THE AUSTRALIAN NAVAL ARCHITECT

Volume 13 Number 3
August 2009

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Cover Photo:

Austal's new trimaran for the US Navy, *Independence* (LCS2) during recent sea trials
(Photo courtesy Austal)

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RINA Australian Division
on the
World Wide Web
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From the Division President

Over the past few months I have spent some time thinking about the Australian Division of the Royal Institution of Naval Architects, its membership and its journal *The Australian Naval Architect*. Each time I sit at my computer and type these words I wonder if we are catering for the needs of our entire membership base. In the last edition of *The ANA* I wrote about the White Paper and the opportunities for naval architects in the defence sector and in the commercial sector — the sector and industry in which I'm employed. My knowledge of the high-speed ferry industry is aroused every so often when I get the opportunity to visit or meet up with the players in that industry. Most recently I was given the chance to tour Austal's facilities in the west and I learnt about many of the exciting projects on which they are currently working.

Whilst travelling back from the Austal shipyard in Henderson I was listening to the radio in the car and one particular story made my ears prick up. The story was about Origin Energy and Australian Worldwide Exploration. Apparently they were continuing their drilling campaign in the Perth Basin with the spudding of the third well, Jingemai-12. Initially I thought the term *spud* was very odd until I looked it up in the Macquarie Dictionary and found that it does relate to drilling an oil well and, more importantly, a *spudder* is a rig or oil rig, especially one used to begin a well. Having picked up on my new knowledge, I learnt that Jingemia-12 is being drilled as a directional well to intersect the oil-bearing Dongara Sandstone. The operation involved testing the blow-out preventer installed on the surface conductor casing set at 536 m. The well itself has a planned measured total depth of 2709 m. I found this incredibly interesting and my thoughts moved onto the engineers and scientists who are employed in the offshore sector.

If you visit the RINA website you will discover that the RINA is open to everyone who is involved with or interested in the design, construction, maintenance and operation of marine structures. My belief is that this could and should include the designers and operators of oil and gas rigs. When I was employed as a lecturer at the Australian Maritime College there was a move to complement the naval architecture degree with courses in marine and offshore systems and in ocean engineering. Both of these programs are very successful and produce high-quality graduates. Graduates not only come from AMC but other universities such as Curtin University, The University of Western Australia and the University of New South Wales — all provide programs which lead graduates into this industry sector and many of them choose to have RINA as their professional engineering body.

If I now come back to the Australian Division of the RINA and the question about whether or not we are meeting the needs of our entire membership base I start to get a little concerned. In my opinion the majority of those members who get involved at the divisional level have come from the traditional industry sectors which focus around ships rather than the offshore sector. This includes members from designers, builders, operators, and classification societies as well as the education sector. As a consequence of this, many of the articles forwarded to John Jeremy and Phil Helmore for *The ANA* are from this domain. To provide a journal that covers news from our total membership base must be a goal for us all. As mentioned earlier in this column, the technology which was involved to complete the spudding of the third well in Jingemia-12 fascinates me and I do not wish to miss out on reading about Australian achievements by Australian companies and engineers. I am sure that there are many members out there who are employed in this exciting sector of the industry (such as Worleys and AMOG) who could pass on news releases or even provide editorial about your company's recent achievements. I'm sure both John and Phil would welcome this. It would certainly be of interest to all members of the Division and ensure that *The ANA* truly serves our profession.

Stuart Cannon

Editorial

After many months of deliberation and study of evidence, the report of the HMAS *Sydney II* Commission of Inquiry was released on Wednesday 12 August. It is a most thorough and detailed examination of all the circumstances of the battle between HMAS *Sydney* and HSK *Kormoran* on the evening of 19 November 1941. For those who wish to examine the evidence used by the Commissioner in reaching his conclusions, the references have live links to the sources. Naturally, it helps to be on-line when reading the report (available on the Commission's web site).

Whilst the summary of Commissioner Cole's report runs to twenty-one pages, in essence he finds that the original German accounts of the battle were substantially correct. His inquiry has revealed much more detail of the information which would have been available to Captain Burnett (*Sydney's* Commanding Officer) at the time. Based on this information, the Commissioner concludes that it is difficult to understand why Burnett apparently assessed that the ship which he encountered on that fateful afternoon appeared innocent. He concludes 'The terrible consequences of this erroneous decision was that *Sydney* did not go to action stations and approached to a position of great danger, where all her tactical advantages were negated and the advantage of surprise was given to *Kormoran*. It resulted in the loss of *Sydney*.'

The Commissioner has also examined in detail the various conspiracy and other theories which have arisen over the years and found that 'none has any substance whatsoever.'

Will this, the most exhaustive inquiry into the loss of *Sydney*, finally stop the theories and speculation? I would like to think so, but I doubt it. There will be those who, for whatever reason, will be unable to accept the Commissioner's findings or who will find fault with some detail. More books will be published to add to the bookshelf-full which have been published over the decades. In time the ships will probably be revisited and further photographs may reveal more detail of the events of nearly seventy years ago. The debate is likely to continue, which is a pity because nothing can change the simple fact that *Sydney* came upon *Kormoran* on the afternoon of 19 November 1941 and the fierce battle which followed resulted in the loss of both ships and many fine men. It was one of the many tragedies of World War II. Surely it is now time for those men to rest in peace.

John Jeremy

Letters to the Editor

Dear Sir,

I refer to the article *What Future for Fast Ferries on Sydney Harbour* (see *The ANA* May 2009), and I would like to congratulate the authors, Martin Grimm and Garry Fry. The thoroughness of their research is impressive.

I am a big fan of hydrofoils, as they represent one of the most-efficient forms of sea transport. There is a worldwide trend to scrap existing hydrofoils and replace them with more cost-effective vessels. I would be interested in the authors' comments on this and on the reasons why the Sydney hydrofoils were not continued.

My understanding is that hydrofoils are more complex and, therefore, expensive and that the foils need to be maintained to a very high level of fairness in order to fly. The other main problem is the complexity of the drive train. The hydrofoil proposed has come up with a new Z-drive arrangement, but I question whether any operator or manufacturer would take on the risk of guaranteeing its maintenance costs and performance. I recently approached a gearbox manufacturer to make a commercial version of their two-speed gearbox. I am looking to obtain more fuel efficiency (up to 10%) by using an overdrive-type gear for everyday running. The answer I received was simple and concise: NO!!! The reason was that gearbox manufacturers servicing the marine industry have had major reliability issues. If they are unwilling to offer two-speed gearboxes, then we would have little chance with the proposed Z-drive.

This all points to the risk/profit-sensitivity of the world in which we now live. All components need to be certified and guaranteed, or the costs to the operator are huge. As a result, our ferries have become simpler and more reliable.

Figure 1 of the Grimm and Fry article compares operating cost per hour per seat. This data does not take into account the number of passengers carried, and unrealistically makes a big vessel look good. For example, a Manly ferry carrying 150 passengers is not very efficient compared to a purpose-designed 150 passenger vessel. Many ferry trips to Manly carry fewer than 200 passengers. In my study I found operating costs to be extremely sensitive to the ratio of passengers carried to passenger capacity. Cost per passenger was more than doubled by going from 80% to 30% passenger capacity.

The article compares a 320 passenger catamaran with a 150 passenger hydrofoil, where I believe that they should have compared a 150 passenger catamaran equivalent to the hydrofoil. In 2005 we launched a very-efficient 150 passenger catamaran, the SFM 27 m wave-piercing catamaran *Evolution*. She is widely regarded as one of the most fuel-efficient ferries in her class. The North West Bay Ships-built *Silver Sonic* operates from the pen opposite, does similar day trips, with similar passenger numbers and fills up from the same fuel bowser. It is reported that *Evolution* uses 20–30% less fuel. With two 720 kW diesels she is capable of service speeds in excess of 31 kn. With the same engines as the proposed hydrofoil (two 1080 kW diesels), she could easily meet the proposed timetable. She would cost only A$3.25 million and a 2010 version of this design would be even more efficient. This would make the comparison in Table 2 of the article look very different.

Congratulations again to the authors for some fine research. This premium-service ferry model between Manly and Circular Quay does have merit but, unfortunately, in the modern world, it will be difficult to make a hydrofoil fly.

I hope to see more discussion on solutions for Sydney Harbour ferries soon.

Stuart Friezer

Dear Sir,

I'd like to add some further comments to the article *Thales Triple Frigate Docking* in *The ANA* of May 2009, as I had undertaken the design reviews of the three cradles and approved the docking calculations for the two Anzac-class ships.

Originally 4' 6" (1.37 m) high keel blocks had been used in the Captain Cook Dock, but these were replaced in the 1960s by 6' 4" (1.93 m) blocks for the DDGs, with half-height blocks added to give 9' 8" (2.94 m) when the sonar dome needed to be removed. Each full block is concrete, 11' 3" (3.43 m) long, with six timber feet and five timber caps and weighs 20 tons (22 t). I became involved in Captain Cook Dock cradles for FFGs way back in 1977, well before they arrived. For FFGs such as HMAS *Melbourne*, apart from the sonar, propeller and rudder which extend quite some distance below the keel, additional height is necessary in order to unship the rudder, requiring blocks stacked two-high to 12' 8" (3.86 m).

Three additional technical issues had to be overcome for the recent triple docking. Firstly, for HMA Ships *Anzac* and *Parramatta*, the 9' 8" height would suffice but, since the withdrawal of DDGs, a number of damaged half-height blocks had not been replaced and, because there were insufficient remaining, all three vessels had to be docked on double-height cradles. However the numbers of serviceable full blocks were not quite enough for three double-height cradles, so the available blocks had to be more-widely spaced along the keel lines. Secondly, sufficient bilge blocks still had to be installed so as to withstand possible earthquakes. Thirdly, an additional sonar had been fitted forward in HMAS *Melbourne*, which left very little of the keel at the bow able to be supported by blocks. Together, these issues resulted in quite high and sometimes localised loadings, which had to be carefully considered.

In comparison, the last triple docking of frigates in 1972 involved the smaller (earlier) HMA Ships *Anzac*, *Queenborough* and *Yarra*, all on single-height blocks.

Hugh Hyland

NEWS FROM THE SECTIONS

ACT

Committee Meetings

The ACT section has held two committee meetings since the AGM in March and is planning to hold the Annual Dinner in September/October.

Goal-based Standards

Rob Gehling, past President of the Australian Division of RINA, made a presentation on *The Development of Goal-based Standards by IMO* to a joint meeting with the Canberra chapters of IMarEST, the Nautical Institute, and Engineers Australia on 21 July in the Russell R1 Theatrette.

The Maritime Safety Committee of IMO has, for several years, been working on this project, the first phase of which is currently approaching completion. The initial manifestation of this work will be the adoption of SOLAS amendments mandating that new tankers and bulk carriers be constructed to classification society rules which have been verified as compliant with goal-based standards (GBS). Rob described in his presentation the situation which led to IMO's commencement of this work, the goal-based standards structure, the next phase of the work and further developments.

NGN Changes to Civilian Engineering in the RAN

Those of us who are within the Royal Australian Navy (RAN) would be aware of the latest changes happening in the RAN as a result of Chief of Navy's initiative known as New Generation Navy (NGN). A full review of NGN would take considerable time and is not necessary for most readers of *The ANA*. The following is a short review, concentrating on the structural changes to the civilian engineering area of the RAN.

Overall, NGN is intended to be a five-year program aimed at re-invigorating the Navy at all levels and to enhance the ability of Navy to raise, train and sustain the maritime component of the Australian Defence Force (ADF). One of the first steps has been a restructure of the RAN, including the following changes to the civilian engineering area. Additionally, there is a strategic review of navy engineering underway which will look at how uniformed and civilian engineers interact, and at workforce-management issues for civilian engineers. This will be a very important review for all Navy engineers going into our future.

Some of you may have heard of Navy Systems Command (NAVSYSCOM) which, for the past nine years, looked after, amongst many other things, the Navy Systems Branch (NAVSYS). NAVSYS was led by the Director General NAVSYS (DGNAVSYS) who also held the position of the Chief Naval Engineer (CNE). NAVSYS contained the Directorate of Navy Platform Systems (DNPS) in which the bulk of the Navy's specialist civilian naval architects and mechanical, electrical and systems engineers work. Readers should note here a distinction between civilian engineers working for Navy, and those who work for the Defence Material Organisation which has not been directly affected by NGN.

At midnight on 31 June 2009, NAVSYSCOM, NAVSYS and CNE all ceased to exist as organisational units or positions within Navy. The new organisation sees the newly-named Head Navy Engineering (HNE) leading the Navy Engineering Division (NED) and reporting through the Navy Strategic Command directly to the Chief of Navy. DNPS remains unchanged and is one of four components within the NED, the others being Navy Weapon Systems, Technical Regulation—Navy and Navy Engineering Policy. CDRE John Bryson, formerly CNE is now HNE. John Colquhoun remains as Executive Director Navy Platform Systems (EDNPS).

It is important to remember that, as a starting point, almost all the roles and responsibilities being undertaken under the old organisation will be undertaken within the new organisation and, in many cases, the same people will be doing the same work although, in some cases, the names and/or locations will have changed.

Further information on NGN may be sourced from the Navy web site www.navy.gov.au for those interested.

Bay Class Replacement Vessels

The Australian Government has announced that, on 23 June 2009, Customs and Border Protection issued a Request for Proposals (RFP) for the acquisition, maintenance and support of new patrol boats to replace the current fleet of eight Bay-class vessels.

The release of a RFP for new ships marks the beginning of the end of more than a decade of sterling service from Bay-class vessels patrolling Australia's maritime zones and responding to illegal activities, such as unauthorised maritime arrivals and illegal foreign fishing. The first of eight Bay Class vessels, *Roebuck Bay*, entered service in February 1999.

The new vessels will provide an ongoing capability to ensure that Customs and Border Protection has the resources necessary to protect Australia's maritime zones.

The documentation is accessible via the Department of Finance and Deregulation (DoFD) AusTender website www.tenders.gov.au. The RFP reference number is 07/1855.

For more information or enquires please email bcrv@customs.gov.au

Glenn Seeley

New South Wales

Committee Meetings

The NSW Section Committee met on 10 June and, other than routine matters, discussed:

- National Approach to Maritime Safety Reform: Second-round public comment has been incorporated into the final Regulatory Impact Statement submitted to the Australian Transport Council in May. The ATC agreed to endorse the final RIS and submit to the Council of Australian Governments to develop the arrangements whereby the Australian Maritime Safety Authority becomes the sole national regulator of all commercial vessels operating in Australian waters.
- SMIX Bash 2009: Arrangements are progressing, and sponsorships are being sought.

- TM Program: The forum on Harbour Ferries has been moved to October (due to closing date for tenders) and presentation on hull-girder strength has been brought forward to July; the presentation on HMAS *Sydney* and HSK *Kormoran* has been postponed to 2010 (due to date for release of official report) and an alternative presentation on the new NSCV arrangement, accommodation and personal safety sections has been secured for August.
- Professional Indemnity Insurance: The RINA by-laws state that "Every member undertaking a professional assignment ... shall, where appropriate, hold professional indemnity insurance".

The NSW Section Committee also met on 28 July and, other than routine matters, discussed:

- National Approach to Maritime Safety Reform: The documentation is ready to go to the Council of Australian Governments for approval. The administration of the process has been transferred from AMSA to the Department of Infrastructure, Transport, Regional Development and Local Government. This was done because, with the likelihood that AMSA will take over responsibility for the regulatory process, the continued role by AMSA administrating the process could have been seen as raising the possibility of a conflict of interest.
- SMIX Bash 2009: Arrangements are progressing, and sponsorships are being sought.
- TM Program 2009: An alternative presentation has been arranged for the September technical meeting, and a visit to Sydney City Marina is being arranged for September (see *Coming Events*).
- TM Program 2010: Ideas for presentations in 2010 were proposed, and authors to be approached.

The next meeting of the NSW Committee is scheduled for 16 September.

Boosting Energy Efficiency

Rex O'Connor, Sales and Marketing Manager Marine for Wärtsilä Australia, gave a presentation on *Boosting Energy Efficiency in Ships* to a joint meeting with the IMarEST attended by 25 on 3 June in the Harricks Auditorium at Engineers Australia, Chatswood.

Introduction

Rex began his presentation by saying that the efficiency of ships has been receiving much more attention in the marine industry in recent years. The increased volatility in fuel prices has focussed attention on efficiency. Typical figures for diesel engines run something like fuel 76%, crewing 8%, spares 6%, lube oil 6%, auxiliaries 2%, and miscellaneous 2%, total 100%. So fuel efficiency is critical. Even though oil prices have fallen, many believe that it is only a matter of time until they rise again. Not only savings in operational costs, but global warming also requires reduced emissions. Technology in innovation will be quickly adopted to improve efficiency, reduce emissions, and improve the bottom line of the operating cost. The greatest benefits are available in the initial ship design phase.

The aim of the presentation is to show a range of potential areas for efficiency improvement, based on technology currently available worldwide. Four main ship types will be analysed: tankers and bulkers, container ships, ro-ro vessels, ferries, and offshore support vessels.

The technologies are grouped under four main headings: ship design, propulsion, machinery, and operation and main-

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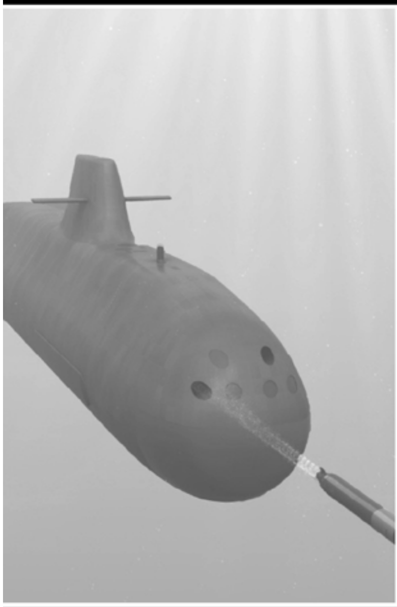

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tenance. Combining these areas and treating them together as an integrated solution can result in a truly efficient ship operation.

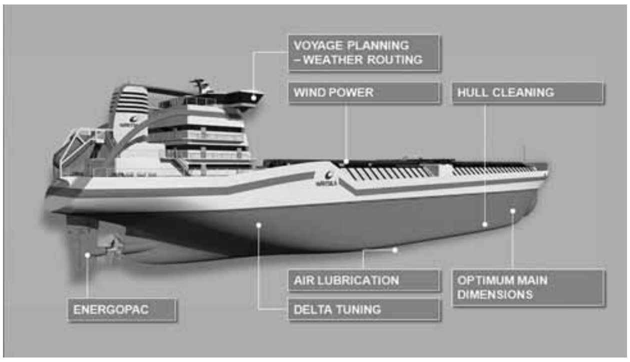
Tankers and Bulk Carriers

Tankers are designed for the transport of liquid cargoes in bulk. Product and chemical tankers represent the small end of the segment (e.g. 5–50 000 dwt). Crude oil carriers may be of more than 450 000 dwt, but there are size ranges covering Panamax, Aframax, Suezmax, VLCC and ULCC.

Bulk carriers are designed for the transport of dry bulk cargoes, such as ore, grain and coal, and there are size ranges covering small, handysize, handymax, Panamax, capsize, etc. They have cargoes of variable density; their hulls have high block coefficients and blunt ends, and their resistance may be reduced by making them more slender.

Tankers and bulkers are slow, generally of the order of 15–16 kn. Most of their resistance is frictional, so a possible area for reducing fuel consumption is via the potential for air lubrication of the hull bottom. Most of these vessels have a single screw, driven by a two-stroke diesel, which is simple and reliable. The system may be helped by improving the aft lines for better flow around the hull and propeller.

Potential areas for savings are shown in the following diagram.



Possible savings for tankers and bulkers
(Diagram courtesy Wärtsilä)

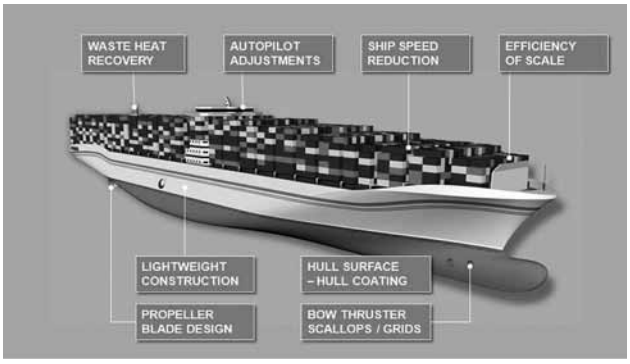
Low speeds over long distances are ideal for the application of wind power, e.g. the Flettner rotor. The Energopac® rudder is Wärtsilä's combination of the rudder and propeller to reduce resistance and improve the flow of water to the propeller (there are other combinations). Air lubrication can reduce the frictional contact area between the hull and water, and reduce the resistance by up to 15%. Optimising the main dimensions can also reduce resistance by up to 9%. Delta tuning can reduce the fuel consumption at port load using common-rail technology. Cargo handling can be improved.

Container Vessels

Container vessels range in size from small feeder vessels (100–1000 TEU) through mainline (1000–8000 TEU) and large (>10 000 TEU).The trend is to increase size, because there are benefits from economies of scale, but also from ecomomies of efficiency. The efficiency of cargo handling is important, because cargo is handled by shore-side cranes, although feeder vessels may have their own. A large part of the voyage occurs at service speed, so this is a prime area for attention. The cargo density on container vessels is low, so they are more slender and more suited to higher speeds (e.g. 25 kn) to try and reduce wave resistance. Active voyage planning and speed control to ensure just-in-time arrival are good ways to save fuel.

These vessels are typically powered by a diesel engine (80 MW on the largest vessels) driving a fixed-pitch propeller. Particular attention is paid to the design of the propeller blades to ensure that there is no cavitation at the high speeds. Waste heat from the main engine exhaust can be recovered with economisers and the like. Refrigerated containers may be carried, and these can be the biggest power consumers on the ship.

Potential areas for savings are shown in the following diagram.



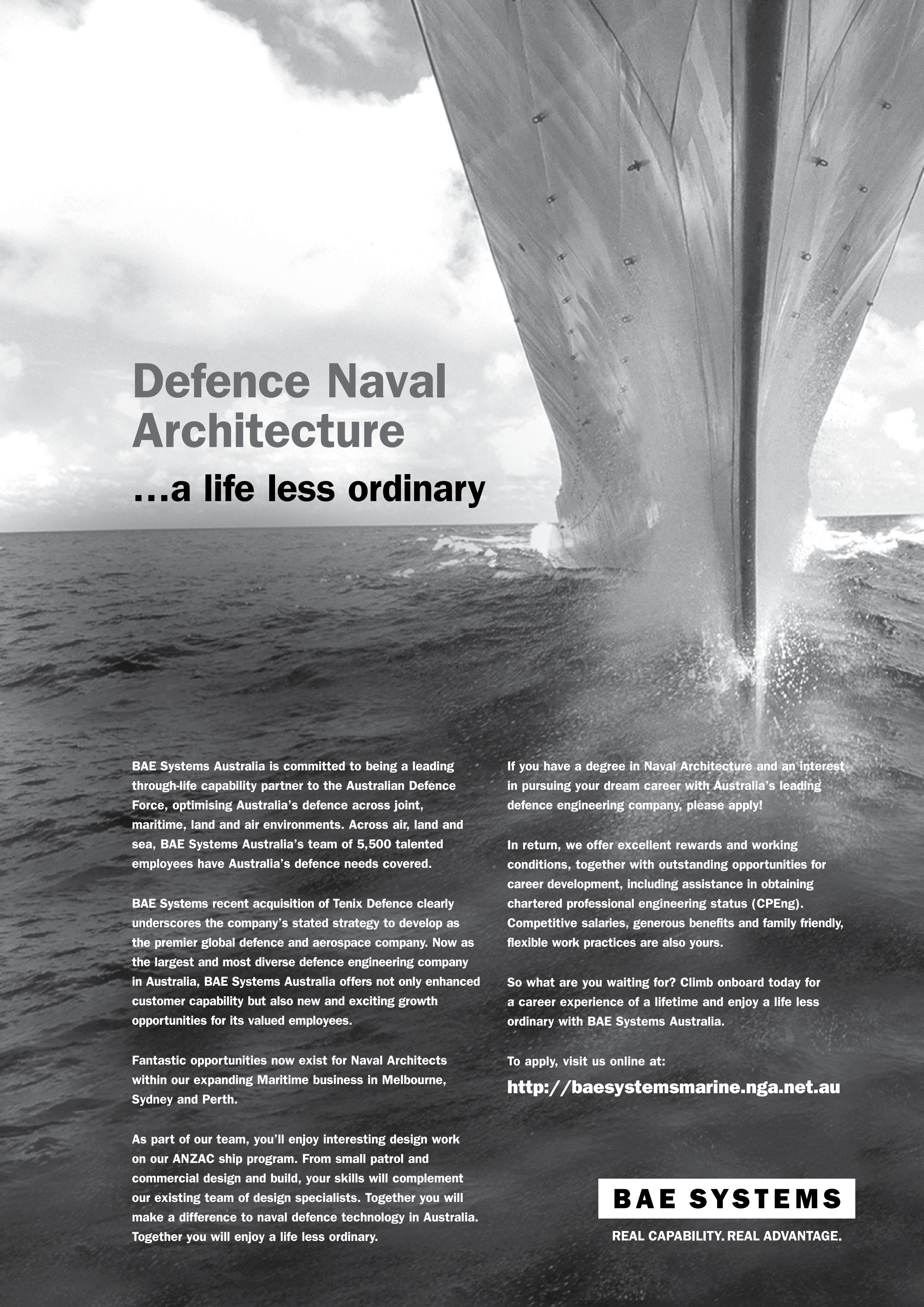
Possible savings for container vessels
(Diagram courtesy Wärtsilä)

Container vessels have a demanding steel structure to ensure continuity of longitudinal strength in a shallow hull with wide openings, and it is important to keep the steel mass down to minimise propulsion requirements. High-tensile steel can be used to minimise the steel mass, and savings of 7% can be realised. Waste-heat recovery can deliver up to a 10% saving, and automatic pilot adjustments up to 4%. Speed reductions at sea can result in an energy cost saving of up to 23%. A 10% increase in ship size typically results in a 5% improvement in efficiency. Harder and smoother hull coatings can result in a 5% reduction in resistance and, similarly, correct design of hull openings can also lead to 5% reduction in resistance. Advanced design of propeller blades can improve the cavitation performance by 2%.

Ro-ro Vessels

Ro-ro vessels are designed to transport wheel-based cargo, and cargo loaded with wheel-based equipment moved over large shore ramps. They are most common on short-sea routes and on deep-sea routes. On short-sea routes there may be regular sailings, while on deep-sea routes they may be more irregular. Good manoeuvring is important for efficiency and so is the efficiency of cargo handling. A PCTC (pure car and truck carrier) may look large and bulky from the air, but the underwater hull is usually slender with a low block coefficient and operating at a modest Froude number. The resistance is usually low and the propulsion efficiency is usually high. To reduce the propeller power demand, attention is paid the design of the propeller, and this offers the potential for savings. A large, bulky superstructure gives rise to high wind resistance, and more attention to streamlining can result in reductions in resistance. PCTCs usually have a large operating range, so the fuel carried is a large fraction of the deadweight of cars/trucks carried, etc.

Potential areas for savings are shown in the following diagram.



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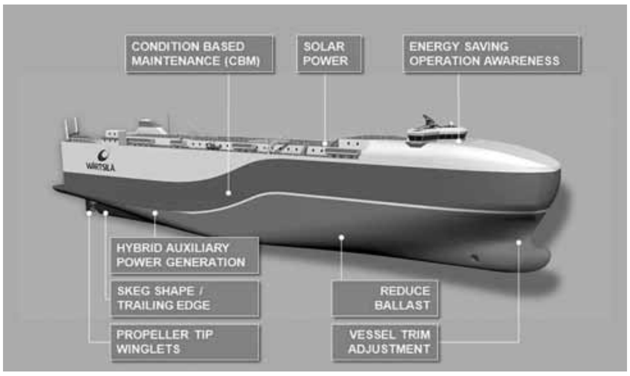
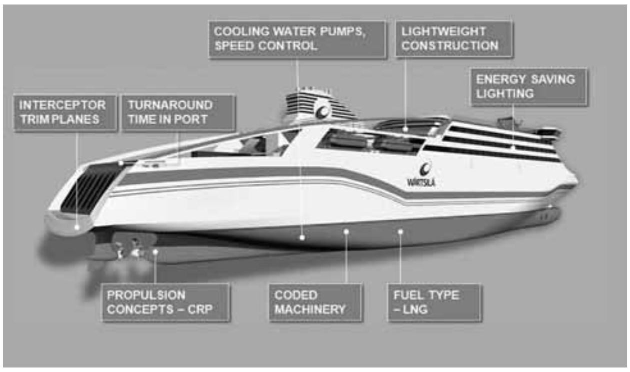


Possible savings for ro-ro vessels
(Diagram courtesy Wärtsilä)



Possible savings for ferries
(Diagram courtesy Wärtsilä)

The amount of ballast carried may be reduced through design changes and have a positive effect by reducing the power demand. The vent fans required for air changes during loading and unloading operations are large power consumers, and this is a possible area for the introduction of solar power, with cells located on large areas of the ship superstructure. The crew can affect the power consumption by adjusting the speed of the vessel to arrive just-in-time.

Condition-based monitoring and real-time monitoring of machinery can reduce the fuel consumption by 5%. The use of solar power for the generation of electricity and heat can reduce total fuel consumption by 4%. An energy-saving culture on board can also reduce the fuel consumption by 4%; hybrid auxiliary power by 2%; the shape of the skeg and the trailing edge to improve the inflow to the propeller by 2%; winglets on the propeller blade tips increases efficiency by 4%; reducing ballast requirements 7%; and adjustments to the trim of the vessel can lead to reductions in resistance of up to 5%.

