70°C to 100°C for marine applications. This process requires a high-quality thermally-stable mould, an oven and a freezer (to store the material). The skill level is the same as for vacuum consolidation to ensure minimal voids before the vacuum consolidation.

Sprint

This is a new fabric type developed by SP Systems (now Gurit) which combines the best aspects of resin infusion with the precise laminate quality of pre-preg. A temperature dependant catalysed resin film is sandwiched between dry fabric layers. The combined material is placed in a mould and then vacuum consolidated and, as the fibres are still dry, these act as a pathway to the vacuum for evacuation of any air trapped between layers. Once the material is consolidated the mould is placed in an oven which has to be heated at the required temperature to start the cure process of the resin, typically 70°C to 100°C. This process requires a high-quality thermally-stable mould, an oven and a freezer (to store the material). The skill level required, however, is lower than for pre-preg as layers are easier to lay down and less care has to be paid to ensure that no air is trapped between layers (i.e. no need for de-bulking).

The average weight savings for each of the above construction methods are listed below in Table 1. The similarity between vacuum consolidation and resin infusion is driven by the additional weight of the resin infused in the core, which doesn't happen with vacuum consolidation.

Cost comparisons between different construction methods are dependent on too many variables and harder to define in one table.

Construction Method	Overall Structural Weight %
Hand Laminated Single Skin	100
Hand Laminated Hull Bottom Cored	85-90
Vacuum Consolidated	65-80
Resin Infusion	65-80
Pre-Preg or SPRINT	55-65

Table 1 — Construction method weights

OH&S Requirements

In recent years the health and safety requirements of the composite boatbuilding industry have been increased significantly. This has led to developments in process technology and changes in the materials used. The main concern is exposure to resin and emissions of styrene from curing of polyester and vinylester resin. Epoxy resins do not have this problem and with careful selection of the correct hardeners, epoxy provides a low OH&S risk for wet resin laminating. The concerns about styrene emissions have led to the widespread adoption of vacuum infusion in the composite boatbuilding industry for vinylester construction (polyester-based resins are generally not ideally suitable for infusion). The infusion process is a closed mould technology so the emission of styrene is greatly reduced as there is little exposure to the air. Sprint and pre-preg both give the additional OH&S advantage of not requiring the user to mix resins.

Toughness

When designing a composite patrol boat-toughness is often one of the driving factors. Impact toughness can be measured quite easily. Research conducted by VT Halmatic in the UK [1] has shown that the impact toughness of modern advanced composites is on par with existing low-tech thick heavy lamination and aluminium plate. The study also showed that Kevlar is not the best composite material to provide good impact toughness, with T700 carbon and glass testing very well. The best-performing laminate was a T700 carbon-skinned sandwich panel.

Composites also have the advantages of natural damping and insulation to protect against shock pressure loads, an advantage which has been well proven in the use of composites in mine-hunter hulls. The US Navy is currently testing a full-composite high-speed patrol boat which has been designed in composite specifically to take advantage of the damping to reduce the effect of the high impact slamming forces on the crew onboard the boat.

Moreover, structural damage to composite ships resulting from minor collisions with concrete wharves, and even minor reef groundings, has generally been shown to be confined to the gelcoat and is easily repairable.

Hull Bottom Core Material

Traditionally the use of core materials in the hull bottom has been frowned upon; this is more to do with poor choice of materials. The cores traditionally chosen for hull bottom slamming regions have proven not suitable for dynamic slamming loads.

A core material to support the high slamming loads experienced in a fast patrol boat's hull bottom must have a combination of high shear strength and shear elongation.

The cheaper structural core-like balsa and the strong cross-linked PVC foams that have traditionally been used have the required high shear strength, but their shear elongation is low which results in core shear failures from high dynamic slamming loads.

Linear PVC and SAN foam cores have the combined benefits of adequate shear strength and excellent shear elongation. This allows the cored panels to support dynamic slamming loads without core shear failures.

Fire Protection

Whilst it is well known that composites have poor fire performance, to reject the use of composites on this basis is akin to rejecting steel and aluminium as boat building materials because they sink.

The fire safety and protection requirements for patrol boats are not governed by a specific rule, whilst passenger craft are typically governed by the IMO codes. However, the fire requirements of the IMO HSC Code are commonly adopted for patrol boats.

The HSC Code has two types of designations: fire-resisting divisions, and fire-restricting materials. However, to be a fire-resisting division, the division must be constructed from fire-restricting materials.

In this area of fire-restricting materials, the approach for composite materials has been to either coat a panel in an intumescent paint or coating, use fire-retarding versions of existing resin systems, or use materials with inherent fire-restricting properties.

The latter two options, whilst providing the fire protection required, have drawbacks of reduced mechanical properties or increased cost. Recent developments have been focussed on producing resins and coating systems which will provide the required fire-restricting properties.

For fire-resisting divisions, a light-weight structural fire protection is also required for all composite materials to achieve the requirements of the HSC Code; this is similar to a boat built of aluminium.

Structural Design

With the performance criteria for the design and the manufacturing technology determined, the structural engineer needs to focus on the structural arrangement of the vessel and the main structural components.

Global Stiffness

Additional research performed by Gurit [2] has looked into the effect of common arrangement complications affecting patrol boats. This study demonstrates the impact of several arrangements on the longitudinal stiffness of a vessel.

As an example, the following findings can be taken from the research.

Patrol boats often have small deckhouses to give plenty of working deck space, however, it can be shown that whilst the deckhouse is small, its contribution to overall longitudinal stiffness is significant and cannot be discounted as a classification society may do.

Larger patrol boats will commonly have a dropped aft main deck for easier deployment and recovery of personnel. Whilst an initial inspection could discount the longitudinal effect of both the upper and lower main decks as providing no contribution to the vessel's longitudinal strength, it can be shown that both decks provide a greater-than-expected positive effect on the hull longitudinal strength. The same effect can also be shown with discontinuous lower decks.

Production-friendly Structures

Where patrol boats are designed for production or series builds, the structural engineer should provide solutions to reduce build time. When building a series of composite boats the hull and deck shells will be produced in a female mould; to speed up the production time of the series, it is important to reduce in-mould time. The structures should be designed to be made out of the boat at the same time as the hull. Parts made out of the boat can be made on separate moulds or on flat tables where the use of vacuum consolidation or infusion can be utilised to reduce weight and improve laminate quality.

