THE AUSTRALIAN NAVAL ARCHITECT

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Cover Photo:

The RAN's new amphibious ship *Canberra* (LHD 01) ready for launching in Spain on 17 February. The hull is being completed by Navantia and the ship will be transported to Australia in 2012 for completion by BAE Systems at Williamstown, Victoria (RAN photograph)

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From the Division President

As this is my first column as Division President I would like to start by thanking my predecessor, Dr Stuart Cannon, for doing such a wonderful job over the last four years. It will be very difficult for me to follow in his footsteps; however, I will do my best.

I would also like to thank my fellow Council members who voted for me as President. I appreciate their faith in me and hope that I won't let them down.

Finally, my thanks go to the retiring Council members who have served on Council so well, and I look forward to them returning to Council at some stage in the future.

There have been a few very interesting developments of late. Firstly, most members will be aware of the movement towards the Single National Jurisdiction, which will be administered by AMSA, in conjunction with the relevant state administrations. This is potentially a very good step forward for the industry in Australia, and should result in a much simpler process, particularly when registering vessels across states. The Secretary and I met with Mr John Fladun, AMSA's General Manager, Regulatory Affairs and Reform, in Canberra in early April to receive a briefing on this and we were both very encouraged. A copy of the presentation provided at the briefing can be obtained from the Secretary at rina.austdiv@optusnet.com.au. We were also pleased to hear that AMSA is moving into the consultative phase of this process, and so we can all expect to hear more about progress in the near future. Unfortunately, it was not possible to arrange for an article on this issue for the current edition of *The ANA*, but AMSA has promised us such an article for the next edition, which I'm looking forward to.

RINA recently made a submission to the Inquiry into Defence Procurement, which is being undertaken by the Senate's Standing Committee on Foreign Affairs, Defence and Trade. The main points which we made included the vital importance of Department of Defence being an intelligent customer; the need to maintain a continuous stream of work to the industry; and the importance of Australian conditions for the design of warships. A copy of our submission can be obtained from the Committee at www.aph.gov.au/senate/committee/fadt_ctte/procurement/submissions.htm.

On a different note, at the recent Council meeting we agreed to propose a change to the Division by-laws to permit Associate Members to serve on Council. We see this as a very important change which will permit younger members to take an active part in the running of the Division. To enable this change to be made, we are holding a Special General Meeting to follow the next technical meeting of the Tasmanian Section on Thursday 19 May. I hope that by the time you read this, the change will have been agreed by the membership and we will be able to welcome Associate Members to the Council. I know that there are one or two enthusiastic Associate Members who would like to be able to contribute, and I look forward to their input.

Finally, a brief reminder that abstracts for the forthcoming Pacific 2012 International Maritime Conference are due on 7 July. I'm looking forward to this conference, as these are always very well attended with interesting papers, and I have enjoyed them in the past. Details can be found at www.pacific2012imc.com.

Martin Renilson
President, Australian Division RINA

So, again, my thanks to the Council members who put their faith in me as President, and I am looking forward to serving the Institution in this manner over the next two years.

Martin Renilson

Editorial

Sometimes one misfortune can be to another's benefit — the availability of RFA *Largs Bay* as a result of recent British Defence cuts has proved to be ideal timing for Australia. Whilst it should be no real surprise that HMA Ships *Manoora* and *Kanimbla* are showing the effects of their 40 years of active service, it is unfortunate that *Manoora* has come to the end of her economical life earlier than desired to suit the in-service date of the first of the RAN's new LHDs — the first of which, *Canberra*, was launched recently in Spain. *Largs Bay* is almost a new ship and, with her modern propulsion system and docking capability, should help greatly with transition to the new ships.

In *From the Archives* in this edition of *The ANA,* we trace the origins of the ships which became *Manoora* and *Kanimbla*. Over the next few years the RAN will be celebrating several important centenaries and we will continue to review the development of ships of our naval forces over the last century in coming editions of *The ANA*. Viewed in retrospect, the developments have been dramatic, as will surely be the changes of the next century.

John Jeremy

NEWS FROM THE SECTIONS

Victoria

At the recent annual general meeting of the Victorian Section of RINA the following were elected to serve on the Committee.

Chair	Karl Slater
Secretary	Simon Kelly
Treasurer	Sam Tait

Karl Slater

New South Wales

Annual General Meeting

The NSW Section held its 13th AGM on the evening of 2 March, following the March technical presentation in the Harricks Auditorium at Engineers Australia, Chatswood, attended by five with Phil Helmore in the chair.

In the absence of Graham Taylor, Phil Helmore presented the Chair's Report which Graham had previously submitted. Some of the highlights of 2010 included nine technical meetings held jointly with the IMarEST (Sydney Branch) with attendances varying between 42 (for John Jeremy's presentation on *A Forensic Analysis of the Wrecks of HMAS* Sydney *and HSK* Kormoran) and 14, with an average of 25. The EA move from North Sydney to Chatswood is having a continuing effect on attendances: average attendance for the nine meetings was 27, compared to 37 prior to the move to Chatswood, and 33 as the long-term average. SMIX Bash 2010 was successful and was attended by 200. The event has become established as the Christmas party for the marine industry, with a number of visitors coming from interstate and overseas. Our ability to continue to run SMIX Bash is entirely due to the generosity of our sponsors.

Adrian Broadbent presented the Treasurer's Report. The EA venue at Chatswood had, as usual, been our major cost for the year. With a close watch on the outgoings, we had managed to operate within our budget; the Section account at 31 December was $120 in the red, but we are owed $495 by the Australian Division, which will put the account back into the black and give us a small float. SMIX Bash is funded separately through the Social account which currently has a healthy balance, although there are accounts still to be paid, but projections are for a sufficient surplus to enable preliminary arrangements for SMIX Bash 2011 and to support the NSW members, mainly for additional catering at technical meetings and presentation of "thank you" bottles of wine for our presenters at TMs.

There have been several changes to the NSW Section Committee. Graham Taylor's term as elected member of the Australian Division Council has expired, and Adrian Broadbent continues. Craig Boulton has been elected to the Council and has taken up the position of Treasurer of the Australian Division. During the year, Stuart Friezer relocated to Denmark and resigned from the committee. At the same time the committee was strengthened by the addition of Valerio Corniani, and Anne Simpson who has taken up the position of Auditor. Other committee members have agreed to carry on in their respective positions for a further year, and there have been no new nominations. The committee for 2011 is therefore as follows:

Chair	Graham Taylor
Deputy Chair	Craig Hughes
Treasurer and AD Council Nominee	Adrian Broadbent
Secretary and AD Council Treasurer	Craig Boulton
Assistant Secretary	Rozetta Payne
Website and TM Program Coordinator	Phil Helmore
Auditor	Anne Simpson
Member	Valerio Corniani
	Matthew Stevens

Committee Meetings

The NSW Section Committee met on 23March and, other than routine matters, discussed:

- SMIX Bash 2010: The accounts are close to finalisation, although four sponsorships have yet to be finalised. Projections are for a small surplus which will provide seed funding for SMIX Bash 2011.
- SMIX Bash 2011: Thursday 1 December has been pencilled in with the Sydney Heritage Fleet for the hire of *James Craig*, and the SMIX Bash organising committee is scheduled to meet in the near future.
- Inquiry into Defence Procurement: A document had been circulated regarding a Senate inquiry into Defence procurement procedures and timelines. However, this had been picked up by the Australian Division and would be handled at that level.
- Technical Meeting Program: The technical presentation on 2 March by Tim Holt of Det Norske Veritas on *DNV's Quantum Containership Concept for the Future* had been recorded by Engineers Australia, and is now available for viewing on the website www.mediavisionz.com.au/ea_flash/syd/2011/110302-easyd/index.htm. Both the presenter and the current slide can be seen simultaneously, and members are encouraged to check it out and give us their feedback.
- The National Engineering Registration Board was established jointly by the Institution of Engineers Australia (EA), the Association of Professional Engineers, Scientists and Managers, Australia (APESMA) and Consult Australia. Currently almost 9000 engineering practitioners are registered by the Board in 17 areas of practice throughout Australia and internationally, and this includes an area of practice in Naval Architecture. Details may be seen on the NERB website www.engineersaustralia.org.au/nerb/board/introduction.cfm. The effect on naval architecture practitioners will be referred to the Australian Division Council.

The next meeting of the NSW Section Committee is scheduled for 11 May.

Containerships for the Future

Tim Holt, Country Manager Maritime for Det Norske Veritas, gave a presentation on *Quantum—A Containership for the Future* to a joint meeting with the IMarEST attended by fourteen on 2 March in the Harricks Auditorium at

Engineers Australia, Chatswood.

Tim's presentation was recorded for webcast by Engineers Australia and is available for viewing online at www.mediavisionz.com.au/ea_flash/syd/2011/110302-easyd/index.htm

This was the inaugural webcast recording for RINA and IMarEST in Australia and, as it costs to make the recordings, your comments on the value of the recording are requested. Please send comments to the NSW Technical Meeting Program Coordinator at p.helmore@unsw.edu.au.

Introduction

Tim began his presentation by saying that Det Norske Veritas is a foundation, with no need to return money to shareholders, and around 6% of revenue is put into research and development. He then showed a video of containership evolution, from the first vessel converted by McLean in 1956 through six generations in 50 years to 2006.

He then asked the question: Is anyone brave enough to propose the ideal speed for a containership? Several replies homed in on a speed of 18 kn; ships are slowing down from recent speeds, referred to as "slow steaming". *Lloyd's List* of 15 January 2010 had the headline "Slow Steaming Set to Become A Way of life". What size is the workhorse of the containership fleet? Probably around 5000 TEU now, but what will it be in the future?

Shipping is facing a new reality. Features include changes in the global economy, increasing cost of fuel oil, environmental rules and legislations, extended ECA areas, "cold ironing", proposed carbon taxes, shipper requirements for environmentally-friendly shipping, and public awareness and environmental footprint. Peter Jackson of Seaspan Ship Management Ltd has said "Shipowners need to take the environment into account as part of their business plan, as it is one of the biggest factors that will influence shipping over the next years".

DNV's objective with the Quantum project has been to develop an innovative containership concept which could be realized in 3–5 years, and to achieve improved performance with respect to operational efficiency and environmental impact. Factors considered include fuel efficiency, loading flexibility (stability/strength), loading/unloading efficiency, cargo space utilisation, cargo security, fire safety, fabrication cost and operational cost.

More than 30 people have been involved in the project and developing the design of the new vessel.

Industry Needs and Solutions

DNV began by sending out a survey to industry to define the needs of industry and to rank the different possible solutions. Responses were received as follows:

Type of company	Invited (%)	Response(%)
Shipyard	15.4	13.0
Shipowner/liner operator	82.8	75.9
Others	1.8	11.1

They were asked to rank their needs from 1–5, and the possible solutions from 1–5.

As an example of the replies, 78% of replies thought that flexibility for speed variation (slow steaming) was a high-priority (rank 5), but only 33% thought that LNG for auxiliary engines in port and SECA areas was a high-priority.

When asked "How would you rank the following items when building a new containership?" Fuel efficiency ranked 1, Reliability of operation and ability to keep to the schedule 2, Environmental footprint 5, Flexibility for speed variation (slow steaming) 6, but Same design speed as existing designs ranked 25! The standard deviation for the top 5–10 items was small, indicating a good consensus on the most-important items. After the first 10, the SD increased.

When asked "How willing would you be to consider the following 'alternative' solution for a new containership design? LNG for auxiliary engines in port and SECA areas ranked 3, Use of lightweight or composite materials in lasing gear/lashing rods 4, Dual-fuel propulsion—diesel/LNG 5, but the Multihull concept (such as catamaran or trimaran) 22, Wind power (such as sails and/or kites) 23, Nuclear power for propulsion and auxiliary 24.

Design Case

In order to zero-in on a design case, they looked at market studies from external sources. Alphaliner found that existing and emerging markets offer opportunities for new designs: United States imports from South America are expected to increase; Middle-Eastern imports are expected to increase as demand for consumer goods grows; export from India to Europe and the USA is expected to increase significantly; and large economies in South America are expected to grow fast, leading to increased imports and exports. In short, there will be an increased demand for vessels fitted to serve the emerging regions.

The market analysis homed in on the "Baby post-Panamax" (5500 TEU) size, saying that there is a shortcoming of specialised tonnage with shallow draft and high reefer capacity. The number of suitable trades for vessels of about 5500 TEU is larger than for any other segment. The trade selected for the design case was Europe–South America. Analysis of the probable routes showed that there was a large variation in the power (%MCR) required on different routes.

Case studies of various service speeds and numbers of vessels showed that 17 kn with 8 ships, or 21 knots with 7 ships gave close to minimum cost, depending on what was factored in. Eventually the design case was settled on Baby post-Panamax (5500–7000 TEU) operating in the Europe–South American trade, with high reefer capacity, flexibility in operation, a maximum draught of 12 m, design speed 21 kn, but flexible speed in operation.

Hull Concept Development

A number of alternative hullforms was considered, including catamaran, trimaran, trapezoidal cross-section, and wide-deck monohull (both aircraft-carrier style and sponsons), which increases the payload without penalising the required power. The wide-deck monohull was chosen, and resistance predictions were carried out with the object of optimising main dimensions, hullform and block coefficient. It was found that a length of 261 m with low block coefficient (0.57) gave the lowest resistance when considering both hull friction and wave-making. Graphs of resistance showed that increasing beam increased the resistance, and increasing block coefficient above 0.57 increased the resistance by 10% for a C_B of 0.63. The influence of trim was shown to be less than 1% for trims of up to 2 m, i.e. marginal.

The midship section went through a total of four iterations following the initial concept, settling on a deck wider than the beam of the main hull.

The use of lightweight materials was considered, with 55 potential applications screened. They selected the most promising: superstructure, hatch covers, piping, and fairings, and found a weight-reduction potential of 1000 t. Benefits from weight saving included a 0.5% fuel saving for the 1000 t saved, emissions reduction and future tax reduction, corrosion resistance, improved fatigue properties, and reduced cost on some items, such as pipes or complex shapes.

Verification analyses included hull-strength analysis of section scantlings and hull-girder torsion, and finite-element analysis of the cargo hold, and intact and damage-stability assessment (due to a large breadth, ballast is avoided for most loading conditions).

In summary, the main hull features include increased breadth, improved stability, minimum ballast, increased deck-load capacity, optimised hullform with low block coefficient and low resistance, narrow side, high capacity and low weight.

Machinery and Propulsion Concept Development

Seven alternative machinery and propulsion arrangements were considered:

- Single screw: direct drive, geared transmission, and electric drive
- Twin screw: direct drive, geared transmission, and electric drive
- Azimuthing thruster: electric pods and shaft propeller

Dual-fuel engines were considered, burning both MDO and LNG.

As an example, with 33 MW installed and azimuthing thrusters, there are a number of pros and cons. On the plus side, there is flexibility in speed, space saving, manoeuvring (no tugs required), redundancy, and cold ironing is not required. However, on the minus side there is higher investment, reputation, and few manufacturers.

LNG has advantages: it is a clean fuel, it is now proven technology with 14 ships in operation, there is limited availability but large resources, the price of LNG fuel is expected to decrease relative to oil, and DNV has already developed rules for LNG propulsion.

LNG requires a tank volume approximately three times that for HFO. Alternative combinations of MDO and LNG which were assessed included: MDO only, LNG only, LNG in port, LNG in coastal legs and MDO on Atlantic crossings.

The LNG tank arrangement was based on LNG refuelling in Rotterdam and Buenos Aires, leading to an LNG tank capacity of 5000 m^3. The LNG tanks were sited below the superstructure, so there was no loss of cargo space.

In the engine room, the dual-fuel electrical arrangement gave flexibility to utilise other void space.

Cargo-handling Concept Development

For cargo handling, they considered "boxes in boxes", i.e. up to eight empty 20 ft containers being lifted together in a frame. This results in fewer crane lifts, reduced lashing, no specialised equipment, and the frame folds for easy storage. The main benefits are increased loading efficiency, and cargo safety.

Cost-benefit Analysis

An analysis of the carbon footprint showed that a Quantum vessel at 21 kn would generate 16% less CO_2 per TEU than a similar-capacity current vessel at 21 kn, and 36% less than the same current vessel at 25 kn.

Three different scenarios were then investigated: high fuel-price escalation combined with very-strict legislation; moderate fuel-price escalation combined with strict legislation; and low fuel-price escalation combined with moderate legislation. The results showed that there is a short pay-back time on the improved hullform; new machinery without switching to LNG is not profitable due to high initial investment; the switch to LNG is profitable (payback time 12–16 years) because of reduced fuel cost and no need for other expensive NOx-reducing measures; the advantages of LNG will be more significant for ships built after 2016 when NOx Tier III will be required in ECAs and expensive NOx-reducing measures will have to be installed.

Conclusion

Quantum is a concept container ship developed by DNV to test new ideas and future-oriented solutions. DNV wants to work closely with owners and yards in developing future designs and, by undertaking this study, have shown that they have the intent and the competence, and have taken the opportunity.

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

100 Years of Destroyers in the RAN

John Jeremy gave a presentation *One Hundred Years of Destroyers in the Royal Australian Navy* to a joint meeting with the IMarEST attended by twenty-six on 30 March in the Harricks Auditorium at Engineers Australia, Chatswood.

John's presentation appears elsewhere in this issue

The vote of thanks was proposed, and the "thank you" bottle of wine presented, by Martin Renilson, who averred that it was most appropriate for him to be proposing the vote, since both he and Australia's first destroyers came from Scotland! The vote was carried with acclamation.

Arrangement, Accommodation and Personal Safety

Mori Flapan, Principal Technical Adviser to National Marine Safety Committee, gave a presentation on *The Draft NSCV Standard C1 on Arrangement, Accommodation and Personal Safety* to a joint meeting with the IMarEST attended by fourteen on 20 April in the Conference Room at Lloyd's Register Asia, 44 Market St, Sydney.