Ferries

Ferries transport a mix of passengers and wheel-based cargo, ranging from high-speed craft to small double-ended ferries and ro-pax vessels. There is usually a fixed itinerary, and so regular departure and arrival times. Froude numbers range from 0.35 to 0.50. The relatively high hull sped makes the design important. Lengthening the waterline is usually beneficial, and these vessels can profit from the use of dual fuels. Interceptors and wedges can give good results. Appendage design can have a significant effect on power demand. New propulsion concepts may give savings; e.g. combined diesel electric; where the electric propulsion gives high efficiency at low seeds, combined with mechanical boost at transit speeds. This works best in shallow waters, or waters where there are speed restrictions, and the operating profile makes optimisation difficult. Good manoeuvring and cargo handling are of the utmost importance. A dual-level linkspan is beneficial, as are steerable thrusters, in reducing port times.

Potential areas for savings are shown in the diagram.

The payload function can be divided into passengers and cargo and their effects on the operation. Large passenger areas typically lead to high power requirements. Reducing the displacement of the ferry leads to clear power savings. Since speed is relatively high, and the lightship represents a large portion of the total displacement, attention to detail can have a big impact. Alternative fuels, especially LNG, can be used beneficially and can eliminate the need for HF heating in some vessels. The main component of LNG is methane (CH_4), which is the most-efficient hydrocarbon fuel, having the highest energy content and lowest emissions. Switching from diesel to LNG can reduce exhaust gas emissions by 25%.

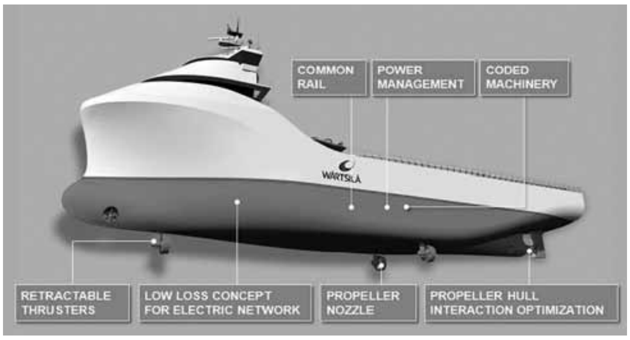
Some possible savings are as follows: cooling water pumps 5%, lightweight construction 7%, interceptors or wedges 3%, turnaround in port 10%, energy saving in lighting 1%, new propulsion concepts 12%, and CODED machinery 4%.

Offshore Support Vessels

Offshore support vessels can be divided into many sub-types, accounting for specialist operations such as platform supply vessel, anchor-handling tug, anchor-handling tug and supply vessel, construction field vessel, etc. Offshore support vessels are often designed to carry out their functions in very rough weather conditions. Their speed is low, but their short hull length leads to high Froude numbers. The bow is shaped to work well in heavy seas, and these vessels may have a high DP (dynamically-positioned) rating, as they may spend long periods in DP or stand-by mode. Most OSVs have their shaftlines or thrusters associated with side thrusters to comply with the DP class requirements. Newer vessels often have a single centreline propeller on a centreline skeg for higher efficiency used for free running. If better manoeuvring is required, then steerable thrusters may be lowered.

AHT vessels often have mechanical propulsion with twin shaftlines and nozzles. Diesel-electric power plant gives efficiency in the part-load condition. The twin power plants give a good level of redundancy, while the diesel-electric combination gives low losses in the free-running condition and control benefits in the DP mode.

Potential areas for savings are shown in the following diagram.



Possible savings for offshore support vessels
(Diagram courtesy Wärtsilä)

Some possible savings are as follows: common-rail technology 2%, power-management systems 5%, CODED machinery 4%, retractable thrusters give enhanced manoeuvrability, low-loss concepts 2%, and propeller-hull interaction optimisation 5%.

Ship Design

We turn now to look at some of the specific items which can be targeted at the design stage.

A larger ship will in most cases offer greater transport efficiency. A larger ship can transport more cargo at the same speed with less power per cargo unit, although limitations may be met in port handling. Regression analysis of recently-built ships show that a 10% larger ship will give about 4-5% higher transport efficiency.

Minimising the use of ballast (and other unnecessary mass) results in lighter displacement and thus lower resistance. The resistance is more or less directly proportional to the displacement of the vessel. However, there must be enough ballast to immerse the propeller in the water, and provide sufficient stability (safety) and acceptable seakeeping behaviour (slamming). Removing 3000 tons of permanent ballast from a PCTC and increasing the beam by 0.25 m to achieve the same stability will reduce the propulsion power demand by 8.5%.

The use of lightweight structures can reduce the ship displacement. In structures that do not contribute to ship global strength, the use of aluminium or some other lightweight material may be an attractive solution. The mass of the steel structure can also be reduced. In a conventional ship, the steel mass can be lowered by 5–20%, depending on the amount of high-tensile steel already in use. A 20% reduction in steel mass will give a reduction of ~9% in propulsion power requirements. However, a 5% saving is more realistic, since high-tensile steel has already been used to some extent in many cases.

Finding the optimum length and block coefficient has a big impact on ship resistance. A high L/B ratio means that the ship will have smooth lines and low wave-making resistance. On the other hand, increasing the length means a larger wetted surface area, which can have a negative effect on total resistance. A too-high block coefficient makes the hull lines too blunt and leads to increased resistance. Adding 10–15% extra length to a typical product tanker can reduce the power demand by more than 10%.

An interceptor is a metal plate which is fitted vertically to the transom of a ship, covering most of the breadth of the transom. This plate bends the flow over the aft-body of the ship downwards, creating a similar lift effect to a conventional trim wedge due to the high pressure area behind the propellers. An interceptor has proved to be more effective than a conventional trim wedge in some cases, but so far it has been used only in cruise vessels and ro-ro vessels. An interceptor is cheaper to retrofit than a trim wedge, and can lead to a 1–5% lower propulsion power demand for a typical ferry.

A duck-tail is basically a lengthening of the aft end of the ship. It is usually 3–6 m long. The basic idea is to lengthen the effective waterline and make the wetted transom smaller. This has a positive effect on the resistance of the ship. In some cases the best results are achieved when a duck-tail is used together with an interceptor, and can lead to a 4–10% lower propulsion power demand.

The shaft lines should be streamlined. Brackets should have a streamlined shape, otherwise this increases the resistance and disturbs the flow to the propeller. There can be up to 3% difference in power demand between poor and good design, and a corresponding reduction of up to 2% in total energy consumption for a typical ferry.

The skeg should be designed so that it directs the flow evenly to the propeller disk. At lower speeds it is usually

beneficial to have more volume on the lower part of the skeg and as little as possible above the propeller shaftline. At the aft end of the skeg the flow should be attached to the skeg, but with as low flow speeds as possible. There can be 1.5–2% lower propulsion power demand with good design, and a corresponding reduction of up to 2% in total energy consumption for a container vessel.

The water flow disturbance from openings to bow thruster tunnels and sea chests can be high. It is therefore beneficial to install a scallop behind each opening or, alternatively, a grid that is perpendicular to the local flow direction can be installed. The location of the opening is also important. Designing all openings properly and locating them correctly can give up to 5% lower power demand than with poor designs. For a container vessel, the corresponding reduction in total energy consumption is almost 5%.

Compressed air may be pumped into a recess in the bottom of the ship's hull. The air builds up a "carpet" which reduces the frictional resistance between the water and the hull surface. This reduces the propulsion power demand. The challenge is to ensure that the air stays below the hull and does not escape. Some pumping power is needed. Typical savings in fuel consumption are tanker 15%, container vessel 7.5%, PCTC 8.5%, and ferry 3.5%.

The low resistance and high propulsion efficiency of a single-skeg hull form can be combined with the manoeuvring performance of steerable thrusters for some vessels, e.g. OSVs. Single-screw propulsion is then used for free running while retractable thrusters are used in DP mode when excellent manoeuvring is needed. The machinery also combines mechanical propulsion in free-running mode with electric drive in DP mode. Diesel-electric machinery and twin steerable thrusters reduce the annual fuel consumption of a typical OSV by 35% compared to a conventional vessel.

Propulsion

Installing wing thrusters on twin-screw vessels can achieve significant power savings, obtained mainly due to lower resistance from the hull appendages. The propulsion concept compares a centreline propeller and two wing thrusters with a twin-shaftline arrangement. This can give better ship performance in the range of 8% to 10%, and more flexibility in the engine arrangement and more competitive ship performance.

Counter-rotating propellers consist of a pair of propellers one behind the other which rotate in opposite directions. The aft propeller recovers some of the rotational energy in the slipstream from the forward propeller. The propeller couple also gives lower propeller loading than for a single propeller resulting in better efficiency. CRP can either be mounted on twin coaxial counter-rotating shafts or the aft propeller can be located on a steerable propulsor aft of a conventional shaft line. The CRP has been documented as the propulsor with one of the highest efficiencies, and the power reduction for a single-screw vessel is 10–15%.

The propeller and the ship interact. The acceleration of water due to propeller action can have a negative effect on the resistance of the ship or appendages, and this effect can today be predicted and analysed more accurately using computational techniques. Redesigning the hull, appendages and propeller together will, at low cost, improve performance by up to 4%.

The rudder has drag in the order of 5% of ship resistance. This can be reduced by 50% by changing the rudder profile and the propeller. Designing these together with a rudder bulb will give additional benefits. This system is called the Energopac® system, and can improve fuel efficiency by 2% to 6%.

Advanced propeller blade sections will improve the cavitation performance and frictional resistance of a propeller blade. As a result the propeller efficiency can be improved by up to 2%.

Winglets are known from the aircraft industry. The design of special tip shapes can now be based on computational fluid dynamic calculations which will improve propeller efficiency by up to 4%.

Installing nozzles shaped like a wing section around a propeller will save fuel for ship speeds of up to 20 knots and provide up to 5% power savings compared to a vessel with an open propeller.

For controllable-pitch propellers, operation at a constant number of revolutions over a wide range of ship speeds reduces efficiency. Reduction of the number of revolutions at reduced ship speed will give fuel savings of up to 5%, depending on actual operating conditions.

Wing-shaped sails installed on the deck or a kite attached to the bow of the ship use wind energy for added forward thrust. Static sails made of composite material and fabric sails are possible. Typical fuel consumption savings are: tanker 21%, PCTC 20%, and ferry 8.5%.

Spinning vertical rotors installed on the ship convert wind power into thrust in the direction perpendicular to the wind, utilising the Magnus effect. This means that in side wind conditions the ship will benefit from the added thrust. Less propulsion power is required, resulting in lower fuel consumption.

Steerable thrusters with a pulling propeller can give clear power savings. The pulling thrusters can be combined in different setups. They can be favourably combined with a centre shaft on the centreline skeg in either a CRP or a wing thruster configuration. Even a combination of both options can give great benefits. The lower power demand arises from less appendage resistance than a twin-shaft solution and the high propulsion efficiencies of the propulsors with a clean water inflow. The propulsion power demand at the propellers can be reduced by up to 15% with pulling thrusters in advanced setups.

Measuring propeller performance data on board can save fuel. The measurements taken will include propeller performance data such as speed through the water, propeller torque and propeller thrust. Accurate measurement of propeller data will enable fuel savings in operation. Experience shows that this can reduce fuel consumption by as much as 4%.

Machinery

Hybrid auxiliary power systems consist of a fuel cell, diesel generating set and batteries. An intelligent control system balances the loading of each component for maximum system efficiency. The system can also accept other energy sources such as wind and solar power. This can lead to reduction of NOx by 78%, reduction of CO_2 by 30%, and reduction of particulate emissions by 83%.

Installing diesel-electric drives will have a greater impact on operation, especially where changes in operation and load profiles are part of normal operation. Other important areas are processes where speed regulation can be utilised. Installing electric propulsion gives the following main benefits: reduced installed power (typical >10%), flexible arrangement (more cargo area), flexible and efficient operation, and excellent redundancy. The savings can be as much as a 20–30% reduction in fuel consumption when DP is part of the operation. For other vessel operational profiles fuel savings are typically 5–8%.

Combined diesel-electric and diesel-mechanical machinery can improve the total efficiency in ships with an operational profile containing modes with varying loads. The electric power plant will bring benefits at part load, where the engine load is optimised by selecting the right number of engines in use. At higher loads, the mechanical part will offer lower transmission losses than fully-electric machinery. Total energy consumption for an offshore support vessel with CODED machinery is reduced by 4% compared to diesel-electric machinery.

Low Loss Concept (LLC) is a patented power-distribution system which reduces the number of rectifier transformers from one for each power drive to one bus-bar transformer for each installation. This reduces the distribution losses, increases the energy availability and saves space and installation costs. It gets rid of bulky transformers, and transmission losses are reduced by 15–20%.

A variable-speed power-generation system uses generating sets operating in a variable rpm mode. The rpm is always adjusted for maximum efficiency, regardless of the system load. The electrical system is based on DC distribution and frequency-controlled consumers. This reduces the number of generating sets by 25% and optimises fuel consumption, saving 5–10%.

Switching to LNG fuel reduces energy consumption because of the lower demand for ship electricity and heating. The biggest savings come from not having to separate and heat HFO. LNG cold (–162°C) can be utilised in cooling the ship's HVAC to save AC-compressor power. The saving in total energy is up to 4% for a typical ferry. In 22 kn cruise mode, the difference in electrical load is approximately 380 kW, and this has a major impact on emissions.

Waste-heat recovery recovers the thermal energy from the exhaust gas and converts it into electrical energy. Residual heat can further be used for ship onboard services. The system can consist of a boiler, a power turbine and a steam turbine with alternator. Redesigning the ship layout can efficiently accommodate the boilers on the ship. Exhaust waste heat recovery can provide up to 15% of the engine power. The potential with new designs is up to 20%.

Delta tuning is available on Wärtsilä 2-stroke RT-flex engines. It offers reduced fuel consumption in the load range which is most commonly used. The engine is tuned to give lower consumption at part load, while still meeting NOx emission limits by allowing higher consumption at full load which is seldom used. This gives lower specific fuel consumption at part loads compared to standard tuning.

Common rail is a tool for achieving low emissions and low SFOC. CR controls combustion so that it can be optimised throughout the operation field, providing at every load the lowest possible fuel consumption. It also gives smokeless operation at all loads.

Using lighting that is more electricity and heat efficient where possible, and optimising the use of lighting, reduces the demand for electricity and air conditioning. This results in a lower hotel load and, hence, reduced auxiliary power demand. The fuel consumption saving can be 1% for a ferry.

Correct timing for changing the number of generating sets is critical factor in fuel consumption in diesel-electric and auxiliary-power installations. An efficient power-management system is the best way to improve the system performance. Running extensively at low load can easily increase the SFOC by 5–10%. Low load increases the risk of turbine fouling with a further impact on fuel consumption.

Solar panels installed on a ship's deck can generate electricity for use in an electric propulsion engine or auxiliary ship systems. Heat for various ship systems can also be generated with the solar panels. Depending on the available deck space, solar panels can give the following reductions in total fuel consumption: tanker 3.5%, PCTC 2.5%, and ferry 1%.

Pumps are major energy consumers and the engine cooling-water system contains a considerable number of pumps. In many installations a large amount of extra water is circulated in the cooling water circuit. Operating the pumps at variable speed would optimise the flow according to the actual need. Pump energy-saving case studies show the following possible savings: cruise ship (DE) 20-84%, ferry 20–30%, and AHTS 8–95%.

An Integrated Automation System (IAS) or Alarm and Monitoring System (AMS) includes functionality for advanced automatic monitoring and control of both efficiency and operational performance. The system integrates all vessel monitoring parameters and controls all processes onboard, so as to operate the vessel at the lowest cost and with the best fuel performance. Power drives distribute and regulate the optimum power needed for propeller thrust in any operational condition. Engine optimisation control, power generation and distribution optimisation, thrust control and ballast optimisation give 5–10% savings in fuel consumption.

Power management is based on intelligent control principles to monitor and control the overall efficiency and availability of the power system onboard. In efficiency mode, the system will automatically run the system with the best energy cost. This reduces operational fuel costs by 5% and minimises maintenance.

Operation and Maintenance

A faster port turnaround time makes it possible to decrease the vessel speed at sea. This is mainly a benefit for ships with scheduled operations, such as ferries and container vessels. The turnaround time can be reduced, for example, by improving manoeuvring performance or enhancing cargo flows with innovative ship designs, ramp arrangements or lifting arrangements. The impact of reducing port time for a case-study ferry is as follows:

Port time	Energy used
2 h	100%
1 h 50min	97%
1 h 40 min	93%
1 h 30 min	90%

Regular in-service polishing of propellers is required to reduce surface roughness caused by organic growth and fouling. This can be done without disrupting service operation by using divers. Up to 10% improvement in service propeller efficiency can be achieved compared to a fouled propeller.

Modern hull coatings have a smoother and harder surface finish, resulting in reduced friction. Since typically some 50-80% of resistance is friction, better coatings can result in lower total resistance. A modern coating also results in less fouling, so with a hard surface the benefit is even greater when compared to some older paints towards the end of the docking period. Savings in fuel consumption after 48 months compared to a conventional hull coating for some vessels are as follows: tanker 9%, container vessel 9%, PCTC 5%, ferry 3%, and OSV 0.6%.

Engines are usually optimised at high loads. In real life, most of them are used on part loads. New matching that takes into account real operation profiles can significantly improve overall operational efficiency. New engine matching means different TC tuning, fuel injection advance, cam profiles, etc.

Reducing the ship speed is an effective way to cut energy consumption. Propulsion power vs ship speed is a one-third power curve (according to the theory) so significant reductions can be achieved. It should be noted that, for lower speeds, the amount of transported cargo per unit time period is also lower. The energy saving calculated here is for an equal distance travelled. Typical reductions in ship speed vs saving in total energy consumption are as follows:

Speed reduction (kn)	Energy saving (%)
0.5	7
1.0	11
2.0	17
3.0	23

The purpose of weather routing is to find the optimum route for long-distance voyages, where the shortest route is not always the fastest. The basic idea is to use updated weather forecast data and choose the optimal route through calm areas or areas which have the most downwind tracks. The best systems also take into account the currents, and try to take maximum advantage of these. This track information can be imported to the navigation system.

The optimum trim can often be as much as 15-20% lower than the worst trim condition at the same draught and speed. As the optimum trim is hullform dependent and for each hullform it depends on the speed and draught, no general conclusions can be made. However, by logging the required power in various conditions over a long time period, it is possible to find the optimum trim for each draught and speed. Alternatively, this can be determined fairly quickly using CFD or model tests. However, it should be noted that correcting the trim by taking on ballast will result in higher consumption (due to increased displacement). If possible, the optimum trim should be achieved either by repositioning the cargo or rearranging the bunkers. Optimal vessel trim reduces the required power.

Poor directional stability causes yaw motion and thus increases fuel consumption. The autopilot has a big influence on the course-keeping ability. The best autopilots today are self tuning, adaptive autopilots. Finding the correct autopilot parameters suitable for the current route and operation area will significantly reduce the use of the rudder and therefore reduce the drag. Finding the correct parameters or preventing unnecessary use of the rudder gives an anticipated benefit of 1–5%.

A shipping company, with its human resources department, could create a culture of fuel saving, with an incentive or bonus scheme based on fuel savings. One simple means would be competition between the company's vessels. Training and a measuring system are required so that the crew can see the results and make an impact. Historical data can be used as a reference. Experience shows that incentives can reduce energy usage by up to 10%.

In a condition-based monitoring system all maintenance action is based on the latest, relevant information received through communication with the actual equipment and on evaluation of this information by experts. The main benefits are lower fuel consumption, lower emissions, longer interval between overhauls, and higher reliability. Correctly-timed service will ensure optimum engine performance and improve consumption by up to 5%.

Algae growing on the hull increases ship resistance. Frequent cleaning of the hull can reduce the drag and minimise total fuel consumption. Achievable reductions in fuel consumption are: tanker 3%, container vessel 2%, PCTC 2%, ferry 2%, and OSV 0.6%.

Summary

Methods for increasing the efficiency of ships have been investigated. These were applied to five main ship types: tankers and bulkers, container ships, ro-ro vessels, ferries, and offshore support vessels. The technologies are current, and were grouped under four main headings: ship design, propulsion, machinery, and operation and maintenance. Combining these areas and treating them together as an integrated solution can result in a more-efficient ship operation.

Questions

Question time elicited some further interesting points.

Flettner rotors could not be applied with their axes horizontal (rather than vertical) as they rely on the air flow for their direction of lift.

Common-rail injection is preferable because it gives cleaner combustion due to the higher pressure and, hence, lower emissions. There is not a huge cost saving.

Diesel-electric propulsion generally gives lower vibration and noise, especially underwater noise.

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

MSC Napoli

Rodney Humphrey, Head of Approvals Centre Sydney for Det Norske Veritas, gave a presentation on *MSC Napoli: DNV Findings and Conclusions* to a joint meeting with the IMarEST attended by 34 on 1 July in the Harricks Auditorium at Engineers Australia, Chatswood.

Introduction

Rod began his presentation with a brief overview of the containership *MSC Napoli*, which suffered collapse of the hull girder on passage in heavy weather in 2007. This was an extraordinary incident, and triggered an extensive investigation by Det Norske Veritas to determine the cause and whether other vessels were also at risk.

The vessel was built by Samsung Heavy Industries in 1991 to a new design, and was the largest container ship in the world at the time of building. She was based on a smaller design, but increased in breadth to increase container capacity, and there were no sister ships. Principal particulars were:

Length OA	275.66 m
Breadth	37.13 m
Draught	13.50 m
Gross tonnage	53 409
Capacity	4419 TEU

The vessel was built to BV class, but changed to DNV in 2002. Her last renewal survey was carried out in Singapore in 2004, and there were no conditions of class at the time of the incident. The vessel was well maintained.

The Incident

The vessel left Antwerp on 17 January 2007 at 1004 h, bound for Sines, Portugal. The vessel was already four days late on arrival in Antwerp and had skipped several ports to regain the schedule.

As the ship started the transit of the English Channel on the morning of 18 January, the weather was reported to be worsening. Weather forecasts received onboard the vessel at various times predicted winds of increasing severity, southwesterly Force 6–7–8, increasing to 9–10–11, high rainfall and rough seas, and visibility decreasing from good to poor. Europe was starting to experience one of its worst windstorms for several years, which caused widespread damage, especially in the United Kingdom and Germany. Forty-seven fatalities were subsequently recorded, as well as extensive disruption of public transport, power outages to over one hundred thousand homes, severe damage to public and private buildings and major forest damage.

On 18 January, the log of the 0400–0800 watch stated "Vessel rolling and pitching moderately, pounding heavily at times. Seaspray over focsle." The vessel was heading south into storm-force winds, and occasionally pitching heavily into huge seas. She was making good speed at 11 kn at engine revolutions which, in calm seas, would have resulted in 17 knots.

Shortly after 1100, the ship encountered several large waves. A loud "cracking sound" was heard at 1105, and water ingress in the engine room was reported shortly after. Rapid flooding of the engine room ensued, and severe listing of vessel. A distress signal was sent and all crew abandoned the vessel through liferafts. The vessel's position was reported as 49.20°N, 4.36°W, in the English Channel, off Cornwall. All 26 crew members were rescued from the liferafts by helicopters.

In order to prevent a major environmental disaster, the vessel was taken under tow, intending to head for Portsmouth, UK. However, there was concern that she may break up, and so she was beached in Branscombe Bay, Devon, on 20 January. The vessel had carried a cargo of 2318 containers, of which 103 were lost, and 56 were subsequently found and identified.

MSC Napoli on 18 January 2007
(note vertical dark line indicating compression buckling below, and change of deck line at, forward end of superstructure)
(Photo courtesy DNV)

Salvage

The location on the south coast of England meant that there were many enthusiastic helpers removing flotsam from the beaches! The containers were removed from the vessel, the last one coming off on 17 May. The vessel was refloated and, on 20 July she was split in two by use of explosives, the split occurring at the failure line at the forward end of the superstructure. The aft part was dismantled at the beach, and the larger, forward, part was towed to Belfast and dry-docked for scrapping.

The incident caused headlines in all the major media, and there were calls for an investigation of the cause. It as estimated that the total cost amounted to €400 million for the write-off of the ship, her cargo, salvage, clean-up, and repairs (to local roads, etc.)

DNV Initial Investigation

DNV immediately established a team of experts which was tasked with identifying a possible cause of the incident, leading up to the final failure mechanism. The methodology would be based on the known facts, and use experience, know-how, available computer software, etc. Theoretical methods would be used to estimate induced loads, and the capacity of the structure to absorb the loads.

The observed damage was available from photos shortly after the incident. There was localised damage on the ship sides, both port and starboard. In addition, there was a change in deck line aft of the forward engine room bulkhead, implying that the bottom structure in this area must have shortened significantly in longitudinal direction to allow for the observed hinge effect. The two results were likely to be the result of buckling and collapse of longitudinally-compressed elements.

A number of possible failure scenarios were then considered:

- Effect of major grounding accident in 2001: The vessel grounded while at full speed in the Malacca Strait, causing damage to the bottom from the forward perpendicular to 90 m aft. Steel was replaced/repaired from the bottom and up to the summer waterline (3000 tonnes renewed). Grounding simulations were performed by DNV, but there were no indications that the grounding in 2001 could be related to the current incident.

- Fatigue damage leading to cracking and flooding, analysed by NAPA simulations.
- Engine vibrations leading to fatigue cracking and flooding.
- Propeller out of water combined with engine-induced vibrations leading to fatigue cracking and flooding.
- Hull skin buckling leading to hull girder collapse, cracking and flooding. This case fitted the observed damage.

All except the last were ruled out, as the observed damage did not fit the proposed scenarios.

Phase 1

Phase 1 was a quick and simplified analysis, to see if global loads could have exceeded the corresponding hull-girder ultimate capacity. The ship hull loads at the time of the incident were assessed using DNV's hydrodynamic wave-load program WASIM and preliminary environmental and vessel data. The strength of the structure was assessed using a simplified hull girder analysis. The comparison showed that the ultimate hull girder strength just aft of the engine room bulkhead could have been exceeded, and was close to 70% of capacity in the midship area. It was concluded that wave loads, possibly amplified due to a whipping response, were close to the hull girder ultimate strength capacity. Progressive flooding was not found to have increased bending. The investigation led to belief that hull skin cracking was most likely the result of extreme localised buckling and collapse, leading to flooding, and not the other way around.

An examination of the structural drawings for the vessel showed that, forward of the engine room, the hull was longitudinally framed, i.e. the shell plate was reinforced by closely spaced stiffeners which ran in the fore and aft direction. Generally, the longitudinals were spaced at 870 mm intervals in the bottom structure and were supported by transverse floors spaced a maximum of 3200 mm apart. Aft of the forward engine-room bulkhead (Frame 88) the bottom structure and lower portion of the side shell up to the fourth deck (9620 mm above baseline) changed to being transversely framed with plate floors spaced at 800 mm. There was an area of framing transition in the bottom structure aft of Frame 88 where longitudinals from the cargo hold region continued aft for a short distance before termination or replacement by intercostal stiffeners. With hindsight, the transition region was quite short.

Phase 2

The conclusions of Phase 1 had to be confirmed. The only way to provide such evidence was to apply advanced nonlinear finite-element analysis to accurately describe the plastic deformation and progressive collapse pattern. Phase 2 included a number of coordinated investigations:

- Direct wave load calculations (WASIM)
- Linear strength analysis (FE SESAM)
- Non-linear strength analysis (FE ABAQUS)
- Automatic load transfer WASIM to FE models
- Load and strength comparisons
- Failure mode identification

Wave Loads

Wave loads were determined by direct calculations using WASIM and detailed input.

The wave conditions around the time of the incident were reported by several sources, including the vessel, Ocean Systems Incorporated, Argoss, and the UK Meteorological Office. However, there were variations between the reports, and a summary of the wave conditions at the time 1000–1200 show that the significant wave height observations vary from 7 to 9 m. The up-crossing period T_Z is, however, more uniquely identified to be around 10 to 11 seconds.

In view of the variability of reports, a wave-load sensitivity study was made in order to quantify the main response characteristics of the vessel operating under environmental conditions specific for the English Channel at the time of the incident, and to assess the importance of parameters such as zero upcrossing period, water depth, wave spreading, wave-energy concentration and steepness, non-linear effects, etc. The most important findings were:

- A wave period of 10 s gave the highest vertical bending moment at the engine room bulkhead (VBM).
- Water depth was moderately important (70 m), giving about 10% higher VBM than infinite depth.
- Wave spreading: Uni-directional waves (long crested) gave 10% higher VBM than normal sea (short crested).
- Wave spectra: Narrow band (γ = 5, JONSWAP) gave 15% higher VBM than normal spectra (γ = 1, Pierson-Moskowitz)
- Wave headings: ±15° off head sea had a negligible effect on VBM.
- Speed variations: ± 5 kn on top of average speed 11 knots changed VBM by 10–15%.
- Non-linear hogging effect: VBM reduced by 20–25% relative to linear theory (small waves).
- Container mass variations: Important for still-water bending moment, less important for wave loading.

Based on a thorough examination of the existing data, judgement of possible sources of uncertainties and using in-house experience, two sea states were defined in order to cover the total range of important parameters:

Case 1 "high" was considered to be a maximum environmental condition giving severe global hull loads. In particular, assuming a very narrow wave-spreading function meant that almost all wave energy was localized into an uni-directional wave train meeting the vessel in head sea. Moreover, a value of g = 5 in the JONSWAP wave spectrum reflects an energy-rich, regular and steep wave profile. A significant wave height of 9 m is high, but not unrealistic for a short duration.

Case 2 "low" represented a less-severe set of environmental conditions. By setting the JONSWAP wave spectrum parameter to γ = 1 (Pierson-Moskowitz), the wave profile is more "disturbed" and in line with standard class guidelines and international recommendations (fully developed sea). A significant wave height of 7 m is very likely and as reported by different meteorological offices. Moreover, a vessel speed of 11 knots at a 15 degrees angle off head sea is also within the variations as reported.