The layout of the systems installation should be created at the same time as the structure is designed to remove any unnecessary clashes and incorporate penetrations into the initial build. Having the system penetrations already designed and built will save time when building the structure and during the installation of the systems.

The choice of hull bottom laminate needs to be considered, not just on the cost difference between the materials used in the basic laminate of a sandwich hull bottom or a single skin hull bottom. Typically a single-skin hull will require more transverse frames between bulkheads than a cored hull bottom. The additional labour and material costs required to build the additional transverse frames of a single-skin laminate has to be included when comparing hull bottom laminate costs. See Figures 1 and 2 for images of typical hull bottom supporting structure for a 9 m RIB as an example of the additional material and labour that would be required.

Figure 1 — Example of internal structure of single skin hull bottom

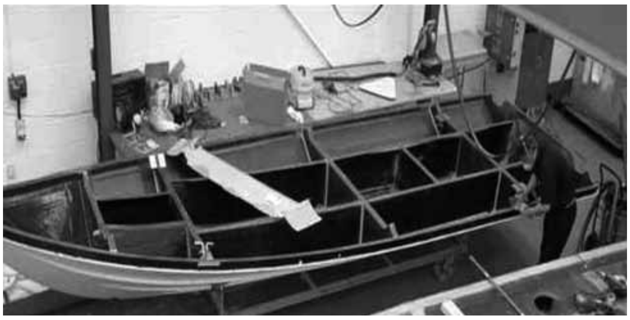


Figure 2 — Example of internal structure of sandwich hull bottom

Pre-Made Hull Beams

An efficient way of saving time and weight in the build of a composite boat is to build the longitudinal and transverse supporting beams out the boat on a flat table. A vacuum-consolidated beam will be lighter and have higher laminate quality than a foam-cored top-hat beam laminated in the boat. The pre-made beam will use less core materials, saving cost as well. A simple wooden former mould is required on the table; however, this is a simple detail as good surface finish is not required. See Figure 3 for typical beam cross sections.

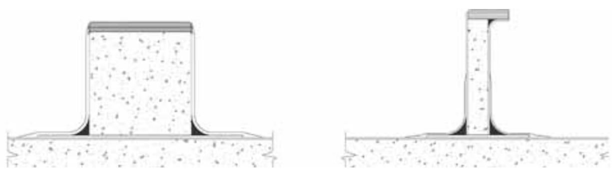


Figure 3 — Typical Beam Sections

One-piece Frames and Bulkheads

If a total approach is taken to the design of the hull bottom, topsides and deck supporting structure to ensure continuity between the different elements, then the complexity of the structure can be simplified. This will lead to savings in material and labour cost. Combining the structural elements into ring frames or partial bulkheads allows these elements to be built as a single moulding on a flat table using either vacuum consolidation or infusion. With the structural elements combined, there is a reduction in the total build time as less parts have to be laminated into the boat.

Through-life Cost

Maintenance

A composite structure offers the clear advantages of having no susceptibility to corrosion or fatigue cracking, combined with relative ease of localised repair.

In-service experience with composite naval ships has demonstrated that the elimination of the need for structural maintenance serves to minimise dry-dock downtime and additionally frees up crew from traditional day-to-day painting for corrosion protection.

The benefit to the navy is greater operational availability of both the crew and the vessel.

Hull Longevity

Steel and aluminium ship structures may experience fairly constant maintenance costs over a 15-year service life, thereafter maintenance costs begin to rapidly soar with the onset of steel corrosion and aluminium fatigue cracking. For small naval vessels with relatively light hull scantlings, 20% of steel hull plating typically needs replacing at the 15 year mark. By comparison, today's composites technology has eliminated osmosis, so composite vessels retain their aesthetics, exhibit no structural deterioration, and experience no escalation in maintenance costs over and beyond a 20-year lifecycle. The comparison is represented in Figure 4.

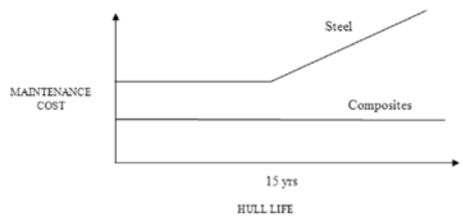


Figure 4 — Structural Maintenance Costs over Lifecycle

Moreover, the additional downtime required for maintenance of both steel- and aluminium-hulled patrol boat fleets beyond year 15, would reduce further their relative operational availability.

The useful operational life of a composite vessel is not limited by its structural integrity or any escalating maintenance in the final years of operation. However, extended life could be limited by the aging and obsolescence of the equipment outfit. These issues can be separately addressed by designers, in particular in the selection of the installed configuration of the propulsion system so as to optimise its serviceability and extend the system service life.

Operational Costs

A composite patrol boat structure can be engineered to be significantly lighter and, as a consequence, require less installed power for equivalent performance. This enables the selection of smaller, lighter engines, creating better access for machinery maintenance which can help to minimise vessel downtime and maximising operational availability. Smaller engines will have reduced fuel and consumables consumption which provide significant cost savings per year.

The careful selection of composites hull material and associated installed power could achieve the maximum fleet availability and minimum support costs over the longest term. The higher boat availability achievable through adopting composite vessels means that mission requirements could be achieved from a smaller fleet of boats — effectively delivering direct savings in fleet acquisition and support costs, in addition to the projected operational fuel savings.

Military Requirement

Composite materials have several properties that are of advantage when considering the implications of military requirements of a patrol boat.

Radar/Stealth Signature

Being non-metallic, composites have a very low radar signature and, combined with the ability to maintain very flat panels, gives composite patrol boats a low radar signature. Further reductions can be included with the use of radar-absorbing materials into the laminate. The thermal insulation properties of a sandwich composite panel, combined with the low thermal conductivity of composite laminates, will help to reduce the infra red signature of the vessel.

The combination of low thermal properties and low radar signature give composite boats the possibility of excellent stealth characteristics, without the need for additional components.

Magnetic Signature

The suitability of composites for use in boats operating in minefields has been well documented and proven with the use of composite materials in modern-day mine counter-measure vessels.

Ballistic Protection

There are currently developments in the field of ballistic protection incorporated into composites; however, these technologies are not yet commercially available. The use of aramid in bullet-proof vests is well documented; however, the use of aramid in a structural composite laminate does not give the same protection. The main reason for this is not only that the type of aramid used in bullet-proof vests is a different grade from the one used for structural laminates, but also that, when laminated, the aramid is locked in the layup by the resin, not allowing membrane deformation but forcing the fibres to work in shear.