Introduction

Mori began his presentation by indicating that the new Part C Section 1 of the NSCV would combine provisions from Sections 5E, 5F, 6, 7, 9, 11, 13, 16 and 18 of the Uniform Shipping Laws Code.

An inspection of the contents of the standard provides a summary of its scope. There are six chapters:

1. Preliminary
2. Operating stations
3. Navigation signals
4. Accommodation spaces
5. Access, escapes and evacuation
6. Personal safety

The preliminary chapter covers definitions, references and so on.

Unlike many other NSCV Sections, performance-based required outcomes have been presented at the beginning of each chapter rather than being aggregated together. This is because of the separate nature of the content within each chapter.

Chapter 2 Operating Stations

Chapter 2 begins with required outcomes which pertain to operating stations. They address perception and situational awareness, compliance with collision regulations and minimising the risk of human error.

In the USL Code, Subsection 9 Clause 21.4 specifies requirements for the helmsman's view as follows: *The steering arrangement shall be such that the operator has a clear view ahead in the normal steering position*. However, how do you establish compliance with this? The provision fails to provide a clear objective specification for compliance.

Mori then showed a chart compiled from data from the NMSC's *Commercial Vessels Incidents in Australia 2005–08* published in December 2009. The outcome of a series of incident types is measured in terms of the percentage of total so-called equivalent fatalities (also known as e-fatalities), which is a way of aggregating fatalities and serious injuries where one e-fatality is equivalent to one fatality or ten serious injuries.

Of the eight incident types having the largest total e-fatalities, collision and unintentional grounding together account for over 20% of the total. Lack of situational awareness by the operator is likely to be a significant factor in instigating a proportion of these incidents. In addition, it is reasonable to suggest that a lack of situational awareness at the operating station may also be a factor in person overboard, crushing and pinching, and propeller strike incidents. Collisions and groundings continue to represent a significant proportion of total commercial-vessel fatalities and show that the current USL Code provisions are highly subjective.

Mori showed a slide of a vessel with wheelhouse aft and the top of the wheelhouse windows approximately level with the top of the focsle, an example of the outcomes of the current USL Code. Field-of-vision in the ahead sector was limited to say the least!

Since the USL Code was first compiled there have been big changes to standards applicable to field-of-vision from the helm in various relevant national and international standards. SOLAS Chapter V Safety of Navigation is applicable to all vessels. It contains discretionary provisions for vessels below 55 m in length. Recreational boat standards have been developed, such as the American Boat and Yachting Council's Rule H1. Recreational boat standards can provide a benchmark for lower-risk commercial vessels.

The draft standard proposes a graded approach based on SOLAS Chapter V and ABYC Rule H1. For vessels of all lengths, the SOLAS Chapter V standards are a deemed-to-satisfy solution. For vessels of length less than 45 m, requirements based on ABYC rule H1 are specified as an alternative minimum standard. The standards in both SOLAS Chapter V and ABYC Rule H1 are quite detailed and are not that easy to interpret. To assist the user, the draft standard contains illustrations. Field of vision directly forward is given a very high priority.

What about vessels which set sail? Should the standards for field-of-vision apply to a sailing vessel when operating under power alone? Some sailing vessels, such as have the helm position aft of a cabin, have poor field of vision from the helm.

The draft standard Clause 2.8 contains the following provision: *A vessel capable of carrying sail shall be arranged to comply with the requirements specified in Clauses 2.6 (SOLAS) or 2.7 (ABYC) as applicable when operating under power alone*. This differs from standards applicable under ABYC in that the ABYC rule specifically excludes "sailboats"—but sailboats are not defined!

The question is, is the proposal reasonable and achievable for vessels which carry sail when they are under power? If not then what, if any, standards should apply? One solution by a European recreational sailing catamaran manufacturer is to have the cabin top lower than the helm position.

Chapter 3 Navigation Signals

Navigation lights and other signals are addressed by the Uniform Shipping Laws Code in Section 16. One option would be just to replace Section 16 by a direct reference to the Collision Regulations (ColRegs)

Anecdotal reports have indicated that there have been variations in the consistency of compliance with ColRegs on vessels which have been assessed under the USL Code. Sometimes this has arisen because of a tension between style and the requirements of collision regulations.

Consider the issues which would arise if there was an application for survey for a production 23 m recreational vessel which Mori showed in a slide. The vessel would not be compliant with ColRegs because the masthead light is abaft the forward half length, the masthead light is obscured by the awning, and the side lights are forward of the masthead light!

The proposal presents relevant requirements from ColRegs in a different format so as to be both better-suited for use by persons designing or assessing the design of a vessel, and focussed on those aspects relevant to the arrangement of a vessel—the fore and aft locations, heights and avoidance of obstructions. The standard makes it clear that a sailing vessel under power alone is required to meet the requirements for a powered vessel.

Chapter 3 should only be included in the standard if it would be beneficial compared to just relying on a cross reference to the ColRegs.

Mori then showed a slide of an offshore supply vessel which, because of its length, is required to carry two masthead lights; however in this case the forward masthead light was not on a mast but on top of the wheelhouse. A clarification of the meaning of a 'mast' may be required.

Chapter 4 Accommodation Spaces

This chapter covers accommodation for both passengers and crew. In reviewing the standards for accommodation, the reference group recognised that a number of significant changes had occurred since the USL Code was first developed.

The first pertains to changes in community expectations as reflected by relevant legislation; in particular, standards produced by the International Labour Organisation and the Commonwealth Disability Discrimination Act.

The second has been changes in demographic characteristics of the population. In addition to an aging population, people are getting physically bigger, both in height and weight.

The third factor is the increased recognition that human factors play a pivotal role in the achievement of safety goals, both in the context of situational awareness and the factors which might degrade human performance, such as fatigue.

Perhaps the most significant change since the USL Code was introduced has been the ongoing reforms to the International Labour Organisation's conventions. The latest version is the Maritime Labour Convention 2006. It applies to passenger and cargo ships of 200 GT or more. Title 3 within the convention applies to crew accommodation.

MLC 2006 has yet to be ratified by Australia. The Commonwealth Government has been taking steps to ratify later this year and, if so, then the MLC 2006 will take effect in Australia 12 months later. In addition, MLC 2006 has yet to be ratified internationally. The Commonwealth anticipates that MLC 2006 will come into force internationally in 2012. Application of MLC 2006 could have significant implications on new vessels in the domestic fleet.

Mori then showed a table from the standard, showing the proposed application of MLC 2006. MLC 2006 is limited to certain Class 1A, 1B, 2A and 2B vessels; i.e., passenger or trading vessels which are likely to engage in long voyages. Those vessels of 3000 GT or more (about 70 m measured length or more) are required to apply the provisions of Clause 3.1 of MLC 2006. Those vessels less than 3000 GT but 35 m or more are also required to apply the provisions of Clause 3.1. However, MLC 2006 provides for limited discretion when applying certain provisions of Clause 3.1 to vessels less than 3000 GT. The proposal specifies that the deemed-to-satisfy solution for these discretionary provisions is the same as that specified in the NSCV for non-MLC 2006 vessels.

The provisions for accommodation were summarised in another table, with the item shown in the first column, and the second and third columns showing their application to passenger accommodation and crew accommodation respectively. Application may also be subject to other relevant risk factors, and some aspects of passenger accommodation are more a matter of comfort than safety. The proposal is to allow market forces to drive some of these outcomes.

The first parameter to look at is minimum clear deck height. Different standards specify different minimum heights:

- 1.9 m in the USL Code
- 1.98 m in the current ILO convention
- 2.03 m in MLC 2006
- 2.0/1.9 m in Work in Fishing Convention. This convention is similar to MLC 2006 but intended for Fishing. The provisions of WIFC are less onerous than MLC 2006 and are more applicable to vessels of smaller size.
- 1.83 m is quoted in Canadian legislation

Which one is the right one to use? Why not just continue on with 1.9 m?

The USL Code value of 1.9 m aligned with ILO 93 which dated from 1949. ILO 133, adopted in 1970, raised the minimum from 1.9 m to 1.98 m and came into force in 1991. Studies indicate that the average height of males is increasing at 7.4 mm per decade; over 61 years since 1949, this amounts to 45 mm. So arguably, retaining the same value for minimum clear height would represent a reduction in performance as the population gets taller.

Increasing deck height affects displacement, centre of gravity and windage, and so potentially capital cost and earning capacity. The smaller the vessel, the greater the relative cost increase is likely to be.

Mori then showed Table 9 from the standard. A graded approach is proposed which recognises that higher costs are likely on smaller vessels. Quite literally, the cost/benefit balance falls in a different spot for these vessels. Hence different minimum requirements are specified for vessels greater than, and less than, 35 m in length.

There are two cases: the first where full and free movement is necessary (e.g. for rapid evacuation) or where persons are expected to stand for long periods (e.g. in the operating compartment or in accommodation spaces on vessels which do not have seating for all passengers. The second case is a minimum for the floor space to be included in the calculation of deck areas.

The familiar value of 1.9 m is retained for many circumstances, minimising the impact on the industry. The higher value of 1.98 m applies to vessels best able to accommodate the increase. The value of 1.83 m corresponds to the Canadian standard, and replaces what previously was a discretionary clause under the USL code. A similar method of grading requirements is used throughout the standard.

We have already seen that the MLC 2006 represents the upper benchmark applicable to large vessels engaged in extended voyages. At the other end of the scale are small open vessels for which rudimentary accommodation suffices. The provisions of the standard are intended to bridge the gap between the two extremes.

The main driver of requirements for accommodation is the duration of the voyage. The draft standard proposes a grading of vessels based on this parameter. Four so-called accommodation levels are proposed varying from Accommodation Level 72+ which applies to situations where persons would remain on board away from the shore for more than 72 hours, to AL< 12 where persons are on board for less than 12 hours. There is a presumption that vessels in Operational Areas A or B are intended for voyage lengths exceeding 72 hours and 36 hours respectively.

The accommodation levels provide a gradual increase in requirement as the length of voyage increases. A possible disadvantage of the proposal is the added complexity of the risk model used. However, the potential benefit is the optimisation of the design for the particular operational needs. Some examples of the application of the graded approach follow.

Table 11 from the standard specifies maximum number of crew per sleeping room and minimum required deck area per person. Different values apply for different accommodation levels. Note that there is no specified requirement for vessels of the two lowest accommodation levels. Compare this with the MLC which provides for a maximum of one crew per sleeping room if GT≥3000 or more, or two if GT<3000.

Table 12 is a second example of the graded approach. The current USL Code minimum requirement for sleeping berths is 1900×680 mm. The proposal provides for two different sizes depending upon the length of vessel and accommodation level. As previously discussed, people are getting taller and bigger. The smaller-sized berth has been increased slightly in width from 680 mm to 700 mm to align with the Work in Fishing Convention. The larger size, 1900×680 mm aligns with MLC 2006, but only applies to larger vessels or vessels engaged in longer voyages. Note that there is no minimum berth size specified for vessels of AL<12.

For vessels of accommodation levels 36-72 and 72+, the draft standard specifies minimum requirements for

- mechanical ventilation;
- temperature control;
- lighting; and
- noise and vibration.

A summary of outcomes from the proposed temperature control criteria was given in a table. Heating would be required on vessels operating in Melbourne, Sydney, Hobart and Adelaide. Air conditioning would be required on vessels operating in Darwin or Broome. Both heating and air conditioning would be required if a vessel intended to operate anywhere in Australia.

Are the maximum noise values of 55 dB and 60 dB appropriate and/or achievable? If not, what should the values be?

There is a number of significant reforms proposed for the requirements for passenger accommodation. Starting with the deck area requirement, reductions in requirement are proposed for

- upper decks so that they use the same area per person as on main decks; and
- vessels operating in Areas D and E if the passage time is less than 2 hours.

The method of determining deck areas has been clarified with a view to avoiding the need for interpretations.

There is a requirement for 100% seating on all Operational Area A, B and C vessels.

Proposals have been included for the minimum clearance between rows of seats based on standards applicable ashore.

Provisions in the RIB circular pertaining to seating for divers have been included and extended to other types of dive vessels.

Some of the sleeping accommodation requirements have been left to market forces to determine, while others are required to be consistent with crew accommodation requirements. By this means, dormitory-style backpacker accommodation, and lounge sleeping accommodation may lie within the range of acceptable arrangements.

During development of the standard, the questions were raised "What constitutes a seat? Is the minimum required width of seat sufficient by itself to define a seat? Should only seats with a seat back be counted? Should only seats which allow feet to be placed on the floor be counted?"

Disability Standards for Accessible Public Transport have been issued under the Commonwealth Disabilities Discrimination Act. The standards have specific provisions applicable to ferries and apply regardless of whether the

NSCV has similar provisions or not. Feedback was received which indicated that something should be done in the NSCV to address the access needs of persons with disabilities.

Four approaches were considered:

1. Specify in the NSCV that verified compliance with Disability Standards is a prerequisite of NSCV compliance.
2. Advise that compliance with Disability Standards is needed, but keep verification outside scope of NSCV.
3. Duplicate exactly the relevant Disability Standards in the NSCV.
4. Ensure that relevant aspects of the NSCV are kept consistent with Disability Standards.

Advice was taken from the Human Rights Commission, the government body responsible for administering the Disabilities Discrimination Act, and the Transport Standards. Their advice was supportive of either Option 2 or 4. The reference group decided upon Option 4 for the purposes of the public comment draft.

Clause 4.10.4 in the draft addresses access for persons with disabilities. It applies only to Class 1 vessels engaged in ferry or tourist services carrying 32 passengers or more. The Transport Standards set no lower limit for ferries, but do for light aircraft. The proposal is similar to this lower limit. The standard has specific requirements for

- doorways, passageways, corridors;
- priority seating;
- allocated spaces;
- sleeping accommodation; and
- sanitary facilities.

The NMSC has analysed a large list of exemptions from provisions of the USL Code obtained from the Marine Authorities. A pie chart showed the relative frequency of exemptions pertaining to the subject matter of this standard: guardrails and bulwarks 52%, sanitary 17%, escape 11%, deck heights 8%, deck areas 7%, protection 3%, berthing 2% and seating <1%. These exemptions can be viewed as something akin to a canary which highlights potential problems in the application of the USL Code provisions. It is clear that guardrail and bulwark arrangements, sanitary requirements and escapes were all aspects for which alternatives were frequently being proposed and accepted.

Exemptions from sanitary requirements amounted to 17% of the total. The draft proposes that the requirements for provision of sanitary facilities should be in accordance with Table 17. The time varies from 15 minutes for a passenger vessel carrying more than 36 passengers to 12 hours for Class 2 or 3 vessels which do not carry passengers. A lesser arrangement is specified to provide some protection in the event of an 'emergency'.

Chapter 5 Access, Escapes and Evacuation

The next burning issue for our exemption canary is escapes: 11% of the total exemptions from USL Code were for escapes. Chapter 5 of the draft deals with access, escapes and evacuation. The content of Chapter 5 is as follows:

- Escapes from spaces, including clauses on accessways as escapes; alternative means of escape; type, number and size; arrangement in accommodation; and required dimensions.
- Evacuation paths, including clauses on size of evacuation paths; special provisions on passenger vessels; evacuation analysis; assembly stations; and embarkation stations
- Two types of escapes are defined:
  - a high-capacity escape, being an escape which allows rapid movement of large numbers of persons to a place of comparative safety (e.g. wide doorways, wide stairways); and
  - a low-capacity escape, being an escape which permits movement of small numbers of persons to a place of relative safety (e.g. hatches, ladders, windows, narrow stairways, narrow passageways).

This distinction is important because it allows a grading of requirements which takes into account the different performance outcomes.

The aggregate width of escapes from a space is determined on a performance basis, assuming a required time of not more than two minutes. Redundancy of escape is required when a space contains more than 12 persons.

Low-capacity escapes can be included in the aggregate. The flow capacity of each low-capacity escape is assumed to be 18 persons in 2 minutes.

The proposal provides maximum design flexibility while, at the same time, setting a clear benchmark for compliance

Chapter 5 also specifies more detailed standards applicable to doors and hatchways, passageways, handrails, stairways, ramps and ladders. These have been derived from relevant national and international standards with a view to providing for maximum design flexibility.

There are clauses for the provision of safety information which includes the marking of escape and evacuation routes an vessels. The proposal is that this should apply to vessels carrying more than 12 berthed persons or more than 36 day persons. A higher standard is proposed if more than 36 berthed persons are carried.

A number of options for marking are provided, depending upon the particular application. These are self-illuminated and self-contained, marking which is self-illuminated but with a central power source, photo-luminescent marking, and marking which relies on reflected light.

The proposal also includes instructions for safe escape; in particular, the identification of decks and the provision of mimic plans.

A point raised by one jurisdiction during the development of the standard was the tension between vessel security and free movement. Their concerns arose from findings after a tragic loss of life some years back. The issue is addressed by proposed clauses in the draft:

5.12.2 pertains to doors which are locked while underway; and

5.12.3 pertains to doors and hatches which are locked to secure the vessel when persons are not on board.

Chapter 6 Personal Safety

Chapter 6 deals with many 'workplace related' hazards. There are clauses for

- protection of persons from the elements;
- bulwarks and guardrails;
- protection from machinery;

- protection from fall hazards;
- safe access to and from the vessel; and
- recovery of persons that fall overboard.

Looking at a graph of the eight highest e-fatality incidents, we find that 46.2% of all e-fatalities are to individuals and can loosely be termed 'workplace related'. That is almost half the total.