The most severe loading for the area of the forward engine-room bulkhead is with a wave crest at about midships, and the aft end of the ship accelerating out of the water due to the heave/pitch, so that the hull girder sets up a hogging condition giving compressive loads in the bottom/bilge region.

The maximum loads at the engine room bulkhead were illustrated as probability distributions (Rayleigh-based extreme values) in for the two sea states analysed, Case 1 "high" and Case 2 "low". The probability distributions then were scaled down by 27% and 20 % (Case1, Case 2) according to the non-linear hogging wave effect relative to linear methods. This was done in order to reflect the real-life vessel response as closely as possible. The total moment range defined includes the likely span of the extreme short-term wave loads assumed for the load cases. A 10% probability of exceedance value was used for the upper-limit wave load for the Case 1 distribution, corresponding to a total moment of 4300 MN-m. A similar definition of 90% probability was used for the Case 2 distribution, giving a lower-limit value of 3400 MN-m.

Whipping effects were not included in the calculations. DNV experience from model tests and full-scale measurements on container ships and other ship types indicates that the whipping loads may contribute significantly to the overall hull-girder stress level and increase loads by 10–50%. However, the calculations are complex, and knowledge in the industry is limited, and further studies are required before being able to quantify any possible contribution from whipping. It is acknowledged that whipping may have contributed.

Strength Analysis

The structural capacity of *MSC Napoli* was determined by two separate methods: a linear stress analysis using SESAM, and a non-linear stress analysis using ABAQUS. The finite-element model was made according to drawings provided by builder, and scantlings used "as built" dimensions, with no corrosion margins deducted. Normal fabrication tolerances were implemented as geometrical imperfections in the non-linear structural analysis for ABAQUS. A region of fine meshing was introduced for the hull between Frames 64–106.

The linear analysis using SESAM found that the vertical bending moment was a maximum at the forward engine-room bulkhead, and that local yielding was occurring. There was therefore a need to consider the redistribution of loads as single elements fail (buckle), and so a non-linear analysis using ABAQUS was commenced.

The whole ship was modelled, with particular attention to details of the structure in way of the engine room area and well into the first cargo hold. All structural and load-carrying parts such as decks, bulkheads, girders, cut-outs, sea chests, stiffeners, plating, flanges, etc. had to be modelled carefully in order to assess the correct stress flow in the structure and in order to predict the local buckling and collapse mechanism. A very-fine mesh was implemented in way of the engine room, from Frames 79–88, with 6 elements between stiffeners and 3 elements across stiffener height, i.e. sufficient mesh density to simulate a local buckling failure mechanism. The total degrees-of-freedom were 1.22 million, with 1.06 million non-linear degrees-of-freedom.

The main output from the non-linear calculations was the global vertical bending moment and shear loads when the hull girder collapses. This is the ultimate hull-girder capacity. A non-linear method is the only approach available which is capable of simulating inelastic material behaviour, and load-shedding phenomena due to local large buckling deflections, all effects which may lead to a progressive and localised collapse and, ultimately, total collapse of the vessel. The non-linear calculations took approximately 24 h to determine failure capacity, and approximately one week to determine the collapse failure mode.

A sensitivity analysis was carried out, using three values of yield strength for the hull steel, a lower value of 315 MPa, mean 349 MPa, and upper 383 MPa.

The results of the non-linear analysis showed that the hull had the capacity to absorb a bending moment at Frame 88 (the forward engine-room bulkhead) of 4200–4950 MN-m. However, this overlapped the loads predicted by WASIM (in the previous section) of 3400—4300 (MN-m). The conclusion was that global hull girder failure was possible.

As the hull girder collapses, we can follow the local progressive failure mechanism; what starts with elastic buckling of the bottom/bilge plate soon breaks the back of the ship. If M_U is the vertical bending moment at engine room bulkhead Frame 88 at collapse in engine room area:

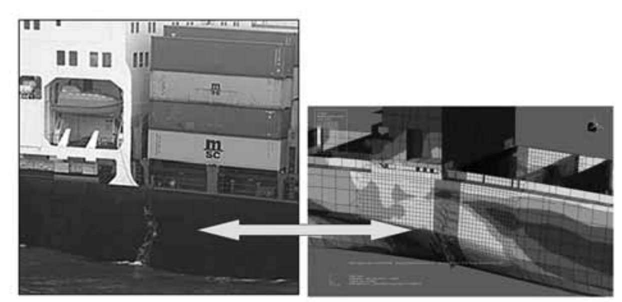
- At 25–30% M_U: Elastic buckling starts in the lower bilge area. Buckling deflections are not very visible due to gradual load shedding to stiffer and stronger areas.
- At 25–100% M_U: Load distribution will take place gradually from 25% M_U and upwards to 100% M_U. Buckling deflections grow slowly in the beginning, while accelerating and spreading from the bottom and up into the ship side for load levels approaching 100% M_U.
- At 75% M_U: A clear stress accumulation in longitudinal "hard corners" can be seen. Elastic plate buckling in the bilge area becomes more visible.
- At 95% M_U: The stress accumulation in "hard corners" reaches material yield stress. Significant plate buckling occurs in bilge, bottom plate and tank top.
- At 98% M_U :The "hard corners" are overstressed and suffer plastic collapse. A marked localisation of the collapse pattern is seen. Plate buckling deflections are significant and localised in a narrow band. Significant plate buckling in bilge and tank top plating. Locally significant plastic deformations.
- At 100% M_U: The localised collapse pattern becomes even more marked and progresses further into the ship side. Buckling deflections become very large and the plastic deformations are significant.

A very realistic and well-defined failure mechanism unfolded in the FE model. Compared to the failure mode as observed on vessel, the FE computer simulation gave a very close match.

DNV Conclusions

There was harsh weather and wave loading, with wave heights of 7–9 m and steep waves. The loading condition (containers, ballast, fuel, etc.) meant that in the stillwater condition the hull-girder strength was at 98% utilisation.

As far as the structural integrity of the vessel went, it was



Comparison of actual damage and finite-element simulation of failure mode
(Photo and diagram courtesy DNV)

not a "rust bucket". However, margins were insufficient in one particular area. High wave loads were necessary for the total load to exceed the capacity limit. Whipping effects may also have contributed to the total load. The hull girder was not strong enough, and the loading exceeded the structural capacity.

The ship's strength was not satisfactory. However, the weather and sea conditions were severe that day. The loading condition was within limits but very close to the allowable limit. Structural integrity was low in the engine room area (low buckling strength). It must also be clearly said, however, that DNV was not responsible for supervising initial drawing approval or construction of the ship but only assumed responsibility later when *MSC Napoli* transferred into their class.

For other vessels, DNV concluded that the probability of re-occurrence was very low due to the very low probability for such a severe sea state, the overlap between load and capacity being narrow, and damage statistics being very low. However, considering the consequences, screening of the existing fleet was considered necessary. IACS agreed that all large existing container vessels should be assessed using a simplified screening procedure for hull girder capacity, and 1500 vessels were subsequently assessed by the IACS societies. 12 vessels were identified as being at risk and needing to implement mitigating measures; of these, two were classed by DNV, but had not been designed to DNV rules. These 12 vessels had operating restrictions placed until they could have suitable strengthening measures undertaken. The remedy was, ultimately, simple and required the fitting of intercostal flat-bar buckling stiffeners, a minor modification.

IACS also agreed to reassess the new building rules, with transversely-framed areas being specially considered in way of the engine room. For new rules, important issues for long-term R&D development included wave loads for slender vessels—whipping/slamming, ultimate-strength criteria for both local and global strength, and hull surveillance via full-scale measurements. IACS would consolidate R&D activities on hull-girder loads and strength via the Marine Accident Investigation Bureau.

Conclusion

Following the hull-girder collapse of the container vessel *MSC Napoli*, DNV launched a comprehensive investigation into the cause of the incident and the failure mechanism. The results showed the likely mechanism, which agreed well with the observed damage. Similar ships were assessed for exposure to similar levels, and in-service modifications carried out on those assessed as at risk.

Questions

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

There was no investigation of whether, had the vessel slowed below 11 kn, she may have avoided the collapse which occurred. The investigation centred on replicating the failure conditions as closely as possible. However, slowing would clearly have been beneficial.

The linear finite-element model of the ship took of the order of one week to prepare, and the non-linear super-model model close to six weeks.

The analysis which is now undertaken is streets ahead of the analysis which was undertaken when the ship was built in 1991, and the new analysis will highlight any areas of concern in the new super-containerships which are being designed to carry 14 000 TEU. DNV also do more extensive buckling checks that the other classification societies. There are more unknowns in whipping, and this is likely to be investigated far more in the future.

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

NSCV Arrangement, Accommodation and Personal Safety

Mori Flapan, Technical Adviser to the National Marine Safety Committee, gave a presentation on *Revised Standards for Commercial Vessel Arrangement, Accommodation and Personal Safety* to a joint meeting with the IMarEST attended by 21 on 5 August in the Harricks Auditorium at Engineers Australia, Chatswood.

Introduction

Mori began his presentation by outlining the component parts of the National Standard for Commercial Vessels:

Part	**Title**	
A	Safety Obligations	
B	General Requirements	
C	Design and Construction	
	1	Arrangement
	2	Watertight Integrity
	3	Construction
	4	Fire Safety
	5	Engineering
	6	Stability
	7	Equipment
D	Crewing and Competencies	
E	Operational Requirements	
F	Special Vessels	
	1	Fast Craft
	2	Leisure Craft (new name for hire-and-drive vessels)
	3	Novel Vessels
	4	Special-purpose Vessels

Sections C1, C2, C6 and F2 are under way, Sections F3 and F4 have yet to be started, and other sections have been completed.

There is a number of stages in the development of each section, including identification of the issues, a first draft, public comment, and the final draft. The Arrangement, Accommodation and Personal Safety section is a new section which combines provisions from the Uniform Shipping Laws Code Sections 5E, 5F, 6, 7, 9, 11 and 18. For this new section, the issues have been identified and the first draft is being prepared.

Mori then looked at the composition of the domestic fleet of vessels, which looks roughly like this (based on 2003 figures) [1]:

Length range (m)	Proportion of fleet (%)
<7.5	39
7.5–12	25
12–24	32
24–35	3
>35	1

In dissecting the fleet by class and area of operation,a chart showed that most Class 3 (fishing) vessels are seagoing, most Class 2 (non-passenger) vessels operate in Areas C (restricted offshore) and D (partially-smooth waters), and most Class 1 (passenger) vessels operate in Areas D (partially-smooth) and E (smooth waters).

So there is, in fact, a wide range of vessels to be accommodated.

The International Context

Since the USL Code was written, there have been big changes on the international scene, and many relevant standards have been altered in the relevant sections of the International Labour Conventions. These apply in full to ships of 500 gross tons (approximately 42 m in length) or more with exceptions (sailing, fishing or whaling), *and where reasonable and practicable* to vessels between 200 GT (approximately 30 m in length) and 500 GT.

Applicable conventions include:

Convention	Title	Ratified by Aust
C92	Accommodation of Crews (Revised) 1949 [2]	Yes
C133	Accommodation of Crews (Supplementary Provisions) 1970 [3]	Yes
C147	Merchant Shipping (Minimum Standards) 1976 [4]	No
MLC	Maritime Labour Convention 2006 [5]	No
C188	Work in Fishing 2007 [6]	No

C147 was not adopted by Australia, and there have been other new conventions produced by the International Labour Organisation which have not been ratified by Australia, such as the Maritime Labour Convention of 2006.

So, to what extent should these apply to Australian commercial vessels?

In order to find out, NMSC asked industry the question "To what extent should those ILO Conventions ratified by Australia and New Zealand, i.e. C92 and C133, be incorporated into the requirements of the NSCV?"

Responses included the following:

- As a reference, but suspect this would effect a small number of vessels.
- Supported, but with the stated intention to provide an exemption for fishing vessel in excess of 500 GT.
- To their full extent.
- If included, should be based on the ship's gross tonnage as per ILO conventions.

In general, the adoption of ratified ILO conventions was supported.

NMSC also asked industry the question "To what extent should the NSCV pre-empt the ratification of the Maritime Labour Convention (2006) and/or the Work in Fishing Convention (2007)?"

Responses included the following:

- Australia's unique conditions need to be considered, i.e. the diverse nature, size and area of operation of passenger/tourist vessels. I do not agree with blindly adopting rules "to be seen to do it".
- Don't pre-empt.
- NSCV should not pre-empt the ratification of MLC 2006 and WIFC 2007.
- NSCV should not pre-empt.
- If included, should be based on the ship's gross tonnage as per ILO conventions.

There was no industry support for pre-empting the entry into force of the latest ILO conventions. That does not mean that they won't come into force, but it will need legislation to make it happen.

Vessel Exemptions

Exemptions are a measure of the applicability of rules to particular vessels, and so NMSC conducted an analysis of recent exemptions.

Exemption	Proportion (%)
Rails	52
Sanitary	17
Escapes	11
Deck heights	8
Deck area	7
Protection	3
Berthing	2
Seating	1

Most exemptions applied to guardrails and bulwarks, so they looked at these first.

Guardrails and Bulwarks

Issues which affect the determination of what the requirements should be include unsupervised children, the height, intermediate courses, strength, and possible alternative arrangements.

A proposed set of required outcomes is:

1. A vessel must be provided with arrangements which prevent persons from falling overboard, taking into account the competence and physical characteristics of the persons.
2. A vessel must be provided with arrangements which prevent persons from falling from elevated locations on the vessel, taking into account the competence and physical characteristics of the persons.
3. The arrangements must be capable of retaining a person lying on the deck from falling (either overboard or from elevated locations) due to seas on deck, excessive deck angles or excessive motions.

Looking for feedback, NMSC asked industry the question "Do you agree with the above draft required outcomes for guardrails and bulwarks??"

Responses included the following:

- Six agreed.
- Generally supported, but for commercial fishing vessels, bulwark and rail heights should be subject to exemption where required (e.g. where gear is being brought on board).

- None disagreed.

This is valuable feedback. The required outcomes have been designed to be generic in nature, allowing equivalent solutions which may differ from the prescriptive requirements for guard-rail geometry specified as the deemed-to-satisfy requirement, subject to their being equivalent in outcome. Thus alternative arrangements can be accommodated within the standard, rather than relying upon an exemption by the surveyor on the spot.

By way of comparison, Mori looked at the requirements for fences around backyard swimming pools, which require a height of 1200 mm, and vertical bars spaced at a maximum of 100 mm. No horizontal bars are allowed, because children can climb! This is very different to anything on board ships.

NMSC also asked industry the question "Do you believe that the current standards, which appear to only be sufficient for children under supervision, are appropriate for all vessels, or only for some vessels, or are inadequate generally?"

Responses included the following:

- Generally realistic, but there needs to be a change in attitude which leans more to personal responsibility than the "cotton wool" approach. Vessels vary so greatly in purpose, use, size and so on, that it would be virtually impossible to have a standard railing height, station and railing spacing.
- Yes, children on boats should be supervised.
- Current standards are adequate. (2)
- The current standards are adequate; the responsibility for the children lies with their parents or carers, not the rule makers.
- Standards should be extended to vessels including those that may be used to supplement public transport/ commuter services carrying unsupervised children, such as school children to or from school.
- Adequate for most vessels. Perhaps a more stringent requirement should be placed on vessels such as ferries which represent a higher risk and/or perhaps the code should adopt a policy similar to the airline industry which requires unaccompanied minors to be assisted/ supervised by airline personnel.

As a matter of interest, the USA's standards under the Code of Federal Regulations (CFR) 46 for guardrails on ferries are different to those for other vessels [7].

Sanitary Arrangements

When do sanitary arrangements have to be fitted? What is the minimum number of toilets and basins?

NMSC asked industry the question "Should the 15 min threshold for fitting of toilets on vessels currently specified in the USL Code be reviewed?" (i.e. no toilet is required if voyages are of less than 15 min duration).

Responses included the following:

- Yes. (3)
- Yes, for Class 1E and 1D vessels, where seasickness is less of an issue. Buses and trains carrying commuters do carry toilets, and 1 h journeys during peak hours are not unusual.
- Although, on the face of things, 15 min is fair enough, in practice now—with water taxis and the like—it is not always practical. There needs to be an underlying requirement for minimum toilet facilities, but there also needs to be room to tailor the facilities to the operation.
- Yes; this will also alleviate a person being forced to use other alternatives where there is no toilet fitted, such as the environment!

Escapes and Evacuation Routes

Issues which affect the requirements include escapes vs. evacuation paths, minimum number of escapes, the nature of escapes, minimum dimensions of escapes (either singly or in the aggregate).

A high-capacity escape is one which allows rapid movement of large numbers of persons to a place of comparative safety, e.g. wide doorways or wide stairways. A low-capacity escape is one which permits movement of small numbers of persons to a place of relative safety, e.g. hatches, ladders, windows, narrow stairways or narrow passageways.

A survey of requirements by other administrations around the world for minimum widths of high-capacity escapes shows that the USL Code requirements are lower than other standards.

NMSC asked industry the question "Should the minimum width of single high capacity escapes be increased to align with the minimums specified in the HSC Code 2000?"

Responses included the following:

- Yes. (2)
- The codes should align.
- No; aircraft, for example, can have much longer escape routes than many passenger vessels and aisles of much less than 900 mm width.
- Support 900 mm width for all vessels.
- Why the difference between Class 2 (up to 12 pax) and Class 1? 900 mm should be the case for all vessels; people are the same even if the class of operation is different!
- Yes, as a minimum.
- No; for vessels under 24 m in length, Class 2 and 3 should be allowed 650 mm minimum width.

Other issues include assembly stations, evacuation paths, redundancy of evacuation paths, and evacuation time.

NMSC asked industry the question "If you support the provision of assembly stations on vessels under the NSCV, which vessels should be provided with defined assembly stations?"

Responses included the following:

- Vessels of 35 m or more in length.
- Class 1 vessels (i.e. passenger vessels).
- With regard to fishing vessels, MCA LY2 would seem to cover what is required.
- Passenger vessels carrying more than 16 passengers.
- Only really applicable for Class 1B (i.e. passenger vessels operating up to 200 n miles from the coast).

What about paths (e.g. passageways) *not* used for escape or evacuation; should there be minimum standards?

For escape hatches, the USL Code requires a minimum of 460 mm in any direction; ISO allows a minimum of 450 mm diameter, or 380 mm diameter plus a minimum area [8]. Tests by Wissler [9] indicate that location (height above floor), size, whether a lifejacket is worn and type of lifejacket, are all important factors in determining the minimum dimensions for escape hatches. Wissler recommended a minimum of 500 mm diameter, or 450 mm diameter plus increased area.

This is a particularly difficult decision, because some people would not fit through even a 500 mm diameter escape hatch, even if *not* wearing a lifejacket. Not only that, but Murphy's Law would say that at least half the people would be trapped behind the one person who could not get through!

NMSC asked industry the question "Should the minimum clear width of 460 mm contained in the USL Code be retained and, if not, what should the minimum clear width be?"

Responses included the following:

- Yes. (6)

Minimum Deck Heights

Should small vessels and sailing vessels be subject to the same requirements? The USL Code allows 1.9 m for small vessels, and 1.6 m for hire-and-drive vessels—why the difference?

There have been changes in relevant national and international standards. The ILO proposed in the MLC 2006 a minimum deck height of 2.03 m. For naval architects, this will mean pushing up the VCG of the vessel.

Deck heights should take account of anthropometric design principles and dimensions. People are getting taller, with the mean male height being 1717 mm, but this varies by country.

NMSC asked industry the question "Should the minimum required clear height under the NSCV (1.9 m) be increased for some or all vessels to align with current (1.98 m) or future (2.03 m) ILO standards?"

Responses included the following:

- Not for sailing vessels, but should be in line with the current standard (1.98 m) [SIC: actually 1.9 m] for all passenger-carrying (commercial) vessels.
- No. (2)
- Yes. (2)
- 1.98 m minimum.
- Would support 1.98 m head height.
- That may be a good idea!

Minimum Deck Area

Issues to be addressed include the required outcome, i.e. what are we trying to achieve by specifying minimum deck areas? NMSC thought that this would allow the crew to move freely within the space when at maximum capacity, and to allow persons to move away from hazards.

There are minimum values specified for allowable passenger densities in the USL Code of 0.55 m^2/pax (0.4 allowable in smooth waters) on the main deck, but 0.85 m^2/pax on other decks—why?

Other issues include grading of densities for area of operation, and duration of journey, flexibility for berthed accommodation of passengers, and new standards for crew accommodation.

Protection of Persons

NMSC asked industry the question "Do you support including a clear provision for the fitting of protection for passengers and crew, based on operational area (likelihood of exposure) and duration of voyage (time of exposure)?"

Responses included the following:

- Yes. (5)
- Yes, but this best applied by the operator; if he puts customers out in inclement weather, then they will not patronise the service.
- No.

Berthing of Persons

Since the USL Code was written, there have been changes in berthing arrangements and, in particular, high-speed ferries often use reclining-style aircraft seats, and a full USL Code berth would not be appropriate. Are "berths" required for all passengers? When are berths needed for crew? What should be the minimum length of berths—currently 1900 mm in the USL Code, and 1980 mm in the MLC 2006. Can berths be too big?

NMSC asked industry the question "Should the minimum size of berth remain the same, or should it be increased to take into account changes in the demographics of persons?"

Responses included the following:

- Remain the same.
- Remain the same as a minimum, but for vessels of less than 12 m in length.
- Should remain the same; in smaller fishing vessels an increase in the size of the berth, particularly if floor space is stipulated, maybe impractical and have no clear benefit.
- Sizes should remain the same; smaller vessels in particular may have trouble fitting standard mattress sizes.
- Update to take into account of changes.

Seating for Passengers

In the USL Code there are different requirements for the width of seating required for hire-and-drive vessels (600 mm/pax) and all other vessels (475 mm/pax)—why? What would be a reasonable minimum?

Other issues to be addressed include the required number of seats, the pitch (distance between rows) of seats, and seating for divers on RIBs.

NMSC asked industry the question "Should vessels which proceed to sea have seating for all persons as the deemed-to-satisfy solution?"

Responses included the following:

- Yes.
- Yes, and wet-weather gear.
- No. (2)
- No—standing passengers are quite legitimate, as on other forms of transport.
- Depending on the vessel's use, passenger vessels most definitely, work vessels may not necessarily need them.

Access On and Off the Vessel

Gangways are addressed in Section 13 of the USL Code, of which not many people are aware. There are no clear requirements as to the form or function of gangways or accommodation ladders.

Other issues to be addressed include smaller vessels, performance-based risk parameters, construction standards, and recovery of persons from the water.

NMSC asked industry the question "Do the current USL Code requirements for gangways and accommodation ladders need revision?"

Responses included the following:

- No. (3)
- They are adequate.
- Yes they do, but we have to be careful not to be too prescriptive.

Dangerous Machinery

The USL Code only requires guarding of dangerous machinery in the machinery space. What about dangerous machinery elsewhere, such winches on the deck of a trawler? How does this relate to OH&S requirements?

NMSC asked industry the question "Should the NSCV contain provisions for the protection of persons from machinery in locations other than in the machinery space?

Responses included the following:

- Yes. (2)
- No. (2)
- If referring to deck machinery on fishing vessels, then I believe it is already covered by Work Place Safety.
- For deck machinery and the like, yes.

The comment about Work Place Safety is useful, and will be checked out because, if it is covered by OH&S, then we don't want to be doubling up on requirements.

Field of Vision

Field of vision from the operating compartment is covered in Section 9 of the USL Code [10] in one line, which says:

21.4 Helmsman's View

The steering position arrangement shall be such that the operator has a clear view ahead in the normal steering position.

There are relevant national and international standards for vessels of 55 m or more in length. IMO's SOLAS Chapter 5 applies to these vessels, and there are detailed requirements. These regulations do not apply to smaller vessels, but some jurisdictions apply them to smaller vessels, e.g. New Zealand applies them to vessels of 45 m or more in length.

What about sailing vessels—they have the sails impeding the field of vision! Should there be special requirements for vessels travelling at high speed?

NMSC asked industry the question "Do you support the use of the American Boat and Yachting Council Rule H1, or a similar standard, as the minimum required standard for field of vision from the helm for smaller domestic commercial vessels?"

Responses included the following:

- Yes. (3)
- No.
- I am not entirely convinced.

It is, in fact, hard to argue against the ABYC Rule H1 being at least the minimum requirements for commercial vessels, when it is a requirement for recreational vessels.

Access for the Disabled

Issues to be addressed include applicable laws, relevant standards for access, and evacuation of disabled passengers.

NMSC asked industry the question "To what extent, if at all, should the NSCV reflect and/or proactively mandate requirements specified in applicable legislation for providing disabled access?"

Responses included the following:

- For new builds only and for vessels of 50 m or more in length.
- This should be left to market forces. The range of vessels to which the rules are applied (e.g. RIBs and other such boats) would make the application of long ramps, etc. difficult to administer. Also, most boats have crew to assist with disabled access, which is not necessarily assumed in legislation applying to, say, shooting centres for example, where ramp slopes and the like are based on un-assisted access.
- Given the complexity of water-borne vessels, it is very difficult to legislate for disabled access; maybe there should be reference to the issue, and have it handled on a case-by-case basis. It is a very difficult and important issue.
- Not at all.
- Only for vessels carrying 200 or more passengers.

Conclusion

The provisions of the USL Code which refer to arrangement, accommodation and personal safety have been reviewed to identify relevant issues. Public comment has provided opinions on the relative importance of, and possible solutions for, the issues raised. The main items in the new section of the NSCV have been discussed here, including some of the comments received. The comments are being considered by a reference group of both industry and government representatives which has been formed to steer the direction of the new standard. The new section of the NSCV is being drafted, and will be released for public comment. Stakeholders are encouraged to review the draft section when it is released for public comment and provide their comments.

Endnotes

1. NMSC Inc. *Arrangement, Accommodation and Personal Safety Issues Paper*, 2009, http://www.nmsc.gov.au/media/pages_media_files/files/Arrgt%20Issues%20Paper%20v1-7.pdf.

2. International Labour Organisation, *C92 Accommodation of Crews Convention (Revised)*, 1949.

3. International Labour Organisation, *C133 Accommodation of Crews (Supplementary Provisions) Convention*, 1970.

4. International Labour Organisation, *C147 Merchant Shipping (Minimum Standards) Convention*, 1976.

5. International Labour Organisation, *MLC Maritime Labour Convention*, 2006.

6. International Labour Organisation, *C188 Work in Fishing Convention*, 2007.

7. Sec. 72.40-5(c) On the passenger decks of ferryboats, excursion vessels, and vessels of a similar type, the space below the top of the rail shall be fitted with suitable wire

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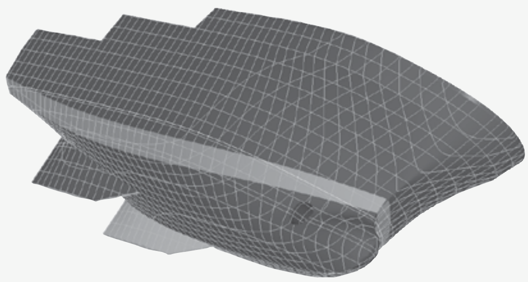

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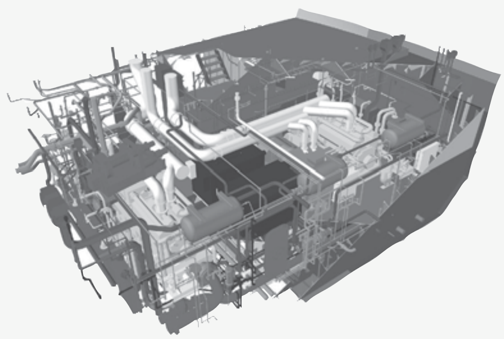

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mesh or the equivalent. Depending upon the type of construction, the lower rail courses may not be required.

8. International Standards Organisation, ISO 9094-1:2003 *Small craft - Fire protection - Part 1: Craft with a hull length of up to and including 15 m*.

9. Wissler, Swedish Maritime Safety Inspectorate, 2007-11-01/A, *Tests of ISO manhole escapes*.

10. Uniform Shipping Laws Code Section 9, http://www.nmsc.gov.au/media/pages_media_files/files/uslc-section9.pdf.

Questions

Question time was lengthy and elicited some further interesting points.

The requirements for stairways on land are more onerous than those on board ships; for example, some shipboard gangways may have a handrail on one side only. However, the fact that a gangway or stairway met a minimum standard does not necessarily protect a consultant from prosecution. Many accidents occur when accessing or egressing from vessels.

Statistics on marine accidents have been compiled by the NMSC, and the report is available on their website. However, this shows overall statistics; case studies are often more revealing about what can be done to prevent a particular type of accident. Some case studies are available on the Queensland Department of Transport's website, and New Zealand Maritime's website.

It was decided to create a new national standard, the NSCV, rather than simply updating the USL Code, because the standard needed to be more performance based (in line with current thinking and other world standards), where the USL Code is very prescriptive. The change of name reflects the change in thinking behind the standard.

The USL Code, when introduced, provided designers with a very good tool which was ahead of much of the rest of the world at the time, and contributed to the success of the fast ferry industry in Australia. The NSCV is an evolution of the USL Code, but its aim is the same, to provide designers with a good tool.

In developing the NSCV, the NMSC looks closely at other standards which are in use around the world. The outcomes required by the NSCV have to be achieved by both large and small vessels. Most other standards around the world are specialised, e.g. for passenger vessels, non-passenger vessels, large yachts, etc. This means that they are often not consistent, and that there is often a hard step between the requirements for, say a vessel carrying less than 15 passengers, and one carrying 15 or more passengers. The NSCV aims to provide a gradual bridging from small vessels up to full SOLAS vessels.