A 15 m Patrol Boat Example

Gurit was recently contracted to re-engineer an existing design with the design brief to reduce weight and simplify the construction. After several design loops exploring the various possible structural arrangements, we defined the optimal solution for our client.

The initial structure was designed with a single-skin hull bottom and cored topsides and deck. The hull and deck panels were supported by numerous foam top-hat beams.

The materials chosen for this structure were pre-preg carbon with Nomex cores for the main mouldings, and wet-laminated carbon and foam for the supporting structure.

Gurit's approach was to switch to a foam-cored hull bottom and change the technology level to infusion to reduce the costs. The main mouldings are laminated with carbon fibre and Corecell (SAN) foam vacuum infused with epoxy resin; the supporting structure is, where possible, laminated on vacuum tables with carbon fibre and epoxy resin. The amount of transverse hull structure has been reduced significantly; the remaining transverse structure has been combined to incorporate beams into complete frames or partial bulkheads.

The weight and cost savings made are summarised in Figures 5 and 6; the summary has been broken down into sections to show where the main savings have been made.

The figures show that, whilst a light-weight high-quality laminate option has been chosen, without including a light-weight structural arrangement, further weight and cost savings would have not been realised.

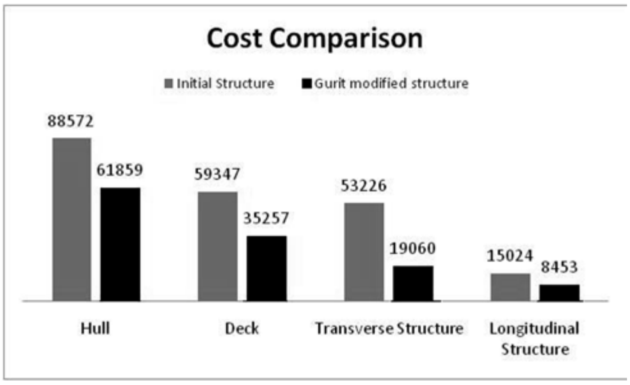


Figure 5 — Cost comparison

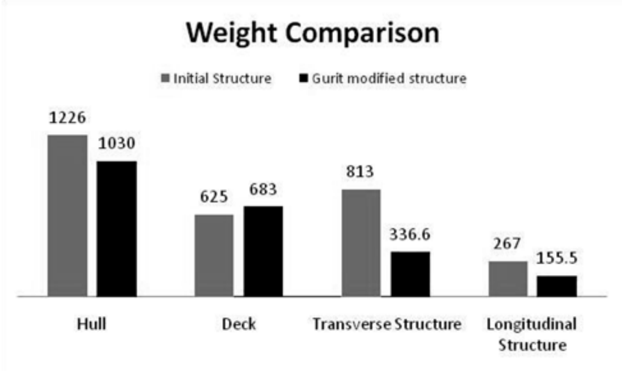


Figure 6 — Weight comparison

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1. Lee, S. and Findon E.; *Impact testing of High Technology Laminates and Structures*, METS 2005 Presentation

2. Schrum, M. and Wadia, M.; *Hull Girder Strength of a Composite Patrol Boat*, SNAME 2009 Annual Meeting.

This paper was presented to the NSW Section technical meeting on 1 June 2011. It was first presented at the Pacific 2010 International Maritime Conference, Sydney, January 2010

THE INTERNET

CurveExpert

Have you ever had a set of data to which you wanted to fit a curve or surface, and MS Excel didn't do the job very well, and you were daunted by the prospect of programming a least-squares fit to do it properly yourself?

Well, help is at hand in the shape of CurveExpert Professional. Visit www.curveexpert.net and download a free 30-day trial version of this program, and test out its features. For a two-dimensional (*x-y*) set of data, it tries 46 different curves of many different types (including linear and polynomial regressions up to degree 9, built-in nonlinear regressions and Lowess smoothing). For a three-dimensional (*x-y-z*) set of data, it tries 26 different surfaces. Data can be imported by cutting and pasting from MS Excel, for example.

For each fitted curve the regression coefficient R^2 is given, together with the form of the equation and the coefficients determined, a plot of the data and the fitted curve, together with values interpolated at any intermediate locations.

CurveExpert Pro is compatible with all versions of Windows, OSX 10.5.8 and above (Leopard or Snow Leopard), and Linux.

If you do this sort of thing regularly and decide to buy, then the cost is $70 for CurveExpert Professional, or $45 for CurveExpert Basic.

Geordie Grant
UNSW Student

Live Flight Radar

You may be aware of websites for airport flight arrivals and departures; see, for example, the one for Sydney airport at www.sydneyairport.com.au/flights/flight-arrivals-and-departures.aspx?SearchLeg=A&SearchType=I.

However, a new twist is the live flight radar, which you find by clicking on the link towards the top left of the screen. This brings up a map of the world and, superimposed on it, the tracks of flights currently inbound for Sydney and the location of each flight along that track. Hover the mouse over each plane icon, and you get the flight details of airline, flight number, point of departure and arrival, and scheduled and estimated arrival times. For direct access, enter www.sydneyairport.com.au/flights/live-flight-radar.aspx.

Phil Helmore

VSE Consulting

Following the closure of the SP-High Modulus composite engineering group in Sydney, Engineering Manager Valerio Corniani and Senior Engineer Warren Miller have formed VSE Consulting to continue service to the Australasian region. VSE Consulting creates composite solutions for the marine, civil and mining industries with a combined experience of over 40 years.

"Having a passion for creating innovative solutions has driven my career at Gurit and I am really excited about moving forward with VSE" says Corniani. "The marine industry in Australasia has slowed somewhat, but there are still many opportunities for smaller, more-agile consultancies".

With several customers already on the books, the firm is postured for rapid growth over the next few years. The current workload includes customers from a variety of fields, with the majority being marine and civil related.

"We have a much more hands-on approach as a smaller firm, and are much more flexible in terms of spending time directly with customers. Our effectiveness is enhanced enormously by being available on site" according to Miller.

Valerio Corniani

FormSys acquired by Bentley Systems

On 31 October 2011, Formation Design Systems (FormSys) was acquired by Bentley Systems, Inc. Bentley Systems are well-known for their MicroStation CAD software, but they also have a comprehensive portfolio of software products covering most engineering disciplines and data-management requirements for the full spectrum of capital infrastructure projects and operations.