Clause 6.9 provides for protection from the elements. This includes protection from seas when at work, at rest, or moving about on the vessel, and protection from the weather. For example, Clause 6.9.2 proposes that a cabin is required on vessels for Operational Area A, B or C if passages are 12 hours or more, and Operational Area D or E if passages are 36 hours or more

Going back to the fatalities graph, the single incident type which caused the largest proportion of e-fatalities (and indeed actual fatalities) was person overboard, accounting for a full 25%. Based on these figures, if there was any part of the content of the standard that deserved closer scrutiny, it probably would be the requirements for bulwarks and guardrails. And yet, lo and behold, our exemption canary shows that guardrails and bulwarks account for 52% of the USL Code exemptions! So not only are guardrail and bulwark requirements associated with the highest number of e-fatalities, but they are also most likely to be modified by an exemption. The proposal contains some significant changes to bulwark and guardrail requirements.

Three types of deck are defined:

- General purpose deck: this is your ordinary deck space for passengers or crew.
- Special purpose deck: such as the aft cockpit of a game-fishing boat.
- Special working deck: such as the deck in way of the stern roller of an offshore supply vessel.

Minimum heights are specified for vessels of less than 10 m length; as distinct from what has been an undefined discretionary clause under the USL Code. The minimum height for general-purpose decks on vessels of length more than 10 m is now 1000 mm. Changes have been provided to permit the minimum clear opening between rails to be increased on special decks, allowing two courses on yachts under specified conditions. Minimum strength requirements are proposed for rigid and flexible guardrails. Alternative arrangements are proposed for 'special' decks to enhance safety.

The proposal for minimum deemed-to-satisfy heights for bulwarks and guard rails are specified in Table 31 in the standard, with the second, third and fourth columns for the general-purpose, special-purpose, and special-working decks. The required heights for a general-purpose deck are conservative, but there is nothing in the way of additional controls. The required heights for a special-purpose deck are considerably lower, and for a special working deck the guard-rails may be eliminated entirely, as on a pilot boat. This table attempts to accommodate the wide diversity one sees in the commercial vessel sector, but it does not stand alone.

Table 32 from the standard specifies the additional safety measures which need to be applied to special-purpose decks or special-working decks to achieve the required safety outcomes. It is based on an approach in an ISO small craft standard. The first column lists the types of measures proposed. The second and third columns specify which of these measures apply for a special-purpose deck, depending upon whether seagoing or not. The fourth and fifth columns do the same for special-working decks.

A very sad incident a few years ago highlighted the issue of unsupervised children. The reference group considered the grieving mother's statement that child-proof safety fences should have been fitted. The view of the reference group was that young children should always be supervised when on the deck of a vessel.

The fitting of child-proof fences meeting a specification similar to those for swimming pools (with vertical bars 1200 high and spaced not more than 100 mm apart) was considered impractical on the majority of vessels. However, the reference group noted that the US Code of Federal Regulations CFR46 provided an added safety measure for ferries and excursion vessels which gave additional protection against a parent's moment's inattention.

The proposal in the draft is to limit the clear opening on ferries and excursion vessels to not more than 125 mm diameter, as would be achieved by fitting a net or similar.

Crushing and pinching incidents and other on-board incidents accounted for over 14% of e-fatalities. Accidents with machinery frequently give rise to serious consequences. The USL Code has provisions for protection from machinery in the machinery space but not elsewhere on the vessel. The proposal extends the USL Code machinery space provisions to plant and machinery generally. Annex C incorporates comprehensive guidance for protecting persons from machinery based on clauses in the IMO fishing vessel safety code and voluntary guidelines.

Access on and off a vessel was previously addressed as equipment in USL Code Chapter 13. Hidden there, it was often something of an afterthought. The proposal considers four types of arrangements: accommodation ladders, gangways, gangplanks, and other arrangements as appropriate. Requirements for pilot boarding are specified for seagoing vessels of 50 m or more in length. Construction standards are specified for accommodation ladders, gangways and gangplanks. The proposal in Table 35 based on operational area and length of vessel is much more graded that the USL Code.

Conclusion

This has been a brief overview of the new draft standard. There are other proposals contained in the draft which have not been covered due to time limitations. Mori encouraged everyone to review the draft standard and regulatory impact statement and to provide public comment before the closing date of 11 May.

A new duration record for a technical meeting of 2¾ h from 1830 to 2115 was established, with questions being asked—both by the audience and by Mori—and discussed all the way through.

The vote of thanks to Mori was proposed by Graham Taylor, who extended the thanks to Lloyd's Register Asia for providing the venue, and to Chris Hughes and Adrian Broadbent for their organisation. The vote was carried with acclamation.

Counter-piracy Operations

John Willy, Commander, Royal Australian Naval Reserve and Regional Operations Manager Australia, Orient Overseas Container Line, gave a presentation *Counter-piracy Operations in the Gulf of Aden, Arabian Sea and Somali Basin* to a joint meeting with the IMarEST attended by twenty-nine on 4 May in the Harricks Auditorium at Engineers Australia, Chatswood.

The area covered by the Gulf of Aden, the Arabian Sea and the Somali Basin is currently a major hot spot for maritime piracy, with daily attacks against passing ships as well as frequent hijackings taking place every month. The situation has worsened over the past few years, with attacks by pirates becoming more daring and extremely aggressive. Vital shipping trade lanes connecting Asia with the Mediterranean and Europe pass through the Arabian Sea, Somali Basin and Gulf of Aden from the Indian Ocean. Piracy in this area is holding the international shipping community to ransom.

John Willy recently returned from a three-month deployment in the United Arab Emirates, serving with the Royal Navy and working in their counter-piracy operations. John provided a detailed presentation on the current situation regarding piracy in this area, and explained some of the tactics used by the various pirate action groups in capturing passing ships. He also gave an overview of the military presence in the region involved with counter-piracy, and exposed some graphic images of damages to ships' superstructures.

It is expected that John's presentation will be written up in the August issue of *The ANA*.

The vote of thanks was proposed, and the "thank you" bottle of wine presented, by Hannah Flint, the Membership Manager for IMarEST in the UK. The vote was carried with acclamation.

Phil Helmore

Section News *is continued on page 45*

COMING EVENTS

NSW Section 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 2011 (with exceptions noted) is as follows:

1 Jun	David Firth, SP-High Modulus *Design and Construction of Composite Patrol Boats*
6 Jul	Fraser Johnson, Oceanlinx Ltd *Marine Renewables — Mooring Design for Wave Energy Systems*
3 Aug	David Lyons, EMP Composites *Delamination Characteristics in Curved Composite Structures*
7 Sep	William Bixley, RoTech Engineering Services *Fuel, Diesel Engines and Exhaust Gas Emissions*
5 Oct	RINA TBA
1 Dec	SMIX Bash 2011

Tasmanian Section Technical Meetings

The Tasmanian Section is currently planning a series of six technical meetings to be held at the AMC. The final program is still to be confirmed, but we already have a number of speakers willing to visit Tasmania to speak on all aspects of the maritime industry from surfing to Antarctic expeditions. The Tasmanian section committee will keep all Tasmanian members informed of upcoming events, and will report on them post-event to *The ANA*. If anyone outside Tasmania would like prior notice of these talks then please email Jonathan Binns on jrbinns@amc.edu.au.

Jonathan Binns

Maritime Matrix 2011

The Institute of Marine Engineering, Science and Technology (IMarEST), Australia, New Zealand and South Pacific Division (ANZSPAC) and the South East Asia Division (SEAD) will host a conference and exhibition from 23 to 25 August 2011. Maritime Matrix 2011 will be held at the Cairns Convention Centre, Cnr Wharf and Sheridan Sts, Cairns. This conference is a major bi-annual event for IMarEST, attracting more than 350 national and international marine engineers, scientists and technologists from diverse fields. The conference represents a unique opportunity for Australian and South East Asian maritime practitioners to address challenges and opportunities.

The theme will be *Technology's Impact on the Maritime Environment and Future Challenges*. Areas covered will include academia and regulatory, environment, and solutions.

Expressions of interest are now being sought for the following:

- Submission of Technical Papers
- Sponsorship
- Exhibition

For further details, visit the website www.icebergevents.com/IMarEST2011, or contact Greg Bondar on (0411) 854 115 or email execdirector.anzspac@imarest.net.

Basic Dry Dock Training Course

Following the success of the courses held in Melbourne in 2008 and Brisbane in 2009, the Royal Institution of Naval Architects has announced that this course will again be held in Australia, in Melbourne on 11–14 October 2011.

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 Dock Masters, Docking Officers, Engineers, Naval Architects, Port Engineers and others involved in the dry docking of ships and vessels.

The course leader, Joe Stiglich, is a retired Naval Officer, qualified NAVSEA Docking Officer and holds a Masters Degree from MIT in Naval Architecture and Marine Engineering. Responsible for over 250 safe docking and undocking operations, he currently runs a series of conference and training courses for personnel involved in all phases of the drydocking industry and acts as a consultant for ship-repair companies.

Places for this course are limited and so early booking is strongly advised.

For more information about this course see www.rina.org.uk/drydockaustralia2011.html or contact the conference department, phone +44-20-7235 4622, fax +44-20-7259 5912 or email: conference@rina.org.uk.

SIA Technology Conference 2011

The Submarine Institute of Australia, supported by the Australian Society for Defence Engineering, will conduct its Inaugural Technology Conference at the Crowne Plaza Hotel, Adelaide, between 8 and 10 November 2011.

The theme for the conference is *The Future Submarine — Australia's Science, Technology and Engineering Challenge of the 21st Century*. The call for abstracts closed on 13 May 2011 and the draft conference programme should be available by early September.

More information can be found under 'Conferences' at the Submarine Institute's website, www.submarineinstitute.com.

Pacific 2012

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

- The International Maritime and Naval Exposition, organised by Maritime Australia Ltd, to be held from Tuesday 31 January to Friday 3 February. Further information on the exposition can be obtained from the exposition website www.pacific2012.com.au/content-exposition or by contacting the exposition organisers, Maritime Australia Ltd, PO Box 4095, Geelong, Vic 3220, phone (03) 5282 0500, fax (03) 5282 4455 or email expo@amda.com.au.
- The Royal Australian Navy Sea Power Conference 2012, on the theme of *The Naval Contribution to National Security and Prosperity*, organised by the Royal Australian Navy and the Sea Power Centre Australia, to be held from Tuesday 31 January to Thursday 2 February.

The deadline for submission of abstracts for proposed papers, 31 January 2011, has already passed. For any queries on submission of papers, contact the Chair of the SPC Papers Committee, Andrew Forbes, at andrew.forbes1@defence.gov.au.

Further information can be obtained from the conference website www.seapowerconference.com.

- The International Maritime Conference, organised by the Royal Institution of Naval Architects, the Institute of Marine Engineering, Science and Technology, and Engineers Australia, to be held from Tuesday 31 January to Thursday 2 February.

The call for papers is out, and the timescale is as follows:

Abstract submission deadline	7 July 2011
Authors notified of acceptance	29 July
Registration opens	August
Refereed papers submission deadline	3 October
Full paper submission deadline	14 November
Presenter registration deadline	15 November

Abstracts can be submitted on any of the following topics:

- Commercial Ship Technology
- Naval Ship Technology
- Submarine Technology
- Commercial Ship Operations
- Maritime Safety

All abstracts are to be submitted online at: www.pacific2012imc.com. Further instructions regarding abstract format and guidelines are also available on the website.

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

The Pacific 2012 IMC Welcome Cocktail Party will be held at the Australian National Maritime Museum on Wednesday 1 February 2012. This relaxed evening will give delegates a chance to catch up with old friends and meet new ones.

Further information on the conference, including the conference and social programs, can be obtained from the conference website www.pacific2012imc.com or by contacting the conference organisers, Arinex Pty Ltd GPO Box 128, Sydney, NSW 2001, phone (02) 9265 0700, fax (02) 9267 5443 or email pacific2012imc@arinex.com.au.

Fourth High Performance Yacht Design Conference

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

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

The call for papers is out, and abstracts are invited on a range of topics, including:

- performance prediction and measurement;
- computational methods;
- wind tunnel and towing tank technology;
- materials and structural analysis;
- regulations and rating rules; and
- hull and appendage design.

Abstracts of no more than 400 words should be submitted in Word or PDF format to technical@hpyd.org.nz by 31 May. For further details please see www.hpyd.org.nz or email info@hpyd.org.nz.

GENERAL NEWS

Future HMAS Canberra Launched in Spain

The first of the Royal Australian Navy's two new amphibious ships was launched in Spain on 17 February, heralding a new era for Australia's amphibious capability.

Chief of Navy, Vice Admiral Russ Crane, attended the launching and said the event was enormously significant.

"These ships are officially known as Landing Helicopter Docks or LHDs and will be the largest ships the Australian Navy has ever owned," Vice Admiral Crane said.

LHD01 was launched at the Navantia shipyard at Ferrol in northern Spain with the event having a distinctly Australian feel, as children of Australian diplomats in Spain joined the official delegation, waving Australian flags. A Canberra-region sparkling wine was broken over *Canberra's* bow by Vicki Coates, wife of the late Rear Admiral Nigel Coates, who commanded the previous HMAS *Canberra*.

Vice Admiral Crane said that with a new generation in technology would come a new way of thinking in terms of how Navy would operate and crew this new capability.

"We are well progressed in our planning for the LHD arrival. I am confident that we will have the people and the know-how by the time the first LHD comes on line. Most importantly for now, this project is on time and on budget."

Both ships will be based at Fleet Base East in Sydney. Crewed by all three services, the LHD will mark a significant strengthening of the ADF's amphibious capability and tri-service culture.

Canberra (LHD01) will arrive in Victoria next year where she will be fitted with her island superstructure and completed before being accepted into service in 2014, with her sister ship *Adelaide* (LHD02) to follow in 2015.

LHD 01, *Canberra*, on the slipway in Spain. The first module for LHD 02, *Adelaide*, (in the foreground), was placed in position after *Canberra's* launching
(RAN photograph)

Canberra (LHD 01) ready for launching
(RAN photograph)

RFA *Largs Bay*, purchased in April for the Royal Australian Navy
(Photo courtesy Department of Defence)

LSD Purchase for RAN

On 6 April Minister for Defence, Stephen Smith, and Minister for Defence Materiel, Jason Clare, announced that Australia has been successful in its bid to acquire the United Kingdom's Bay-class amphibious ship *Largs Bay*.

The Government had previously announced that it had asked Defence to develop new and comprehensive options to ensure transition to Australia's Canberra-class amphibious Landing Helicopter Dock ships (LHD), which become operational from 2014, including the lease or purchase of a Bay-class ship from the UK Government.

Largs Bay is a Landing Ship Dock (LSD) which was commissioned into service in 2006. She became surplus to UK requirements as a result of the UK Government's 2010 Defence Strategic Review.

The ship displaces 16 000 t and is 176 m long with a beam of 26 m. Her flight deck has room for two large helicopters and she can also carry around 150 light trucks and 350 troops.

The cargo capacity of *Largs Bay* is the equivalent of the Royal Australian Navy's entire amphibious fleet.

Largs Bay has proven capability, having provided humanitarian relief as part of the international response to the Haiti earthquake in 2010.

Largs Bay will help ensure that the Royal Australian Navy has the amphibious capability it needs for operation and humanitarian support in our region in the period leading up to the arrival of the LHDs.

The ship has been acquired for £65 million (approximately $100 million).

Teekay Shipping Australia thoroughly inspected the ship and found that "The ship presents very well and, from a technical point of view, there are no major defects."

Before the acquisition is finalised, Defence and the Royal Australian Navy will conduct sea trials to confirm the material state of the ship.

The ship is expected to arrive by the end of the year in time for it to be operational in early 2012. The Government will announce further details of the transition plan for Australia's amphibious ship capability to provide this essential capability until arrival of the Canberra-class LHDs in due course.

Built for function not appearance — a port quarter view
of RFA *Largs Bay*
(Photo courtesy Department of Defence)

Incat LNG ship for South America

On 29 March Incat Tasmania Pty Ltd announced the name of the customer for their world-first high-speed passenger ro-ro ship powered by liquefied natural gas (LNG).

The 99 m LNG ship was ordered by South American company Buquebus in November 2010; however, for commercial reasons Buquebus requested that their identity be kept under wraps. They have now announced that they will operate the vessel on their River Plate service between Buenos Aires in Argentina and Montevideo in Uruguay.

Incat Chairman, Robert Clifford, said "Incat is excited about this project as it represents a significant step in the global move for natural gas-powered ships to replace those operated with less environmentally-friendly fuels.

"Incat is especially pleased to be building this ship, Hull 069, for a repeat customer. Buquebus have clearly demonstrated their preference for Incat technology over a twenty year period and Hull 069 will be the eighth which we have built for Buquebus and their associated companies. It will be the largest catamaran they have operated and the fastest, environmentally-cleanest most-efficient high-speed ferry in the world. "

The vessel, which is yet to be named, is under construction at the Incat shipyard at Prince of Wales Bay in Hobart. Delivery is anticipated to be in the spring of 2012.

Hull 069, with capacity for over 1000 passengers and 153 cars, has a projected lightship speed of 53 knots, and an operating speed of 50 knots. Crossing the River Plate (Rio de la Plata) at high speed will allow the ferry service to compete with airline traffic between Uruguay and Argentina.

The passenger cabin will include tourist, business and first class seating, and over 1000 m^2 of extensively fitted out duty-free shop, the largest shopping area ever installed on a fast ferry.

The vessel will be the first installation of LNG-powered dual-fuel engines in an Incat high-speed ferry, and the first high-speed craft built under the HSC code to be powered by gas turbines using LNG as the primary fuel and marine distillate for standby and ancillary use.

Navy Opens New Warship Simulator

Junior officers in the Royal Australian Navy will learn to pilot the next generation of warships in an upgraded $10 million training facility at HMAS *Watson*, Sydney, which was be officially opened on 25 March.