The interesting thing is that NMSC is receiving feedback that some overseas countries are picking up on the principles in the NSCV and starting to apply them on vessels within their jurisdictions!

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

Triton alongside the Common User Facility in Western Australia for refit in May. Now operated by Australian Customs and based in Darwin, *Triton* was built by Vosper Thornycroft, Woolston, for the UK Ministry of Defence as a trial ship for a possible 7000 t future trimaran frigate. Commissioned in September 2000 she is built of steel with a full load displacement of 1100 t. *Triton* is 98 m long, has a 22.5 m beam and is 3.2 m deep. MTU diesels have replaced her original Paxman diesels. She was originally owned and operated by the Defence Evaluation Research Agency, with instrumentation provided by the USN. After trials in the UK, the USN undertook further evaluation to examine all aspects of the trimaran configuration.
(Photo courtesy Hugh Hyland)

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Institute of Marine Engineering, Science & Technology IMarEST
NAVY

COMING EVENTS

NSW Technical Meetings

Technical meetings are generally combined with the Sydney Branch of the IMarEST and held on the first Wednesday of each month at Engineers Australia, 8 Thomas St, Chatswood, starting at 6:00 pm for 6:30 pm and finishing by 8:00 pm.

The program of meetings remaining for 2009 (with exceptions noted) is as follows:

2 Sep Andrew Dovell, Murray, Burns and Dovell
Design Development of the 60 ft Sailing Catamaran Plastiki

23 Sep Site visit to Sydney City Marine, commences 4 pm at SCM.

7 Oct Forum/Panel Discussion
Harbour Ferries

3 Dec SMIX Bash 2009

ACT Technical Meeting

Nick Lemon, Head of the Human Element and Training Department of the Australian Maritime Safety Authority, will make a presentation on Thursday 20 August on *Will e-Navigation Help with the Increasing Problem of Information Management both Onboard and Ashore?* The meeting will be held in the Russell R1 Theatrette, starting at 5:30 pm for 6:00 pm, and will be combined with the Canberra chapters of IMarEST, the Nautical Institute, and Engineers Australia.

There is an ever-increasing amount of information to be managed by the officer-of-the-watch on board today's ships, as well as ashore by various authorities including an increasing number of vessel traffic service organisations. This presentation will:

- cover the development of e-Navigation to date;
- seek to answer the question *Will e-Navigation provide any benefits to those at sea and ashore, currently faced with too much information?*; and
- provide details of the latest benefits in e-Navigation from the most-recent meeting of the IMO's Safety of Navigation sub-committee (late July 2009).

Basic Dry Dock Course

Following on from the success of the course held in Melbourne in 2008, the Royal Institution of Naval Architects is pleased to announce that this course will again be held in Brisbane at Forgacs Cairnscross Dockyard on 7–10 September 2009.

This unique four-day course covers the fundamentals and calculations of dry docking. The course begins with the basics and safety concerns, and progresses through all phases of dry docking: preparation, docking, lay period, undocking, and ends with a discussion of accidents and incidents.

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

The course is designed to be relevant to dockmasters, docking officers, engineers, naval architects, port engineers and others involved in the dry docking of ships and vessels.

The course leader is Joe Stiglich, a retired naval officer and qualified NAVSEA Docking Officer who holds a masters degree from MIT in Naval Architecture and Marine Engineering. He has been responsible for over 250 safe docking and undocking operations, and currently runs a series of conference and training courses for personnel involved in all phase of the drydocking industry, and acts as a consultant for ship repair companies.

To register your interest in the course visit www.rina.org.uk/drydockaustralia2009.

The course program (including topics) and registration form may be downloaded from www.rina.org.uk/c2/uploads/basic dry dock _ australia 2009.pdf.

SMIX Bash 2009

The tenth SMIX (Sydney Marine Industry Christmas) Bash will be held on Thursday 3 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).

Tickets are available from Adrian Broadbent of Lloyd's Register Asia on (02) 9262 1424, fax 9290 1445. Cost is $35 per head till 2 November and payments by credit card are acceptable till then. After 2 November, the cost will be $45 per head and credit card payments will no longer be acceptable; cash or cheque (payable to RINA NSW Section) only. There is a limit of 225 guests on board *James Craig*, so it would be wise to book early.

For further details and booking form, see the advertisement on Page 25.

Pacific 2010

The Pacific 2010 International Maritime Exposition and Congress will be held at the Sydney Convention and Exhibition Centre, Darling Harbour, Sydney, from Wednesday 27 to Friday 29 January 2010. It will include:

- The Pacific 2010 International Maritime and Naval Exposition, organised by Maritime Australia Ltd, to be held from Wednesday 27 to Friday 29 January.
- The Royal Australian Navy Sea Power Conference 2010, on the theme of Combined and Joint Operations from the Sea, organised by the Royal Australian Navy and the Sea Power Centre Australia, to be held from Wednesday 27 to Friday 29 January. Further information on the conference can be obtained from the conference website www.seapower2010.com or by contacting the conference organisers Navy Events and Marketing, email navymarketing@bigpond.com.
- The International Maritime Conference, organised by the Royal Institution of Naval Architects, the Institute of Marine Engineering, Science and Technology and Engineers Australia on the theme Meeting the Maritime Challenges, to be held from Wednesday 27 to Friday 29 January. Further information on the conference, including the conference and social programs, can be obtained from the conference website www.pacific2010imc.com or by contacting the conference organisers, Arinex Pty Ltd GPO Box 128, Sydney, NSW 2001, or email pacific2010imc@arinex.com.au.

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SMIX

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Photo courtesy of ANMM

PS: Don't spoil your copy of the Australian Naval Architect – photocopy the coupon instead

Those wishing to attend the Sydney Maritime Industry Christmas Bash (SMIX) should complete this form and return it, together with your remittance, to the RINA (NSW) Treasurer, Adrian Broadbent, c/o Lloyd's Register Asia, PO Box Q385, Sydney NSW 1230 or Fax (02) 9290 1445.

Price: $35:00 per person for Early Birds – before 2 November 2009; or $45:00 per person after 2 November. No refunds will be granted.

Name: (Block Letters) ____________________
Guests: ____________________
____

Cheque payable to "Royal Institution of Naval Architects (NSW Section)" for __________ is enclosed.

Or please charge my MasterCard ☐ or Visa ☐ (please tick relevant box)

Credit Card payments can only be used for Early Bird bookings and MUST be received before 2 November 2009.

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Please advise your email address so that your booking can be confirmed.

Attention: Adrian Broadbent, Lloyd's Register Asia
PO Box Q385
Sydney NSW 1230 or Fax (02) 9290 1445

CLASSIFICATION SOCIETY NEWS

New President for LR Asia

Lloyd's Register has appointed John Rowley as its new President for Lloyd's Register Asia. He succeeds John Stansfeld who has returned to London to drive the implementation of the organisation's new Group strategy. Rowley joins the Group after a 14-year career with Ecolab Inc, a Fortune 500 multi-national corporation operating in the industrial chemicals sector, where he most recently held the position of Vice-President and Managing Director for Asia.

"John Rowley is a veteran of the Asia-Pacific region who brings with him a wealth of experience in managing a multinational company, such as ours, in a commercial arena where there is a diversity of cultures, languages and unique regulatory challenges," said Paul Huber, the Lloyd's Register Group's Chief Operating Officer. "He has a deep understanding of business relationships in Asia and a broad spectrum of business knowledge spanning many industries."

As President for Lloyd's Register Asia, Rowley will be responsible for a rapidly-expanding workforce of almost 2 000 people across a region which stretches from China and Japan to Australia and west to the Indian subcontinent. His remit will include operational responsibility for the Group's five divisions in Asia: Marine, Management Systems, Chemicals and Power, Oil and Gas, and Transportation. In taking the helm at Lloyd's Register Asia, Rowley inherits a part of the Group which has seen average annual revenue growth exceed 20% since 2006.

"It has been a long search, but we are confident that we have found the right person to assume control of our activities in the dynamic Asian region from John Stansfeld," said Huber. "We were particularly impressed by John Rowley's extensive Asian business experience and his team approach to achieving strategic objectives. His positive attitude and proactive leadership will fit in well with our dynamic Asian team. I would also like to take this opportunity to thank John Stansfeld for his dedication and leadership demonstrated throughout the past eight years in his role as President for Lloyd's Register Asia. We are delighted to welcome him back to London to focus on his new position as Group Strategy Director, but I know that he will be missed by his friends and colleagues in Asia."

Rowley joined Ecolab Inc in 1995, following short careers in the British Army and water management. He has a degree in biotechnology from the University of Reading in the UK. He has lived in the Asia-Pacific region for the past 18 years, during which time he held executive leadership roles in Hong Kong, China, Singapore and Australia. Rowley, whose appointment became effective on May 25, is based in Hong Kong.

Avoiding Propulsion Loss due to Switching Fuels

The United States Coast Guard has issued a safety alert highlighting the possible hazards arising from switching from residual fuel oils to distillate fuel oils in order to reduce emissions.

It is expected that ships will switch fuel more frequently to comply with new emission reduction regulations. When switching fuel oil, some ships have experienced propulsion losses linked to procedural errors or fuel oil incompatibility. The American Petroleum Institute has developed a paper, *Technical Considerations of Fuel Switching Practices*, which discusses problems which lead to propulsion loss while switching fuel. This may be useful to vessel owners, operators, and engineers interested in preventing fuel-system failures and propulsion casualties while meeting current and future exhaust emission-control requirements. The paper is available at www.marineinvestigations.us (select Safety Reports from the Investigations menu on the left).

In order to prevent casualties associated with fuel-oil switching, the Coast Guard strongly recommends that owner and operators:

- consult engine and boiler manufacturers for fuel-switching guidance;
- consult fuel suppliers for proper fuel selection;
- exercise tight control when possible over the quality of the fuel oils received;
- develop detailed fuel-switching procedures;
- establish a fuel-system inspection and maintenance schedule;
- ensure system pressure and temperature alarms, flow indicators, filter differential pressure transmitters, etc., are all operational;
- ensure system purifiers, filters and strainers are maintained;
- ensure system seals, gaskets, flanges, fittings, brackets and supports are maintained;
- ensure a detailed system diagram is available;
- conduct initial and periodic crew training;
- complete fuel switching well offshore before entering restricted waters or traffic lanes.

In addition to the advice above, engine builders are to be consulted to determine whether system modifications or additional safeguards are necessary for the intended fuels. Owners are also reminded that all modifications to main and auxiliary engines and associated fuel supply systems are to be appraised by the vessel's classification society in order to ensure that class is maintained.

International Naval Safety Association

To develop a common safety standard for naval ships, the Naval Ship Code, several Navies and Classification Societies have joined together to form the International Naval Safety Association (INSA).

The NATO group MCG/6 established a specialist team in June 2004 to consider the development of a Naval Ship Code to provide a naval alternative to SOLAS. The result of four years of work by navies and classification societies is the soon-to-be-published NATO document ANEP77. INSA will work with NATO MCG/6 to develop, maintain and promote the application of this document.

The aim of the INSA is to develop, maintain and promote adoption and application of the Naval Ship Code, and to capture feedback from the Code's application.

It is the vision of the INSA that the Naval Ship Code becomes established as a cost-effective goal-based framework for naval ship safety and environmental assurance, benchmarked against statute, and accepted by the global naval community and intergovernmental bodies.

The INSA inaugural meeting took place in April 2008 in London. At this meeting nine navies and eight classification societies agreed to take forward the work of the NATO specialist team and establish the INSA.

The first Annual General Meeting took place on 21 and 22 October 2008 where the founding members of INSA were formally recognised and work started on developing and updating the code in the light of recent experience on a number of naval projects.

Mr Denis Pattison of the UK Ministry of Defence, Chair of the INSA, stated that "The Naval Ship Code represents a step forward in the development of a common baseline for naval ship safety and the INSA provides a unique collective resource from around the world to address the associated technical issues."

Details on the work of INSA are available on the website www.navalshipcode.org.

GENERAL NEWS

New Chairman for ASC

Federal Minister for Finance and Deregulation and sole shareholder of ASC, Lindsay Tanner, announced in June that Vice Admiral Ritchie would succeed Mr John Prescott as Chairman on the expiry of Mr Prescott's term on 30 June 2009.

Mr Prescott, who has been Chairman of ASC since November 2000 when the Company became 100% owned by the Commonwealth, said Vice Admiral Ritchie brought a broad range of experience and capability to the role including a deep understanding of customer requirements for the Company's services.

Vice Admiral Ritchie has had a distinguished naval career, including terms as both Chief of Navy and the Australian Defence Force Theatre Commander, and has served as a director on ASC's Board since August 2007.

He said he was honoured to be chosen as Chairman of ASC.

"I am privileged to have the opportunity of leading the Company through what will be an important time for us," he said. "I look forward to working with the ASC Board, senior management and staff."

Vice Admiral Ritchie said that he was pleased that Mr Graeme Bulmer would continue to act as Managing Director and Chief Executive Officer while ASC's Board conducts an executive search for a replacement for Greg Tunny, who resigned in May 2009.

He also acknowledged the commitment and contributions of Mr Prescott, and fellow director Mr Charles Bagot who, likewise, was retiring on 30 June after serving on the Board since 2000.

"Through their roles on the Board, Mr Prescott and Mr Bagot have made significant contributions to important stages of the company's development, in particular its expansion through diversification in submarine activities and surface ship construction," Vice Admiral Ritchie said.

He said thatASC is well-positioned to continue its role as a major provider of naval defence support.

"We are about to start building the Hobart-class air-warfare destroyers; we will continue to maintain and upgrade the Collins-class submarines; and we want to help the Government in any we can with its future submarine project," Vice Admiral Ritchie said.

ASC Restructuring

In June ASC announced a major restructure of its operations as part of a drive to reduce maintenance costs and improve efficiencies. Sixty-five white- and blue-collar staff associated with ASC's Collins-class submarine through-life support program had their employment terminated, with 21 contractors also being released.

Another 35 submarine staff were to be offered the opportunity to transfer to ASC's shipbuilding business to meet the needs of the Air Warfare Destroyer (AWD) Program.

After the changes, ASC's submarine workforce now numbers 950, while its AWD workforce is approximately 300. ASC will still require another approximately 500 people over the next four years to work on the AWD Program.

Acting Managing Director and Chief Executive Officer, Graeme Bulmer, said that the reduction of employee numbers was regrettable.

"It is an unfortunate course of action to have to take and we are concerned for those affected and their families," he said.

"On behalf of the company I wish to thank those employees and contractors who have been directly affected by this restructure for their contribution.

"We have provided generous redundancy packages to those employees, and also offered an outplacement support service to enhance their opportunity of obtaining further employment.

"Wherever possible we have tried to relocate staff to our shipbuilding business but, unfortunately, this has not been achievable in all cases."

Mr Bulmer said that the reduction in employee and contractor numbers would in no way compromise the safety of the Collins-class submarines and those who serve or work on them.

Anzac-frigate Missile Project on Track

The Minister for Defence, Senator John Faulkner, and Minister for Defence Personnel, Materiel and Science, Greg Combet, formally announced on 3 August the Government's commitment to ensuring that the Anzac-class frigates will be able to operate effectively for the remainder of their operational lives.

As indicated in the recently-released Defence White Paper, the Government has agreed to put all of the Anzac ships through the anti-ship missile defence (ASMD) program, subject to the successful outcome of sea trials on the first ship.

The ASMD program involves a comprehensive upgrade of the Anzac frigates, including the addition of innovative phased-array radar technology designed and built by an Australian company, CEA Technologies.

The Government is committed to completing the development and trials of this highly-innovative Australian-designed technology at a cost of $158 million.

This is the first lightweight application of such technology and, if successful, will deliver an enhanced search-and-track and target-illumination capability in the maritime environment.

"The ASMD program will ensure that the Royal Australian Navy's Anzac frigates have a far greater level of self-defence against modern anti-ship missiles. It will also improve the ability of the frigates to provide close-in protection to an amphibious maritime task group and support the Navy's future air-warfare destroyer capability," Senator Faulkner said.

In a very encouraging outcome for the development of this high-technology system, the prototype radar has performed beyond expectations throughout the testing and evaluation process.

"Over the last 12 months, the practical demonstration of this phased-array radar technology has provided the Government with confidence that the new acquisition strategy will maximise the integrity and maturity of the system before beginning the first ship installation in 2010," Mr Combet said.

"This challenging project has experienced delays, so it is pleasing to see this level of technical maturity and managed risk being achieved. However, full integration of the radar into the Anzac frigates is yet to be completed, and the Government will continue to closely monitor the progress of this project."

The first Anzac ship to undergo the upgrade will be HMAS *Perth* which is scheduled to complete sea trials in July 2011.

Future Submarine Project Study

On 6 August John Faulkner, Minister for Defence, and Greg Combet, Minister for Defence Personnel, Materiel and Science, announced that Defence will call for Requests for Tender (RFT) to complete a Domestic Design Study for the Future Submarine Project, SEA 1000.

"The procurement of Australia's future submarine will be Australia's largest-ever single defence project and will form a critical part of the nation's future defence force," said Senator Faulkner.

"Investigations by the Future Submarine Project Office to date have covered a number of diverse areas aimed at developing an understanding of the capability of the international submarine industry."

"This RFT adds to these preliminary investigations by examining Australia's design capabilities, and forms part of a program of studies being undertaken to support the planning of Australia's future submarines as outlined in the Defence White Paper," said Senator Faulkner.

"The RFT would add to current information collected to

HMAS *Sirius* in the Cairncross Dock, Brisbane, in April/May 2009. This was the first docking of this ship since she was built five years ago. *Sirius* is 189.5m long with a beam of 31 and draft of 10.5 m at 46 017 t full load. Her bow thruster was used to help to centre the vessel when entering and leaving the dock. A quantity of ballast water forward, required to minimise the trim aft, was discharged as the dock emptied so as not to overload the forward blocks, and was refilled as the dock flooded. In contrast, at the wharf in the background is one of the 1200 t oil fuel lighters built for the RAN during World War II and now in private service on the Brisbane River
(Photo courtesy Department of Defence)

help shape the approach to the design of the next generation submarine."

"We are undertaking a number of studies to identify and explore all the options to ensure that we have the appropriate design capability to support our submarines throughout their life. The information we collect through this process will help to develop strategic options for the Government's consideration," said Mr Combet.

"This Government is committed to carefully planning for Australia's next generation of submarines. This is clear through the program of studies and information we are gathering."

"This request for tender recognises the skills that our Australian domestic defence industry has in the design and development of submarine technologies and systems," Mr Combet said.

Incat Ship Delivered

LD Lines' brand new Incat 112 m wave-piercing catamaran, *Norman Arrow*, arrived in the Port of Dover for the first time on Tuesday 26 May, following completion of her three-week delivery voyage from Hobart, Tasmania.

Norman Arrow departed Tasmania on 2 May and her voyage included calls at Fremantle, Port Victoria (Seychelles), transit through the Suez Canal and a final call into Valetta from where she departed on 24 May, en route to Dover and Boulogne.

Master for the voyage from Hobart, Captain Nick Dunn, summed up his new ship perfectly, "The vessel has performed admirably throughout the voyage," he said.

"Power, performance and quality all meet expectations and *Norman Arrow*, on appearance alone, is sure to catch the public imagination. She is set to revolutionise cross-channel travel and provide an exciting new option for passengers," Captain Dunn said.

On a packed quayside at Dover to welcome the vessel after

Norman Arrow arriving in Dover
(Photo courtesy Incat Tasmania)

12 000 n miles of long ocean passages were crew relatives, friends and well wishers, including Incat's Chairman Robert Clifford.

"Nineteen years ago, our first-generation 74 m catamaran, *Hoverspeed Great Britain*, made her first crossing between Dover and Boulogne, so it obviously gives me great pleasure to see what is now the English Channel's largest fast ferry arrive to take up service on this important link," Mr Clifford said.

Speaking after disembarkation from the ship was Captain Guy South, who assisted Captain Dunn on the voyage from Hobart.

"The last leg of our journey illustrated perfectly the capability of *Norman Arrow*: 2272 n miles at an average speed of 39 kn running at about 80% MCR", he said.

"As a crew we are looking forward to seeing what *Norman Arrow* is capable of in service and, hopefully, changing the face of the UK short-sea market with our enhanced weather ability and freight capacity.

"To a man we enjoyed the delivery voyage, a once-in-a-lifetime experience. *Norman Arrow* is a fantastic craft and we will endeavour to get the best out of her and push the LD name to the forefront of the UK short-sea sector," Capt South concluded.

Norman Arrow became the largest-ever fast ferry to operate on the cross-channel routes between England and France, when she commenced service on the Dover–Boulogne route on 6 June.

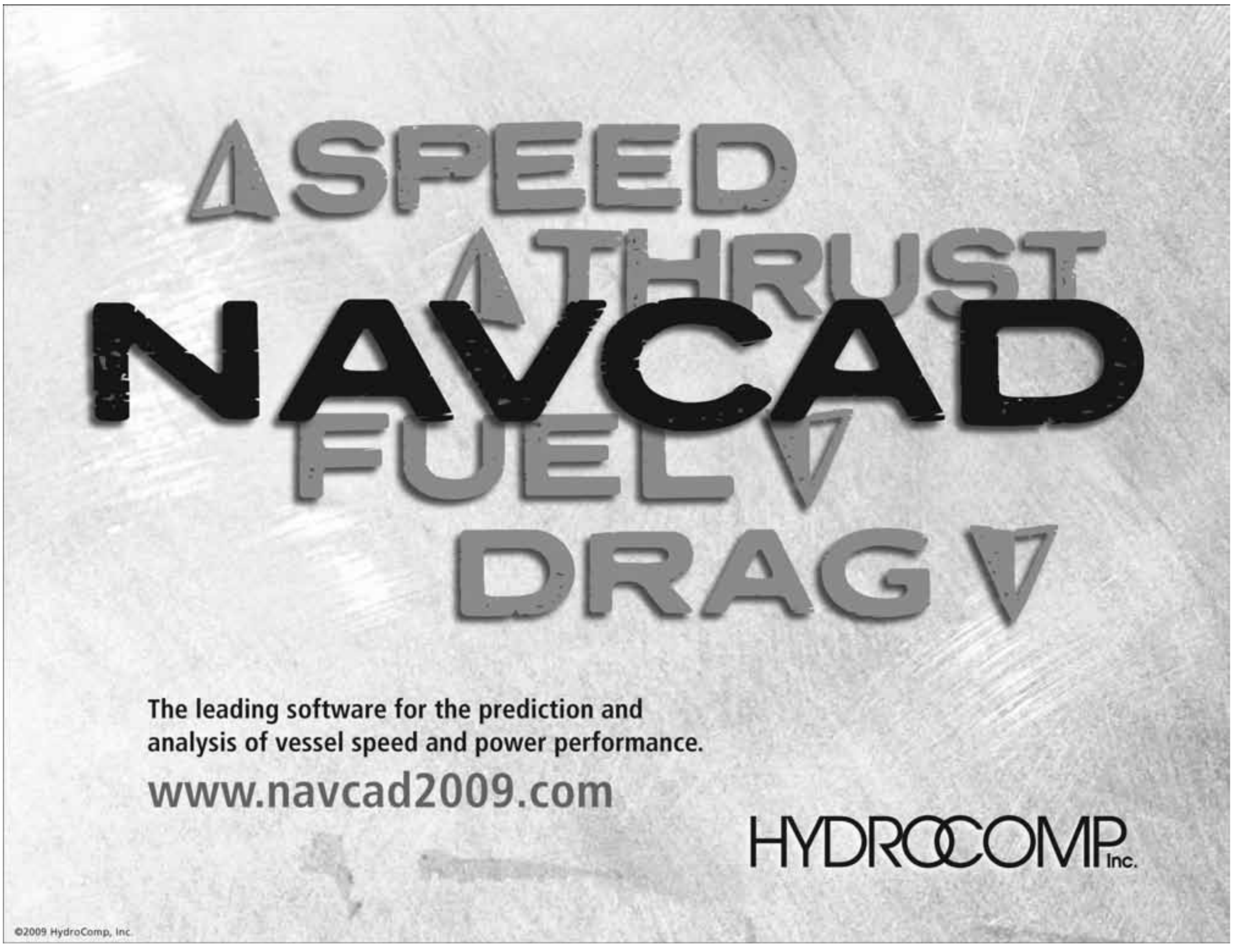
The fast ferry is the world's largest diesel-powered catamaran and will also be the first-ever freight-carrying high-speed vessel to operate across the Dover Straits and first Incat 112 m to operate in Europe.

LD Lines new Dover–Boulogne service will be greatly enhanced as the new fast ferry will increase frequency from the current two to six return sailings daily. All types of tourist traffic will be carried including cars, caravans, motor homes, motorcycles, coaches and foot passengers, in addition to freight.

Sub Rescue System in Australia

The LR5 submarine rescue system arrived in Australia early on the morning of 2 June 2009. While having the LR5 submarine rescue system on call in the United Kingdom met the Navy's requirements for responding to submarine emergencies, the relocation improves response times and allows the Royal Australian Navy to exercise the capability with Collins-class submarines.

The ancillary equipment for the LR5 suite arrived in



Australia by a chartered 747 the prevoius week and the LR5 rescue vehicle by RAAF C17 Heavy Air Lift.

The LR5 rescue system arrives in Australia
(Photo Department of Defence)

The suite has been at 12 hours notice to deploy in the event of a disabled submarine throughout the transport period from the United Kingdom to Australia.

The current Navy support vessels have already been modified to deploy the LR5 rescue system.

The LR5 has mated safely on many occasions with submarines fitted with the standard NATO rescue seat, which is fitted to most submarines, including the Collins class.

This rescue system complements the international support which would be available through Australia's membership of the International Submarine and Rescue Liaison Organisation.

All these aspects form part of a mature submarine search and rescue organisation with proven measures in place to ensure effective domestic and global responses for any of the Navy's submarines in the unlikely event of an emergency.

Austal JHSV Milestone

In May Austal took a significant step towards commencing construction of the US Department of Defence's next generation multiuse platform — the Joint High Speed Vessel (JHSV) — after successfully completing the Initial Critical Design Review (ICDR).

During the ICDR, Austal provided a comprehensive summary of the critical areas of the JHSV design for US Navy approval. The successful completion of the ICDR means that Austal is now proceeding towards the project's next critical milestone — the Final Critical Design Review.

US Navy Strategic and Theater Sealift Program Management Office Program Manager, Capt. George Sutton, commented, "The Austal JHSV program team performed well during the review process. I look forward to working with them towards the successful completion of the next critical milestone of this program."

Austal USA President and Chief Operating Officer, Joe Rella, commented, "I am proud of the hard work the JHSV program team has put forth to achieve a successful ICDR. The team now enters the Transitional Design Phase with production of the lead JHSV to commence later this year. The solid relationships we have developed with the Navy and its onsite representatives have been instrumental in our ability to remain on schedule."

Austal was awarded the contract to design and build the US Department of Defense's JHSV in November 2008. As prime contractor, Austal will design and construct the lead 103 m JHSV, with options for nine additional vessels expected to be exercised between FY09 and FY13.

The Austal JHSV will provide rapid intra-theater deployment/transportation of personnel, equipment and supplies supporting military logistics, sustainment, and humanitarian relief operations at speeds of more than 35 kn.

The aluminium vessel will have the capability to transport medium-size units with their vehicles or reconfigure to provide troop transport for an infantry battalion, allowing units to transit operational distances while maintaining unit integrity. The vessel also has a flight deck for helicopter operations and an off-load ramp allowing vehicles to quickly drive on or off. The ramp will enable use of austere piers and quay walls, common in developing countries, while the vessel's shallow draft (under 15 feet) will further enhance theatre port access.

The Austal JHSV team includes platform systems engineering agent, General Dynamics Advanced Information Systems (GDAIS), which is responsible for the design, integration, and testing of the ship's electronic systems, including an open architecture computing infrastructure (Open CI), internal and external communications, electronic navigation, aviation, and armament systems.

FPB Crew Training at Austal

In July more than 90 personnel from the Trinidad and Tobago Coast Guard (TTCG) completed a comprehensive Austal vessel training program in preparation for the delivery of their six-vessel fast-patrol craft fleet in early 2010.

The crew training program — held at Austal's dedicated training facilities in Western Australia — familiarised TTCG personnel with the specific features and capabilities of the 30 m fast patrol craft, equipping them with the skills necessary to operate the vessels and perform basic maintenance.

Ordered in 2008, the all-aluminium fast patrol boats will support the Trinidad and Tobago Coast Guard in providing sustained surveillance in the country's internal waters, the archipelagic territorial sea and its exclusive economic zone.

Additional contracts for scheduled and unscheduled maintenance, along with the crew-training services, were attached to the initial order, demonstrating Austal's growing Integrated Logistics Support (ILS) capability.

The crew-training package comprises two different streams — a familiarisation training program for TTCG deck officers and ratings, and a maintenance training program for engineer officers and ratings.

The comprehensive maintenance training program familiarised the TTCG's shore-based support personnel with the construction of the vessels, equipping them with the capability to conduct operational-level maintenance as required.

Austal General Manager — Service, Michael McCourt, said that coinciding the training program with the construction of the vessels provided the ideal environment for Austal's dedicated training service.

"Trades covered by this program include aluminium fabricators and welders, electricians, engineers and outfitters, who each already have a certificate and a minimum of two years experience in their respective trade," Mr McCourt said.

"Completion of the training program will elevate each of the personnel to a new level of expertise in their relevant field in a timeframe much shorter than traditional training programs," he said.

Mr McCourt said Austal would train a further 60 TTCG personnel on location in Trinidad and Tobago commencing in January 2010.