The FormSys team become a part of the Integrated Engineering Group within Bentley which includes structural and offshore solutions and ,with FormSys, marine. They will be working closely with the SACS team in New Orleans who were acquired by Bentley in February 2011. SACS is an industry leader in the analysis of offshore structures.

As a part of Bentley, FormSys will now have additional resources to support the ongoing and very active development program for Maxsurf and Multiframe. The acquisition of FormSys represents a significant additional step by Bentley to strengthen its software solutions in the marine, structural and offshore sectors. Philip Christenson is now the Director of Product Development — Marine Solutions.

More information can be found at http://www.formsys.com/home/home/about-us/bentley-acquisition.

Wärtsilä to equip First US-flagged LNG Offshore Vessel

Wärtsilä was awarded a contract in October 2011 to supply liquefied natural gas propulsion equipment for two advanced offshore supply vessels owned by Harvey Gulf International Marine. These supply vessels will be the first-ever U.S. flagged platform supply vessels (PSV) to be powered by clean, safe and efficient LNG. The contract includes options for supplying propulsion equipment for additional follow-on vessels.

Wärtsilä will deliver an integrated system which includes the dual-fuel machinery, and electrical and automation packages, complete propulsion and the LNG fuel storage and handling components. The STX Marine Inc SV310DF Offshore Support Vessels will be powered by Wärtsilä 6-cylinder 34DF dual-fuel engines. The LNG storage capacity of 290 m^3 enables more than a week of vessel operational time. In addition, the vessels will carry 5520 t of deadweight at load line and have a transit speed of 13 kn. The vessels are scheduled for delivery in two years and will operate in the Gulf of Mexico.

Mr Shane Guidry, Harvey Gulf International Marine's Chairman and CEO, said that the stringent governmental demands for reduced emissions, together with predictions that availability of ultra-low-sulphur diesel fuel will be restricted, caused the company to consider the use of gas as fuel. "We're committed to bringing the world's best technologies to our customers, and these vessels with Wärtsilä's integrated system based on the use of LNG further demonstrates Harvey Gulf's Going Green Vision," he said.

Pete Jacobs, Business Development Manager, Offshore at Wärtsilä North America added "It's a pleasure to work with a company such as Harvey Gulf whose management is dedicated to introducing advanced, clean, natural gas supply vessels. These modern supply vessels showcase Wärtsilä's leading position as a complete solutions provider of LNG propulsion with electric drive systems."

"We are witnessing a transformation of the marine industry as it charts a course towards a new era for natural gas. It's exciting for Wärtsilä to be a trusted partner in this launch with industry leader Harvey Gulf, whose natural gas supply vessel investment actions of today signal a coming paradigm shift. This is aimed at capturing operational savings while simultaneously reducing emissions," said John Hatley, Vice President Ship Power, Wärtsilä North America.

Wärtsilä has been at the forefront in the development of highly-efficient dual-fuel engine technology, allowing the same Wärtsilä 34DF engine to be operated on either gas or diesel fuel with full EPA emissions Tier 2 compliance. This dual-fuel capability means that when running in gas mode, the environmental impact is minimized since nitrogen oxide (NOx) emissions are reduced by some 85% compared to diesel operation, sulphur oxide (SOx) emissions are completely eliminated as gas contains no sulphur and emissions of CO_2 are also lowered. Natural gas has no residuals, and thus the production of particulates is practically non-existent.

The shipping industry finds the operational savings that gas offers to be very compelling. Similarly, the significant environmental benefits that LNG fuel provides are of increasing importance. With fossil fuel prices, and especially the cost of low-sulphur marine fuel, likely to continue to escalate, gas is an obvious economic alternative.

Drawing from decades of experience in the development and application of natural gas engines for both the power generation and marine industries, Wärtsilä is the global leader in this advanced technology. Wärtsilä recently passed the 3 million running hours milestone with its dual-fuel engine technology.

MSV *Fennica*
(Photo courtesy Wärtsilä)

Wärtsilä to Supply Catalytic Converters for Finnish Multipurpose Icebreakers

Wärtsilä has been contracted by Finland-based Arctia Offshore Oy to carry out modification work to two of the company's vessels. The contract was signed in September 2011. The turnkey project involves the fitting of combined Wärtsilä NOx Reducer (NOR) and Oxidation Catalysts (OXI) to MSV *Fennica* and MSV *Nordica*, both of which are multi-functional vessels based on a modified icebreaker design. The ships will also be converted to enable the use of ultra-low-sulphur diesel fuel.

When this conversion work is completed, the vessels will meet the United States Environmental Protection Agency's (EPA) emission requirements for operating in the Arctic Ocean. This opens up the possibility for Arctia Offshore to participate in Arctic oil exploration projects in an environmentally-sustainable manner. The work will involve fitting the combined Wärtsilä NOR/OXI solution to each of the eight engines that drive the two vessels. The installation schedule is divided into two parts, with the first set scheduled for completion by the end of December 2011, and the second set by the end of April 2012. The emission-control device consists of a combined abatement system designed to reduce nitrogen oxides (NOx) and to enable the oxidation of carbon monoxide and unburned hydrocarbons. The NOR is a customised solution specifically engineered to meet the EPA's emission standards.

Wärtsilä NOx Reducer (NOR) and Oxidation Catalyst (OXI)

The Wärtsilä NOx Reducer is based on Selective Catalytic Reduction (SCR) technologies, and achieves a reduction in NOx emissions of 85–95 per cent. The new SCR product range caters for the needs of all four-stroke engines in Wärtsilä's portfolio, and is seamlessly integrated into the Wärtsilä engine control system. The units come with a complete prefabricated ancillary system.

Wärtsilä has gained considerable field experience in running SCR on its own engines in marine, as well as power-plant applications, since the early 1990s. As a result of this experience, Wärtsilä has developed a standard selection of modularised SCRs under the Nitrogen Oxides Reducer (NOR) product name in close co-operation with a major catalyst manufacturer. The solution is designed to combine efficiency with minimal investment and operational costs.

The Wärtsilä Oxidation Catalyst oxidizes unburned components with the help of the residual oxygen in the flue gas, and forms carbon dioxide and water as end products.