The new simulator uses computerised virtual-reality software to simulate a working warship's bridge, complete with a 240° view of a computer-generated 2D scene through the bridge windows.

At work in the new RAN bridge simulator
(RAN photograph)

The bridge training faculty, one of the most advanced simulators in the world, was opened by Commander Australian Fleet, Rear Admiral Steve Gilmore.

"This facility is at the cutting edge of simulator technology and provides junior seaman officers with very realistic training so that they will be capable of carrying out the duties of the officer-of-the-watch before heading out to sea," Rear Admiral Gilmore said.

"Our Navy is the first in the world to use multi-flex touch screens in a warship bridge simulator, which increases functionality without cumbersome hardware," Rear Admiral Gilmore said.

The simulators replicate the full range of maritime operations likely to be experienced while on the bridge of a warship and can be reconfigured to match most classes of ship in the RAN's current fleet. New functionality includes boat operations, interdiction, and docking and beaching evolutions pertinent to the new Canberra-class LHDs.

"An example of a complex scenario is manoeuvering a 3500 t warship within 2000 m of a number of other ships while under air attack, or ships within 50 m of each other conducting replenishment-at-sea approaches" Rear Admiral Gilmore said.

With two full-mission simulators and four part-task simulators, the facility allows up to six warship bridge teams to train for specific scenarios in a joint exercise environment or, conversely, run six independent scenarios.

The graphics system can replicate different environmental conditions, from a clear day through to a raging storm, detailed land- and sea-scape features as well as dynamic models of aircraft, tugs and other ships, including the Canberra-class LHDs and Hobart-class AWDs.

A dedication ceremony was also held for the combined navigation and bridge training faculties, which was renamed the Taylor Building after former Chief of Navy (1994–97), the late Vice Admiral Rod Taylor AO, a specialist navigation and operations officer.

The ship bridge simulation system was delivered to the Navy by the Defence Materiel Organisation on time and under budget. The system was provided by Kongsberg Maritime Simulation and Training, Norway.

Strategic Marine to build Barge for North West

Perth-based shipbuilding company, Strategic Marine, has won a contract to supply a 26.8 m work barge to service the energy and resources sector in Western Australia's north-west.

The vessel, being built for Karratha business, Offshore Plant Hire, will be based in the Port of Dampier and be chartered to marine operations company Bhagwan Marine. It will service the areas around Dampier, Onslow and Barrow Island and be used primarily for port upgrades, construction support, mooring maintenance and shallow-water dive perations.

Chief Marketing Officer Terry O'Connor said increasing Strategic Marine's presence in the north-west region of Western Australia was a key element in the company's growth strategy for the next five years.

In addition to the above, Strategic Marine's current projects in the north-west region include construction of work barges for Leighton Contractors, tug pens for Woodside, and a range of ship repairs for international ship operators engaged in providing services for the Gorgon Project.

LNA Tackles New Challenge for the World Cup

All rugby fans will know that the World Cup will be held later this year in New Zealand. Thousands of visitors are expected to fly into the country and tour around, attending tournament games. The race is on to ensure that *Aratere*, owned and operated by Interislander, a division of KiwiRail, can be converted to provide increased rail, road and passenger capacity between the North and South Islands, in time for this major event.

Interislander considered purchasing a new ship for increased capacity; however, their two existing rail ferries, *Arahura* and *Aratere*, have ship-to-shore infrastructure specifically designed to suit the current rail facilities. A new vessel designed to meet the current regulations would be larger and have more freeboard, thus requiring extensive and expensive modifications to the shore-side rail configurations.

The 150 m ferry is being lengthened by the addition of a 29.25 m parallel mid-body section. The bow is also being replaced at the same time to reduce wave slamming. Passenger numbers will increase from the current 350 to around 600 post-conversion. Lightning Naval Architecture is part of the technical team working on this complex task.

"It is an exciting project", said Jennifer Knox, MD of Lightning Naval Architecture. "The extension is quite long relative to the ship's length, and the vessel was not designed to be lengthened. This presents structural and damage stability challenges."

LNA is providing general naval architecture support and ship-design services, hydraulic calculations for sprinkler and drencher system modifications, marine interior design and materials schedules. The company also has responsibility for meeting SOLAS requirements for all safety issues, including fire and damage control.

The new midship blocks and bow structure are currently under construction at Singapore's Sembawang Shipyard. *Aratere* will be departing Wellington in late April for Singapore where the conversion will take place.

"Due to the Christchurch earthquake and the need for *Aratere* to support the reconstruction efforts, departure was delayed by one month. This makes the conversion timeline quite tight, but Sembawang is very experienced with ship conversions and we are confident that *Aratere* will be home in time for the kick-off in September!" said Ms Knox.

Part of the new midship section for *Aratere*:
the first block (of twenty five) being moved during
work in progress.
(Photo courtesy Ray Newall)

Three 35 m Catamarans from One2three

Aluminium Boats Australia has recently commenced construction of three 35 m One2three-designed low-wash commuter ferries for Transit Systems. The boats are required to exhibit a low wash profile and are operating at service speeds up to 24 kn.

The boats will operate daily in environmentally-sensitive areas including operations in the vicinity of marine mammals, primarily dugong and turtle feeding grounds.

Accordingly the boats are waterjet powered to remove any possibility of open water propeller damaging marine life in accordance with strict requirements demanded by the local harbour authorities. In addition to minimising external protrusions, the bows have been custom-designed to include a shallow forefoot with a blunt, rounded entry to minimise the possibility of injury to dugongs and turtles at or close to the water surface. The bows and frontal hull shape were re-designed after a series of tank tests to minimise bow impacts at speeds up to 25 kn in order to allow for high-speed operations in these areas. 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 new boats are powered by four Scania DI1269M engines producing 515 kW each, driving newly-released quad Rolls Royce 40A3 waterjets.

The vessel's configuration allows for 450 passengers, of which 400 can be seated internally. The new vessels form the main transportation system for construction workers travelling to and from offshore work platforms, and as such are required to carry a variety of luggage, tools and cargo. Extensive luggage racks and storage areas are provided both internally in the cabin and at the main boarding areas. A lightweight and durable fitout was selected to handle the rigours of the service, and the vessel's aluminium structure is fabricated to One2three's design.

Profile of 35 m catamarans for Transit Systems in Gladstone
(Image courtesy One2three Naval Architects)

Six 14 m Catamarans for the America's Cup from One2three

One2three has custom-designed a fleet of six new 14 m catamarans for use as corporate entertaining and multi-purpose work boats by the Americas Cup Race Management Authority in the running of the 23rd America's Cup due to be held in San Francisco in 2013.

The new boats have been commissioned by ACRM CEO and Regatta Director, Iain Murray, as part of the rejuvenation of the America's Cup into a spectacle which will rival the dynamic impact of other popular televised sports. Iain's vision is for a "ring-side seat" on the One2three cats which will be used as actual rounding marks of the course and provided to corporate sponsors and VIPs. This will provide an unparalleled experience not previously available in yachting at this level and the sight of 72 ft (21.95 m) catamarans approaching these boats at significant speeds will be an experience to behold.

The boats are currently under construction at EAC Composites in China for a staggered delivery in time to be used in the 2012 AC45 events in Cascais, Portugal. The vessels are required to meet EU and US requirements and will be shipped around Europe and to San Francisco to service the entire racing program up to and including the 23rd Cup defence in San Francisco.

The vessels are powered by Volvo IPS drives and are fitted with a dynamic positioning capability to enable them to maintain an accurate location as required by the race officer for a rounding mark of the course.

The main deck is arranged for entertaining with loose furniture on the aft deck to allow for flexibility in viewing the racing combined into a relaxed entertaining space. A small galley and food preparation area is fitted to the starboard hull with WCs fitted into the port-side hull.

Principal particulars of the new vessels are

Length OA	13.9 m
Beam moulded	5.5 m
Fuel oil	1200 L
Fresh Water	500 L
Sullage	300 L
Main engines	2×Volvo each 246 kW @ 3500 rpm
Cruising speed	25 kn

Starboard bow of 14 m America's Cup catamarans
(Image courtesy One2three Naval Architects)

12 m Catamaran for Church Point Ferry Services

The One2three custom-designed 12 m catamaran vessel for the iconic Church Point Ferry Services on Sydney's picturesque Pittwater has recently been launched and is currently en-route to Sydney. The new boat was constructed at Aluminium Boats Australia and will replace the ageing fleet to service the communities on Church Point, Scotland Island, and the western foreshores. The service is the only commercial means of transport off the island which has grown from a community largely based on holiday shacks to a large cross section of dwellings ranging from luxurious residences to small artists retreats.

Powered by twin John Deere engines of 63 kW brake power, the vessel is to operate at a loaded speed of 8 kn.

Port quarter of 12 m catamaran ferry for Church Point
(Photo courtesy One2three Naval Architects)

Port side of 12 m catamaran ferry for Church Point
(Photo courtesy One2three Naval Architects)

15 m Catamaran Workboats from One2three

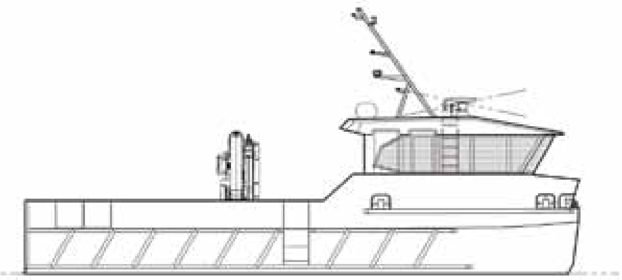
One2three has custom-designed a fleet of new 15 m catamaran multi-purpose work boats for servicing the offshore fish-farming industry. The new boats have been commissioned by Hobart-based Plastic Fabrications and are currently under construction at Incat Tasmania for a Scandinavian operator. The new boats will complement their existing fleet to service the significant aquaculture industry in the coastal areas around Scandinavia.

Plastic Fabrications has been extremely successful in developing and selling their net-cleaning MIC equipment to a worldwide market. The market has demanded an increasingly-large platform to support this MIC equipment so they approached One2three to assist them to develop a suitably rugged platform to expand their range and market penetration.

The vessels feature a large open aft deck, hydraulic crane, hoppers and Plastic Fabrications specialist net-cleaning equipment. Yanmar engines power the vessels and are coupled to conventional propellers. Each vessel is designed to the EC and Nordic Yacht rules and maximised in length to remain inside the 15 m length limit, which accounts for their straight stem.

Side boarding doors and water access ladders are incorporated into the vessel's side to support net repair and cleaning operations, making the boat a true multi-purpose low-speed offshore support vessel.

There are two twin-berth cabins fitted into the side hulls forward, and appropriate services to provide comfortable accommodation for the crew who routinely operate on week-long shifts.



Profile of 15 m catamaran workboat
(Drawing courtesy One2three Naval Architects)

Principal particulars of the new vessels are

Length OA	15.0 m
Beam moulded	5.9 m
Fuel oil	2800 L
Fresh water	1000 L
Sullage	1000 L
Deck load capacity	8 t
Main engines	2×Yanmar
`	each 268 kW @ 2400 rpm
Cruising speed	15 kn

16 m Harbour-cleaning Catamaran Workboat from One2three

Q-West New Zealand recently delivered a 16 m workboat to NSW Maritime. Designed by One2three, the vessel is to be deployed primarily in Sydney Harbour on aquatic cleaning operations.

ES-8 is due to commence operations in June 2011 and is configured for a range of workboat duties, with a large aft working deck and crane. However, her primary usage is as a cleaning vessel and she is equipped with a waterjet spray system to draw rubbish between the hulls and hold it in a submersible cage which is retrieved via a large moonpool and emptied into a scow located on main deck.

Sea trials were extremely successful, and the vessel exceeded her predicted contractual speed by 3 knots in extremely rough New Zealand west-coast sea conditions. This is the first boat Q-West have built to a One2three design and they are to be congratulated for such a high quality build, delivered inside the contract period and on budget.

16 m harbour-cleaning workboat for NSW Maritime
(Photo courtesy One2three Naval Architects)

12 m Landing Barge from One2three

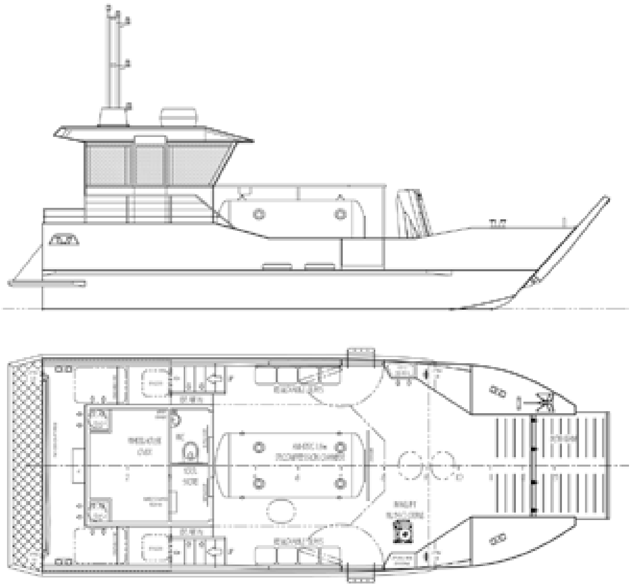
Evolution Commercial is a new shipbuilding and repair operation located in Henderson, Western Australia. The new company is headed up by local shipbuilding legend, Mark Stothard, co-founder of Image Marine and now owner of the 50 m charter vessel, *True North*. Mark has teamed with well-known local builder, Jurien van Rongen, and their first Evolution Commercial new-build is due for launch this financial year.

Fabrication of a One2three-designed 12 m landing barge began in April, with a 12-week delivery schedule. The vessel is designed for service up to 200 n miles from a safe haven as a multi-purpose landing barge with bow door and heavy cargo deck. The initial configuration to be delivered is as a dive-support vessel. The cargo deck holds a decompression

chamber and a hydraulic crane for lowering a submersible pump to the ocean floor. Diving storage tanks and an air compressor are stored below decks.

Principal particulars of the new vessel are

Length OA	14.0 m
Beam moulded	5.0 m
Deck load capacity	6 t
Fuel oil	3000 L
Main engines	2×Yanmar 4LHAM
	each 179 kW @ 3300 rpm
Waterjets	2×Hamilton HJ274
Cruising speed	10 kn



General arrangement of 12 m landing barge
(Drawing courtesy One2three Naval Architects)

Siem Piata from Incat Crowther

The 36m monohull crewboat *Siem Piata*, designed by Incat Crowther, was recently launched by ETP Engenharia Ltda in Rio de Janeiro, Brazil, successfully completed sea trials, and was delivered to Siem Consub for service to Petrobras. Developed primarily at Incat Crowther's USA office in Morgan City, Louisiana, *Siem Piata* will perform the role of a P2 crew boat in the Siem Consub fleet. The vessel is certified to Bureau Veritas and Brazilian Maritime standards.

The vessel features a large aft main cargo deck devoted to crew transfer and cargo carrying. *Siem Piata* has a deck cargo capacity of 50 tonnes.

The main cabin contains seating for 60 passengers in large reclining seats, some at tables. There are also generous luggage-storage racks, a beverage counter and two toilets.

Below-decks accommodation includes sleeping quarters for 10 (including two with ensuites), galley, mess, crew wet room, toilets and showers, and a laundry.

Below-deck tankage includes cargo fresh water and fuel tanks, each capable of holding in excess of 30 000 L. Multiple transfer pumps are provided for both cargo fluids. 15 100 L of ship's fuel and 5800 L of ship's water are also provided.

The vessel is powered by three Caterpillar C32 main engines, each driving a Hamilton HM721 waterjet. A ZF3050 gearbox will provide gear reduction and clutching. A single 75 kW bow thruster will be mounted forward for station-keeping purposes. Primary electrical power is derived from a pair of Caterpillar C4.4 gensets, each producing 99 kW.

The vessel also features a fire-fighting monitor (6000 L/min) for combating off-ship fires and a purpose-designed transfer platform has been arranged on the foredeck to further suit the Petrobras P2 vessel requirements.

Principal particulars of *Siem Piata* are

Length OA	36.00 m
Length WL	32.95 m
Beam	7.50 m
Draft (hull)	1.20 m
Passengers	60
Crew	10
Ship's fuel	15 100 L
Ship's water	5800 L
Cargo fuel	30 200 L
Cargo water	30 200 L
Deck cargo	50.0 t
Deadweight	85.0 t
Main engines	3×Caterpillar C32 ACERT
	each 1044 kW
Propulsion system	3×Hamilton HM721 waterjets
Gensets	2×Caterpillar C4.4
	each 99 kW
Service speed	20 kn
Construction	Marine-grade aluminium
Survey	Bureau Veritas

Siem Piata from Incat Crowther
(Image courtesy Incat Crowther)

Starboard bow view of *Siem Piata*
(Image courtesy Incat Crowther)

24 m Catamaran Ferry from Incat Crowther

Incat Crowther has announced the design of a 24 m catamaran passenger ferry to be built by Baltic Workboats in Estonia. The vessel is a follow-up to the Incat Crowther-designed 24 m catamaran scientific research vessel under construction at the yard, and will be operated in the Gulf of Riga, Estonia.

Incat Crowther worked closely with Baltic Workboats in their successful bid, developing a vessel utilising the same platform as the research vessel. As part of the development process, changes were made not only to meet the operator's requirements, but also to streamline the build process, including the use of prefabricated extrusion-based panels. The close cooperation between Incat Crowther and Baltic Workboats resulted in a winning bid selected as the most suitable vessel for the operation, offering the best value.

In addition to passengers, two vehicles will be carried on the aft deck, with deck capacity allowing vehicles up to 6.5 m in length, and axle loads up to 2.4 t. Vehicles will be loaded via the stern-mounted ramp. There is also an 8 t-m Guerra M 75.90A1 deck crane for loading cargo. The aft deck has passenger-loading gates situated amidships and is connected to the passenger cabin through a large passageway which houses the passenger toilets.