Trinidad and Tobago personnel with one of their new fast patrol craft during training in Western Australia
(Photo courtesy Austal)

Triple Naval Docking in WA

In May, for the first time, three major RAN vessels were docked together at the BAE Systems' shiplift at Henderson and, for added measure, there was a fourth in refit alongside. Those docked were the submarine *Waller*, the frigate *Perth* and the guided missile frigate *Darwin*. Each was on a purpose-built steel cradle giving a keel height of 3.35 m above the rails for the frigates and 3.5 m for the submarine. There was also a large tug in dock.

The cradles are owned by Defence and are fully interchangeable, the differences between each class being accommodated by changing the caps. For greater flexibility, additional caps are held so that two vessels of one class plus a third of another class can be docked together. Indeed, the keel caps for the submarines could be flown anywhere in the world and used in conjunction with shores in numerous graving and floating docks should the need arise.

The Sydney-based HMAS *Darwin* was the first of her class docked in WA with mine avoidance sonar, while the WA-based HMAS *Anzac* was docked in Sydney, also the first of that class docked there with mine avoidance sonar. The addition of this sonar in the keel at the bow necessitates some careful considerations regarding adjacent keel block location and support — divers can assist with the accurate location of each vessel when raising the lift, but this is not possible when pumping a graving dock.

The use of staff for the docking calculations was also flexible. Depending on staff availability, some docking/undocking calculations for Sydney were checked and approved in WA and some for WA were checked and approved in Sydney. BAE Systems in Melbourne prepared the calculations for the submarine.

After almost 20 years of docking submarines in this shiplift, the docking of *Waller* was likely to be the last — future dockings will be in the new floating dock in the adjacent Common User Facility, with transporters moving the vessels undercover in the new ASC facility.

Hugh Hyland

HMA Ships *Perth*, *Waller* and *Darwin* high and dry in Western Australia, with a tug in the middle and HMAS *Arunta* at the wharf beyond
(Photo courtesy Hugh Hyland)

Provisional Acceptance of HMAS *Newcastle*

On 29 May 2009 the Defence Materiel Organisation agreed to the contractual hand back and provisional acceptance of HMAS *Newcastle* from the prime contractor, Thales Australia.

HMAS *Newcastle* is the fourth and final guided missile frigate to complete the FFG upgrade. The timing of provisional acceptance is within the amended schedule agreed in May 2006.

Contractual acceptance of HMAS *Newcastle* is scheduled for December 2009 and project completion is scheduled for 31 December 2009.

HMAS *Newcastle*
(Photo John Jeremy)

19 m Patrol/VIP Boat from Kamira Holdings

Kamira Holdings and its associated builder in Malaysia, Marlin Marine Sdn Bhd, have signed a contract to design and build a 19.7 m patrol/VIP boat for Lembaga Pelabuhan Johor (Johor Port Authority). LPJ has the responsibility for patrolling both Johor Port and PTP, but they are at opposite ends of southern Johor and separated by the causeway to Singapore. The vessel must travel around Singapore to undertake its duties, requiring a larger and faster vessel than might otherwise be needed. Johor Port itself is a considerable distance from the sea and the patrolled area is extensive.

Additional duties include boarding vessels for routine inspections, and entertaining visiting VIPs. A principal requirement for the vessel was that its aesthetics and outfitting had to reflect a high-end corporate image. The ports in southern Johor are in stiff competition with Singapore for container trade, and the Authority is often called upon to entertain visiting investors, government officials and shipping-line representatives.

The monohull vessel will be built from aluminium but with a GRP cabin top to improve the styling. Almost all of the interior, including decks, will be made from composite panels (not aluminium honeycomb) to attenuate the noise and vibration common in all-metal boats. A considerable amount of shape (longitudinal and transverse) has been designed into the hull and superstructure.

Although the vessel is not required to meet any construction standards, it will be built to BV Class but with "black dot" machinery (type-approved machinery and systems). The customer also has retained the right to exempt certain class requirements which are deemed to be unnecessary (with builder and designer "high-fiving" behind the surveyor's back).

The propulsion system uses a close-coupled V-drive arrangement, driving propellers in shallow tunnels. This helps to keep the engines aft for reduced noise and easier maintenance. The medium-duty V12 MAN engines have simple mechanical governing, as the benefits of electronically-controlled engines are often overshadowed by the problems generated when they break down. In contrast to this, most other equipment is of a high standard, including underwater exhaust discharges, investment-cast duplex stainless-steel shaft brackets, fuel-polishing systems and an Inconel exhaust system.

The outfitting standard includes Recaro marine seating, leather settees, Nakamichi and Bose sound systems and Raymarine G-Series electronics with more screens than a multiplex cinema (including five processors).

Construction will commence when the cheque clears.

Greg Cox

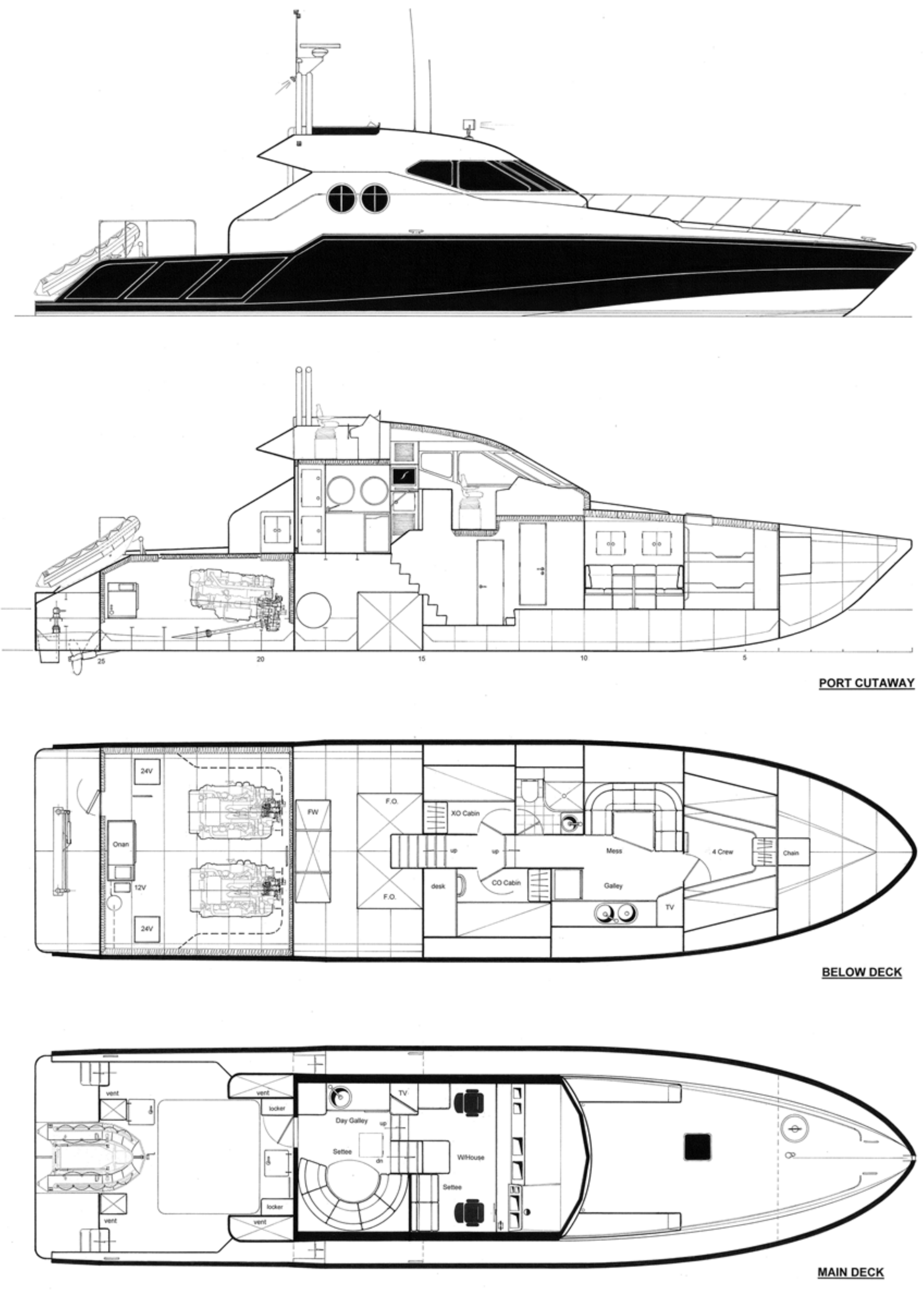
Principal particulars of the new patrol vessel are:

Length OA	19.70 m
Length WL	18.20 m
Beam OA	4.75 m
Depth	2.60 m
Draft (hull)	0.85 m
Displacement	28.6 t at full load
Crew	4
Passengers	8
Fuel	3500 L
Fresh water	1000 L
Main engines	2×MAN 2842 LE 413 each 735 kW at 2100 rpm
Gearboxes	2×ZF 500-IV
Reduction ratio	1.767:1
Propellers	2×812 mm diameter 5-bladed NiBrAl
Speed	35 kn at half load
Genset	Onan 27 kW
Airconditioning	Cruisair 108 000 BTU/h
Design Criterion	Must be "like sex, but better"!

Arabian 100 Trimaran from Boatspeed

The first Arabian 100, a new class of 105 ft (32 m) trimaran, has arrived in the city of Salalah in southern Oman for final assembly. Built by Boatspeed in Somersby, NSW, the three hulls and connecting beams were shipped on deck to Salalah via India. On Saturday 2 May, the parts were transferred to the custom-built shed in Salalah in the Royal Yachts compound where the fleet of yachts belonging to His Majesty, Sultan Qaboos, is maintained.

Over the next four months the spars will arrive from Southern Spars in Auckland, New Zealand, whilst the Harken deck gear and winches will arrive from Italy. Before the trimaran is launched at the end of August for sea trials, a full set of North Sails will arrive from France.



General arrangement of 19 m Patrol/VIP vessel
(Drawing courtesy Kamira Holdings)

Originally designed by Nigel Irens and Benoit Cabaret, the Arabian 100 is a close sister ship to the very successful and very famous *Sodeb'O* campaigned by Thomas Coville. *Sodeb'O* has set many records around the world and her design was a perfect platform on which to develop a new class of racing trimarans which also offer perfect training platforms.

His Majesty will name the Arabian 100 on completion, and she will be used by Oman Sail to further the profile of Oman internationally whilst training a new generation of young Omanis. Without the rotating mast of *Sodeb'O* and the simplifying of some of the processes, the new trimaran will easily accommodate a large crew of trainers and trainees on short- or long-distance challenges. The Arabian 100 will be part of the programme which will involve long-distance races as well as being an international ambassador for Oman. An Omani crew will be trained to sail the Arabian 100, but there will also be a strong Omani contingency in the background doing the boatbuilding, maintenance, systems, rigging and sailmaking. A cornerstone of Oman Sail's charter is the development of young Omanis in the larger scheme of reigniting Oman's maritime heritage. The Oman Sail Academy is in the second phase of recruitment for young Omani men and women, many of whom will be part of the

Arabian 100 crew when she starts her schedule of events. For further details and photographs, visit www.omansail.com/article.asp?aid=20781.

Boatspeed Receives Hunter Region Exporters Award

Boatspeed of Somersby recently received the Judges' Special Encouragement Award in the Hunter and Central Coast Export Awards for 2009. The citation says "The history of Boatspeed has centred on the building of high-technology high-performance racing sailboats and the cruising yacht market. An attitude highlighting detail and accuracy has seen many successful racing campaigns begin at the Boatspeed company."

Apart from successful vessels in Sydney–Hobart and other local races, Ellen MacPherson's maxi trimaran *B&Q*, holder of the solo around-the-world sailing record, and Thomas Colville's maxi trimaran *Sodeb'O*, holder of the solo North Atlantic sailing record, were built by Boatspeed.

John Oxley Restoration

The restoration of *John Oxley* on board the Sea Heritage Dock in Rozelle Bay continues.

The port side plating up to the sheer strake is now all in place and almost completely rivetted. The team is about to start the plating under the counter stern. This part of the vessel is much higher than other parts, and a more-elaborate scaffold system is needed, with additional scaffolding being supplied by sponsors.

The bilge keel port side has also been manufactured and has been riveted into place. The bilge keelson port side has also been riveted.

The struts supporting the hull under the main engine have been removed and the weight of the hull here has been transferred back onto the bilge blocks. Similarly, the supporting struts under B-strake on the port side have also been removed.

The fabricators have also been making a new main injection (sea inlet) water box to replace the original casting which failed to pass survey. This assembly will be inserted into the hull on the port side aft.

On the starboard side, the stand for the large Dawson and Downie ballast pump has been riveted back in place. Slightly above and outboard is the stand for the Worthington fire-and-bilge pump. It was generally found that glands leaked on any pump which handled sea water badly and affected the steel work beneath the pump, and repairs to stands and support structures were necessary.

Engineers have also been measuring and drawing the sterntube and shafting so that a commercial sterntube seal can be fitted. The original seal fitted by Bow McLachlan is thought to be a Vista design, with the seal keeping lubricating oil from leaking into the environment. The original seal leaked, and the NSW Maritime Authority has indicated that a commercially-supplied replacement seal is required. Funding is in place and the search is on for a new stern seal.

For all the latest news, visit www.shf.org.au/JO-restoration/JO-latest-news.html.

Phil Helmore

Sunferries Takes Delivery of a Third One2three Catamaran

Following the introduction of two 30 m One2three-designed catamarans at the beginning of the 2007, Sunferries have recently taken delivery of their third One2three designed 30 m catamaran, *Palm Cat*, for use on the longer 40 n mile Palm Island route along the lines of their Magnetic Island ferries.

Maggie Cat and *Sun Cat*, built by Brisbane Ship Constructions, were introduced in February 2007 as part of Sunferries' upgrade on the Townsville-to-Magnetic Island run. After 12 months of tracking fuel usage of the new vessels on the route, Terry Dodd, Managing Director of Sunferries, reports that *Maggie Cat* and *Sun Cat*, in addition to reducing travel time from 25 to 18 minutes, have produced significant fuel savings over the existing fleet vessels. These savings highlighted a compelling economic case for the replacement of the Incat Designs 24 m *Sunbird*, previously running to Palm Island at 22 knots." Following a government-funded dredging and wharf modification programme, Sunferries have scheduled a return trip to Palm Island 3 days a week to greatly enhance the service provided to the island community, with increased services to be brought online as public demand increases. *Sunbird* was built by NQEA Australia in 1987, and acquired by Sunferries in 1998.

The 60 n mile Palm Island run requires greater interior seating capacity and, to meet this demand, an enclosed passenger cabin has been added to the upper deck behind the wheelhouse to accommodate 40 interior seats. Other major changes include the provision of additional space on the upper deck to support cargo and baggage handling, and the inclusion of a rescue boat at the stern for offshore operations.

Whilst the existing Sunferries 30 m hull was suitable, One2three have optimised the hull to suit the additional deck cargo and increased route length. The new hull has a modified hull shape to suit the offshore nature of the route, and is slightly longer in order to deliver the highest fuel savings possible. It has also been fitted with an MDI interceptor ride-control system to provide a greater level of ride comfort.

Palm Cat on trials
(Photo courtesy One2three Naval Architects)

Principal particulars of the new vessel are:

Length OA	30.0 m
Length WL	29.0 m
Beam moulded	8.0 m
Passengers	
Total seats	222
Total certified	300

Fuel	2×2500 L
Fresh Water	1×1200 L
Sullage	1×1200 L
Main Engines	2Cat 3412E each 895 kW brake power at 2300 rpm
Service speed	28 kn @ full load and 85% MCR

24 m Catamaran from One2three for Whale Watch Australia

Sea World Whale Watch, in conjunction with Whale Watch Kaikoura of New Zealand, have taken delivery of a One2three-designed 24 m catamaran. *Spirit of Migloo* was built by Aluminium Boats Australia, and is specifically designed for whale watching with large walk-around decks on both main and upper decks, and a full-width open sundeck. Grandstand seating is also provided on the foredeck. A large bar at the rear of the main-deck cabin supports sunset charter cruises and corporate events outside of the whale season.

One of the distinctive features of the vessel is the whale-tail sun canopy fitted to the sun deck to provide shade from the magnificent Gold Coast weather. It was faithfully modelled in 3D to exacting dimensions provided by the owner and constructed from high-tech composites.

Powered by twin MTU 8V2000 M72 engines with Twin Disc MGX 6599 SC Quick Shift gearboxes driving conventional propellers and with marine mammal strike-protection skegs added, the vessel's speed on trials was in excess of 27 kn in a fully-loaded condition.

Principal particulars of the vessel are:

Length OA	24.0 m
Length WL	22.0 m
Beam moulded	9.0 m
Passengers	160
Fuel	2×2500 L
Fresh Water	1×150 L
Sullage	1×1150 L
Main Engines	2 × MTU8V2000 M72 each 720 kW brake power @ 2250 rpm
Service speed	27 kn fully loaded

Spirit of Migloo
(Photo courtesy One2three Naval Architects)

Bird's-eye view of *Spirit of Migloo*
(Photo courtesy One2three Naval Architects)

Three 23 m Patrol Catamarans from One2three

Earlier this year, three 23 m patrol catamarans designed by One2three Naval Architects were delivered to the Queensland Police Service following construction by Austal in Tasmania. The three vessels form the Class 1 Fleet for the QPS, and are stationed at Yeppoon, Cairns and Brisbane.

The vessels are configured with four 2-berth cabins in the hulls, allowing patrols of up to two weeks' duration, and can accommodate up to 28 personnel on shorter-duration voyages. Each vessel is equipped with a fresh-water maker, a sewage-treatment plant and WC and shower facilities on each deck.

The catamarans are fitted with two MTU Series 60 diesels rated at 499 kW brake power each, giving the vessels a cruising speed of 20 kn at approximately 80% power with a 700 n mile range. Sprint speed is in excess of 26 kn. A feature of the vessel is the ability to launch and retrieve a 6 m RHIB under a range of sea conditions, the RHIB being housed on the aft deck between the hulls.

All three vessels were delivered under their own power from Tasmania to Brisbane by Austal.

23 m patrol catamaran for Queensland Police Service
(Photo courtesy Queensland Police Service)

One2three 30 m Catamaran for Manly Run

April saw the introduction of a One2three-designed 30 m catamaran ferry on the Manly-to-Circular Quay route in Sydney. Named *Ocean Dreaming II*, the vessel was built by Aluminium Boats Australia for Bass and Flinders Cruises, a Sydney-based charter operator with a fleet of whale watching and tourist charter vessels.

Originally configured for whale watching, the new vessel entered service immediately with Manly Fast Ferry, (a subsidiary of Bass and Flinders Cruises) on the Manly-to-Circular Quay express service, replacing the STA JetCats. *Ocean Dreaming II* operates the commuter services in the morning and evening peak hours, and undertakes whale-watching cruises during the day and on weekends in the whale season, with harbour charter services in the off season.

Features of the vessel include extensive seating, with 170 interior seat on the main deck and 48 interior and 43 exterior seats on the upper deck. Passengers have full walk-around access on the upper deck, from an aft stairwell and two forward stairs leading to the foredeck. Unlike the Sunferries' 30 m catamarans, the Bass and Flinders' vessel also has a large whale-watching sundeck, for 20 seated and 50 standing passengers. Standing passengers may also be carried, subject to route limits. Foldable rails and mast on the sundeck ensure access under the Pyrmont Bridge to Darling Harbour on all tides.

Principal particulars of *Ocean Dreaming II* are:

Length OA	30.0 m
Length WL	28.0 m
Beam moulded	9.0 m
Passengers	
Total seats	277
Total certified	320
Fuel	2×2030 L
Fresh Water	1×300 L
Sullage	2×1700 L
Main Engines	2×Cat C32 each 1044 kW brake power at 2300 rpm
Propulsion	25-bladed propellers
Service speed	28 kn at 75% MCR

Ocean Dreaming II
(Photo courtesy One2three Naval Architects)

Suncat transfers to Sydney Harbour

Following the introduction of *Ocean Dreaming II*, Bass and Flinders Cruises have purchased *Suncat*, a One2three-designed 30 m catamaran build by Brisbane Ship Constructions in 2007, from Sunferries in Townsville. *Suncat* is dedicated to the Manly-to-Circular Quay route. Together, the two vessels operate 110 trips per week, carrying in excess of 2000 commuters each day.

One2three Atomic 45 Express Cruisers

One2three Naval Architects have further refined their design of the Atomic 45 Express Cruiser. The first Atomic 45 was sold to Hamilton Island for use as the resort tender to their exclusive six-star Qualia resort, where she ferries VIPs to island hideaway beaches and to/from their accommodation. The second vessel has completed construction and is currently awaiting delivery, with the vessel under construction at Atomic Marine in Sydney. While the first boat was configured for twelve passengers and four crew and was brought into Queensland survey, subsequent boats are destined for the pleasure-boat market, where this platform has found appeal as a motor-yacht tender and for upmarket high-speed fishing charters and dive and reef trips for up to 20 passengers.

The Atomic 45 features a variable-deadrise hull, with construction consisting of a fully-cored structure and vinylester layup. The laminate design was produced by Gurit Australia. The design is centred around the extensive cockpit deck. Flexible lounge seating allows the deck to be re-organised for sun-baking, formal dining, snorkelling and everything in between. A set of retractable stairs forms a "beachfront" at the rear of the vessel, allowing easy access into the water or directly onto the nearest sandy cay. The helm station boasts a bench seat for four, with the servery and fridge located immediately behind.

Retained from her pleasure-vessel heritage, a full-size double berth is located under the cockpit floor. On entry downstairs, a galley is provided to port, with toilet and shower facilities to starboard. Moving forward, interior seating for six guests converts into a V-berth

Powered by twin Volvo Penta D6-350 stern drives each producing 260 kW brake power, the first Atomic 45 exceeded 37 kn on trials at 100% deadweight. The new Atomic 45 will offer speeds of up to 45 kn with a choice of stern drive, Volvo IPS or conventional waterjet drive units.

Pricipal particulars of the Atomic 45 are:

Length OA	13.0 m
Length WL	11.0 m
Beam moulded	4.0 m
Passengers	12
Fuel	2000 L
Fresh Water	500 L
Sullage	300 L
Main Engines	2Volvo D6-350 each 260 kW brake power @ 3500 rpm
Propulsion	Duo-prop stern drives
Service speed	37 kn fully loaded


The latest Atomic 45
(Photo courtesy One2three Naval Architects)

One2three 12 m Catamaran for Hamilton Island

Continuing their association with Hamilton Island and the new Qualia Resort, One2three have delivered a 12m custom-designed catamaran, *Island Links,* to operate a guest-transfer service between the main island and the newly-opened 18-hole golf course on nearby Dent Island. The client's brief required a striking design, ease of loading of up to 50 golfers and their clubs, and provision to carry a motorised golf buggy when required.

The vessel is being constructed of aluminium by Aluminium Boats Australia, with Ayres lightweight alloy panels forming part of the cabin's external structure. Boarding ramps are incorporated into the cabin side to enable embarkation from the floating pontoons. Teak decks, and implementation for the first time of a new range of teak/alloy seats from Transport Seating set the standard inside the cabin and complement the external design.

Powered by twin Suzuki 112 kW four-stroke outboard motors, *Island Links* attained a service speed in excess of 23 kn.

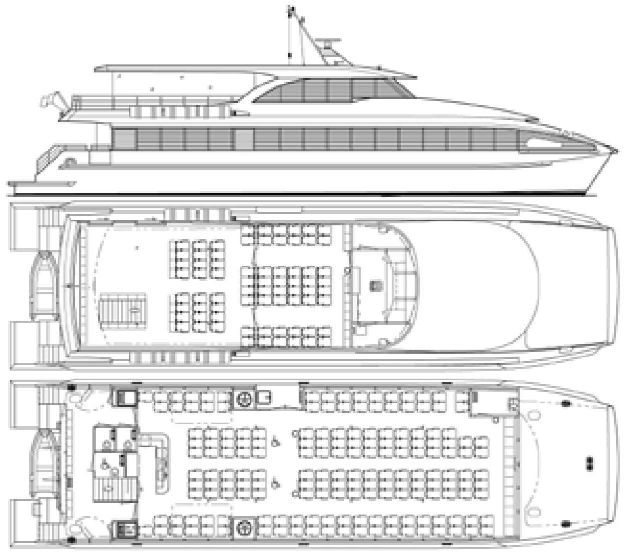
Island Links
(Photo courtesy One2three Naval Architects)

Fourth One2three 30 m Catamaran for Sunferries

Following the sale of *Suncat*, Sunferries have contracted Aluminium Boats Australia to construct a fourth One2three 30 m catamaran ferry, with delivery due in the second quarter of 2010. The vessel is based on *Palm Cat*, but with subtle variations to increase passenger and luggage capacities on the Palm Island–Townsville run.

Principal particulars of the new vessel are:

Length OA	30.0 m
Length WL	29.0 m
Beam moulded	8.0 m
Passengers	
Total seats	309
Total certified	320
Fuel	2×2500 L
Fresh Water	1×750 L
Sullage	1×1750 L
Main Engines	2Cat C32 each 1044 kW brake power at 2300 rpm
Service speed	28 knots at 80% MCR



General arrangement of new 30 m catamaran for Sunferries
(Drawing courtesy One2three Naval Architects)

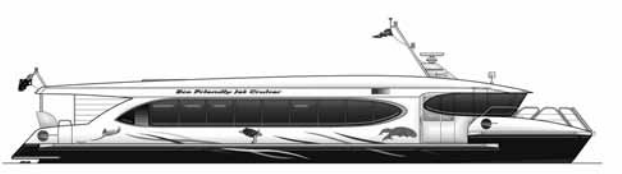
24 m Catamarans for Bay Island Transit System from One2three

Aluminium Boats Australia have secured an order for an additional two 24 m One2three low-wash commuter ferries for operations in Brisbane. Delivery is scheduled for late 2009. The boats are required to exhibit an extremely low-wash profile at service speeds up to 22 kn.

The boats operate daily in environmentally-sensitive areas, including operations in the vicinity of dugong feeding grounds. Accordingly, the boats are waterjet powered to remove any possibility of open-water propellers damaging marine life. In addition, the bows have been custom-designed to include a shallow forefoot with a blunt, rounded entry to minimise the possibility of injury to dugongs at, or close to, the water surface. Fernstrum grid coolers permit operation in shallow, sandy waters, and are recessed into the hull sides to remove any protrusions from the hull which may also result in injury to marine life.

The boats are powered by two Scania DI 1259M engines each producing 331 kW brake power, driving a pair of Hamilton HJ364 waterjets with inlet grids.

The vessel's configuration allows for 200 passengers, of which 146 can be seated. The operators advise that the vessels form the main transportation system to and from the island communities and, as such, are required to carry all sorts of luggage and cargo, ranging from lawn mowers and shopping trolleys to the odd goat and other family pets. Extensive luggage racks and storage areas are provided both internally in the cabin and externally on the foredeck. A lightweight and durable fitout is required to handle the rigours of the service, and the vessel's superstructure is to be fabricated from composite cored structure utilising resin-infusion to One2three's design, fixed to the alloy hulls and cross structure.



Profile of new 24 m low-wash catamaran
(Drawing courtesy One2three Naval Architects)

One2three/Hoek 24 m Sailing Ketch

Construction continues on the One2three/Hoek design 78 ft (23.77 m) sailing ketch. The vessel is designed and constructed to Lloyd's Register requirements, with the hull and decks manufactured from high-strength stainless steel. An extensive teak and timber fitout will be provided to match the vessel's 1930s style. The central design concept is a flush-deck boat with an aft cockpit, low deckhouse, sweeping sheer, moderate freeboard and long overhangs to bow and stern.

The design is a joint venture between One2three and Hoek Design of the Netherlands, with One2three providing structural and engineering design, and Hoek supplying the vessel's lines, appendages and arrangement.

Rob Tulk

24 m sailing ketch
(Photo courtesy One2three Naval Architects)

First Look at new Austal Trimaran

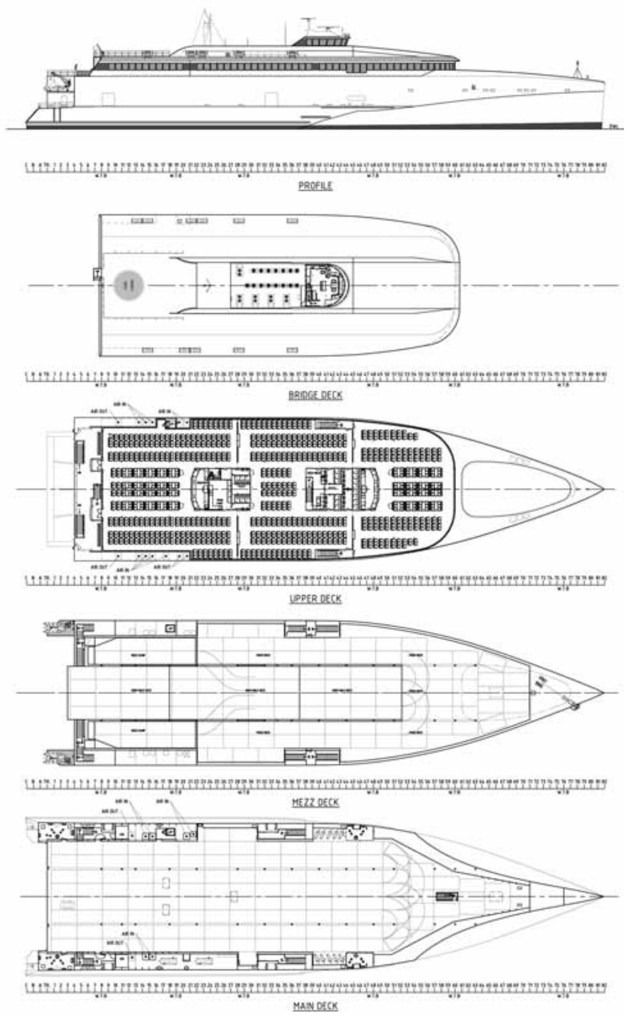
Austal has officially unveiled its new 102 m trimaran vehicle-passenger ferry, which is currently under construction at its Western Australian shipyard and is available for purchase.