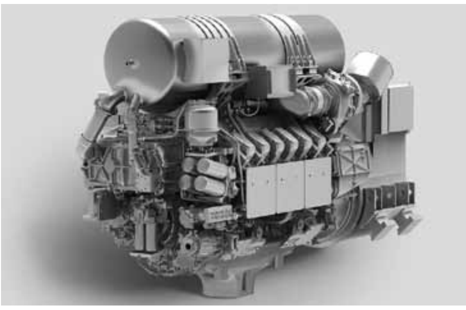
Battery-charging Technologies for Advanced Submarine Requirements

Arndt von Drathen
Senior Manager, Application Centre Marine, Submarine and MCMV Applications, MTU

Product Concept of Further-developed Battery-charging Units

Naval operational scenarios have changed significantly over the last thirty years. Together with technology advances, this has changed advanced submarine requirements. These surpass the continuously-improved and well-established submarine-engine designs. Starting in 2009, MTU began combining the properties of its existing successful submarine solutions for all customers' submarine designs with new market requests from submarine builders. The resulting product specification was then augmented with the requirements of modern submarines. In 2011 the detailed concept study for these functional and performance requirements showed the feasibility of such an improved product. The major challenge facing the project team was to maintain the benchmark setting characteristics of the Series 396 SE and simultaneously incorporate abilities to meet the latest operational requirements. Following the successful development of the Series 396 submarine engine, the vast experience gained with the Series 4000 provides a reliable and commercially viable basis for the development of the next generation of submarine engines. MTU's Series 4000 has been successfully established in various applications, including navies, commercial vessels, yachts, locomotives, mining trucks and generator sets since 1996. It is the first off-highway engine with a common-rail fuel-injection system. So far more than 21 300 of the Series 4000 engines have been delivered. More than 3100 of those have been in marine applications. The delivered engines have accumulated more than 35 million operating hours.

The advanced submarine engine will therefore utilise a large number of proven components from Series 4000. As for all predecessor submarine engine designs, submarine-specific components have been developed to satisfy the demanding operating conditions on board submarines.



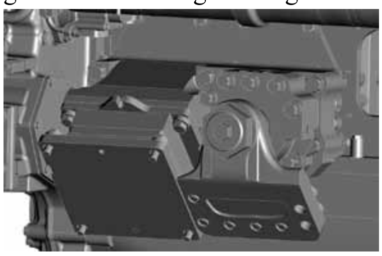
The MTU 12V 4000 U83 Submarine Charging Unit
(Photo courtesy MTU)

An Advanced Submarine Charging Solution: Design Objectives

Due to the great numbers of 16V 396 SE engines in the existing submarine designs, one of the design objectives was to meet dimensions, weights and volume flows of such generating sets as closely as possible. This would allow an installation in existing submarine designs with a minimum of changes to the actual submarine drawings. A submarine charging unit with a 12V 4000 submarine engine does have smaller dimensions compared to a 16V 396 SE design. However, the mechanical power is noticeably increased to 1300 kW at 1800 rpm. Volume flows of intake air and exhaust gas are slightly higher but almost match those of the most powerful 396 design.

Another major design objective was the reduction of the specific fuel consumption in combination with greater operating flexibilities for different scenarios. A common-rail system in connection with combustion processes and modern engine electronics is able to satisfy both requirements. One completely new feature of the Series 4000 submarine engine is therefore the ability to operate in different modes. The standard operating mode is the acoustically optimised mode. In this operating mode, the engine has the lowest air- and structure-borne noise emissions, with a specific fuel consumption improvement of at least 5 g/kWh. For long operational periods in transit to the theatre of operations, the engine can be switched to a fuel-consumption-optimised mode with slightly increased acoustic signatures. This will allow reduced specific fuel consumption by at least 10 g/kWh. Finally, it is possible to select an emissions-optimised mode for surface operation. The emissions-optimised mode operates under IMO II-compliant conditions without increasing the specific fuel consumption.

With the Series 4000, MTU is improving the integration of the charging unit and generator even further. The charging unit has only one interface to the ship's automation as the generator and exhaust system can be monitored and controlled from the local operating panel when needed. Due to the continuous charging of an uninterruptable power supply directly via generator (including a power-safe function during standby), the generating set can be operated under black-ship conditions. The engine is started quietly via the generator and includes an air-start motor with turning and draining capability for emergency purposes. High and competitive shock and acoustic requirements are met with a special engine foot including an integrated shock limiter.



Integrated engine carrier and shock limiter
(Image courtesy MTU)

Extended Operation Periods, Lower Maintenance Load

One of the most significant improvements, however, relates to the logistics challenges described previously — maintenance and LCC. Following the operational cycles of a modern submarine, with long periods of transit as well as a more demanding lithium-ion-battery-based load profile the complete overhaul cycle of the engine can be increased to more than 20 years. As a comparison, the Series 396 SE engine when operated according to the less demanding lead-battery-based load profile does require the first complete overhaul after 12 years. Along with the reduced number of maintenance steps of this modern engine in general, this design improvement leads to significantly reduced maintenance hours and lower numbers of spare parts over the lifetime of a submarine, as well as extended periods of operational availability.

Survey Catamaran from Incat Crowther

Humber Guardian, the first of three new coastal survey catamarans designed by Incat Crowther was delivered by the UK's Mustang Marine to Briggs Marine in August. The vessel will be deployed by Briggs Marine to support coastal survey operations for the Environment Agency of England and Wales

Incat Crowther worked with Mustang Marine and Briggs Marine to develop a practical, capable and rugged vessel.

The vessel's aft working deck features a 2-t A-frame, man-overboard davit and moon pool. A work bench is also fitted.

The main deck cabin has three primary areas. The first of these is the large working space consisting of both wet and dry laboratories, as well as a day toilet. A data network has been installed, as has a fridge/freezer and two computer terminals for data processing.

Forward of this is a crew space featuring a galley and mess, as well as access into the hulls. At the forward end of the cabin is a raised wheelhouse, affording excellent all-round visibility.

A RIB is stowed on the deckhouse roof which is launched and retrieved by the adjacent Effer 3700/1E hydraulic knuckle boom crane. This crane is fitted with a 600 kg winch, capable of lifting items with a maximum weight of 1300 kg at a radius of 2.5m.

Accessed via stairs from the galley/mess space, the hulls offer more comfortable live-aboard accommodation than previous vessels used by the Environment Agency. There is accommodation for six in three twin cabins, as well as a bathroom in one hull.

Humber Guardian is powered by a pair of Volvo Penta D9-MH main engines, each producing 261 kW at 2200 rpm. The power is driven through Twin Disc MGX-5075 gears to five-bladed propellers. The vessel has a service speed of 16 kn, and a maximum speed of 18 kn.