The forward end of the main deck cabin accommodates all 60 passengers and features a small bar and luggage racks. At the aft end of the cabin is a crew area which comprises a crew mess, twin cabin and bathroom.

The vessel will be powered by a pair of Volvo D16MH R2 main engines, each producing 560 kW, giving a service speed of 22 knots and a top speed of 26 knots.

Starboard bow of 24 m catamaran ferry
(Image courtesy Incat Crowther)

Eagle's view of 24 m catamaran ferry
(Image courtesy Incat Crowther)

Passenger cabin and bar on 24 m catamaran ferry
(Image courtesy Incat Crowther)

Incat Crowther is proud to support Baltic Workboats, not only in securing this contract, but also in their mutual drive to find ways to continually refine the boatbuilding process. Baltic Workboats has a strong record for producing robust, well-built vessels and Incat Crowther looks forward to supporting Baltic Workboats in their expansion into this new market.

Principal particulars of the new vessel are

Length OA		23.9 m
Length WL		23.3 m
Beam OA		8.0 m
Depth		3.4 m
Draft	(hull)	1.1 m
	(propeller)	1.4 m
Passengers		60
Crew		10
Vehicles		2
Fuel oil		5000 L
Fresh water		1500 L
Sullage		1500 L
Main engines		2×Volvo Penta D16MH R2 each 560 kW @ 2200 rpm
Propulsion		Propellers
Generators		2×Cummins 17.5 MDKBR
Bow Thrusters		2×Side Power SH550 each 33 kW
Speed	(service)	22 kn
	(maximum)	24 kn
Construction		Marine-grade aluminium
Flag		Estonia
Class/Survey		LR ✠100A1 SSC Passenger Catamaran HSC G3 MCH UMS

42 m Wave-piercing Catamaran Ferry from Incat Crowther

Incat Crowther has secured a contract to design a 42 m wave-piercing catamaran ferry for Quicksilver Bali. The Indonesian operator runs day tours and dinner cruises out of Bali, using the Incat Crowther-designed wave-piercing catamaran *Quicksilver 6*.

Under construction at PT Caputra Mitra Sejati Shipyard, in Indonesia,the vessel will be built to Lloyd's Register and carry 450 passengers in two saloons and on three outdoor decks. In addition to passengers, the vessel will carry up to 50 crew, many of whom work at the operator's pontoon at Nusa Penida Island. At this pontoon, the operator offers activities including snorkelling, semi-submersible scuba, jet skiing and even tattooing. The vessel is configured not only to transport this small army of support staff to the pontoon, but also to allow meetings and briefings onboard during the outbound voyage.

Incat Crowther worked in close collaboration with Quicksilver Bali to develop a vessel optimised for the service being offered. Many features have been implemented to increase passenger comfort, such as window-washing platforms on both decks. Safety demonstrations and live music shows performed on the main deck are relayed throughout the vessel via the integrated AV system.

The main-deck interior cabin features seats for 268 passengers, and has a large bar at the aft end. Adjacent to the bar is a dual-entry cool room, which allows for quick loading of supplies, and immediate access from the bar. Behind the bar and cool room are extensive amenities. A total of 15 toilets are fitted in ladies and gents rooms.

The mid-deck cabin seats 168 passengers, with a small servery aft. The servery is linked to the main deck bar via a dumb waiter. The aft mid deck has 42 exterior seats. Stairs lead from this deck to a large sundeck, with 50 outdoor seats and ample standing room.

The vessel will have multiple boarding points to allow quick embarkation and disembarkation. Large aft quarter decks are provided for transfer of passengers to the pontoon. These load into broad stairs which link to the main-deck boarding area. Large passageways and stairs are provided to the main-deck cabin and the mid deck. There are also passenger loading gates on the mid deck.

At the aft end of the main deck is an area reserved for luggage trolleys and supplies for the pontoon. These are loaded by a pair of davits outboard, allowing loading and unloading on both sides.

The design of the vessel pays particular attention to adequate access for maintenance of machinery and to the fast and easy removal of engines for major overhauls.

The vessel is fully compliant with IMO HSC stability regulations, providing a level of safety exceeding regulations for domestic use.

Starboard side of 42 m wave-piercing catamaran ferry for Quicksilver Bali
(Image courtesy Incat Crowther)

Starboard bow of 42 m wave-piercing catamaran ferry for Quicksilver Bali
(Image courtesy Incat Crowther)

The vessel will be powered by four Caterpillar C32 ACERT C engines, each producing 1080 kW. Power is carried to KaMeWa 50A3 waterjets via ZF3050/D gearboxes and cardan shafts. The vessel will have a service speed of 26 kn and a top speed of 30 kn. Extensive long-range fuel tanks will be fitted, giving the vessel a delivery range of 800 n miles.

As the pioneer of the wave-piercing catamaran, Incat Crowther is pleased to be working with Quicksilver Bali to evolve this technology, creating a modern state-of-the-art vessel.

Principal particulars of the new vessel are

Length OA	42.0 m
Length WL	38.2 m
Beam OA	15.6 m
Depth	4.55 m
Draft (hull)	1.40 m
Passengers	450
Crew	50
Fuel oil (day tanks)	6200 L
Fresh water	2000 L
Sullage	2000 L
Main engines	4×Caterpillar C32 ACERT C Rating each 1080 kW @ 2300rpm
Gearboxes	4×ZF3050/D
Propulsion	44×Kamewa 50A3 waterjets
Speed (service)	26 kn
Speed (maximum)	30 kn
Construction	Marine-grade aluminium
Flag	Indonesia
Class/Survey	Lloyds Register

Bow view of 42 m wave-piercing catamaran ferry for Quicksilver Bali
(Image courtesy Incat Crowther)

Santa Ana from Incat Crowther

The 17.5 m catamaran, *Santa Ana*, a vessel specifically designed for the wind-farm service industry by Incat Crowther, has been launched. Built by Lyme Boats in the UK, *Santa Ana* features Incat Crowther's proven hull form, which brings new levels of stability, safety, comfort, efficiency and flexibility to the wind-farm service-craft market. Operator P&O Maritime Services saw the platform's potential for wind-farm service, and worked closely with Lyme Boats and Incat Crowther to develop the vessel's design.

Santa Ana recently completed extensive seakeeping trials, which were endorsed by a brace of vessel operators on board for the trials. "We are extremely happy to have her in the water to show the world what she can do", said Lyme Boats' Principal, Brian Pogson. "Everybody worked very hard on the development and construction of *Santa Ana*, so we are justifiably proud to hit the market with a real boat built for real operators."

Santa Ana is distinguishable by its twin cargo areas, one aft and one on the foredeck. The aft cargo area has space for a 10 ft (3.05 m)sea container, and has a capacity of 10 t. The foredeck cargo zone has capacity for 4 t. The vessel is specifically designed to interface with wind-farm pylons, allowing transfer of crew and cargo over the bow, stern or alongside.

To enhance the flexibility of the vessel, there are crane bases located on the foredeck, as well as on the upper deck outboard. This will allow the operator flexibility to configure the crane location as necessary for the contracted service.

Between the two cargo areas is the main cabin, featuring comfortable seating for 12 passengers with tables, lockers, a large galley and lounge, as well as a wet room and shower facilities.

On the upper deck is the wheelhouse with excellent vision of both cargo areas. Safety is further enhanced by the addition of "pilot-style" windows in the forward wheelhouse deckhead, which afford the operator the ability to observe the platform and crew heading up the turbine ladder.

Accessed from the main deck cabin, the hulls feature tank spaces amidships and two twin cabins each side forward.

Santa Ana represents a new era in wind-farm service craft, bringing the hallmarks of Incat Crowther catamarans to the wind-farm industry.

Santa Ana on trials
(Photo courtesy Incat Crowther)

Principal particulars of *Santa Ana* are

Length OA	17.50 m
Length WL	17.14 m
Beam OA	7.50 m
Depth	2.80 m
Draft (light)	1.00 m
(loaded)	1.45 m
Passengers	12
Crew	4
Max. deadweight 20 t	
Fuel oil (main tanks)	4000 L
(transfer tks)	1000 L
Fresh water	800 L
Sullage	250 L
Main engines	2×Scania DI16 42M each 559 kW @2100rpm
Propulsors	2×fixed-pitch 5-blade propellers
Generators	1×Onan 13.5 ekW
Speed (maximum)	29 kn
(cruising)	25 kn
Construction	Marine-grade aluminium
Class	Structure and machinery— Lloyds Register
Flag	UK MCA SCV Category 1/ Workboat

Starboard side of *Santa Ana*
(Photo courtesy Incat Crowther)

Starboard bow of *Santa Ana*
(Photo courtesy Incat Crowther)

Two Passenger Ferries for Russia from Incat Crowther

Incat Crowther is has signed contracts with Russian builder Pacifico Marine for two catamaran ferry projects. Incat Crowther and Pacifico Marine have formed a relationship which sees the design company assist Pacifico Marine to service the Russian market with proven designs. The relationship has already found success with the contracts for these two vessels, and both companies are hard at work to secure further orders.

The vessels are being constructed for operation during next year's APEC summit to be held in Vladivostok, the administrative centre of the Primorsky region. It is envisaged that the locally-constructed vessels, operated by Vladmorpass Co. Ltd, will not only provide comfortable and efficient transport for the APEC summit members, but will also showcase the region's maritime industry.

The first of the two vessels will be a 27 m aluminium catamaran ferry, which will carry 223 passengers. This vessel has been delivered to Pacifico Marine as an aluminium kit, which not only includes aluminium structure, but also major components such as windows and doors.

Profile of 27 m aluminium catamaran ferry
(Image courtesy Incat Crowther)

Profile of 28 m composite catamaran ferry
(Image courtesy Incat Crowther)

The second vessel will be a 28 m composite catamaran ferry, which will carry 223 passengers and for which Incat Crowther provided a complete composite-engineering service in addition to their full drafting and naval architectural design service. The design package for this vessel further demonstrates Incat Crowther's the strength and versatility.

Each of the vessels will be powered by a pair of MTU 10V200 M72 main engines driving though propellers, and will have service speeds of 25 knots.

They will enter service under Russian Maritime Register Shipping flag.

Incat Crowther has a strong track record of supporting its clients to bring their proven technology to new markets. It is anticipated that Incat Crowther will make announce further Pacifico Marine projects in the coming months.

Principal particulars of the 27 m aluminium catamaran passenger ferry are

Length OA	27.0 m
Length WL	24.6 m
Beam OA	8.5 m
Depth	3.0 m
Draft (hull)	1.0 m
Draft (propeller)	1.7 m
Passengers	223
Crew	5
Fuel oil	6000 L
Fresh water	2000 L
Sullage	1000 L
Main engines	2×MTU 10V2000 M72 each 900kW @ 2250 rpm
Propulsion	2×fixed-pitch 5-blade propellers
Generators	2×50 kW
Speed (max.)	29 kn
(cruising)	25 kn
Construction	Marine-grade aluminium
Flag	Russian Maritime Register of Shipping
Notation	KM✠ MHC HSC Passenger Craft "B"

Principal particulars of the 28 m composite catamaran passenger ferry are

Length OA	28.0 m
Length WL	23.3 m
Beam OA	8.1 m
Depth	3.0 m
Draft (hull)	1.2 m
Draft (propeller)	1.9 m
Passengers	223
Crew	5
Fuel oil	6000 L
Fresh water	1000 L
Sullage	500 L
Main engines	2×MTU 10V2000 M72 each 900 kW @ 2250 rpm
Propulsion	2×fixed-pitch 5-blade propellers
Generators	2×50 kW
Speed (max.)	29 kn
(cruising)	25 kn
Construction	Fibre-reinforced plastic
Flag	Russian Maritime Register of Shipping
Notation	KM✠ AUT3 HSC Passenger Craft "B"

Stewart Marler

19.7 m Patrol Boat for Marlin Marine

Marlin Marine's 19.7 m patrol vessel built for the Johor Port Authority in Malaysia which was designed by Kamira Holdings was launched in February and handed over in March.

The Secretary to the Malaysian Federal Minister of Transport officiated at the launch which was attended by 300 guests. The launching went without incident, including an engine start immediately after hitting the water and a short run in the river for the benefit of the audience ashore. Only the designer was left scratching his head, this being the third vessel in a row launched under the design weight, but by a significant amount of 1.5 tonnes (7% of lightship). Around 800 kg of weight margins could be accounted for, but the remaining 700kg could not!

As a consequence of the lighter displacement, the vessel easily achieved the contract speed of 35 kn with a maximum of 36 kn in the contract condition. However, this was achieved with the engines running at 2210 rpm against a rated speed of 2100, leaving a power margin of around 5%. It was considered pointless to re-pitch the propellers as full power is rarely used and the mechanically-governed engines do not have the narrow full throttle rpm window of their electronic counterparts. The cruise speed of 25 kn was achieved at barely 45% power, giving a cruising range of 530 n miles with 3600 L of fuel. The cruise speed has been increased to 30 kn to ensure the engines are more properly loaded.

Greg Cox

Marlin Marine's 19.7 m patrol boat after launching
(Photo oourtesy Greg Cox)

The 19.7 m patrol boat on trials
(Photo courtesy Greg Cox)

The Cunard liners *Queen Mary 2* and *Queen Elizabeth* during their 'royal rendezvous' in Sydney Harbour early on the morning of 22 February; *Queen Elizabeth* was on her first round-the-world cruise
(Photo John Jeremy)

Cruising

The summer cruise season wound down through autumn, with visits by by *Europa, Asuka II, Amsterdam, Pacific Princess, Seven Seas Voyager, Queen Mary 2* and the new *Queen Elizabeth* (on the same two days)*, Balmoral, Amadea* and *Deutschland* in late February; *Silver Spirit, Aurora, Saga Ruby, Pacific Pearl, Albatros, Sun Princess, Christopher Columbus, Pacific jewel, Pacific Sun, Dawn Princess, Volendam* and *Rhapsody of the Seas* in March; *Rhapsody of the Seas, Dawn Princess, Pacific Pearl, Pacific Jewel* and *Sun Princess* in April; and *Pacific Jewel* and *Dawn Princess* in May.

Pacific Jewel and *Pacific Pearl* are the only vessels scheduled for cruises over the winter months, and the cruise vessels for the next summer season start arriving with *Dawn Princess* and *Sun Princess* due in September, and *Le Diamante, Radiance of the Seas* and *Sea Princess* due in October.

Phil Helmore

Queen Mary 2 alongside Fleet Base East on 22 February (right)
(RAN photograph)

Queen Elizabeth departing Sydney Harbour on 23 February
(Photo John Jeremy)

Modules for the first of the Royal Navy's new aircraft carriers, *Queen Elizabeth*, continue to take shape in yards in the UK. This photograph shows a ring being moved into position for consolidation into a major module at Portsmouth in February. The operation appears to be largely under the control of the man in the bottom left of the photograph
(Photo courtesy BAE Systems)

EDUCATION NEWS

University of New South Wales

Student–Staff Get-together

The naval architecture students and staff held a get-together on Wednesday 16 March. This was to enable the students in early years to meet and get to know the final-year and post-graduate students and the staff on a social level, and to discuss the course and matters of mutual interest. Pizza, chicken, beers and soft-drink were provided and, after a slow start, conversation was flowing pretty freely an hour later! This year we have nine students in the third year and about twelve in fourth year (one expecting to complete in mid-year), most of whom attended. One of the post-graduate students came along as well as the three full-time staff. A broad mix, and some wide-ranging discussions ensued.

Graduations

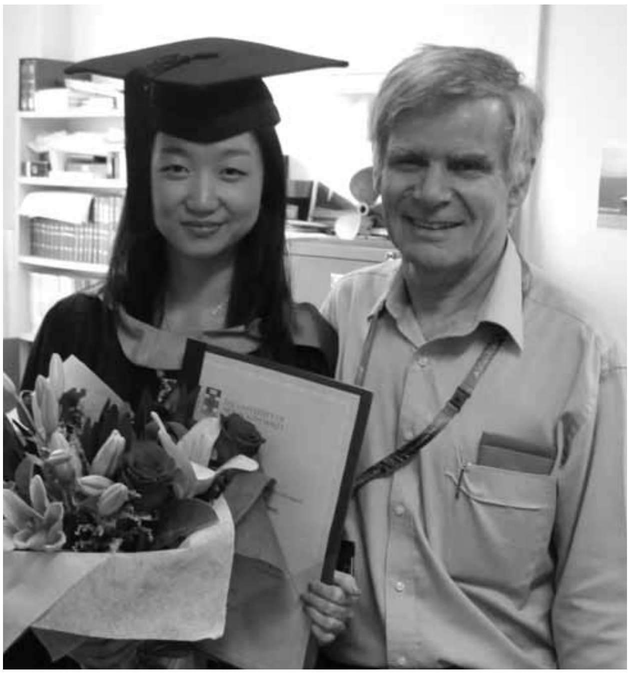
At the graduation ceremony on 15 March, the following graduated with degrees in naval architecture:

Tom Bromhead	H1
Annette Hill	H1
Nazmul Hossain	H1
Claire Johnson	H1
Chia How Khee	H1
Nai Wee Ling	
Anthony Livanos	H1
Daniel Oliver	H1
John van Pham	H1 and University Medal
Michael Stuart	H2/1
Gabriel Wong	H2/1

At the graduation ceremony on 1 April, the following graduated with degrees in naval architecture:

Gayoung Suh	H2/1

H1	Honours Class 1
H2/1	Honours Class 2 Division 1



Gayoung Suh and Phil Helmore
after the graduation ceremony on 1 April 2011
(Photo courtesy Gayoung Suh)

UNSW graduates in naval architecture
after the ceremony on 15 March 2011
(Photo Phil Helmore)

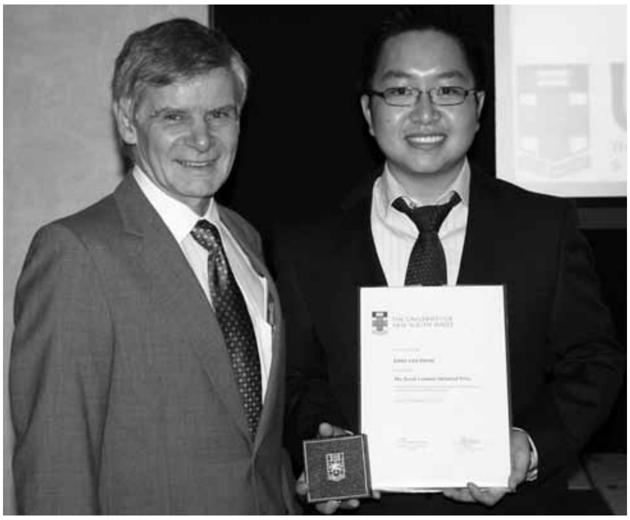
Prize-giving Ceremony

At the prize-giving ceremony on the same day, the following prizes were awarded in naval architecture:

The Royal Institution of Naval Architects (Australian Division) Prize for the best ship design project by a student in the final year to Anthony Livanos for his design of a 38 m aluminium monohull ferry carrying 285 passengers on domestic voyages of up to 120 n miles.