The new 102 m trimaran is an evolution of Austal's 2005 trimaran ferry *Benchijigua Express* in every sense — optimising performance, seakeeping, fuel efficiency, passenger comfort and payload to deliver a truly next generation transportation solution.

The vessel utilises Austal's trimaran technology, combining the softer roll of monohulls with the low resistance, stability and carrying capacity of catamarans, to open up new markets beyond existing fast ferry designs. A lower roll speed means lower accelerations experienced by passengers — significantly reducing passenger seasickness.

The trimaran's unique hydrodynamic hull form combined with its three engine propulsion train delivers fuel efficiency across a range of operating conditions.

An impression of Austal's new 102 m trimaran
(Image courtesy Austal)



General Arrangement of Austal's new 102 m trimaran
(Image courtesy Austal)

Austal's new 102 m trimaran under construction in Western Australia
(Photo courtesy Austal)

Release of the Loss of HMAS *Sydney II* Report

The loss of HMAS *Sydney II* Commission of Inquiry Report was released by the Minister for Defence, Senator John Faulkner, in Canberra on 12 August.

"This report offers Australians confirmation of the circumstances surrounding the loss of HMAS *Sydney*, and I thank the President of the Commission of Inquiry, Terence Cole, for his painstaking work," Senator Faulkner said.

The Chief of the Defence Force, Air Chief Marshal Angus Houston, AC, AFC, said that HMAS *Sydney* was lost with all hands on 19 November 1941, following an engagement with the German raider, HSK *Kormoran*, off the Western Australian coast.

"For a long time our nation has struggled to understand how our greatest maritime disaster occurred. The unanswered questions have haunted the families of those brave sailors and airmen who never came home," Air Chief Marshal Houston said.

President of the Commission, the Honourable Terence Cole, AO, RFD, QC, said that the Inquiry's key findings confirm that "accounts provided by the HSK *Kormoran* survivors of *Sydney's* last movements and of the damage she sustained during the engagement with the German raider are correct."

When *Sydney* was lost, the Commanding Officer of HMAS *Sydney* was performing his military duty in seeking to identify an unknown ship.

"The Commanding Officer of HMAS *Sydney* was not expecting to encounter any merchant ship in the location where he encountered *Kormoran*. That knowledge together with his knowledge of the possible presence of a German raider should have caused the sighted vessel to be treated as suspicious," Mr Cole said.

Another key finding is that there is now additional compelling evidence to support the conclusion that the body recovered from Christmas Island in 1941 is that of a member of HMAS *Sydney's* ship's company.

Mr Cole further concluded that "each of the many frauds, theories and speculations reported to the Inquiry were thoroughly investigated and none were found to have any substance whatsoever."

Chief of Navy, Vice Admiral Russ Crane, AM, CSM, RAN, encouraged those with an interest in HMAS *Sydney* to read the report, and reflected that the loss of HMAS *Sydney* needs to be viewed in context of the times.

"An appreciation of the training, tactics and procedures of the time and the particular circumstances of the day in question, including the fact that merchant vessels frequently did not properly respond to queries by warships, must be taken into account to help understand why HMAS *Sydney* approached so close to HSK *Kormoran*," Vice Admiral Crane said.

"In 1941 and today, command at sea of one of HMA Ships is an extremely complex and challenging job in a very harsh and unforgiving environment. This is even more so during times of conflict. The crewmembers of HMAS *Sydney* were highly-trained professionals doing a tough job, in a period of war. They took great pride in the fact that they were defending Australia, our values and our way of life," Vice Admiral Crane added.

The Commission was appointed in May 2008 to inquire into and report upon circumstances associated with the loss of HMAS *Sydney* and the consequent loss of life and related subsequent events.

A copy of the report can be downloaded from the Defence website at http://www.defence.gov.au/sydneyii/finalreport.

FROM THE CROWS NEST

Shipbreaking Boom

When times were good, shipping companies ordered huge numbers of new steel ships to ply the oceans. Now though, many of those same shipping companies are eager to get rid of their ships. The scrapping business in South Asia is booming.

The sandy beaches north of Chittagong in Bangladesh look like giant steel graveyards. Ships line the banks ready for dismantling. Others are so far disassembled that their hulls are all that is left protuding morosely from the water, according to shipping industry journal, *Lloyd's List*. All kinds of vessels get broken down here: bulk carriers, container ships, vehicle transporters and oil tankers.

The global economic and trade crisis is so severe that a growing number of ships are being pulled from their routes and sent to scrap yards to be sold for parts. Freight and charter rates have fallen, and regularly-scheduled passenger lines are being cancelled. Those container ships that are still sailing can barely cover their costs. Over-capacity created in recent boom times has accelerated the trend toward scrapping ships.

Yet one boom replaces another. With shipping down, shipbreaking is the business of the hour. The shift began late last year and initially targeted ships with a combined load-carrying capacity of 10 million tons. Now the heavy rigs are being lined up too, as they sit idly anchored in harbours around the world. Much of the scrapping happens in South Asia and with little regulation in place.

As the economy worsens, the shipbreaking business improves. The best place to beach large ships is near Alang, in the southern part of the Indian state of Gujarat. Tides are high here, allowing the ships to run ashore under their own power. Once the tide is low and the hulls are out of the water, work begins on gutting and cutting up the ships.

Nearly ninety percent of the world's shipbreaking happens in India, Pakistan and Bangladesh.

For more details visit www.tinyurl.com/qhs7d5.

Boatspeed's *Sodeb'O* Readying for Another Record

On 15 July 2008, Thomas Coville became the new Solo Transatlantic Record holder. Setting out from New York on 9 July 2008, his maxi trimaran *Sodeb'O*, built by Boatspeed in Somersby, NSW, covered the 2925 miles from the Ambrose Light in the USA to Lizard Point in England at an average speed of 20.97 knots.

This year, Thomas has one objective which he describes as just a week's work, as it consists of making Lizard Point in less than 5 d 19 h 29 min 20 s "With the boat we have today, we can do better than last year. Over the last few hours in 2008, we were conservative with the weather forecast. We knew we were going to beat it if *we* didn't break. We think we're going to take more risks this year" explains Thomas.

Colville and *Sodeb'O* arrived in New York in late June and began setting up for an attempt to break his own solo North Atlantic record. The shore crew have lightened the boat by 800 kg and removed the propeller shaft. At the same time, on the other side of the Atlantic, routers Christian Dumard and Richard Silvani (Météo France) are on the look-out for the slightest hint of a depression system, which would provide a favourable weather window to beat the record. "The North Atlantic in less than six days isn't superhuman. You can even perform the crossing in under five days single-handed with a good weather forecast; for that you have to hook onto a system and not let go" explains Thomas. "It's a playing field that I'm very familiar with. It's also the most amusing and the most impressive record" recalls the skipper of *Sodeb'O* with a smile.

North Atlantic Records Poised to Fall

The maxi trimarans *Banque Populaire V*, skippered by Pascal Bidegory, and *Groupama III*, skippered by Franck Cammas, are also set to rendezvous in the Gateway Marina to the South of Brooklyn in New York. Like *Sodeb'O*, these giants intend to line-up at the Ambrose Light in a bid to tackle the North Atlantic record this summer, but there will be one fundamental difference: unlike Thomas Colville solo on *Sodeb'O*, the two skippers will be sailing with 11 sailors on *Banque Populaire V* and 9 on *Groupama III*.

"This year, we're creating a competition against the clock with a number of candidates" says Thomas. However, it's worth noting that though the three maxi multihulls will be attempting to break the same record, there's nothing to say that they'll set off with the same weather window. Indeed, the conditions required aren't necessarily the same for a solo sailor or a crew.

For more details, visit www.sodebo-voile.com/actu/news/eng/522-Sodeb-O-and-Thomas-Coville-on-stand-by-in-New-York.html.

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 200–300 dpi is preferred.

Fiftieth Anniversary of the First Crossing of the English Channel by Hovercraft

Lawrence J. Doctors

25 July 1909 is well known in aviation circles as being the day on which Louis Bleriot traversed the English Channel for the first time in an aircraft. Thus, the one-hundredth anniversary of this significant date is being celebrated at this time. In addition to this, 25 July 2009 is the fiftieth anniversary of the first crossing of the English Channel by a hovercraft. This feat was accomplished by the SR-N1, the first large hovercraft, which was shown to the public and launched six weeks earlier on 11 June 11 1959. Another curiosity linking the two Channel crossings, separated by precisely 50 years, is that one of the reporters who interviewed the pilot, Bleriot, after his monoplane flight in 1909 was an uncle of Peter Lamb, the driver of the SR-N1 hovercraft in 1959.

The impetus behind the construction of this craft came from Christopher Cockerell (1910–99) who devoted his efforts in the early 1950s to reducing the drag of a waterborne vehicle. His experiments eventually led him to a design which essentially required an air jet around the periphery of the base which fed and pressurized the air cushion underneath, thus lifting the craft above the water by about 0.4 m.

The air jet was supplied by a special fan drawing air from a large intake in the centre of the craft. In this way, the frictional resistance is essentially eliminated and the wavemaking resistance is greatly reduced. An additional benefit is that the hovercraft is amphibious and can also travel over land, ice, and muddy surfaces with equal ease.

In many ways, that first hovercraft crossing, on 25 July 1959, was fraught with many difficulties. The main difficulty was that it was considered advantageous to cross the Channel from east to west, thus mimicking precisely the famous flight by Bleriot. This necessitated battling relatively heavy head winds, which increased the crossing time. As a result, the vessel had to be manually refuelled during the trip, using an additional tank which was specially fitted with the problem of limited range in mind. Another peculiarity is that correct fore-and-aft ballasting was problematic. The inventor himself served as movable ballast and he (and sometimes the navigator too) can be seen crouching on the exposed deck of the hovercraft in many of the aerial photographs of the event.

The major improvements to the hovercraft concept in the ensuing fifty years relate to the development of the flexible skirt to contain the air cushion. The skirt is made of a rubberised or plasticised material which increases the hoverheight (up to 2–3 m for large craft) and greatly reduces the power requirements. The use of ducted propulsion propellers and diesel engines results in a quieter craft.

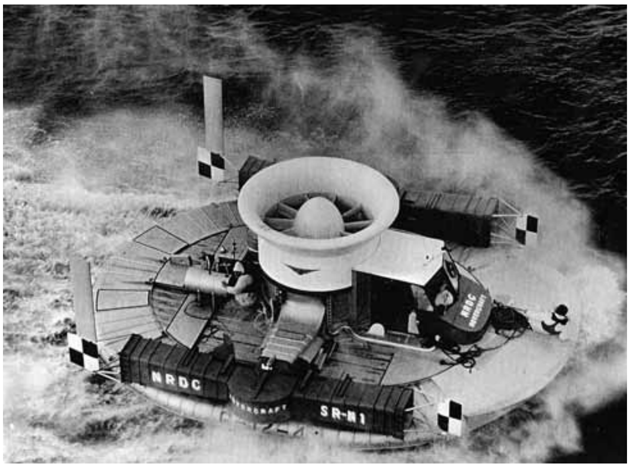
The hovercraft has been found useful where its amphibious capabilities are an advantage. Typical examples include tourist applications in Broome, Western Australia, beach-rescue services at low tide over mud flats in England, flood rescue assistance after hurricane Katrina in the USA, and transporting mined gold along the bed of the Yukon River in Alaska. There are also specialised ferry services, such as the service linking mainland UK to the Isle of Wight.

Reference

Wheeler, R.L., and Chaplin, J.B., *In the Beginning ... The SR-N1 Hovercraft*, Cross Publishing, Chale, Isle of Wight, 112 pp (2009).

Lawrence Doctors

First flight of the first air-cushion vehicle SR-N1 on 11 July 1959
(Photo courtesy British Hovercraft Museum)



First crossing of the English Channel by SR-N1 on 25 July 1959
(note movable human ballast forward and aft!)
(Photo courtesy British Hovercraft Museum)

AVIATION ASPECTS OF THE NEW AMPHIBIOUS SHIPS

Our capacity to deploy and sustain land forces from the sea will be substantially enhanced when the Landing Helicopter Dock (LHD) amphibious ships enter service in the coming decade. They will be able to carry a substantial quantity of equipment stores and personnel.[1]

To develop the full potential of its two new *Canberra*-class LHDs, the Royal Australian Navy needs to develop sophisticated multi-spot flight-deck operating skills. These joint skills have not seen similar use in the Australian Defence Force since the decommissioning of the fast troop transport, HMAS *Sydney,* in 1973.

Nevertheless, other operators of large, helicopter-capable amphibious ships, such as the US Navy and Royal Navy, have evolved techniques to launch heli-borne assaults and continuously refined them over the past fifty years. Australia is already leveraging off our allies' experience, by establishing a number of loan postings as it seeks to generate the necessary expertise before the LHDs enter service. Key issues requiring attention range from the composition of the flight-deck crew, through to the use of non-naval helicopters and the systems integration of unique army, navy and air force equipment and ordnance.

During operations the LHD's flight deck will be a busy and dangerous place. Aircraft handlers and assault logistics specialists must work together to get troops and equipment ashore and back again in the most efficient and effective manner; in RN and US Navy/Marine Corps amphibious ships, the latter group comprises dedicated marines. Without them, the RAN will need to develop its own unique solution, and planning for flight-deck manning is already well underway. The LHDs will have specialised departments for both air and amphibious operations, and also being developed is a concept of employment in areas such as flight-deck management and mission planning.

An impression of the Canberra-class LHDs
(RAN image)

The number of helicopters needed for an initial assault is dictated by the size of the military force to be landed. Numbers of troops, known as 'sticks', carried by each helicopter will vary according to the fuel needed to fly to the landing zone (LZ) and return with a viable reserve. It is quicker to add fuel to an aircraft than to pump it out, so helicopters are usually ranged with pre-planned low-fuel states and brought up to the required amount at the last minute before the assault to give greatest flexibility. A late planning change would be very difficult to implement and could cause chaos. Standardised stick sizes and fuel states give flexibility, but might be a limitation on longer-ranged insertions if not carefully briefed. Ammunition, artillery, stores and vehicles have to be pre-positioned on the flight deck or other concentration areas, but kept clear of operating spots. Mechanical handling equipment must be placed ready to move palletised loads at short notice.

Each stick and each load will have an identity to allow the amphibious command to know what has been flown ashore, or taken ashore in landing craft. The order in which they are taken must be reactive at short notice; it is no good flying in ammunition according to a pre-arranged plan, for instance, if the military force urgently needs engineering equipment, barbed wire and water.

In other navies a primary assault technique is to range helicopters on the standard deck spots with extra fuel and launch them empty to orbit the ship at low level. Further helicopters, manned and with engines or auxiliary power units started, are then towed onto the spots, spreading their rotors and engaging them when in position. Once ready they are loaded and launched, but the process takes time. The first group then lands to pick up their loads and relaunch. Both groups join up and fly in tactical sections to the LZ inshore. An alternative technique packs helicopters into the available deck space, ranged as tightly as possible with minimum clearance between them, without using the painted spots. The result is a single group which would launch from aft to forward and set off immediately for the target. Getting sticks of troops into the helicopters and removing lashings would be more difficult and slower in the latter case but the overall effect would be a slightly faster first-assault group, albeit with a smaller military force to land. The latter technique also needs more marshallers to control the start-up and launch of each helicopter and first-aid fire-suit men would be spread thin between them as they start. The embarkation of helicopters that do not auto-fold may limit the first option, but both methods have their basic merits and drawbacks and can form the basis of a plan to suit individual operations.

After the initial assault waves, it is a judgement decision whether to break down to a continuous shuttle of individual helicopters or to continue to fly in tactical formations. The former keeps a stream of personnel and stores moving ashore and is more flexible in matching loads to aircraft quickly. The latter might be a better counter to enemy air and ground-based opposition, but would need a larger number of marshallers to be available at any given time. The officer in charge of the flying-control position (FlyCo) controls the deck and the movements of aircraft in the visual circuit. He or she has a considerable responsibility to ensure the efficient, safe operation of helicopters, many of which will be from Army Aviation with crews unaccustomed to regular flight-deck operations. Helicopters from coalition allies may also need to be assimilated carefully into the flight deck's operation.

FlyCo must liaise with the command to keep the LHD in the right place with enough wind over the deck to help heavy helicopters to lift off safely for many hours on end. He must ensure that the deck is able to deliver the number of helicopter sorties at the pace required by amphibious operations.

FlyCo's 'eyes, ears and strong right arm' on deck will be the Flight-deck Officer (FDO) and his handful of senior sailors. As well as moving helicopters on deck and marshalling them at take-off and landing, the aircraft handlers must ensure that sticks of men are brought safely but quickly to them, past aircraft lashings and under turning rotor blades, only when cleared to do so by the pilots. The assault supply team work under the direction of the handlers to move bulk stores into helicopter cabins or hook them on as an external load. If 'break-bulk' stores have to be packed into the cabin, then the assault suppliers must ensure that there are sufficient personnel available to do so quickly. The potential need in a non-benign environment to move quantities of fuel and water ashore can represent a considerable part of the assault supply requirement. Information is the key to assault flying. After the initial waves, FlyCo must know how many aircraft are needed to maintain support for the military force at the required level and match helicopters to reinforcement sticks and loads. They may return from shore low on fuel and a 'flop spot' kept clear with fuel line rigged is a very good idea. The squadrons need to know for some hours ahead how many aircraft they need to have ready and when replacement crews will be needed. Surges such as those required to land a mobile air-operations team, the military force commander and staff or a field hospital, need to be forecast and the extra aircraft prepared and moved to the flight deck. As flying hours increase, maintenance and battle-damage repair will need management, and parts of the deck may be required for helicopters not immediately available for operational flying. Without maintenance time, the number of available helicopters will gradually diminish.

In many ways, the operation of an LHD flight deck is more complicated than that of a strike carrier. In the latter, launches and recoveries tend to happen in planned pulses of activity; in an LHD they can be non-stop and may continue for days, including at night and in adverse weather. This must be taken into account in the provision of manpower, with most tasks 'doubled up'. Yet even with the flight deck party in two watches, there will be occasions — such as the initial assault or the early stages of humanitarian relief operations — when both watches might be required simultaneously. Again, the need to use both watches and for how long is a judgement decision.

The Australian LHDs will routinely operate both Fleet Air Arm and Army Aviation helicopters. The latter will need to spend sufficient time embarked to be familiar with deck operations. Thought needs to be given to the number of different types that might embark; these will include Army Chinooks and Tigers, Navy Seahawks and joint force MRH-90s. Chinooks provide a very significant load-lifting ability but take up a lot of deck and their blades cannot be folded. The blades may have to be removed to stow the aircraft into a smaller area of deck parking space. Good procedural knowledge will be essential, especially when instrument recoveries prove necessary at night, in adverse weather or sand-storms. To prepare for this, the ADF will need to emphasise a joint approach to getting full value from the LHD's flight deck and flying patterns. It should not be assumed that someone from a non-ship orientated background will slot into the deck operating technique immediately, but there is no reason why they should not do well once briefed and trained. In 1956 the first ever helicopter assault was conducted by the RN's 845 Squadron and the Joint RAF/Army Helicopter Development Unit. Joint operations work well when all participants accept the need for differing operational techniques to suit the environment from which they are flying.

In an example of the attention to detail required, the provision of assault life jackets (ALJ) may seem trivial, but their inadequate management can cause problems. They are worn by all troops and passengers in sticks that fly over water and are designed so that as the helicopter goes 'feet dry' over land the wearer can remove a locking pin in the ALJ straps to slide out of them as they leave the seat to disembark. The aircrew must ensure that ALJs come back to the ship with the helicopter; otherwise, if they are taken ashore by troops and discarded, later serials might be limited by the low numbers available on board until sufficient are collected and brought back. Good ALJ discipline is one of the hallmarks of good amphibious operations.

Recovering a military force from shore resembles the assault-phase functions in reverse, with slightly differing priorities. A stream of helicopters returning at short intervals is more easily assimilated than groups flying in tactical formation. Each shore-bound helicopter needs sufficient ALJs for any stick it might have to lift, and guides must be ready on the flight deck to lead sticks to concentration areas for the removal of unused ammunition and its return to the magazines. They will then lead them back down the assault routes to the domestic areas where they can shower. Again, the command needs to know what sticks and serials of equipment have been recovered. For troops who have been ashore for days, fresh water requirements will be significant. Plans for feeding and de-briefing will also need to be flexible.

With their ability to carry out amphibious strike, humanitarian assistance and disaster-relief operations at long range, LHDs have become valuable strategic assets in a number of navies including those of Spain, France, Italy and Korea as well as the United Kingdom and the United States. Australia's LHDs will, no doubt, prove equally important and versatile.

1. Department of Defence, *Defending Australia in the Asia Pacific Century: Force 2030*, Canberra, 2009, p. 73.

[Reproduced from *Semaphore,* No. 9, July 2009, published by the Sea Power Centre — Australia]

Summit Down Under Sets the Standard

Chairman of the ISO Committee on Small Craft, Nik Parker, confirmed to delegates at the Summit Down Under on the Gold Coast in May that the International Council of Marine Industry Associations is sponsoring a program to develop globally-recognised technical standards for boats.

"They are undertaking a program of standards harmonisation, encompassing ISO (Europe) and ABYC (USA) standards," he explained. "We are currently working with ABYC on harmonising standards relating to fuel systems and ventilation, capacity and plates, principal data, and LPG systems."

Organised by the National Marine Safety Committee, and coinciding with the Sanctuary Cove International Boat Show, the event, held on Friday 22 May, was attended by more than 60 delegates from marine agencies and industry.

NMSC CEO, Margie O'Tarpey, emphasised that the Committee has always valued its collaboration with the private sector with the shared aim that 'boating should be a pastime which everybody can enjoy safely'. "We recognise the challenges currently faced by the Australian recreational boating industry in these difficult financial times, and that has been a key factor in planning this seminar. It is important to target safety initiatives in such a way that they achieve the desired goals in a flexible manner, without unduly affecting the viability of the sector or putting jobs at risk."

Issues such as safer boats or better rescue services, consumer attitudes to boating safety, standards for recreational boats, the need for a national boat operator's license and doing business in the current financial climate were just some topics "on the table" during the summit.

According to keynote speaker, Peter Chennell, the UK's Royal National Lifeboat Institution's Safety Manager, your brain is your most important piece of safety equipment. "Unlike Australia, the UK does not have any form of recreational boat registration or licensing of boaters, nor is the carriage of safety equipment mandatory. It's about attitude, we need to find out how we get people to change their behaviour and use their safety equipment." To this end, the RNLI, the charity which provides the lifeboat and lifeguard service around the shores of the UK and Ireland, is commissioning research into the psychology of behavioural change.

From an Australian perspective, Margie O'Tarpey confirmed that the NMSC has implemented a variety of measures to improve boating safety, such as developing a national incident database and research initiatives, education campaigns, the Australian Builders Plate for recreational boats and technical standards.

A full catalogue of Summit Down Under presentations is now available on the NMSC web site www.nmsc.gov.au.

Margie O'Tarpey and Nik Parker at the Summit Down Under (Photo courtesy NMSC)

NMSC Commercial Vessels Industry Advisory Group

The National Marine Safety Committee's revamped Commercial Vessels Industry Advisory Group held its first formal meeting on Friday 31 July under the chairship of Greg Hodge, CEO of Defence Maritime Services. Among the range of issues discussed was the government decision to move the state-based commercial-vessel survey system across to a single national jurisdiction under AMSA. The timetable for this move is by the fourth quarter of 2010. Whilst ambitious, it is generally recognised that there is considerable political will to make this happen. Details of the framework for the transition, the method by which AMSA will provide service delivery across all states, and the extent of required changes to the Navigation Act 1912 are all under consideration.

NSCV Standards to Enter National Law

The next raft of national standards for commercial vessels enters legislation nationally on 1 October this year through an amendment to the USL Code (Amendment 7). This round of reform will see six sections of the National Standard for Commercial Vessels (NSCV) come into force for new vessels. The relevant standards are:

Part	Section	Title
C	3	Construction
C	6A	Stability Information
C	6C	Stability Tests
C	7B	Communication Equipment
C	7C	Navigation Equipment
C	7D	Anchoring Systems
E		Operational Practices

For those jurisdictions which currently allow vessels to comply with the USL Code, a new vessel for which a design application is submitted prior to 1 October 2009 can be built to the existing requirements, provided that construction work begins within a three-year period. However, applications for design approval submitted after 1 October 2009 must comply with the new standards. This allows a transitional period for vessel builders over the next couple of months—the transition period applies in all jurisdictions except those

which already require compliance with only the NSCV*.
A seventh section, Part E Operational Practices, will also come into force and will apply to new and existing vessels. However, the requirements in the standard to have a safety-management system will only be compulsory for certain high-risk vessels**.

NMSC has placed a helpful guide, entitled the Combined NSCV/USLCode 2009, on its website to allow industry around the country to understand what sections of the USL Code have been replaced by the NSCV.

Once in place, the seven standards will join the first raft of standards which entered legislation nationally in October 2008. Part B General Requirements, Part C4 Fire Safety, Part C5 Engineering, Part 7A Safety Equipment, and Part F1 Fast Craft were adopted successfully last year.

For more information on the Combined NSCV/USL Code 2009 please contact the NMSC Secretariat on (02) 9247 2124 or visit the website www.nmsc.gov.au and click on Legislated Standards 2009. Copies of published standards may also be downloaded.

* For most of the design sections, jurisdictions which have already brought in the NSCV—Queensland and Tasmania—generally apply the design and construction sections in addition to the USL Code.

** A vessel will only be obliged to have a Part E Safety Management System if required by the local marine safety agency.

Houseboat Surveys

The Minister for Ports, Joe Tripodi, announced on 30 July 2009 at the Sydney International Boatshow that there will be a pilot programme which will allow private marine surveyors to conduct periodic surveys of houseboats and other low-risk commercial vessels. There will be no change in survey fees paid by vessel operators.

The press release can be found at http://www.maritime.nsw.gov.au/docs/ministerial-news/house_boat_surveys.pdf

Port State Control — Concentrated Inspection Campaign

The Paris and Tokyo MOUs will begin a concentrated inspection campaign (CIC) on September 1, 2009. The CIC will focus on lifeboat launching arrangements (SOLAS Chapter III). Port state control officers (PSCOs) will use a questionnaire which was published on the Paris and Tokyo MOU websites [*www.parismou.org* and *www.tokyo-mou.*org — Ed.] in the first week of August.

It is expected that other PSC MOUs may also join this CIC or carry out a similar exercise. A press release has been jointly issued by the MOUs, which reads: "The 43 Maritime Authorities of the Paris and the Tokyo Memoranda on Port State Control will begin a joint concentrated inspection campaign to ensure compliance with SOLAS Chapter III — Life-Saving Appliances and Arrangements with regard to lifeboat-launching arrangements. This inspection campaign will be held for 3 months, ending on 30 November 2009."

In practice, the concentrated inspection campaign will mean that, during every Port State Control inspection within the Paris and Tokyo MoU regions, the lifeboat-launching arrangements, maintenance records and other applicable documentation will be verified in more detail for compliance with SOLAS Chapter III. Port State Control Officers (PSCOs) will use a list of 20 selected items to verify critical areas for the safety of lifeboat-launching arrangements, some of which are related to documentation, equipment and familiarisation.

For this purpose PSCOs will apply a questionnaire listing a number of items to cover this concentrated inspection. The questionnaire was published on the websites of Paris MoU and Tokyo MoU in the first week of August 2009.

When deficiencies are found, actions by the Port State may vary from recording a deficiency and instructing the master to rectify within a certain period, to detention of the ship until deficiencies have been rectified. In the case of detention, publication in the monthly list of detentions available on the Paris MoU and Tokyo MoU web pages will take place.

It is expected that the Paris MoU and Tokyo MoU will carry out approximately 10 000 inspections during the CIC. The results of the campaign will be analysed and findings will be presented to the governing bodies of the MoUs for submission to the IMO.

Intact Stability Code 2008

The International Maritime Organization (IMO) has revised the Intact Stability Code and released it as resolution MSC.267(85). The new Code, which is referred to as the 2008 IS Code, is in two parts: Part A contains mandatory requirements and Part B contains recommendations and additional guidelines. Compliance with the new Code will be required under changes to the SOLAS and Load Line Conventions, for all ships whose keels are laid on or after 1 July 2010 and to which these conventions apply.
What has changed?

There are two significant changes. The first is the requirement for all ships to demonstrate compliance with wind and wave criteria. If the standard criteria are not applicable to the vessel, due to the vessel dimensions falling outside those relevant for the formulae given, then model tests may be used to derive a value for the angle of roll. Model tests may also be used to identify the wind-heeling lever for all vessels. The second significant change is the requirement for flag-administration approval of stability instruments, in cases where an instrument is provided to supplement the stability book.

Trimmed hydrostatic data must also be provided in the stability book, covering the expected trim range, and any limiting curves should also cover the expected trim range.

Additions to the text cover dynamic-stability phenomena and non-mandatory requirements for stability instruments. The use of anti-heeling measures must not adversely affect the stability when they fail.

The following items have been removed from the Code:

- the requirements for dynamically-supported craft (these are now included in the HSC Code and the HSC 2000 Code);
- the references to rolling-period tests*; and
- the formula and associated table for calculating the free-surface moment of a tank from an approximate formula.

* Rolling period tests were considered to be applicable only to vessels under 24 m in length. Therefore, as the 2008 IS Code is to be implemented under the SOLAS and Load Line Conventions, these ships are not covered. Information on rolling period tests is available in the Code of Safety for Fishermen and Fishing Vessels.

The IMO is encouraging member states to implement the new Code early. Information about the intentions of individual flag administrations in this respect may be found, for example, in LR's Country Files on ClassDirect Live under Regulatory Requirements. The Danish Maritime Administration will be making the 2008 IS Code mandatory for Danish ships whose keels are laid on or after August 1, 2009.