Principal Particulars

Length OA	18.3m
Length WL	17.2m
Beam OA	6.3m
Draft (skeg)	1.4m
Depth	2.7m
Construction	Marine grade aluminium
Fuel	2400 L
Fresh Water	1400 L
Sullage	1400 L
Crew	2
Science Officers	10
Speed (Max)	18 kn
Speed (Service)	16 kn
Main Engines	2 × Volvo Penta D9 MH each 261kW at 2200 rpm
Propulsors	2 × Five-bladed propellers
Generators	1 × Beta Marine 25 kVA, 50hz 1 × Beta Marine 11kVA, 50hz
Classification	UK MCA SCV Category 2

A port bow view of Humber Guardian
(Photo courtesy Incat Crowther)

Lower block 03 for the Royal Navy's new aircraft carrier HMS *Queen Elizabeth* leaving the Clyde recently for Rosyth where the ship will be assembled. The size of the 8000 t block can be gauged by the Type 45 destroyer in the background
(Photo courtesy BAE Systems)

AUSTRALIAN MARITIME DEFENCE COUNCIL

Navies have had a long relationship with their respective maritime industries and the Royal Australian Navy (RAN) is no exception. Naval capability cannot be built, maintained and supported without a strong industrial sector. This is well known, but there are other aspects to the RAN relationship with the maritime industry that are less well known, and this article examines the relationship with the shipping and port associations through what is now called the Australian Maritime Defence Council (AMDC). While its discussions are not classified, they are occasionally sensitive, so what follows focuses on administrative issues before providing a general outline of topics considered by the Council.

The antecedents of the AMDC go back to the early 1980s, when the Chief of Naval Staff, Vice Admiral Willis, RAN, chaired a meeting between senior RAN officers and senior executives from Australian-flag shipping companies on 8 April 1981 to discuss the need for regular meetings between them. The naval rationale for such meetings was to establish a framework for naval control of shipping operations in Australia during periods of tension or limited aggression. Often forgotten now, the historical experience of the World War II *guerre de course* against merchant shipping informed global military planning during the Cold War where the protection of merchant shipping from naval attack was given a high priority [1].

At a subsequent meeting on 6 November 1981, hosted by the Australian National Line in their boardroom in Sydney, it was agreed there would be considerable value in creating an Australian Shipping Defence Council (ASDC) with membership initially limited to the RAN and shipowners, and to representatives from the Department of Defence (movements and transport) and the Royal Australian Air Force (RAAF).

On 9 February 1982, VADM Willis sought approval from the Minster for Defence, the Hon. D. J. Killen, to create the ASDC with the purpose:

> To provide liaison between the RAN and those who control and operate Australian merchant shipping in time of peace in order to plan for its safety and protection in time of threat, tension, emergency and war.

The Minister for Defence approved the creation of the ASDC on 25 February 1982 as a non-statutory body with the Deputy Chief of Navy as its chairman, and its inaugural meeting was held in May 1982. Early membership from industry included the Australian National Line, BHP, Ampol Petroleum, Howard Smith Industries and TNT Bulkships. The Department of Transport requested membership on 22 June 1982 and this was approved by the Minister for Defence in August; under a variety of different names, the department has played an important role in Council deliberations ever since.

The actual details are difficult to discern after all this time, but there appears to have been some early concern over the ASDC by some areas in the Department of Defence, as the Chief of the Defence Force Staff, Air Chief Marshal McNamara wrote to the Chief of Naval Staff on 25 October 1982 to remind him of the need for discussions to remain within the general bounds of the council's remit, that discussions should reflect a departmental point of view, and that papers to be considered by the Council might usefully be distributed in the department prior to Council meetings.

Importantly however, it was recognised that the ASDC served a useful purpose and that over time it might wish to expand the scope of its deliberations.

By 1984, Council members thought there was little more they could discuss within their limited terms of reference, and that wider consultation was now necessary. Concurrent with these deliberations was the creation of an Inter-departmental Working Group (led by Defence and Transport) to examine the coordination of maritime resources for use during hostilities and in emergencies. One of the tasks of this working group was to identify those areas where consultative arrangements and coordination were required to draw together matters concerning civil maritime resources to ensure their smooth transition for support to the Australian Defence Force should the need arise. Government departments involved in policy areas involving the civil direction of shipping included: Transport, Resources and Energy, Employment and Industrial Relations, Social Security, Administrative Services, Trade, Special Minister for State, Defence, and Finance. As shipowners and the maritime industry would need to be consulted in a contingency situation, new terms of reference for the ASDC were prepared:

> To provide liaison between the RAN and authorities who control, operate and coordinate Australian flag shipping and merchant marine affairs in order to advise on the civil direction of shipping and to plan for its control, safety and protection in time of threat, tension, emergency and war.

The Council deferred submission to the Minister for Defence of the amended terms of reference until the Working Group had issued its report and it had been considered by government. In the interim, the Department of Trade joined the Council on 9 August 1985.

In late 1989 the Council again discussed its terms of reference and thought it should be broadened, but by mid1990 it decided that the draft Ministerial submission should not proceed as government deliberations over the national shipping industry were pending, which might influence its future membership and direction.

In mid-1993 the need to expand the membership of the Council was raised and on 6 September 1994, the Minister for Defence (the Hon. Robert Ray) approved a new charter and membership. The impetus for action on the terms of reference and membership were changes in Commonwealth administration and departmental structures, changes within the ADF and within the Australian shipping industry. The revised purpose of the ASDC was:

> To provide a consultative forum for government and the Australian maritime industry to initiate and develop proposals for the provision of safety and protection of merchant shipping and Australia's maritime trade, and the provision of merchant shipping support to the ADF in time of threat, tension, emergency and war.

Although the Cold War 'ended' in 1991, there remained a residual concern over the protection of shipping, but the Department of Defence could see the necessity for using the civilian industry, where possible, to supplement its limited amphibious support for operations.

During discussions on 2 September 1997, the Council thought it might need to widen its membership, as changes in the structure and organisation of the Department of Defence would change the manner in which it would operate in the future. Concurrently, the government initiated a Shipping Reform Group to examine the competitive gap between Australian and foreign-owned shipowners involved in Australian trade. The ASDC proposed that the Australian Chamber of Shipping, Liner Shipping Services, the Minerals Council of Australia, and the Association of Australian Ports and Marine Authorities be invited to its next meeting.