The David Carment Memorial Prize and Medal for the best overall performance by a naval architecture student in the final year to John van Pham.

Congratulations to all on their fine performances!



Phil Helmore presenting the David Carment Memorial Prize and Medal to John van Pham
(Photo courtesy Diane Augee)

Graduates Employed

Our 2011 graduates are now employed as follows:

Tom Bromhead	Incat Crowther, Sydney
Annette Hill	One2three Naval Architects, Sydney
Nazmul Hossain	Class NK, Sydney
Claire Johnson	Department of Defence, Canberra
Chia How Khee	Orwell Offshore, Singapore
Nai Wee Ling	Berjaya Dockyard, Sarawak, Malaysia
Anthony Livanos	Austal Image, Fremantle
Daniel Oliver	Defence Materiel Organisation, Sydney
John van Pham	Incat Crowther, Sydney
Gayoung Suh	Travelling and then evaluating opportunities, Australia
Michael Stuart	Evaluating opportunities, Sydney
Gabriel Wong	Evaluating opportunities, Singapore

Thesis Projects

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

Optimisation of Canting Keels for Yachts

Most high-performance ocean-racing yachts are now fitted with canting keels to improve the righting moment and, hence, their performance. As the fin is lengthened to move the bulb further away from the hull, the righting moment increases for a constant size of bulb, or the bulb size may be reduced to maintain the same righting moment. However, the surface area of the fin increases and so, accordingly, does the frictional resistance. It is surmised that there may be an optimum length for a fin keel/bulb combination.

Alex Conway is investigating the problem using computational fluid dynamics on a typical super-maxi hullform by varying the length of the fin and mass of the bulb to maintain a constant righting moment, while aiming to minimise resistance.

Re-analysis of Boomerang Stability Data

The lines of the vessel S.Y. *Boomerang* were lifted and the stability of the vessel was analysed in previous thesis projects in 1999. In the analysis, some errors were inadvertently made but, fortunately, these were all conservative and the vessel's stability is not in question. The hull definition file for the Wolfson Unit software (which was used for the analysis) was no longer available by 2004 when the errors were discovered, and the Wolfson Unit software is no longer available on the MECH computer system.

Ivy Zhang is re-modelling the hullform from the original photogrammetric data which was lifted in 1999. This will then be used to generate new hydrostatic and KN data in Maxsurf and re-determine the displacement, VCG and LCG at the original inclining experiment. These will then be used to revise all loading conditions in the stability book. The opportunity will be taken to update the stability criteria from those previously used in the Uniform Shipping Laws Code to those in the new National Standard for Commercial Vessels, and a new stability book will then be produced from the results. The results of subsequent inclining experiments in 2004, 2005, 2007, 2008, 2009 and 2010 by UNSW Year 3 naval architecture students will also be corrected in light of the updated hydrostatic particulars.

Inclining Experiment

Sydney Heritage Fleet provided access to their yacht *Boomerang* for the third-year students to conduct an inclining experiment at Rozelle Bay on 4 May. The students conducted the experiment with the guidance of lecturer Mr Phil Helmore. The day turned out fine, but with the wind gusting 15–20 kn and making the conditions tough for an inclining. However, it was more important to go through the whole process than to obtain a perfect set of results, and the experiment was completed with the students making a good fist of their first inclining. The theory of stability is fascinating, but seeing it in practice at an inclining makes it come *to life* for the students.

Post-graduate and Other News

Engineering Annual Dinner

The year of graduation is taken as the year in which your testamur was awarded. For most graduates, this is usually in the year following that in which their last coursework requirements were completed. For example, if you completed your coursework requirements at the final exams in November 2010, then you would expect to graduate in April 2011, and 2011 would be the year of your graduation.

The Engineering Annual Dinner for 2011 will be held on Friday 5 August 2011 at 1900 in Leighton Hall, Scientia Building, for the graduates of 1961, 1971, 1981, 1991 and 2001. So, if you graduated with Sean Ilbery (2001), Tony Armstrong (the younger) (1991), Simo Jaatinen (1981), or Mark Gairey (1971), then you should be dusting off the tux or cocktail dress, polishing your shoes and asking your partner to keep the evening of Friday 5 August free.

The 1971 class is distinguished by being UNSW's sixth graduating class of naval architects, the first having been Brian Robson in 1963.

For further information, please contact Tisha Dejmanee on (02) 9385 7324, email invitations@eng.unsw.edu.au, or check the website www.eng.unsw.edu.au/news-and-events, and click on Dates for the Diary/August 2011 and then select Alumni as the audience.

Phil Helmore

Australian Maritime College

Sailing Simulation — Engineering Sailing Participation

The sailing simulation project (a collaboration between AMC, the University of Melbourne and Virtual Sailing) has been reported at various times in recent years as involving a number of final-year thesis projects. This year sees the realisation of the end product being used to actively increase sailing participation through the VSail-Access simulator. The VSail-Access simulator is a small modification of the standard simulator in which a frame supporting an Access Liberty dinghy seat and joystick is placed in the cockpit floor and the joystick connected to the steering system. These simulators are now in use in spinal rehabilitation centres in Melbourne, Sydney, Auckland, Baltimore and Miami.

A VSail-Access simulator has been part of the rehabilitation program at Auckland Spinal Rehabilitation Unit (ASRU) since March 2009.

The VSail-Access simulator being used at the ASRU (Photo courtesy AMC)

Working alongside two organizations — Parafed Auckland and Sailability Auckland — sailing instruction has been offered to novice disabled sailors with the aim of encouraging them to transition their skills learnt in the simulator to on-water sailing. The simulator being housed in the physiotherapy gym has created a lot of interest with patients being able to observe the simulator in action whilst going about their daily rehabilitation. The location has proved to be very successful, and Sailability Auckland actively engages a person in sailing right from the beginning offering all sailing instruction in the simulator. People generally sail a set course using the Liberty Motor sailor boat around a triangular course in 12 kn of wind, racing their previous best time or the best times of other sailors. The steering apparatus has been modified so that people with limited hand and upper-limb functions are still able to participate in sailing the simulator.

Due to demand, Sailability Auckland now offers sailing simulator classes twice weekly with several coaches now being available to coach novice sailors. Since January 2010, 150 individual coaching sessions have been completed — eight people have successfully transitioned their skills in the simulator to on-water sailing and a further seven are eagerly awaiting their first wet trial.

One novice disabled sailor showcased the success of learning to sail initially through active participation in the safe and relaxed environment of the simulator by transferring learnt skills to on-water sailing within six months. In July 2010 she represented New Zealand along with her team mate at the Skud 18 World Championships, qualifying New Zealand for the Paralympics in London in 2012

Jonathan Binns

The end result, more people sailing with more smiles (Photo courtesy AMC)

Doctor of Philosophy Graduation — Chin Bong

Just in time for the December graduation ceremony in Launceston, Chin Bong had all his corrections passed by the Board of Graduate Studies. Congratulations Dr Bong (and his supervisors Dr Goldsworthy and A/Prof. Brandner) on many years of hard work! Following is the official abstract for Dr Bong's work. As you read the following you can get an idea of the size and complexity of his work.

Numerical and Experimental Analysis of Diesel Spray Dynamics Including the Effects of Fuel Viscosity

The maritime transport industry carries the majority of global trade. These large ships primarily consume low-quality heavy fuel oil (HFO). The fuel is introduced as a high-pressure spray in the ship's diesel engine. HFO spray dynamics differ from those of automotive diesel spray due to HFO's high viscosity, complex molecular structure, the presence of liquid phase soot and variable fuel density. Few HFO spray research studies were evident in the literature reviews and gave motivation for the current study.

This project comprised three phases. Firstly, the droplet breakup, inter-droplet collision, multiphase coupling and droplet drag models of the Star-CD v3.26 software were modified to improve the accuracy of the HFO spray prediction with reference to experimental results from literature. Secondly, experiments using Particle Image Velocimetry (PIV) and dropsize shadowgraphy were conducted using laser diagnostics. The experimental results showed that high fuel viscosity significantly increases the macro spray angle and changes the internal structure of the spray. The drop size results showed non-homogeneous droplet distributions which are clustered with varying population density. The experimental also work highlighted difficulties in measuring dense regions of the spray. Finally, the newly developed numerical prediction method, which utilised a combination of Large Eddy Simulation (LES) and modified models, was tested for accuracy against the current experimental results. The results showed that the prediction method was accurate and able to adapt to changing chamber pressure and changing fuel viscosity without additional adjustments.

The LES results suggested that the spray structure could be divided into two regions. Most of the breakup process and momentum transfer was seen to occur in the disintegration region, while the stable region showed the formation of droplet clusters and spray volumetric expansion. The results also showed that a high-viscosity fuel spray contained significantly different internal structures when compared to a low-viscosity fuel spray. Compared with the low-viscosity fuel spray, the high-viscosity fuel-spray droplet dispersion rate was significantly lower, the droplet cluster formations occurred much further away from the nozzle, and the average dropsize was larger. Finally, the results showed that an increase in gas density shortened the distance between cluster formations.

This project demonstrated that simulations using LES could predict the instantaneous turbulent jet instability and droplet cluster formation accurately. This research provided new insight into the formation of a spray and improved understanding of long-duration and high-fuel-viscosity diesel sprays. More importantly, the ultimate goal of accurate and reliable computer prediction of HFO and biofuel spray for the purpose of engine-emission reduction research is brought one step closer by this project.

AMC Principal Malek Pourzanjani, Cronwell Medal recipient Ashley Jones and AMC board Chair David Sterrett
(Photo courtesy AMC)

Awards and Prizes

The Connell Medal: Best AMC Graduate at Bachelor level — Ashley Jones.

Technip Oceania Prize: Highest marks in Sub-sea and Deepwater Engineering in the Bachelor of Engineering (Naval Architecture) degree — Ashley Jones.

Technip Oceania Prize: Highest aggregate mark in Project Engineering — Christopher Hawtone and Jessica Ryan.

McDermott Australia Prize: Best achievement by a graduating student in the unit Offshore Operations in the Bachelor of Engineering (Ocean Engineering) or (Marine and Offshore Systems) degree — Daniel Causon.

Det Norske Veritas Marine and Offshore Systems Prize: Excellence in studies in Marine Engineering, Third Year Bachelor of Engineering (Marine and Offshore Systems) — Mohd Fakhruddin Zainal Ashirin.

Captain Thomas Swanson Prize: The outstanding graduate in a degree program in the National Centre for Maritime Engineering and Hydrodynamics — Ashley Jones.

Engineers Australia Norman Selfe Prize: The best achievement and attainment of professional skills in the final year of a Bachelor of Engineering degree — Ashley Jones.

Royal Institution of Naval Architects Prize: Best research project by a final year student in Bachelor of Engineering (Naval Architecture) degree — Timothy Field-Dodgson.

The RINA–Austal Naval Architecture Prize: Best team project in Ocean Vehicle Design in Bachelor of Engineering (Naval Architecture) — David Harte, Timothy Moore and Marian Gheorghe.

Principal's Roll of Excellence

Bachelor of Engineering (Naval Architecture) — Ramiro Infanzon

Bachelor of Engineering (Ocean Engineering) — Christopher Hawtone, Jason Hill, Yuting Jin, Ashley Jones, Jessica Ryan, Matthew Skledar.

AMC launches innovative new programmes

As part of its ongoing commitment to academic excellence, AMC is pleased to announce the launch of a swag of exciting new courses in 2011.

The National Centre for Maritime Engineering and Hydrodynamics (NCMEH) has introduced the Co-Operative Engineering Programme, which gives students the opportunity to extend their degrees by one year to include periods of paid work experience with industry employers.

This novel approach to teaching and learning gives students the chance to better evaluate their career choice while working under the supervision of professional engineers, as well as gaining practical experience in a variety of industry and engineering sectors.

In the postgraduate field, NCMEH has launched a Master of Maritime Engineering with specialisations in Technology Management and Naval Engineering. This suite of programmes is aimed at engineering professionals already in the workforce but with limited exposure to the maritime engineering sector, and enables students to continue working while studying to gain a relevant professional qualification. They also provide an avenue for potential entry to higher-degree research including Masters by Research and PhD.

Meanwhile, the National Centre for Ports and Shipping (NCPS) has unveiled its Master of Maritime Studies. The course is ideal for middle- to senior-level executives seeking to enhance their knowledge of the maritime sector and take their career to the next level. The course is offered in distance mode, meaning that students can complete subjects covering the maritime domain, international maritime policy and maritime safety at their own pace.

AMC's Model Test Basin — Ten Years On

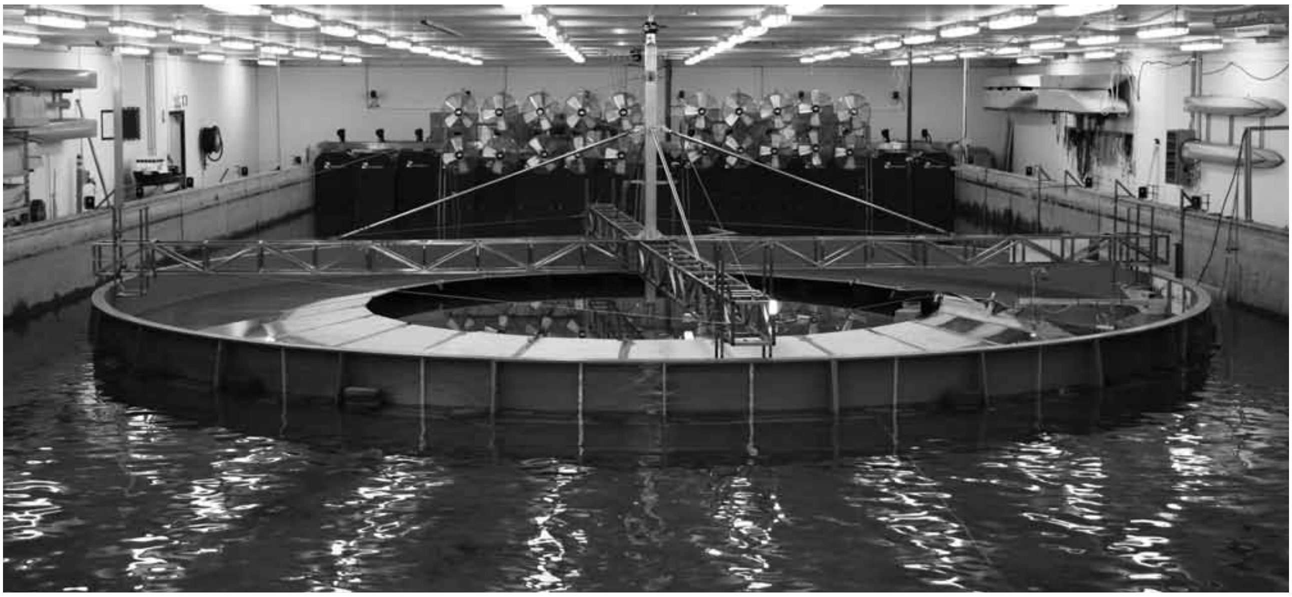
The tenth anniversary of the official opening of the Australian Maritime College's Model Test Basin occurred on 11 May 2011. This facility was established to provide a capability within Australia to conduct physical hydrodynamic experiments which simulate maritime operations within shallow water environments such as ports, harbours, rivers and coastal regions.

The facility was officially opened by the then Premier of Tasmania, Jim Bacon. The State Government provided approximately half of the $0.8 million required to get the facility started. Ten years on, research and consultancy projects conducted within the facility have generated in excess of $2.8 million gross income. This is significantly more than originally projected in the business plan developed when the facility was first proposed in 1999.

- The facility has also exceeded expectations with regard to the quantity and wide variety of projects undertaken. More than twenty different organisations and companies have commissioned model test programs within the facility. Some examples includeThe DSTO Maritime Platforms Division which has conducted many different research programs to investigate the motions, manoeuverability and damage stability of a wide variety of military surface platforms.
- Oceanlinx, an international ocean renewable-energy company, has conducted investigations into the operational performance of many different wave-energy converters.
- Several major port authorities have conducted studies into port design and operation, particularly regarding ship interactions in confined waters. A lot of this work also involves collaboration with AMC's shiphandling simulator.
- Research into the development of a novel method of generating continuous waves for man-made surfing facilities has involved the construction of a 10 m diameter scale model within the basin. Further experiments for this project are currently underway at the time of the tenth anniversary of the opening of the Model Test Basin.