EDUCATION NEWS

Curtin University

Sailing Performance Research

Three mechanical engineering students have recently completed final-year research projects into the sailing performance of Laser dinghies. They fitted instrument packages, each comprising a GPS and three-axis gyro accelerometer which were supplied by the WA Institute of Sport, to two Laser dinghies together with ANSYS FEA software and the CMST Sailtool sail-analysis program. The students investigated windward performance changes resulting from altering mainsheet, Cunningham and vang settings. The trials were based at the Centre for Marine Science and Technology's facility at Fremantle Sailing Club, with support from the Club and guidance from Olympic coach, Arthur Brett, and Olympic gold medallist, Belinda Stowell. Further investigations are planned for the 2009–2010 summer.

Laser dinghy during sail trials — image processed using Sailtool software
(Image courtesy Curtin University)

Sailtool Software now available as Freeware

SailTool is a program written by the Centre for Marine Science and Technology at Curtin, for the measurement and parameterisation of yacht sails and rigging. In celebration of ten successful years of use, CMST has released SailTool as freeware, available from http://cmst.curtin.edu.au/products/sailtool/index.html.

Features include:

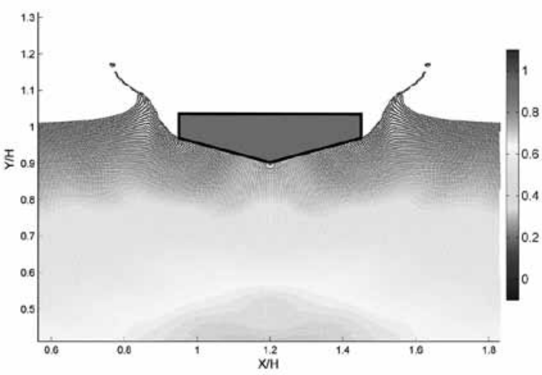
- parameterisation of sail draft stripes;
- mast bend measurement;
- leech twist measurement;
- spinnaker flying distance measurement;
- virtual protractor and tape measure tools;
- grid overlay tool;
- full user-friendly windows interface;
- fully featured online help; and
- database of commonly used yacht classes and parameters.

The program can process images from any source — e.g. digital cameras or scanned images from film cameras.

SailTool was originally developed by the CMST for the Australian Yachting Federation for use in the coaching of the 2000 Sydney Olympics yachting team.

SPH Research goes to FAST '09

Now in the third year of his PhD on *Smoothed Particle Hydrodynamics*, Daniel Veen has developed a robust computer code which can simulate slamming impacts of hull sections in two dimensions. The method is based on compressible-flow equations and is able to calculate the bulk flow, as well as pressure waves moving through the fluid. Pressure-trace results have been validated against experimental drop tests, showing good agreement. Daniel will present the results of his work at the FAST 2009 conference in Athens this October.



SPH simulation of a drop test using 150 000 particles
(Image courtesy Curtin University)

Ship Under-keel Clearance Course in New Zealand

Following the successful one-day course on ship under-keel clearance held in Perth on 30 March, the course will be repeated in Wellington NZ on 19 September, immediately following the Australasian Coasts and Ports conference see http://www.coastsandports2009.com/index.html. Presenters will again be Tim Gourlay from CMST and Jonathan Duffy from AMC. Further details are available from www.cmst.curtin.edu.au or email info@cmst.curtin.edu.au.

Kim Klaka

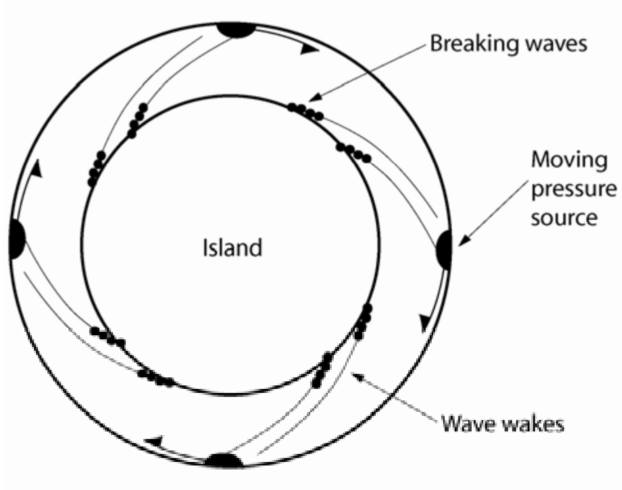
Australian Maritime College

Australian Research Council Award

The Australian Research Council has awarded a team of researchers at AMC, Delft University, and Liquid Time Pty Ltd $210,000 over a three-year period to develop a revolutionary new concept for generating surfable waves indoors. The researchers at AMC include Prof. Martin Renilson, Dr Jonathan Binns, Dr Giles Thomas and Mr Gregor Macfarlane.

The project will enable the design of the world's first circular-track surfing wave pool to proceed. The pool, capable of generating customised continuously-breaking waves, uses a revolutionary idea proposed by industry partner Liquid Time. A disturbance is rotated on the perimeter of a circular wave pool to create breaking waves on a central sloping beach. Immediate outcomes will be: the ability to physically and numerically produce predetermined continuously-generated breaking waves in a circular pool; the control of the wave transformation process; and design of the optimum moving disturbance. Use of a continuous steady-state wave will allow breaking-wave analysis and fundamental knowledge of wave mechanics to be significantly extended.

For further information contact Martin Renilson at m.renilson@amc.edu.au, phone (03) 6335 4667 or at www.liquidtimepools.com.
Martin Renilson



A circular wave pool
(Image courtesy AMC)

Award for AMC Lecturer

Dr Chris Chin was recently awarded a citation for outstanding contribution to teaching and learning from the UTAS Vice-Chancellor, Professor Daryl Le Grew. Dr Chin works at the AMC National Centre for Maritime Engineering and Hydrodynamics. His award is for creating innovative methodologies and on-line resource materials for cross-faculty first-year mathematics which encourage independent learning and improve learning outcomes.

Chris has been a lecturer in mathematics at AMC for the past five years and is primarily responsible for the teaching of engineering mathematics and marine mathematics for students studying the Bachelor of Engineering (Naval Architecture, Ocean Engineering and Marine and Offshore Systems) and Advanced Diploma of Marine Engineering.

Final-year Research Project Mini-conference

The final-year students in each of the three Bachelor of Engineering courses at AMC will be presenting the work of their final-year research projects on Friday 23 October, 2009. The list of students and topics is given below.

Shaun Denehey — *Motions in extreme waves and capsizing of landing-craft-type hull forms.*

Jonathan Windsor — *Damage stability of warships in waves.*

Samual Wilson-Haffenden — *Wavemaking resistance of a submarine operating close to the surface.*

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Keyvan Sartipi — *Closed-array hexagonal control-buoy concept*.

Ben Fitzgerald — *Development of the DSTO AUV, including CFD modelling and experimental analysis*.

Ben Fell — *CFD analysis of generic submarine shapes with appendages, with validation using the Horizontal Planar Motion Mechanism*.

Chris Gaskin — *Development of AMC/UTAS ROV and conversion to AUV.*

Brendon Letter — *Roll modelling of surfaced submarines*.

Jonathan Robarts — *Ethanol fuelling of AMC's marine diesel engine including CFD analysis of ethanol evaporation*.

Poowadol Niyomka — *Design of experiments for collective cyclic-pitch propeller*.

Chris Smith — *Motion response of a SPAR platform*.

Paige Kranz — *Progressive flooding of a self-installing platform.*

Jonathan Emonson — *Full scale T-foil ventilation study*.

Robert Thompson — *Enhancement of reduced-scale sailing-yacht testing*.

Rowan Frost — *Prawn by-catch reduction device*.

Michael Rowe — *Pipeline simplified response model*.

Mark Symes — *IMO severe wind and rolling criterion for high-speed craft*.

Marcus Camille — *Offshore renewable-energy systems for the Seychelles.*

Jacob Gerke — *Optimising GreenLiner waterjet extension*.

Tom Barden — *Conversion of GreenLiner from semi-displacement to displacement*.

Oliver Thornalley — *An investigation into a twin-paddle vectoring arrangement for manoeuvring and for reverse*.

Aaron Cassidy — *Relating flow properties to energy-recovery turbine*.

Shaun O'Connell — *Investigation into wave reflections in the AMC towing tank and model-test basin*.

Matt Fitzpatrick — *An investigation into wave-induced loading on temporary mooring systems*.

Peter Coates — *Fishtailing of FPSOs*.

This mini-conference is always very successful, with the students taking it seriously, and putting in a considerable effort to impress the assessors and external visitors. Each student has 15 minutes to make a presentation, with five minutes for questions and answers.

All are welcome to attend this whole-day event. Please contact Prof. Martin Renilson if you would like to attend and to obtain further details (m.renilson@amc.edu.au, or phone (03) 6335 4667).

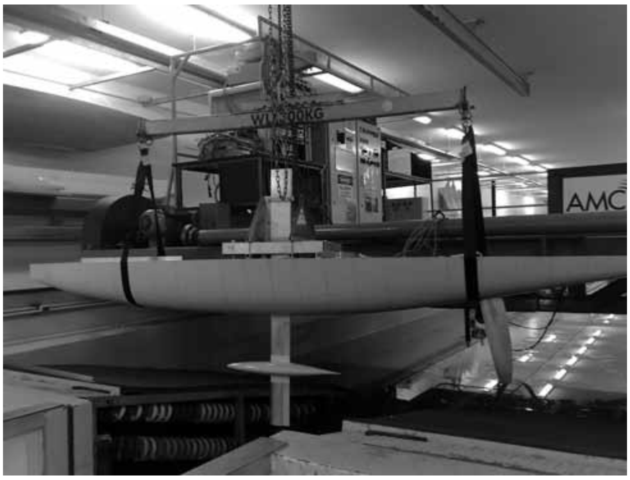
Martin Renilson

Sailing Yacht Research at AMC

Effect of Keel Volume Distribution

The continuation of the sailing-yacht physical modelling extrapolation project in 2009 has seen 4th Year student Rob Thompson take on an ambitious research project. Repeating and extending Keuning's work from the late 1990s we have constructed a model such that we can measure the forces on the keel and bulb package in addition to the total forces on the yacht. To conduct this work we have had to re-commission the small 6-dof force balance designed by Kishore Kanthimahanti and A/Prof .Paul Brandner, and built by Rob Wrigley, in 2003. One of the results from Keuning's work which we are repeating was thatthat there is a reduction of residuary resistance with decreased volume submergence. This cuts at the heart of what naval architects term residuary resistance, so we will be seeing if we can repeat the result, and then if we can understand what it really means. The first set of testing has been carried out, resulting in breaking the small 6-dof force balance. However, not to be deterred, we are presently rebuilding it (slightly more robust) and hope to be back in the tank in September.

Bulb shown at mid-span position — was this an AC90 candidate feature?
(Photo courtesy AMC)



Bulb at the lowest position
(Photo courtesy AMC)

T-foil Ventilation

Following on from the very successful Moth T-foil experimental program which we conducted last year, two sources of ventilation have been identified and are being investigated for a rudder T-foil. Firstly feeding the ventilation cavity from tip vortices from the main centerboard foil is being investigated by 4th Year student Jonathan Emonson. Video of full scale ventilation shows possible interference from trailing tip vortices and the rudder T-foil. To investigate this, we have decided to try for much higher speeds than those attainable in the towing tank by utilising the RV Davies Catamaran (a modified

Tornado with a test beam attached). With the T-foil mounted in front of the catamaran we will be able to feed ventilation from upstream of the foil, simulating an aerated vortex stream from the main centerboard foil. Being a very approximate method, we hope to mainly obtain statistical data on increasing the probability of ventilation.

We are also booked in for a session with the towing tank in August for the T-foil work in which we will alter the angle of attack of the strut (simulating applied rudder incidence) and measure the change in forces for the T-foil. As with the previous investigation, video of full-scale ventilation shows possible increases in ventilation probability when rudder incidence is altered. French intern student, Sophie Coache, is working on this side of the project. So far she has produced some fantastic potential-flow predictions for the change in pressure distribution due to rudder loading. These predictions will be used to estimate cavitation numbers required for ventilation.

Sailing Dinghy Simulation

In collaboration with the University of Melbourne and Virtual Sailing Pty Ltd, we are pursuing a project for the enhancement of the reduced degree-of-freedom sailing simulator. Last year we had a 4th year student working on this project, and this year we have a PhD candidate, Graham Bennett, working at the University of Melbourne on the project. We will be measuring the full scale motions of a Laser dinghy on Port Phillip Bay (hopefully we can teach Graham to sail on the simulator beforehand!) The instrumentation system we are designing utilises micro PC technology from CrossBow. These amazing micro PCs form a distributed system of data-acquisition devices communicating over a wireless network, using the tiny-OS operating system to minimise power consumption. Dr Jonathan Binns first used these devices in the America's Cup — their adaptation to a more modest project is extremely exciting.

Jonathan Binns

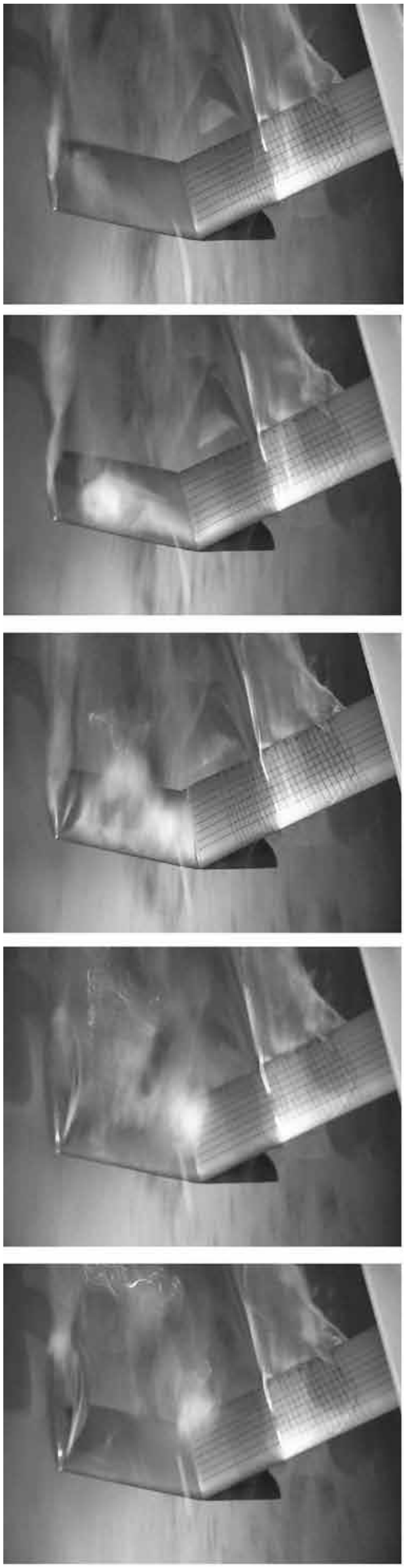
10th International Conference on Stability of Ships and Ocean Vehicles

The 10th International Conference on Stability of Ships and Ocean Vehicles (STAB2009) was held in June in St Petersburg, Russia. This is the tenth in a very successful series of conferences where the latest developments in ship stability are discussed. It involves stability researchers, operators, national authorities, and classification societies, so is a very good mechanism to transmit the latest research into practical application, including regulation.

About 70 papers were presented during the week — many containing valuable new insights into ship capsizing, and the techniques to assess ship stability, both in the intact and the damaged conditions.

Rob Gehling, of AMSA, who has been a member of the International Standing Committee for a number of years, resigned from the Committee, and Martin Renilson was asked to fill the vacancy. Martin served on this committee a number of years ago, including as Chairman, but was unable to continue in this position when he worked for DERA/QinetiQ in the UK.

Martin Renilson



Ventilation progression of a rudder T-Foil
(Photos courtesy AMC)

Ship-Handling Simulator Upgrade Sets Sights on Skills Shortage

After more than 18 months in the making, Australia's latest hi-tech maritime-training facility has officially re-opened for business. The Centre for Maritime Simulation at the Australian Maritime College threw its doors open on 2 July in a special ceremony that featured a host of national maritime-industry figures and dignitaries. The $7 million centre was officially opened with an unveiling ceremony by Federal Infrastructure, Transport, Regional Development and Local Government Minister, Anthony Albanese.

During his earlier opening address, Mr Albanese praised AMC's role in maritime education, saying that a highly-skilled sector was a crucial ingredient for future success. "This college plays a critical role in producing some of the best seafarers in the world and equipping our national maritime industry for the challenges ahead," Mr Albanese said. "It has also developed a reputation for providing quality services not just to the domestic industry but throughout the Asia-Pacific region. The simulation work which has been conducted at the AMC over the past 24 years is of national significance. I have no doubt that this new state-of-the-art simulator will provide outstanding benefits to students and the maritime industry," he said, adding that he was honoured to be charged with the duty of officially opening the facility.

The upgrade means students and industry now have access to the very latest in maritime technology, with real-life simulations across a range of vessels, ports and conditions. The move not only cements the AMC's role as a world leader in maritime education, but is a direct response to a major skills shortage in the booming global maritime industry.

According to the head of the AMC's National Centre for Ports and Shipping, Captain John Lloyd, the upgrade will have ramifications well beyond the Launceston campus. "The simulator is an area where the AMC and industry already work very closely together. This upgrade is essential if we are to keep ourselves and the companies who seek our expertise at the forefront of the industry," Captain Lloyd said. "Traditionally, AMC has led the way with maritime education and research facilities and this is a continuation of that role at a time that is crucial for shipping around the globe."

The simulator upgrade includes a 270° main bridge, six ship operating consoles, 160° bridges with re-configurable cockpit consoles and a 180° tug bridge. The various bridges interact, creating real port situations in a range of weather conditions. Research and development stations to further the AMC's capacity to deliver training and research projects are also included.

Captain Lloyd said that the decision "only came after careful consultation with key industry figures". "The selection of Kongsberg Maritime to meet AMC's simulation requirements comes as a result of a careful evaluation of international suppliers. The system being delivered will ensure that AMC remains at the forefront of maritime training and research in the Australian region," he said.

Patrick Cranny

Researchers Take on the High Seas for Fast Ferry Industry

Researchers at AMC are taking on Mother Nature by establishing a platform for the structural design of large high-speed catamarans to withstand extreme sea conditions. In a collaboration between the UTAS School of Engineering, the AMC and Incat Tasmania, the research has recently been tested on the latest Incat ferry and has demonstrated the sea-worthiness of the vessel design.

Sea trials and model test results are used by Incat in the design of regular ferry and military vessels.

School of Engineering chief investigator, Professor Michael Davis, said that Incat catamarans have a unique wave-piercing design and, due to the complex nature of the transient flow around the bow, it was previously unknown how large wave slam forces could be. Prof. Davis said that trials have shown that these catamarans could experience extreme slam forces of 2200 t without damage.

"We are measuring slam forces about equal to the weight of the boat: those are very large forces," Prof. Davis said. "It is essential that the structure can withstand such forces when exposed to severe sea conditions."

Recent sea trials have been successfully conducted on the 112 m, 3000 t Incat-built vessels now operating between the main islands of Japan and on the latest vessel, *Norman Arrow*, about to enter service between the UK and France. The United States Navy, which has Incat military vessels, has collected data in very severe sea conditions as part of the investigation.

AMC Maritime Engineering researcher, Dr Giles Thomas, said that sea trials are performed by using a wave radar to monitor sea conditions, while motion sensors and strain gauges indicate ship motions and forces which are used to evaluate vessel performance. Dr Thomas said model tests are an essential part of the research and provide greater control of wave conditions than is possible with sea trials and allow extremes to be carefully explored. "There has been good correlation between model and full-scale forces," Dr Thomas said. "We have tested in seas up to 5 m wave height without submerging the bow, demonstrating the inherent seaworthiness of the Incat design."

The UTAS collaboration with Incat began in 1990 and has also included studies of propulsion and motion control.

Patrick Cranny

International Conference on Ship Manoeuvring in Shallow and Confined Water: Bank Effects

The International Conference on Ship Manoeuvring in Shallow and Confined Water: Bank Effects was held in Antwerp, Belgium between 13–15 May 2009. The conference was organised by Flanders Hydraulics Research and Ghent University — Maritime Technology Division in association with the Royal Institution of Naval Architects. This conference allowed researchers and marine pilots the possibility to discuss the latest developments in research and practice related to the behaviour of ships in the vicinity of lateral banks.

Dr Jonathan Duffy, a Research Engineer at the Australian Maritime College, presented a paper titled *Simulation of Ship Manoeuvring in Laterally Restricted Water*. The paper outlined a study conducted at AMC to develop a method for prediction of bank effect in real time on a ship-handling simulator.

28th International Conference on Ocean, Offshore and Arctic Engineering (OMAE 2009)

The 28th International Conference on Ocean, Offshore and Arctic Engineering was recently held in Honolulu, Hawaii, between 31 May and 5 June 2009. Two papers were presented by Dr Giles Thomas and Mr Gregor Macfarlane. Both research projects involved work undertaken by final-year AMC undergraduate students as part of their research theses conducted in 2008. A brief outline of each paper is provided below.

Wave-induced Motions of Gas Cat: A Novel Catamaran for Gas Processing and Offloading — Giles Thomas (AMC), Alexandra Ford (AMC), Landon Kibby (AMC), Jonathan Binns (AMC), Ian Finnie (WA ERA), Neil Kavanagh (Woodside)

The preliminary development of the novel concept of using a large catamaran, known as Gas Cat, as a floating natural gas processing and offloading facility is outlined. The proposed system is based on two ship-shaped hulls joined by a spanning superstructure. For off-loading purposes, a carrier may dock with, or be tethered to, the catamaran.

A concept design has been developed based on two retrofitted VLCCs, allowing for the processing and storage of 1 million barrels of condensate and approximately 240 000 m^3 of LNG. A key aspect of the development of this concept is the accurate estimation of the motions of the catamaran in a variety of operational scenarios. Model experiments were conducted in AMC's Model Test Basin using a 1:78 scale model of two full-form hulls converted into a catamaran configuration. Tests were conducted in head, beam and oblique seas for two hull spacings and a range of wave heights.

The experimental results show that, for the range of wave conditions tested, good linearity of the motions can be expected with respect to wave height. An increase in demihull separation was found to significantly reduce the sway, heave and roll motions in beam seas. However a change in demihull separation had little influence on the motions in oblique seas. A change in heading angle from head seas to beam seas significantly increased the sway, heave and roll motions whilst reducing pitch motions. Bow quartering seas was seen to be the worst heading angle for yaw. The results from the experiments allowed the expected motions of the Gas Cat to be determined in extreme weather conditions.

Hydrodynamic Properties of a Suction Can Oscillating Near the Free Surface — Chris Plummer (AMC), Gregor Macfarlane (AMC) and Yuriy Drobyshevski (IntecSea)

Offshore operations often require heavy subsea equipment, such as suction piles or cans, to be lowered by a support vessel into the sea. A lifting device must have adequate capacity to withstand the dynamic loads generated by the motions of the vessel and the heave response of the structure.

The objective of this study was to determine the added mass and damping of a suction can oscillating in heave near the free surface; knowledge of these hydrodynamic properties is required for the accurate prediction of the dynamic lift forces during the deployment. This project is a logical progression following two similar studies, which investigated these hydrodynamic properties for the suction can in the mid-water position and when approaching the seabed. All three studies involved the conduct of model tests to determine the hydrodynamic properties. Free decay tests were conducted at several heave frequencies, and the added mass, linear and quadratic damping components were determined. In addition, the effect of varying the percentage of open hatch area was investigated.

Test data demonstrates that the added mass in heave is strongly dependent on the frequency of motion, and its values are significantly smaller than those measured in unrestricted flow. From observations, there was no dependency on the motion amplitude, nor did the size of open hatches have any notable effect on the added mass. It was observed that, when the top plate of the structure was in contact with the free surface, a mean "pull down" force appeared. This force is caused by the suction underneath the top plate when the can moves upwards. Compared to the mid-water position and near the sea floor, the study indicates that the area of open hatches has no noticeable effect on the heave damping when the suction can is oscillating near the free surface.

Gregor Macfarlane

AMC Seminar Series for Semester Two 2009

The following presentations will be made as part of the AMC Seminar Series over the coming months. They are held in the AMC Auditorium and are open to anyone interested in attending. Further details can be obtained from Dr Jonathan Binns at j.binns@amc.edu.au.

13 Aug Art Shrimpton — *Commercial Hydrographic and Metocean Data — Collection and Reporting*.

20 Aug Prof. Young Ju Choi — *The HiT Lab Australia.*

27 Aug Dr Troy Gaston — *The Good, the Bad and the Ugly of Rice Grass in the Tamar Estuary*.

10 Sept Jon Nevill, PhD Student — *Living up to our Reputation: Implications of Fishery Management Failures in the Australian Context*.

17 Sept Dr Carmen Primo — *Reproductive Phenology of the Introduced Kelp Undaria Pinnatifida (Phaeophyceae, Laminariales) in Port Phillip Bay*.

24 Sept Dr Christopher Bolch — *Marine Microbial Interactions: are they the Missing Link in Phytoplankton Population Dynamics?*

1 Oct Dr Rozetta Payne — *Optimisation of Composite Sailing Yacht Structure*.

8 Oct Alan Fleming, PhD Student — *A Review of Ocean Wave Energy Conversion*.

15 Oct Dr Chris Burke — *Research in Teaching and Learning in Higher Education*.

22 Oct Dr Jonathan Duffy — *Simulation of Ship Manoeuvring in Laterally Restricted Water*.

Jonathan Binns

University of New South Wales

Undergraduate News

Inclining Experiment

Sydney Heritage Fleet provided access to their yacht *Boomerang* for the Year 3 naval architecture students to conduct an inclining experiment at Rozelle Bay on 20 May. The students conducted the experiment with the guidance of lecturer Mr Phil Helmore. The day was far from perfect for an inclining; it started out raining, but dried fine for the inclining, but the wind was gusting 5–15 kn the whole time, giving significant variability in the angles of heel. However, it was more important for the students to see the whole experiment than to have a perfect set of results. The experiment was completed in good time, and the students made a good fist of their first inclining.

Year 3 UNSW naval architecture students aboard *Boomerang* for their inclining experiment (Photo Phil Helmore)

Thesis Topics

Among the interesting undergraduate thesis projects newly under way are the following:

Optimisation of Keels for Racing Yachts

There appears to have been little systematic work reported on the optimisation of the details of keels for high-performance racing yachts. Stuart Grant is conducting a computational fluid dynamics investigation of the effects of the size, shape and position of a bulb keel, together with the size, shape and position of winglets on the bulb. The CFD results will be verified by tests of one of the keels in the wind tunnel before proceeding with optimisation.

Optimum Length for Hydrographic and Oceanographic Ships

There appears to have been a trend over recent decades for hydrographic and oceanographic ships to become relatively shorter with increased beam. The reasons for this trend are not immediately obvious. It would appear that this trend has been detrimental from consideration of at least the resistance and seakeeping characteristics for such vessels. As an example, the immediate past and current generation of RAN hydrographic ships, HMAS *Moresby* and HMAS *Leeuwin*, while having similar displacements, the older generation ship has an L/B of about 7.5 while the new ship has an L/B of about 4.7 (based on overall length and beam). Anne Simpson is examining trends in overall hullform design over the last few decades to determine whether, indeed, there has been a clear trend to lower L/B ratios. She is developing two conceptual-level hydrographic ships having the same design objective (payload, crew and accommodation requirements, speed, range, etc.), with one intentionally being a longer design and the other a shorter one. Resistance, powering, seakeeping, intact and damaged stability, initial and through-life costs are all being assessed for both designs.

Automated Drawing of Marine Screw Propellers

Most drawing of marine screw propellers is now done via a CAD package, but the level of input required varies significantly. A previous thesis looked at automating the drawing of MARIN B-Series propellers from the design data using Pro/Engineer. Konny Zurcher is now automating the drawing process in Catia. The calculation of the polar moment of inertia of the propeller will be looked at in detail, because the value calculated by Pro/Engineer for the B-Series did not agree well with the results of a manual calculation, although the values calculated for mass agreed closely.

Engineering Design Centre

The fifth floor of the School of Mechanical and Manufacturing Engineering is about to be reborn. In the place of the existing classrooms will be an open and colourful environment for undergraduates, postgraduates and industry. Three significant areas will interlink on the new fifth-floor learning space:

- A Design Space, occupying 300 m^2, will be used as a collaborative learning environment with movable furniture, LCDs, electronic tablets, projectors and wireless computing. This new flexible multi-disciplinary design space will also provide for large functions and an end-of-year gallery environment.
- A Design Research Laboratory will house up to 25 postgraduate students working in a community environment, supported by an academic and adjunct professor. The new laboratory will contain designated break-out areas, a meeting room, and a utility space.
- A Student and Industry Space will provide informal learning and gallery space for students and industry to gather on collaborative projects or presentations. The space allows for a diversity of group and individual needs and is supported with a tea-preparation area, projectors, LCD, wireless network and a variety of loose modern furniture.

The design and documentation has been completed, the contract was awarded in late July, and construction is now well under way. The project is expected to be open in late October as part of the 60 year celebrations at UNSW. This will be a very exciting space for the future of teaching, learning and research for both the School and the Faculty.

Post-graduate and Other News

Head of School

The field of applicants for the position of Head of the School of Mechanical and Manufacturing Engineering has been narrowed to three:

A/Prof. Philip Mathew, Acting Head, School of Mechanical and Manufacturing Engineering, UNSW.

Prof. Josua Meyer, Head, Department of Mechanical and Aeronautical Engineering and Chair, School of Engineering, University of Pretoria, RSA.

Prof. Geoffrey Chase, Mechanical Engineering Department, University of Canterbury, New Zealand.