The Council was advised at its meeting on 3 March 1998 of the creation of the National Support Division within Defence, which would focus on merchant shipping support as well as port access for Defence-owned and chartered vessels, not only in situations of threat, tension and emergency, but also in peacetime [2]. This created a range of opportunities for more-focussed and beneficial discussion between Defence and the maritime industry, so the Council agreed on the need for a strategic plan to guide its deliberations. While the aforementioned invitees would continue to attend meetings, there would be no changes to membership until the strategic plan was developed and agreed.

At its meeting on 17 March 1999, the Council endorsed its strategic plan (later called its business plan) and revised membership. It also recommended a change in its name to the Australian Maritime Defence Council (AMDC), to recognise the wider involvement of the marine industry, including liner shipping owners, the offshore industry, tug operators, ports, the stevedoring industry, and the decreasing role of Australian flag shipowners. The Minister for Defence (the Hon. John Moore) approved these changes on 17 May 1999, with the mission of the AMDC being:

> To promote the partnership between the Australian Defence Organisation (ADO) and the Australian maritime industry and to facilitate the provision of effective advice and support to government on maritime issues in the interests of national security.

The strategic plan contained four goals with a number of associated strategies; the goals were:

- Provision of comprehensive and timely advice to government on strategic maritime policies and operational issues for the maintenance of national security.
- Enhancement of communication links within the AMDC and
- between the AMDC and other relevant organisations.
- Promotion of cooperation between the ADF and the commercial maritime industry for the purposes of Naval Control and Protection of Shipping (NCAPS) [3].
- Promotion of ADO access to maritime infrastructure and services.

In 2002, the Australian Ship Repairers Group became a member, providing a useful link for the development and maintenance of naval capability. With a progressive move to a 'whole-of-government' approach to policy issues, particularly national security issues, the newly created Border Protection Command was invited to join the AMDC in 2006, while the Department of Foreign Affairs and Trade and the RAAF resigned in 2008. From 2007 the Maritime Union of Australia was invited to attend meetings for specific agenda items, bringing a maritime workforce perspective to the Council, and became a member in 2009.

While national security remains the primary purpose of the AMDC, the biannual meetings also facilitate discussion of maritime issues that are of interest to both government departments and the maritime industry. Examples of the types of topics discussed at the AMDC include: implications of archipelagic sea lanes to shipping, oceans resource protection, marine pollution, employment of women at sea, civil recognition of RAN training [4], law of the sea, piracy, shipping reform, port development and security, impacts of growing cruise shipping, and Defence access to and use of merchant shipping along with access to ports of strategic importance [5]. The purpose of much of this discussion is to share information on issues relevant to all members of the Council, so that all understand the dynamics of both the maritime industry as well as national security and ship/port policy issues from a government perspective.

From an operational and planning perspective, the AMDC provides a forum where policy matters related to port access by RAN ships can be raised with the ports' peak body (Ports Australia) and shipping representatives; this is particularly important for continued RAN access to commercial ports. Relevant ports are also advised of planned major bilateral and multinational exercises which may impact upon their activities, and the processes for active engagement with Defence as plans are refined.

For the ADO, the AMDC provides a forum for longer-range planning and contingency planning. As examples, during 2000–02, it considered two reports prepared by the Bureau of Transport Economics that examined the shipping and port capabilities necessary to support Defence in a variety of contingencies [6]. And beginning in 2003, there were detailed discussions over the implementation of the International Ship and Port Facility Security Code, and its impact on ports and RAN port access [7]. Recently, the AMDC also noted implications of the Government's announcement, in September 2011, of major reforms to the Australian shipping industry [8]. The AMDC is also one of the many bodies contributing to wider discussions on Australia's maritime domain and is important as it strengthens the ties the ADO has with other maritime bodies, such as the AMSA Advisory Committee and the Australian Shipowners Association.

From its inception in 1982, the focus of the Council has evolved and expanded from a narrow 'protection of shipping' role, that enabled discussion between the RAN and shipowners; through a broader focus on the commercial shipping industry, associated government agencies and policies, including the support that could be provided to Defence in both peace and war; to a mature focus on the maritime industry and its relationship with 'government'.

Andrew Forbes

1. See Andrew Brown, 'The History of the Radford-Collins Agreement, *Semaphore*, Issue 15, November 2007. The 1959 and 1967 versions of the Radford-Collins Agreement are printed in Andrew Forbes and Michelle Lovi (Eds), *Australian Maritime Issues: SPC-A Annual 2006, Papers in Australian Maritime Affairs No 19*, Sea Power Centre — Australia, Canberra, 2007, pp. 47-67.

Australian Division Council

The Council of the Australian Division of RINA met by teleconference on Wednesday 14 September 2011, chaired by the President, Prof. Martin Renilson.

The main item discussed was advertising in this journal, *The Australian Naval Architect,* to secure its future in its current form. While Council members are applying themselves to approaching corporate interests who may be interested in advertising and/or the future of the journal, all members are urged to identify such interests to the Secretary and approach them directly where appropriate.

Other issues of note included:

- Council appointed Dr Tony Armstrong as Vice-President.
- Council noted that its counterpart in London had approved the posting on its web-site of presentations by distinguished lecturers, reflecting a development that had already been commenced on a trial basis by the NSW and Tasmanian Sections.
- Council noted the finalisation by COAG on 19 August of an inter-governmental agreement on the single national maritime safety jurisdiction and the Commonwealth government announcement of 9 September on revitalising shipping.
- Initial notice had been received of the Chief Executive's visit to Sydney, Adelaide, Canberra and Melbourne in January-February next to coincide with the Pacific 2012 Conference and Exhibition.

The next meeting of Divisional Council will be held on 1 December in Sydney to align with the SMIX Bash.

Rob Gehling
Secretary

AUSTRALIAN MARITIME DEFENCE COUNCIL (continued)

2. The National Support Division was disbanded in 2001 with some of its functions incorporated into Industry Division.

3. In 2003, NCAPS became naval cooperation and guidance for shipping (NCAGS), in recognition of the fact that there were fewer Australian-flagged ships that could be 'controlled', and then became maritime trade operations in 2004.

4. See Jane Landon, 'Civilian Accreditation of RAN Sea Training', *Semaphore*, Issue 13, August 2007.

5. See Andrew Mackinnon, 'The Strategic Importance of Australian Ports', *Semaphore*, Issue 16, October 2005.

6. The logistical support for INTERFET during 1999 came through commercial ports, impacting on commercial operations. AMDC members provided invaluable advice and support to Defence and other agencies during operation.