The GasCat, a novel LNG floating production and storage facility being investigated in the AMC Model Test Basin for a collaborative project with Woodside and WA Energy Research Alliance in 2008 (Photo courtesy AMC)

A 4.2 m long scale model of a bulk carrier experiencing both wind and waves within the AMC Model Test Basin in 2007 (Photo courtesy AMC)



A 10 m diameter scale model of the Webber Wave Pool, including rotating arm, set up in the AMC Model Test Basin in 2010 (Photo courtesy AMC)

A significant percentage of the income generated by the AMC Model Test Basin (and Towing Tank) team has gone back into the facility by developing and/or purchasing new equipment, instrumentation and capabilities. For example, over the past two years a capability to undertake damage stability experiments to determine the transient effects during flooding of vessels with complex internal compartments has been successfully established. Several other new major items of equipment and/or instrumentation have been implemented, for example:

- Digital video motion capture and analysis system (Qualisys) — a donation from DSTO.
- Wind generator (including individual control of all 20 fans).
- Rotating arm (for towing models within a prescribed arc at speed).
- Enhanced control system for the winch system which tows models.
- Enhanced wave damping beaches.
- Numerous other items of instrumentation, including load cells, pressure transducers, wave probes and data acquisition equipment.

The facility is also regularly used to conduct practical laboratory sessions for undergraduate student each year. These include wave mechanics (for example, wave shoaling, reflection, diffraction and refraction), ship manoeuvring, seakeeping of ships and offshore structures and ship stability. In addition, approximately 45 undergraduate engineering students have used the facility to conduct experiments for their final-year research projects. The majority of these have been co-supervised by representatives from industry.

Jonathan Binns

A physical model of a shipping port. These experiments will quantify the hydrodynamic effect of a ship (centre foreground) as it passes several berthed vessels at a known speed. In such scenarios the bathymetry of the shipping channel is also accurately modeled (Photo courtesy AMC)

One Hundred Years of Destroyers in the RAN

John Jeremy

The following is a condensed version of the presentation given to the NSW Section on 30 March 2011. The full presentation will be repeated for the Victoria Section in Melbourne in August.

Over the next few years several important centenaries in the history of the Royal Australian Navy and Australia will be commemorated. Amongst the milestones in RAN history was the centenary of the commissioning of the first two destroyers for the new Australian Navy — HMAS *Parramatta* and HMAS *Yarra* were both commissioned in the UK on 10 September 1910 and they sailed for Australia just over a week later.

What is a destroyer? It is fairly widely known that the term derives from 'torpedo boat destroyer' — a small warship developed to meet the threat to the battle fleet of the small, fast torpedo boat. The ships soon became torpedo boats themselves — heavily armed with torpedos to defend the battleships and attack the enemy. This role continued for many years even as the TBDs developed into much more general-purpose warships. The torpedo boat submerged and became the submarine over 100 years ago and, during the First World War, countering them became a major task of the TBD. The qualification 'torpedo boat' was officially dropped by the Royal Navy in 1925 when the ships became simply 'destroyers'.

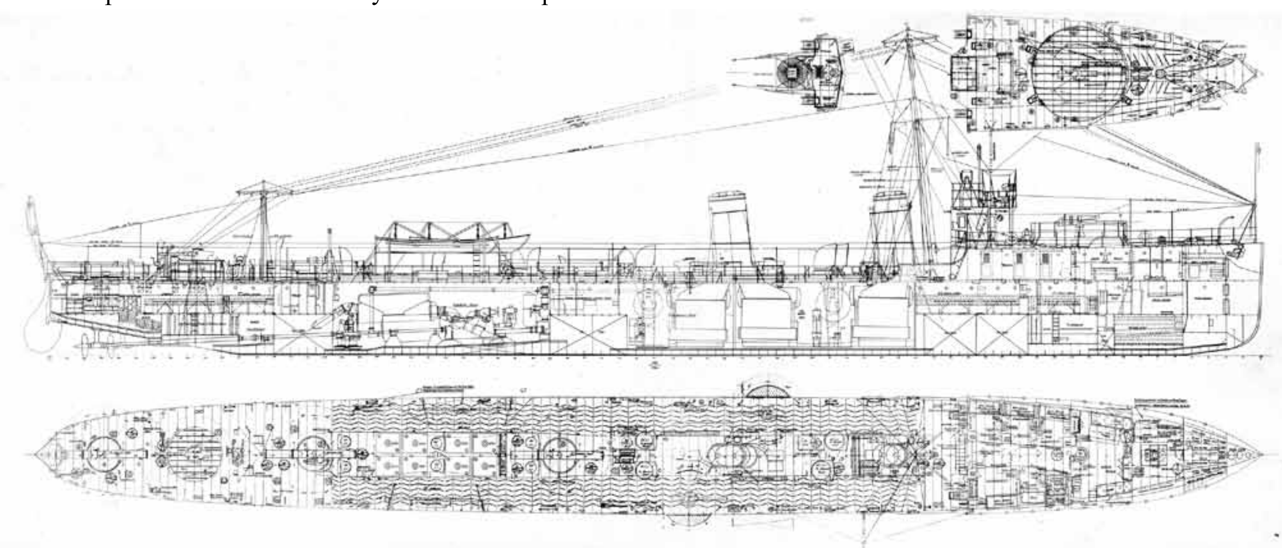
As specialised destroyer variants were developed during the Second World War they became frigates and, today, the traditional classifications have become blurred as the destroyer has taken on many of the traditional roles of the cruiser as well.

A nucleus of an Australian Navy had been formed in March 1901 when the naval forces of the States were transferred to the Commonwealth. Proposals for a more effective force including destroyers, torpedo boats and submarines were soon developed, but it was not until the Imperial Conference of 1909 that plans evolved for a proper and balanced naval force based around the concept of a Fleet Unit comprising at least one battle cruiser, three cruisers, six destroyers and three submarines.

As early as July 1907 the government had sought proposals from British shipbuilders for three destroyers of about 700 tons based on the British River-class design. It was a condition of the proposed contract that one of the ships should be prefabricated for assembly in Australia to provide Australian shipbuilders with experience in building modern warships. The successful tenderer was also required to accept a number of Australian tradesmen to be employed in their yard during the construction of the first ships. In March 1909 the Minister for Defence approved the acceptance of a tender from a consortium of Denny Bros and the Fairfield Shipbuilding Company. Two ships were to be built and completed in Britain with a further ship to be built in Britain but dismantled and shipped to Australia for reassembly.

Although similar to contemporary British destroyers, the ships were uniquely Australian. The displacement was about 700 tons (711 t) and the ships were 250 feet (75.76 m) long overall, 24 ft 6 inches (7.42 m) in beam with a draught of 9 feet (2.73 m). Built of galvanised steel, they were armed with one 4 inch (102 mm) gun, three 12-pounders (5.4 kg) and three 18-inch (457 mm) torpedo tubes. Oil fuelled, they were propelled by Parsons steam turbines with direct drive delivering about 11 000 SHP (8203 kW) for a speed of 26 kn. The complement was 66.

In April 1909 the NSW Government was invited to submit a proposal for the completion of the third ship, *Warrego*, at Cockatoo Island and in July a similar invitation was given to the Victorian Government. The Sydney yard clearly had the better capabilities and the selection of Cockatoo Dockyard was finally confirmed in January 1910. The construction of *Warrego* was completed in Scotland by mid-1910 and she was dismantled and shipped to Australia. Her keel was laid on one of the recently-completed slipways south of the Fitzroy Dock at Cockatoo Island on 1 December 1910 and she was launched on 4 April 1911. Construction took some six months longer than planned and she was completed on 1 June 1912. The experience had been valuable for the



The general arrangement of Australia's first destroyers
(J C Jeremy Collection)

dockyard and the project had not been without its difficulties. Later in 1913 Mr Cutler, speaking at the annual dinner of the new Commonwealth Naval Dockyard, recalled the challenges of the ten years he had been in charge. He said: 'In the case of *Warrego* it was almost as hard to reconstruct the hull as to build it in the first place'.

The Australian assembled destroyer *Warrego* was with her British-built sisters when the young Royal Australian Navy's Fleet Unit steamed through Sydney Heads on 4 October 1913 (RAN Historical Collection)

An order for three more destroyers and a light cruiser was placed with the NSW Government on 18 June 1912. The first two destroyers, *Derwent* and *Torrens*, were laid down in January 1913. After the outbreak of war, to expedite the completion of these ships, an order was placed with Dennys of Dumbarton for two ship's sets of boilers and arrangements were made for the boilers for the third ship, *Swan*, to be built at the Eveleigh Railway Workshops in Sydney. Cockatoo Dockyard assembled the steam turbines for all three ships — the first in a long line of steam turbines to be built on the island for ships of the RAN. The dockyard also built the ship's boats and many of the fittings need for the ships.

Derwent was launched on 19 December 1914, but her name was changed to *Huon* on 16 October 1915 to avoid possible confusion with a Royal Navy destroyer of the same name. The first fully-Australian-built destroyer, HMAS *Huon,* was commissioned on 14 December 1915 and she was finally completed on 2 February 1916. The second destroyer, *Torrens*, was completed on 3 July 1916 and the third ship, *Swan* was completed on 22 August 1916.

The six destroyers saw active service in local waters and the Mediterranean during World War I. They returned to Sydney in March 1919. *Huon* paid off into reserve, but the others continued in service until 1922. Apart from brief periods of use for reserve training, their service was over and in 1929 they were handed over to Cockatoo Dockyard for dismantling.

The development of destroyer design during the First World War was rapid and, by the early 1920s, the RAN's first destroyers, whilst still quite new ships, were out of date. Britain had an enormous number of destroyers at the end of the war, many of recent design, and in 1919 offered Australia as a gift a flotilla leader and five destroyers. The offer was accepted.

The leader was HMS *Anzac*, one of six ships of the Marksman class built under the emergency war programme. Completed on 24 April 1917, she was of 1660 tons (1690 t) standard displacement, 325 feet (98.48 m) long overall with a beam of 31 feet (9.39 m) and armed with four 4-inch (102 mm) guns, two 2-pounders (1 kg), one machine gun and four 21-inch (533 mm) torpedo tubes. She was propelled by Brown-Curtis steam turbines with two shafts delivering 36 000 SHP (26 845 kW) for 34 kn.

The first HMAS *Anzac*
(RAN Historical Collection)

The other ships were selected from the fifty-five Admiralty-designed S-class destroyers — most of which were completed in 1918–19. The handsome S class displaced 1075 tons (1095 t) standard and were 276 feet (83.64 m) long overall with a beam of 26 feet 9 inches (8.11 m). Also propelled by Brown-Curtis turbines they could achieve 36 kn with 27 000 SHP (20 134 kW) but their range was short at only 2000 n miles at 15 kn. The armament included three 4-inch (102 mm) guns and four 21-inch (533 mm) torpedo tubes.

Stalwart, *Success*, *Swordsman*, *Tasmania* and *Tattoo* were new ships when they were taken over by the RAN and commissioned, with *Anzac*, in January 1920. The flotilla reached Australia in April 1920. Their service was unspectacular and quite short. By 1930 they had all been laid up, apart from *Tattoo* which replaced *Anzac* as the only RAN destroyer in commission in 1931.

HMAS Success
(RAN Historical Collection)

The finest destroyers built for the Royal Navy during the First World War were the numerous V&W class, of which some 72 were completed. They proved to be tough and reliable ships and formed the backbone of the Royal Navy's destroyer flotillas during the 1920s. So numerous were they that destroyer development was slow to pick up after the war and, ten year later, only two new ships, prototypes, had been completed.

As the Depression eased in the early 1930s, new ships for the RAN became possible and, in 1933 following a request from the Australian Naval Board, the Admiralty agreed to make available for the RAN some destroyers from amongst those which were soon planned for reserve as new Royal Navy ships joined the fleet. The five ships chosen were to become the famous 'Scrap Iron Flotilla' of the Second World War. Transferred, officially on loan, were the flotilla leader *Stuart* and the V&Ws *Vampire*, *Vendetta*, *Voyager* and *Waterhen*. Commissioned into the RAN after a short refit, the ships arrived in Sydney just before Christmas 1933.

HMAS *Stuart* was one of eight Scott-class destroyer leaders and was completed in December 1918. These ships were large, fast and seaworthy and set the pattern for the development of British destroyers until the Second World War. *Stuart* displaced 1530 tons (1558 t) standard and was 332 feet 6 inches (100.75 m) long overall with a beam of 31 feet 9 inches (9.62 m). Her armament included five 4.7-inch (120 mm) guns, one 3-inch (76 mm) gun and six 21-inch (533 mm) torpedo tubes. Her Brown-Curtis geared turbines could develop 40 000 SHP (29 828 kW) for a maximum speed 36.5 kn. Her range was a much more respectable 5000 n miles at 15 kn.

Stuart survived the war. After her famous service with the flotilla in the Mediterranean, she was converted to an escort destroyer in 1943 and, in 1944, into a fast transport. She was paid off in 1946 and was sold for scrap in 1947.

HMAS *Stuart*
(RAN Historical Collection)

The V&Ws were slightly different from each other, coming from different production orders. Generally they were of about 1100 tons (1120 t) standard displacement. The overall length was 312 feet (94.55 m) with a beam of 29 feet 6 inches (8.94 m). Armament included four 4-inch (102 mm) guns and six 21-inch (533 mm) torpedo tubes. They had Brown-Curtis or Parsons turbines of 27 000 SHP (20 134 kW) for 34 kn with a range of 3500 n miles at 15 kn. *Vampire*, *Voyager* and *Waterhen* were lost during the war. *Vendetta* survived, and was paid off in Sydney on 27 November 1945.

HMAS *Waterhen*
(RAN Historical Collection)

By the time the ships of the future Scrap-iron Flotilla had arrived in Sydney in 1933, the RAN had begun the slow process of rearmament in the lead-up to the Second World War. In 1938 the navy also sought government approval for the construction of four modern destroyers to supplement the older ships with greatly improved capability for surface and underwater warfare. In the event, the RAN received approval for only two.

On 22 December 1938 Cockatoo Dockyard was asked to submit a tender for two Tribal-class destroyers. The tender was accepted on 6 October 1939 and the first ship was laid down on 15 November 1939.

The design of the Tribals departed from the pattern set by the 1920s prototypes *Amazon* and *Ambuscade*. Designed by Mr A. P. Cole, who had taken over the destroyer design section at the Admiralty in 1934, the Tribal-class ships were to be the last transversely-framed destroyers built for the Royal Navy. They mounted eight 4.7-inch (120 mm) guns in twin mountings, with four 2-pounder (1 kg) pom poms in a quadruple mounting, a number of 0.5-inch (12 mm) machine guns, one set of quadruple torpedo tubes and up to 30 depth charges. The new 4.7-inch (120 mm) mounting was the first twin and first power mounting designed for British destroyers. It was hydraulically powered and weighed 25.5 tons (25.96 t). The maximum rate of fire was 12 rounds per minute for each gun. The guns were expected to provide some anti-aircraft capability, but with a maximum elevation of only 40 degrees, they were only effective against targets at long range. The Tribal-class ships were also the first British destroyers to be fitted with an anti-aircraft director. Experience soon proved the need for better anti-aircraft armament and the Australian ships mounted one 4-inch (102 mm) twin mounting in place of X-mounting from the outset. Other changes were made to the Australian ships including additional strengthening of the hull.

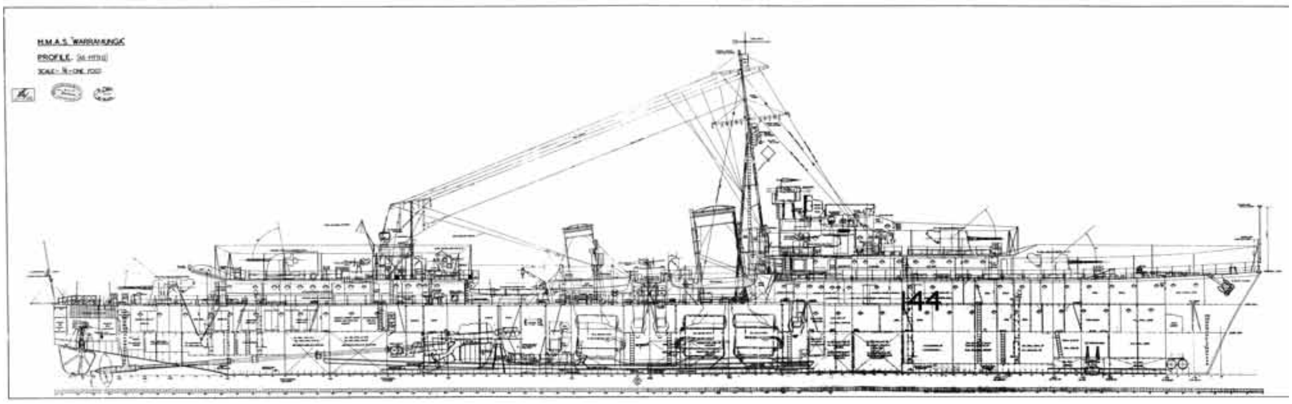
The Tribal-class destroyers had an overall length of 377 feet (114.24 m) and a beam of 36 feet 6 inches (11.06 m). The standard displacement was 1854 tons (1888 t). They were propelled by Parsons turbines supplied with steam by three Admiralty three-drum boilers. The designed maximum power was 44 000 SHP (32 811 kW) for a speed of 36 kn. The range was 5700 n miles at 20 kn.

Progress with the first of the Australian ships was rapid. She was named *Arunta* by Lady Gowrie, wife of the Governor General, Lord Gowrie, on 30 November 1940 and she was completed on 30 April 1942.

HMAS *Arunta* on trials
(RAN Historical Collection)

The second ship, *Warramunga*, was laid down on 10 February 1940. Her construction was delayed by rapidly changing work priorities in the dockyard as the war developed, but she was launched on 7 February 1942 and completed on 22 December that year.