Interviews were conducted at UNSW in late July, and each made a presentation on their vision for the school and research interests to the staff of the School and the Dean of Engineering.

Watch this space!

Basser College Jubilee

Basser College, the first residential college on campus at UNSW, held its Jubilee (50th Anniversary) celebrations on Saturday 1 August.

A barbecue was held in the Senior Quadrangle in the early afternoon for alumni and current residents, with tours of both the college and UNSW campus led by current residents for the alumni to see how things have changed over the intervening years.

The Jubilee Dinner was held in the Goldstein Dining Hall in the evening, with speeches by the current Master, Dr Geoff Treloar, previous Master, Em/Prof. John Kennedy, and several alumni, including previous Vice-Chancellor of UNSW, Em/Prof. John Niland. Other alumni present included previous Deputy Vice-Chancellor at UNSW, Em/Prof. Chris Fell, and UNSW naval architecture graduates Brocque Preece, Dave King and Phil Helmore.

Phil Helmore

Sir David Anderson Bequest Award

Em/Prof. Lawrence Doctors recently returned to Sydney from Glasgow, Scotland, where he spent four weeks at the University of Strathclyde. He was collaborating with Dr Sandy Day and Mr David Clelland in the Department of Naval Architecture and Marine Engineering. Their specific project was to study the resistance and wavemaking characteristics of a model of a compartmented, or split-cushion, surface-effect ship (SES).

A compartmented SES is similar to a traditional SES, except that the air cushion is divided into two or more subcushions, by means of one or more transverse seals or skirts. The advantage of the concept is that, by suitably adjusting the different cushion pressures, it may be possible to reduce the resistance of the vessel even further. Preliminary tests on the 2 m SES model were previously conducted by Beveridge (2009) and were successful. In particular, it was possible to reduce the total resistance by more than 50% in this manner. The implication of this is that the wave generation would have been reduced by considerably more than 50%. This outcome has great ramifications for river-based ferries, where it is desirable to minimise the erosion of the river banks.

An interesting side point is that Beveridge received the 2009 RINA–BVT Surface Fleet Ltd award for the best thesis and presentation at the annual event held for that purpose, on 4 June 2009, at the University of Strathclyde. This was an appropriate outcome, because 2009 is the fiftieth year of the hovercraft.

For the current research effort, the SES model was more-extensively instrumented in order to monitor the pressure in the stern seal as well as both subcushion pressures. A very comprehensive set of experiments was then undertaken, in which the total displacement of the model was changed, as well as the ratio of the pressures in the individual subcushions. The results of these tests in the Towing Tank at the Acre Road facility of the University of Strathclyde are now being analysed.

In order to support Lawry's trip to Glasgow, he was appointed as a Sir David Anderson Fellow. Incidentally, Lawry had, on a previous occasion in June 2006, been honoured with the inaugural Sir David Anderson Bequest Award for a Distinguished Scientist/Engineer. Before leaving Glasgow, Lawry presented an open lecture to the university on the subject of *Ship Hydrodynamics*.

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Lawrence Doctors

Careful! A bulldozer is transferred from a landing craft (LCM8) to HMAS *Kanimbla* via a 'stern door marriage' during exercise Talisman Sabre 2009.

This type of operation will be much simpler in the RAN's new amphibious ships (LHD) HMA Ships *Canberra* and *Adelaide* (RAN Photograph)

Wärtsilä Combines its Ship Design Units

In June Wärtsilä announced that it is to combine all its ship design units into a single entity, to be known as Wärtsilä Ship Design. The units involved in this re-organisation include the recently-acquired naval architect companies Vik-Sandvik of Norway, Conan Wu and Associates (CWA) of Singapore, and SCHIFFKO of Germany, as well as the company's conceptual ship design unit in Finland.

The new entity will generate a variety of new designs, from simple, low-cost, standard vessels to more high-end, ground-breaking tonnage. Wärtsilä, with a broad and high-quality offering of ship design services, expects to increase its share of the ship design market, with the main focus being on a full design scope approach.

"There will be close collaboration between our Ship Design unit, other parts of the Ship Power organisation, and other Wärtsilä businesses. Our long-term ambition is to create standard proven designs with predefined solutions, and to provide operational services with performance guarantees and fixed prices. This may also include extended services, such as yard selection and supervision support in the construction phase," said Arne Birkeland, Vice-President, Ship Design, Wärtsilä Ship Power.

"We will gradually launch a series of designs developed as a result of the knowledge sharing between the different units, and these will be branded as Wärtsilä Ship Designs," said Birkeland. "It is our goal to establish Wärtsilä as an independent ship design brand, which will become the customer's first choice".

The expansion into ship design is in line in Wärtsilä's strategy to strengthen its position as a total solutions provider, and to be the most valued partner for its customers. Through ship design, Wärtsilä can offer competitive solutions which will lead to better total efficiency, improved environmental performance, and reduced life-cycle costs for its customers.

New Wärtsilä Tug Design

One of the first designs to be fully accredited as a Wärtsilä Ship Design is the W Tug 80. This is a compact, high-performance escort tug of 35 m, capable of carrying out ship-assist duties at offshore terminals, as well as high-speed escorting, push-pull operations, and coastal towing.

The W Tug 80 — one of the first designs to be fully accredited as a Wärtsilä ship design.
(Image courtesy Wärtsilä)

The W Tug 80, designed for 80 t bollard pull, can attain a speed of 14.5 kn. Due to its compact size and two Wärtsilä steerable thrusters, the tug is highly manoeuvrable. The rounded bow profile with moderate flare is optimised for pushing and reduces the risk of slamming.

A large skeg, combined with the forward hull shape, results in a steering force of 250 t during escorting. It is powered by two 8-cylinder in-line Wärtsilä 26 engines, each rated at 2600 kW at 1000 rpm. A modular propulsion concept with various engine arrangements can be configured within the same basic design.

The towage and escorting duties are served well with a forward 112 t towing/anchor winch. A 91 t towing winch is sited aft of the superstructure. The tug can be equipped for fire-fighting duties, and can operate 200 n miles from the coastline.

Wärtsilä Package for Ship Lay-ups

Reacting to the changing market place, Wärtsilä has introduced a new, comprehensive package of services, designed to cost-efficiently manage hot and cold vessel lay-ups.

Reduced transportation demand, over-capacity, and low freight and charter rates have become a major concern throughout the marine industry. The laying-up of ships is one option available to ship owners for meeting these challenges. However, when laying-up, it is of the utmost importance that the vessel's machinery be kept in good condition. This is achieved through professional management of the de-activation and re-activation phases, and by regular inspections and maintenance during the interim period.

Wärtsilä's lay-up services will be available for engine room equipment covering 2-stroke and 4-stroke engines, propulsion lines, electrical and automation equipment, and boiler systems.

Centrally controlled and dispatched from Wärtsilä Switzerland, the expert crews are mobilised regionally in the Mediterranean, the Middle East and Asia. The service package is an all-in-one agreement covering a selection of equipment, for de-activation, re-activation, lay-up inspections, or a combination of all of these.

When ships are laid-up with insufficient care, a humid environment will cause accelerated wear, corrosion and deterioration. The re-activation phase will then reveal, for instance, corrosion of the shafts, flanges, pins and journal surfaces, and deposits and sediments in cooling chambers, clogging of filters and gaskets, and seal deterioration. Wärtsilä regularly performs in-situ repair and maintenance jobs, and is well prepared to handle situations such as these. Regardless of the equipment make, or who has performed the lay-up, Wärtsilä offers in-situ shaft machining, laser alignment services, reconditioning, underwater repairs, and flying squad services, on call.

As an option and, on request of the owners, the lay-up period can also provide a good opportunity for implementing machinery upgrades, which will improve the fitness and operational efficiency, and the overall performance of the ship once it re-enters service. Wärtsilä offers a wide range of solutions for main and auxiliary engines, and propulsion lines and systems which offer operational cost reductions, increased reliability, and a reduction in emissions.

Wärtsilä Ship Power Trims the Sheets

In June Wärtsilä Corporation announced that its Ship Power business had finished the formal process in Finland and in some other countries of realigning its organisation and resources to adjust to the substantially weakened global marine market situation.

In Finland the negotiations resulted in the reduction of 77 jobs. The major part of these job reductions were to be implemented by internal job transfers within the company and by the expiration of temporary employment contracts.

Similar negotiations in several other countries have also come to an end. In the remaining countries, the adjustment process is proceeding as planned.

Wärtsilä Ship Power announced on 14 May that it had initiated the formal process to reduce 400–450 jobs, of which approximately 80 are in Finland. The process affects all of Wärtsilä Ship Power's some 1300 employees in all functions globally.

Wärtsilä Ship Power has employees within sales, project management, engineering services and ship design in 30 countries. In all, Wärtsilä Corporation has 19,000 employees. Wärtsilä has three businesses; Ship Power, Services, and Power Plants.

Progress at Austal's Western Australian shipyard on the construction of four patrol boats for Malta
(Photo courtesy Austal Ships)

HMAS *Sydney* arriving in New York as part of a six-month international deployment with HMAS *Ballarat*.
The ships visited New York from 19–22 July to reciprocate the 2008 Great White Fleet centennial celebrations, when USS *Shoup* and USS *John S McCain* visited Australia
(Photo Department of Defence)

VALE

Clem Masters

It is with sadness that *The ANA* records the passing of Romney Clement (Clem) Masters at Caboolture, north of Brisbane, on 23 May 2009.

Clem Masters, the youngest of six children of Louis and Ruby Masters, was born on 13 September 1929 at Palmwoods in Queensland's Sunshine Coast hinterland. When Clem was three years of age, the family moved to Evesham in England's mid-west, where his father, Louis. managed a market garden for about three years, before returning to Eudlo, also in the hinterland of the Sunshine Coast.

Louis Masters began full-time work for the Boy Scouts in Brisbane and the family moved to a house at Sherwood. Perhaps its jetty onto the Brisbane River fuelled Clem's love of boats. Clem attended Sherwood State Primary School and Brisbane Boys College, but completed schooling in Townsville when the family moved there as his father continued his career in Scouting.

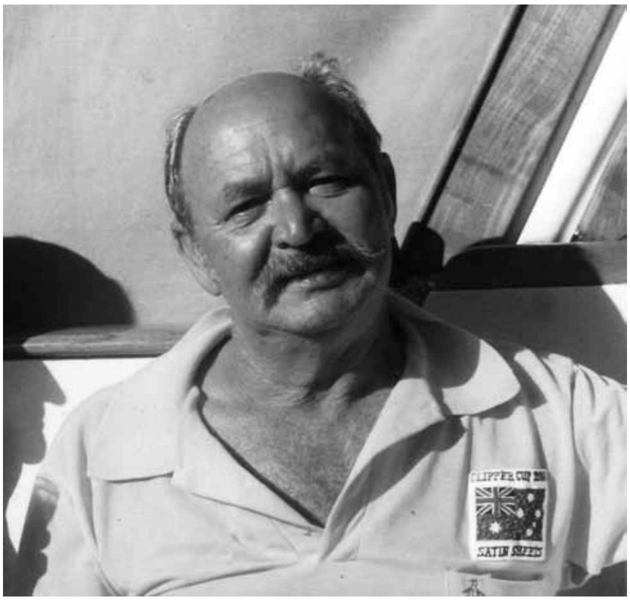
Clem Masters was indentured to Matt Taylor and Company Shipwrights, in Townsville on 14 May 1945, employed on cargo dunnaging, steel-ship repairs, and building and repairing wooden boats until 24 January 1947. His quality work was noted with the Townsville Bulletin's sailing results: '*Malveena* is a new Trainee built by C. Masters, an apprentice with Matt Taylor. His first boat was built of cedar.'

Moving to Sandgate on Bramble Bay in Brisbane, Clem lived with his sister Betty and her husband, medico/yachtsman Peter Prentice, and his indentures were transferred to an apprentice boat builder with the renowned firm of Watts and Wright in the mecca of Queensland boatbuilding at Bulimba. He trained under boatbuilding legends, and Australian champion skiff sailors, building and repairing a wide range of wooden vessels and shaping and rigging spars. He gained his Certificate of Boat Building from Brisbane's Central Technical College on 6 October 1949, completing his indentures on 16 October 1950.

Magnetism drew Clem back to steel ships. In late 1950 he was employed as a Shipwright at Evans Deakin and Company Pty Ltd shipyards at Kangaroo Point in Brisbane, working on interstate cargo ships. Then, unusual for a boat builder he went to sea as the ship's carpenter on iron ore carriers with the BHP Company.

In 1953 Clem started working for himself and leased a lean-to shed at 112 Barclay Street in the Brisbane suburb of Deagon. Remote from the water and before rolled- and pressed-aluminium runabout mass production, he built shapely flat and V-bottomed marine plywood dinghies for fishing club and hire fleets.

When work tapered off, Clem spec-built clear-finished red cedar clinker dinghies. These dinghies were fitted with steam-bent silver ash timbers, keel and stringers, and were fastened with roved copper nails. Clem built these dinghies without a plan — not using any moulds, he set up the keel, stem and transom and completed the planking — spiling, shaping and fitting each plank by eye. He had exceptional eye, hand, and coordination skills, together with an unparalleled understanding of the relationship of hull form with construction processes and materials. He had a fine and exacting touch — on the tiller and sheet, with a fishing line, spokeshaving and using paring gouges shaping a model, caulking a rabbet with oakum, adzing a keel, and calculating design criteria! An early example of his fine work is the Sandgate 16 Foot Skiff Club Champion, *The Trump,* which he designed and built in 1955 using the moulded plywood process — this was a Queensland and Australian industry innovation and a radical departure from traditional seam-battened planked construction.



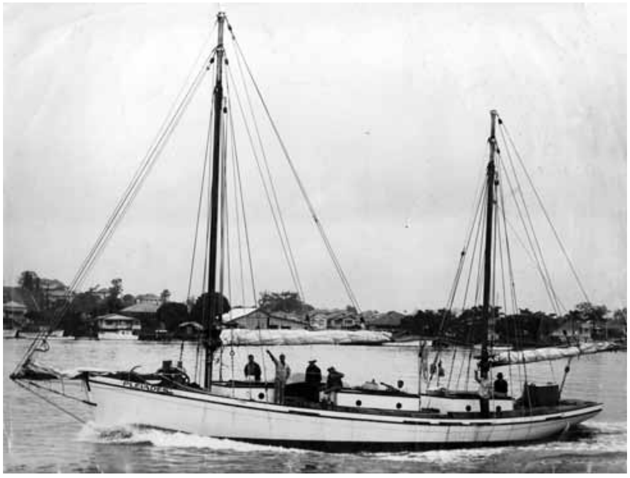
Clem Masters
(Photo courtesy Prentice Family)

He sought out optimal design and the most efficient form of construction. Clem Masters was sharp, quick of wit, very boaty, knowledgeable and positive — he developed visions and transformed them into reality. He looked forward to sailing races and voyages where he would be confronted with the elements. This applied to his boat design and construction — responding to a challenge, he would poke his tongue into his cheek, we can build anything!

However by mid 1956, getting work was difficult and Clem, needing to keep his business afloat and his crew intact, took an order for a carvel trawler from a fisherman who was not cashed for such a venture, but in desperate need for a new boat. Times were frugal! Then, out of nowhere, Clem won the contract to build *Pleiades,* a 60 ft (18.18 m) pearling lugger for Thursday Island — without suitable premises or a sufficient number of skilled staff to build her. In no time Clem obtained Cabbage Tree Creek frontage at 30 Hickson Road, also at Deagon. The site required a lot of attention before a second-hand shed was re-assembled by Clem and his crew, and a slipway carved out of the creek bank.

With the move to 30 Hickson Road, the boat yard had a full job card, but work quickly evaporated when *Pleiades* was delivered to Thursday Island. Clem again moved into the speculative construction, this time of a large sharpie which was built from recycled house framing, including nails which wreaked havoc with tools and machinery — compensation was that it was planked with Queensland beech that had

Clem Masters at work on *Pleiades*
(Photo Clem Masters collection)



Pleiades sailing for Thursday Island in 1958
(Photo Clem Masters collection)

been drying stripped stacked in the yard.

At the end of the 1950s, Clem won contracts to build a number of wooden boats and yachts, including a 30 ft (9.14 m) seam-battened Oregon-planked hard-chine outboard planing hull which was built upside down — and launched that way! Turning it mid-stream was a learning experience! Clem forged ahead with inverted construction for his 30 ft plus wooden carvel cruisers, but he turned them on a spindle in the boat shed. He transformed this design into FRP construction, but by 1969 output at 30 Hickson Road, Deagon, was at variance with Brisbane City Council regulations, further expansion was not possible, and FRP construction out of the question.

On 26 October 1973 he opened new purpose-built premises at the Narangba Industrial Estate, north on the Bruce Highway (M1). Here FRP hulls, decks and components of 34 ft (10.36 m) cruisers and 54 ft (16.96 m) displacement vessels were laminated and trucked about 25 km to Cabbage Tree Creek for assembly and launching. In the late 1960s and early 1970s, traditional materials were becoming of doubtful quality and difficult to obtain, while FRP construction for boats over 50 ft (15.24 m) length OA was out of the reach of most builders and in its infancy in Australia. Clem transformed vision into reality — he was an industry leader!

Clem had a propensity to join in with the crew on the job, and his skilled workers were appreciative of him working alongside them, as were his sixteen apprentices — by joining with them he was teaching them and assessing their progress. Clem provided a new start for migrant workers, and for many carpenters and joiners, and furniture makers who became first-class boat builders. His legacy includes employees who set up their own boatyards, while others became designers, shipwright surveyors, or teachers.

More than fifty locals were employed at Deagon, and up to twenty were employed at Narangba. R.C. Masters (Boat Builders) Pty Ltd, together with employment generated by sub-contractors, and employment in the local fishing fleet kept afloat by the boatyard, made a valuable contribution to the community.

Clem was concerned not only with the standard of his yard's production, but also that high-level skill and knowledge standards were maintained across the industry. He took this responsibility seriously and, from 1966 to 1974, he was a member of the tripartite Group Apprenticeship Committee — Boat Building, providing advice to the Queensland Government on training needs and the standard of training.

Early in his time while working on the tools, Clem enrolled in a correspondence drawing course, where he used Indian ink in a range of adjustable pens — one blot and you started again! Self-taught after hours, he became proficient in design, using the then-traditional equipment and processes. The technical competence of his designs is further evidenced by the performance of the boats built by his firm, and that they are sought after in the market. He was a designer who was also a leading builder.

In 1975 Clem commenced business as a Boat Designer and Marine Surveyor in Brisbane, where he was engaged on design, supervision of construction, surveying and damage assessment, before working in Fort Lauderdale in the USA. In Sydney, operating from Pyrmont, he established R.C. Masters (Marine Surveyors) Pty Ltd. He was accredited as a ship designer, in FRP and wood construction, machinery and safety equipment and as a marine surveyor in aluminium, FRP, steel, wood, machinery and safety equipment with the Queensland Department of Transport until 25 March 2004. From February 1978 he was a registered ship surveyor with the Maritime Services Board of New South Wales. In 1968 he was elected Associate of the Royal Institution of Naval Architects, and was a foundation member of its Queensland Section on 16 March 1999. He relocated to Queensland's Gold Coast in 1985.

Clem Masters made a significant contribution to the community, to the boat design and construction industry, and yachting, and has left an indelible mark on his apprentices, workers, sailors, competitors and peers. His achievements are well recorded, many boats carry his name, and yacht club honour rolls, trophies and publications attest to his sailing commitment.

Brian Hutchison

MEMBERSHIP

Australian Division Council

The Council of the Australian Division of RINA met on Thursday 25 June 2009 with the President, Dr Stuart Cannon in the chair. On opening the meeting, the President formally welcomed Dr Tony Armstrong as an elected member of Council, noting that this was not the first time Dr Armstrong has been a member of Council. He also congratulated Dr Armstrong on the award to him of the 2009 AGM Michell Medal, the highest individual award of Engineers Australia.

These were some of the matters raised or discussed during the meeting:

National Unified System for Vessels Safety

Council believed this matter was now ready to be forwarded to the Council of Australian Governments (COAG) with recommendations for agreement. The proposals had been generated following discussions with interested parties and consideration of numerous submissions to the National Marine Safety Committee (NMSC).

Policy and Funding Guidelines for Section Treasurers

A paper had been prepared by the Treasurer, Mr Allan Soars, setting out details of the financial requirements required to be followed by Section Treasurers. There was a need for guidance for Section Treasurers due to changes in incumbents from time to time. It was agreed that input from Sections should be considered by Council prior to the document being released and this was being sought as a matter of urgency. The Treasurer would then produce a final draft for approval by Council.

Pacific 2010 International Maritime Conference

Mr Jeremy, as Chairman of the Organising Committee, reported briefly on progress. He believed registration for the Conference would commence shortly with the Registration Document being made available electronically. Sponsorship on behalf of the International Maritime Conference and the RAN's Sea Power Conference would commence shortly and would be initiated jointly on behalf of the two conferences.

Inquiry into the Loss of *HMAS Sydney II*

The President reported that technical presentations on the DSTO/RINA study had been deferred until the Commission's report has been released.

Engineers Australia Eminent Speakers Tour

Council was advised that Engineers Australia would be organising a tour by Dr Armstrong to EA centres as part of its Eminent Speakers Tours. When details of the Tour have been finalised, Sections will be advised when they will be urged to liaise with their local EA office to enable members of the relevant Section to attend Dr Armstrong's lecture.

The next meeting of Council of the Australian Division will be held on Wednesday, 23 September 2009.

Keith Adams
Secretary

RINA Council and Committee Members

To keep members up-to-date with who is doing the hard yards on their behalf in Australia, current council, section and committee members are as follows:

Australian Division

President	Stuart Cannon
Vice-president	Martin Renilson
Secretary	Keith Adams
Treasurer	Allan Soars

Members nominated by Sections

	Roger Best (WA)
	Craig Boulton (NSW)
	Chris Hutchings (Qld)
	Ian Laverock (ACT)
	Ruben Spyker (SA/NT)
	Samantha Tait (Vic)
	Giles Thomas (Tas)

Members elected by the membership or appointed by Council

	Tony Armstrong
	Jim Black
	Peter Crosby
	Tim Lyon
	John Jeremy
	Martin Renilson
	Graham Taylor

Executive Committee

	President
	Secretary
	Treasurer
	Roger Best (representing nominees)
	John Jeremy (representing appointees)

ACT Section

Chair	John Colquhoun
Deputy Chair	Peter Hayes
Secretary	Glen Seeley
Treasurer	Tim Lyon
Members	Joe Cole
	Dan Curtis
	Lindsay Emmett
	Robin Gehling
	Kerry Johnson
	Ian Laverock

NSW Section

Chair	Graham Taylor
Deputy Chair	Craig Hughes
Secretary	Craig Boulton
Treasurer	Adrian Broadbent
Members	Stuart Friezer
	Phil Helmore
	Rozetta Payne
	Matthew Stevens

Queensland Section

Chair	Doug Matchett
Deputy Chair	Mark Devereaux

Secretary	Tommy Ericson
Treasurer	Tom Ryan
Members	Bill Barlow
	Antony Krokowski
	Marc Richards

South Australia and Northern Territory Section

Chair	Ruben Spyker
Deputy Chair	Graham Watson
Secretary	Peter Crosby
Treasurer	Peter Crosby
Members	Neil Cormack
	Adam Podlezanski
	Sam Baghurst

Tasmanian Section

Chair	Stuart McDonnell
Secretary	Gregor Macfarlane
Treasurer	Jonathan Duffy
Members	Guy Anderson
	Alan Muir
	Giles Thomas

Victorian Section

Chair	Goran Dublevic
Secretary	Edward Dawson
Treasurer	Terry Turner
Members	Stuart Cannon
	Sean Johnson
	Lance Marshall
	Samantha Tait
	Allan Taylor

Western Australian Section

Chair	Jim Black
Deputy Chair	Kristofer Rettke
Secretary	Toby Clarke
Treasurer	Jim Black
Member	Tiju Augustine
	Roger Best

The Australian Naval Architect

Editor-in-chief	John Jeremy
Technical Editor	Phil Helmore
Referee	Noel Riley

Safety Group

Chair	Graham Taylor
Members	Adrian Mnew
	Andrew Tuite
	Mike Seward

Walter Atkinson Award Committee

In recess

RINA London

Council Members	Stuart Cannon (*ex officio*)
	John Jeremy
	Martin Renilson
Safety Committee	Robin Gehling
High-speed Vessels	Tony Armstrong

RINA/Engineers Australia Joint Board of Naval Architecture

Chair	Robin Gehling
Member	Stuart Cannon

Marine Safety Victoria Marine Industry Advisory Group

Members	Martin Jaggs
	Adrian Mnew

National Marine Safety Committee Reference Group on Stability

Chair	Graham Taylor
Member	Bruce McRae

National Marine Safety Committee Technical Advisory Panel

Members	Tony Armstrong, WA
	Lindsay Emmett, ACT
	Rob Gehling, ACT
	Don Gillies, NSW
	Brian Hutchison, Qld
	Kim Klaka, WA
	David Lugg, WA
	Martin Renilson, Tas
	Dusko Spalj, NSW
	Graham Taylor, NSW

National Professional Engineers Register Naval Architecture Competency Panel

In recess

Pacific 2010 Organising Committee

Chair	John Jeremy
Members	Keith Adams
	Adrian Broadbent
	Tauhid Rahman (representing IMarEST)

Standards Australia Committee AS1799 Small Pleasure Boats Review

Members	Tommy Ericson
	Steven McCoombe

Standards Australia Committee CS051 Yachting Harnesses and Lines

Member	Bruce McRae

Phil Helmore

The 1897 Fife-designed topsail gaff cutter *Sayonara* under sail on Sydney Harbour recently
(Photo John Jeremy)

NAVAL ARCHITECTS ON THE MOVE

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

Nathan Atkinson, a recent graduate of the Australian Maritime College, has taken up a position with Independent Offshore Solutions in Perth.

Ryan Ayres, a graduand of the University of New South Wales has taken up a position as a naval architect with Burness Corlett Three Quays Australia in Sydney.

Tom Dearling has moved on from BMT Defence Services (Australia), having spent a year running their Darwin office, and has taken up a position as a naval architect in the Structural Design Department of Austal Ships in Fremantle.

Annette Hill, a naval architecture student at the University of New South Wales, has taken up a part-time position as a naval architect at the NSW Maritime Authority while she completes her degree.

Brad Hillman has moved on within the Interorient Group, and has taken up the position of Newbuilding Manager for Interorient Marine Services in Limassol, Cyprus.

Tim Lyon moved on from Defence many moons ago, and worked for a small consulting company for a couple of years before going into partnership in Remote, an engineering and IT consultancy, from where he retired in 2006. However, he maintains an interest in naval architecture, having recently worked on the DSTO/RINA study into the loss of HMAS *Sydney*, and remains as Treasurer on the Committee of the ACT Section and an elected member of the Council of the Australian Division of RINA.

Bruce McRae has moved on from Azzura Marine and has taken up a position as a naval architect with Incat Crowther in Sydney.

Sean Mason, a recent graduate of the Australian Maritime College, has taken up a position as a naval architect with Incat Crowther in Sydney.

Misha Merzliakov moved on from Oceanic Yacht Design and then spent year working for Tony Castro Yacht Design in the UK before taking up a position with Austal Ships in Fremantle to work in Design Development.

Rozetta Payne has moved on from Gurit Australia and has taken over the teaching of ship hydrodynamics in the naval architecture degree program at the University of New South Wales. She continues as Assistant Secretary on the NSW Section Committee of RINA.

Brocque Preece, a graduand of the University of New South Wales, has taken up a position as a naval architect at One2three Naval Architects in Sydney.

Alex Robbins has moved on within Burness Corlett Three Quays, and has set up a new technical-services provider, Royale Oceanic, in Sydney for the parent company of BCTQ. The office is in the new Sydney City Marina at Rozelle Bay, and the intent is to attract superyacht building and refitting to Australia. Friends can check out the range of services provided at www.royaleoceanic.com.

Malcolm Rowe has moved on from Pongrass Australia and is now looking for new opportunities.

Glen Seeley has moved on within the Australian Maritime Safety Authority and has taken up the position of Principal Advisor—Vessel Certification in the Ship Safety Section of the Maritime Standards Division in Canberra.

Robert Skerman has moved on from Demat Marine in Dubai, UAE, and has taken up a position as a Project Engineer—Structural and Architectural in the Offshore Division of Al Masaood Bergum in Dubai, UAE.

Chris Tucker has moved on and is now consulting as Chris Tucker Marine Design in Melbourne. Friends can check out his company website at www.ctmd.com.au.

Nick van den Hengel has moved on from ASC Shipbuilder and has taken up a position as a naval architect with Damen Schelde in The Netherlands, working on the new air-warfare frigate project for the Royal Netherlands Navy.

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

Phil Helmore

HMAS *Manoora* and HMAS *Kanimbla* at anchor in Queensland waters during exercise Talisman Sabre 2009
(RAN Photograph)

FROM THE ARCHIVES

The brand-new Daring-class destroyer HMAS *Vampire* at speed off Sydney in June 1959 following her hand over to the RAN by her builders, Cockatoo Docks & Engineering Company Pty Ltd
(RAN Photograph)

The fiftieth anniversary of the commissioning of HMAS *Vampire* was celebrated at the Australian National Maritime Museum, where she is now a popular exhibit, on the weekend of 20–21 June 2009. The Saturday activities concluded with a Ceremonial Sunset on the forecourt of the museum in front of the ship
(Photo courtesy Jim Dennis)

We are where you are.

Wärtsilä is the world's leading supplier of complete ship power solutions and a major provider of turnkey solutions for distributed power generation. In addition Wärtsilä operates a successful Nordic engineering steel company. More than 10,000 service oriented people working in 50 countries help Wärtsilä provide its customers with expert local service and support, wherever they are.

WÄRTSILÄ

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