7. See Andrew Forbes, 'Maritime Security Regulation', *Semaphore*, Issue 3, February 2006.

8. See www.minister.infrastructure.gov.au/aa/speeches/2011/AS26_2011.aspx.

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NAVAL ARCHITECTS ON THE MOVE

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

Jonathan Binns moved on many moons ago, and has taken up the position of post-doctoral fellow at the National Centre for Maritime Engineering and Hydrodynamics at the Australian Maritime College in Launceston, Tas.

Bill Boddy has moved on from the Ship Repair Contract Office at Garden Island and has taken up the position of Fleet Technical Regulations Manager at Navy Fleet headquarters in Sydney.

Tom Boddy has moved on from the Ship Repair Contract Office at Garden Island to the Contract Services Branch at Defence Plaza Sydney. He has recently taken up the position of Naval Architect on secondment to the Amphibious and Afloat Support Systems Program Office at Garden Island. The AASSPO provides in-service support to HMA Ships *Tobruk, Westralia, Success, Manoora, Kanimbla*, the Landing Craft Heavy-class, the sail training ship *Young Endeavour*, and the Army marine equipment fleet.

Levi Catton has moved on from Thales Australia and has taken up a position with Forgacs in Newcastle.

Valerio Corniani has moved on from SP-High Modulus and is now consulting in composite engineering with Warren Miller as VSE Consulting in Sydney.

Greg Cox, in addition to consulting in Malaysia, has gone into partnership in a new aluminium vessel construction company, Alloy Boats Sdn Bhd in Sungai Mati, Johor, Malaysia.

Clive Evans has moved on from Burness Corlett Three Quays (Southampton) in the UK and has rejoined Lightning Naval Architecture in Sydney in the position of naval architect.

Liam Finegan has moved on from Tansu Design in Istanbul, Turkey, and has taken up a position as a naval architect with McFarlane Ship Design in Monaco.

David Firth has moved on from SP-High Modulus and has taken up the position of Engineering Manager for Gebel Aquasafe in Parkes, NSW, a company specialising in composite industrial tanks.

Mori Flapan has moved on from the National Marine Safety Committee and is now evaluating opportunities.

Alan Goddard has moved on from SP-High Modulus and has taken up a position as a composite design engineer for Premier Composite Technologies in Dubai, UAE, on a two-month contract.

Sasha Harrison (nee Ford) has moved on from BMT Design and Technology and has taken up a position as a naval architect with Hart Marine Boat Builders in Mornington, Vic.

David Hooper has moved on from BAE Systems in Williamstown and returned to the UK to take up a position as Head of the Naval Architecture Department with BAE Systems in Barrow-in-Furness. David was with BAE Systems in Barrow before spending approximately two years in Melbourne.

Warren Miller has moved on from SP-High Modulus and is now consulting in composite engineering with Valerio Coriani as VSE Consulting in Sydney.

Adam Podlezanski has moved on from ASC Shipbuilding in Adelaide and has taken up the position of Principal Structural Engineer with Worley Parsons in Brisbane, currently working on the Queensland Curtis LNG Project for Queensland Gas Company. Adam was one of the founding members of the South Australian and Northern Territory Section of RINA.

Nicolas Siohan has moved on from SP-High Modulus and, having just finished his PMI certification project-management course, is now evaluating opportunities.

Karl Slater has moved on from BAE Systems in Williamstown and has taken up a position with the Defence Science and Technology Organisation at Fishermans Bend, Vic., in the Maritime Platforms Division and primarily supporting the SEA 1000 (Future Submarine) project.

Ray Toman has moved on from the Defence Materiel Organisation on the AWD Project, and is now evaluating opportunities.

Ning Wu, a recent graduate of the University of New South Wales, has moved on from ASO Marine Consulting and has taken up a four-year position as a trainee surveyor with Lloyd's Register in China. The first two years will be based in Shanghai, and then moving to shipyards in different locations in China to learn with experienced surveyors.

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 Rob Gehling when your mailing address changes to reduce the number of copies of *The Australian Naval Architect* emulating boomerangs.

Phil Helmore

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.

FROM THE ARCHIVES

BHP'S EXPLORER-CLASS ORE CARRIERS

The growth of the Australian economy after World War II prompted expansion of BHP's steelmaking facilities in Port Kembla and Newcastle and the construction at Whyalla in South Australia of new 10 000 DWT ships (the Whyalla class) to carry coal from Newcastle and Port Kembla to Whyalla and returning with iron ore and fluxes from South Australia. Expansion of the NSW ports during the 1950s meant that larger ships could be employed on the service and the last two Whyalla-class ships were cancelled. Two 19 000 DWT ore carriers were built instead, the second of which was completed a little over 50 years ago.

Iron Dampier
(BHP photo from J C Jeremy collection)

The Explorer-class ore carriers were designed by BHP and built at the Whyalla shipyard. When she was completed in August 1959, *Iron Flinders* was the largest ship to have been built in Australia. She and her sister ship, *Iron Dampier*, completed in June 1961, were the first ships in the BHP fleet to have engines and accommodation aft, the first designed to burn oil fuel from the outset and the first to have air-conditioned accommodation.

The ships were 175.96 m long overall with a beam of 21.4 m. They were powered by three Parsons steam turbines geared to one shaft delivering 5086 kW to a single propeller for a speed of 14 knots. The turbines were imported from the UK and had been intended for the last two ships of the Whyalla class. The crew numbered 54.

Cargo was carried in three cargo holds fitted with six hatches. Two fore-and-aft passages were built below the main deck for access to the forecastle during bad weather.

Iron Flinders and *Iron Dampier* were the only BHP ships to be built specifically for carrying iron ore — later ships were designed as more-versatile general bulk carriers. Despite their specialised design, both ships carried a wide variety of cargoes during their lives; iron ore, billets and steel products, pig iron and even prefabricated homes and building materials.

After a relatively short life, *Iron Flinders* was laid up at Kwinana in November 1977. She was sold in January 1978 and broken up later that year. *Iron Dampier* was sold in February 1978 and also broken up that year.

John Jeremy

Iron Flinders in September 1959 during her first docking since launching in the Sutherland Dock at Cockatoo Island in Sydney
(Cockatoo Dockyard photo from Don Dinnie collection)

Reference

Riley, D.M., *The Iron Ships: a Maritime History of BHP 1885–1992*, BHP Transport Limited, 1992.


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