The machinery in *Arunta* and *Warramunga* was the most powerful yet built at Cockatoo Island, and the ships were the fastest ever built in the yard. *Warramunga* achieved a maximum speed of 36.65 kn at 46 380 SHP (34 586 kW)



HMAS *Warramunga* as completed in 1942
(National Archives of Australia:M3018, 36)

during her full-power trial on 4 December 1942, although at a very low displacement.

In May 1940 work began on a third ship, *Kurnai.* Progress with this ship was slow, with effort directed to higher-priority work. *Kurnai* was re-named *Bataan* and launched by Mrs Douglas Macarthur on 15 January 1944. Many wartime improvements were included in HMAS *Bataan* during construction and she was the most up-to-date of the three ships when she was completed 26 June 1945.

Whilst the Tribals were an advanced design in 1938, by 1945 they had fallen well behind — in habitability, anti-aircraft and, particularly, anti-submarine armament. The extent of modernisation possible in a Tribal hull was limited — nevertheless a modernisation of the anti-submarine capability of the ships was approved to help meet the need for ships capable of dealing with modern Soviet submarines.

Arunta was modernised at Cockatoo Island between 1950 and 1952. She did not serve long — she began a final refit in Sydney in June 1956 and was paid off later that year. *Warramunga* was modernised at Garden Island in Sydney between September 1952 and October 1954. She finally paid off in November 1959. *Bataan* served with distinction in Korea but was paid off on 17 June 1954. Her planned modernisation was subsequently cancelled and she was sold for scrap in 1958.

HMAS *Bataan*, the third Australian-built Tribal-class destroyer, completed in 1945
(RAN Historical Collection)

By the standards of the late 1930s the Tribal-class destroyers were large and expensive — too expensive to be repeated in large numbers. A modified and slightly-smaller design was developed for subsequent classes. The new design also introduced longitudinal framing for hull construction, along with welding where possible — both measures helped to reduce weight and increase strength. The armament was reduced and two, rather than three, boilers were fitted. Of these later ships, five destroyers of the N class were to serve in the RAN. *Napier*, *Nepal*, *Nestor*, *Nizam* and *Norman* remained the property of Britain but were commissioned as RAN ships between November 1940 and May 1942. The N-class destroyers served with distinction and were returned to the RN after the war. *Nestor* was lost in 1942 and is the only major RAN ship never to have come to Australia.

In late 1939 the Admiralty developed another design for twelve flotillas of war emergency destroyers. The design was based on the J-class hull and machinery with some hydrodynamic improvements (e.g. a transom stern) and an armament based on that of a pre-Tribal class destroyer, i.e. four 4.7-inch (120 mm) guns and eight torpedo tubes. The Q-class destroyers were the first of these emergency flotillas. *Quiberon* and *Quickmatch* were commissioned as HMA ships on completion in 1942. *Quadrant*, *Quality* and *Queenborough* served in the RN until the end of hostilities when they were transferred to the RAN on loan. In the post-war navy these destroyers had little value except as fast hulls and, when Australia proposed their conversion to Type 15 frigates, they were all given to Australia outright. The conversion of four of these ships and the construction of modern frigates to meet the threat of the high-speed submarine is another story.

HMAS *Nestor*, the only major RAN warship never to have come to Australia
(RAN Historical Collection)

HMAS *Quality* as completed in 1942 for the Royal Navy. Transferred to the RAN in October 1945, she was in commission for only seven weeks. The only one of the five Q-class destriyers not converted to Type 15 frigates, she was scrapped in 1958
(RAN Historical Collection)

Planning for a post-war navy (and the shipbuilding industry to support it) began well before the end of the war. In April 1944 the War Cabinet had approved the construction of a cruiser at Cockatoo Island and a destroyer at the Williamstown Naval Dockyard. In September the decision to build the cruiser was changed to a Battle-class destroyer and, on 7 October 1944, orders were placed for the two Battle-class destroyers — one to be built at Cockatoo Island and one at Williamstown.

In April the following year the Naval Board submitted further proposals to the government for post-war naval construction, including four more destroyers to be built at Cockatoo and Williamstown as part of a programme to build twelve destroyers over ten years. The recommendations were deferred pending further consideration of overall post-war defence requirements.

The navy sought to have this decision reconsidered in January 1946 so that a steady shipbuilding programme could be maintained in the dockyards to achieve the government's aim of continuity of employment in naval shipbuilding. The RAN asked for approval for four ships of the same class to enable economic production and proposed the latest British design, the Daring class. Despite misgivings within the government, the proposal was approved on 26 March 1946.

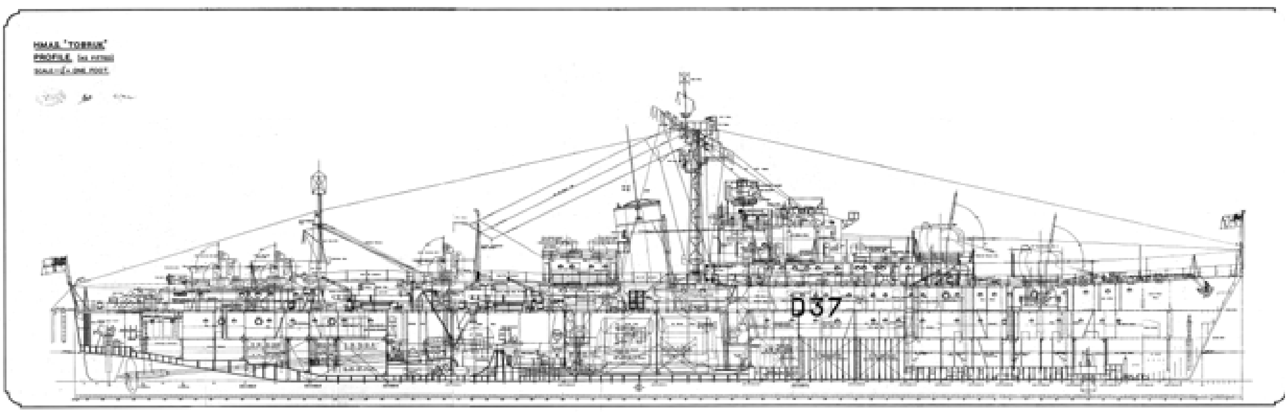
The decisions to build these six destroyers (two Battle class and four Daring class) marked the start of a continuous programme of warship construction at Cockatoo Dockyard and Williamstown which was to last into the 1960s. For both these programmes, Cockatoo Dockyard was designated as the lead yard and Cockatoo built the turbines, boilers and many other fittings like lockers, bunks, furniture, water-tight doors, etc. for all ships.

The Royal Navy's need for destroyers with better capability against aircraft prompted the design of a new class, which became the Battle class, for the 1942 construction programme. The standard 4.7-inch (120 mm) gun was not an effective weapon against aircraft and a new twin mounting using a 4.5-inch (114 mm) gun, originally developed as secondary armament for capital ships, was incorporated in a new mounting which went to sea for trials in 1943. This Mk IV mounting was a compromise until an entirely new mounting, the Mk VI, could be developed. Design of the Mk VI began in September 1942 with a specified rate of fire of 18 rounds per minute and maximum elevation of 80 degrees. The new mounting was hydraulically powered and weighed about 35 tons (35.64 t) — in due course it was to become the standard mounting for British destroyers and frigates for many years. The last five Battle-class destroyers of the 1943 programme for the Royal Navy were intended to carry two of the new mountings. These ships were also to be fitted with a higher bridge because of the bulk of the new mounting and the beam was increased from 40 feet 6 inches (12.27 m) to 41 feet (12.42 m) for extra stability. None of these ships reached completion, although *Talavera* and *Trincomalee* were completed by John Brown and Co. to launching stage — the latter launched after cancellation to clear the slipway.

The two RAN Battle-class destroyers were built to this modified design and working drawings were obtained by the RAN from Browns, together with as many detailed drawings of parts and fittings as might be available as well as order sheets for the materials for *Talavera*, the first of class. The Mk VI mountings for the Cockatoo-built destroyer were imported — those for the second ship were built in Australia at the Government Ordnance Factory in Bendigo, Victoria. The Australian Battle-class incorporated many long-overdue improvements to accommodation with enlarged messes, refrigerators and cold-water drinking units, a laundry and a larger sickbay. Aluminium was used for the foremast and internal fittings, like ventilation trunking and furniture, to reduce top weight and compensate for the Mk VI mountings and the higher bridge.

The Australian ships displaced 3359 tons (3420 t) at full load and were 379 feet 6 inches (115 m) long overall. They were powered by Parsons geared turbines delivering 50 000 SHP (37 285 kW) for a top speed of 32 kn. In addition to the four 4.5-inch (114 mm) guns they mounted twelve 40-mm Bofors anti-aircraft guns, six of which were in Mk II STAAG (Stabilised Tachymetric Anti-Aircraft Gun) twin mountings. The ships were also fitted with a Squid anti-submarine mortar and ten 21-inch (533 mm) torpedo tubes.

HMAS *Anzac* as a training ship
(RAN Historical Collection)



HMAS Tobruk as completed in 1950
(National Archives of Australia:M2835, 74)

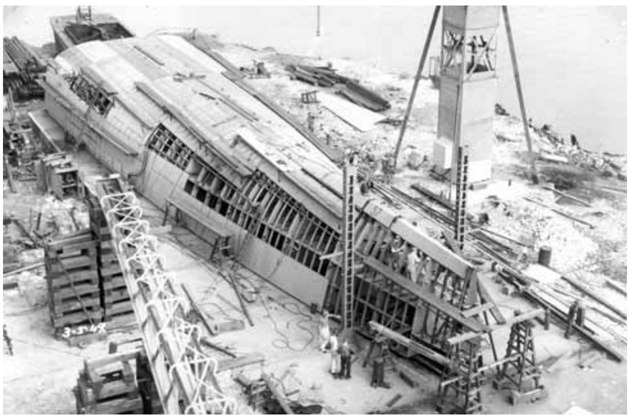
HMAS *Tobruk* was completed on 17 May 1950 and HMAS *Anzac* in March 1951. They were the last riveted destroyers built for the RAN and their life as front-line destroyers was quite short. *Tobruk* was paid off on 29 October 1960 and was sold for scrap in 1972. *Anzac* became a training ship in 1963 and continued in this role until 1974. She was scrapped the following year.

The orders for the four Daring-class destroyers (to be named *Voyager*, *Vampire*, *Vendetta* and *Waterhen*) were placed with Cockatoo and Williamstown Dockyards on 3 December 1946. A separate order was placed with Cockatoo Dockyard for the main machinery, parts and fittings for all four ships, and the gun mountings and torpedo tubes were ordered from the Ordnance Factory in Bendigo.

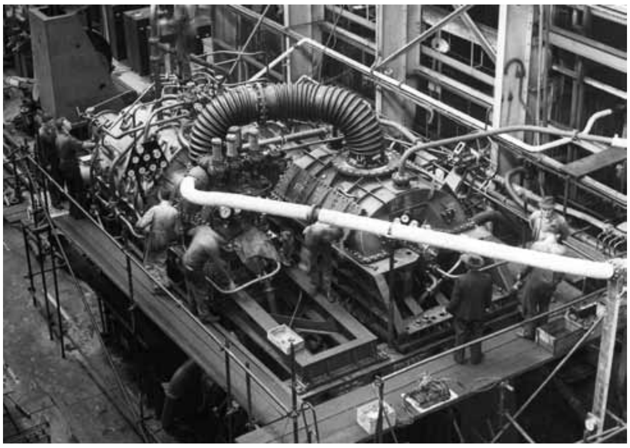
Approval for the order was very conditional — the principal aim was to ensure maintenance of naval shipbuilding capability, and Treasury maintained strict control on the rate of spending. These conditions had a considerable influence on the rate of production, as did delays in the supply of drawings and materials from Britain. The build programme was protracted, and the fourth ship, *Waterhen*, was cancelled in March 1953 to save money.

The design of the Daring class arose from the need for large fleet destroyers, particularly to protect carrier battle groups in the Pacific. They were the last of a long line of traditional British destroyer designs. Some of the British and all of the Australian ships were fully welded, AC power was introduced and, to meet displacement restrictions placed on the final design, extensive use was made of aluminium throughout the ships and braided cables were used instead of lead-sheathed cables.

The Australian ships were further modified with improved accommodation including bunks for all the crew, extensive insulation, airconditioning and cafeteria messing. The Australian ships were armed with three twin Mk VI 4.5-inch (114 mm) mountings, 40 mm guns, five torpedo tubes and a Mk 10 anti-submarine mortar. The machinery was arranged in a unitised layout and was, for a British design, advanced — operating at higher temperatures and pressures than earlier Second World War designs. The English Electric turbines were the most powerful steam turbines ever built in Australia at 27 000 SHP (20 134 kW) per set. Designed maximum speed was around 32 kn.



The lower forebody units for HMAS *Voyager* under construction in May 1949
(J C Jeremy Collection)



One set of steam turbines for HMAS *Voyager* under test in September 1953
(J C Jeremy Collection)

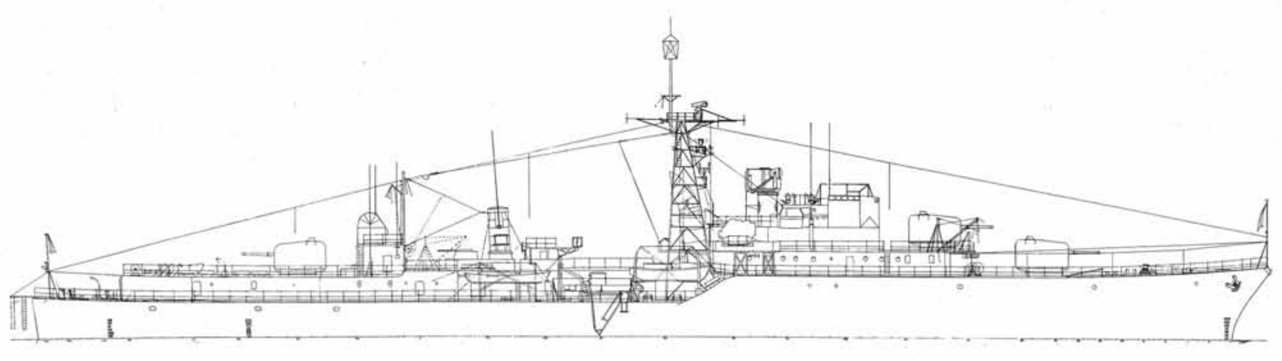
The Darings were the first fully-welded warships built in Australia and introduced large-scale prefabrication to the shipyards. Improvements were made at both Cockatoo and Williamstown for the purpose.

The first ship to be laid down was *Vendetta* at Williamstown on 4 July 1949. *Voyager* followed at Cockatoo Island on 10 October 1949. Construction was slow — *Voyager* was launched on 1 March 1952 but *Vendetta* did not enter the water until 3 May 1954. *Voyager* was completed in February 1957, *Vendetta* in November 1958 and the last ship, *Vampire*, in June 1959.

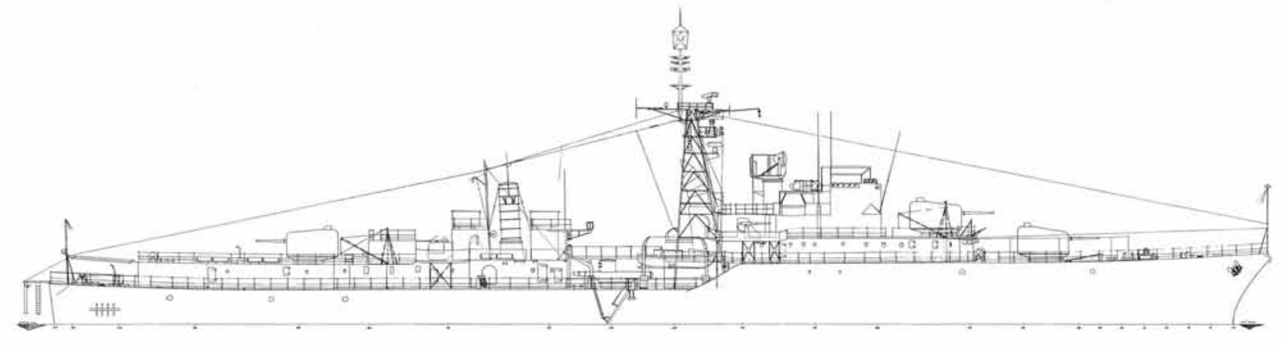
The last Daring-class destroyer to be completed, HMAS *Vampire* at speed shortly after hand over to the RAN in June 1959
(J C Jeremy Collection)

The Darings entered service at a time of great change. The missile age was beginning and the design of the modern destroyer was changing. Nevertheless, whilst *Voyager* was lost after a short life in 1964, they served the RAN well. The remaining two ships were modernised in the early 1970s but emerged still as gun ships. In many ways the modernised Daring-class destroyers became the ships they should have been when they were first commissioned.

In 1959 the government decided to disband the Fleet Air Arm by 1963, a decision which would leave the fleet without air defence, apart from the obsolescent close-in weapons mounted on the Australian destroyers. Surface-to-air guided weapons were under development and the ships to carry them were being built in Britain and the United States. In 1960 the RAN began investigating options for new ships from either source. The contenders were the British County



The outboard profile of HMAS *Voyager* as completed
(Adapted from Sketch of Rig National Archives of Australia:M2849, 40)



The outboard profile of HMAS Vampire as completed. HMAS *Vendetta* was similar
(Adapted from Sketch of Rig National Archives of Australia:M2843, 40)

class or the US Charles F. Adams or Brooke classes.

The County-class destroyer was a large, handsome ship designed around the Sea Slug missile which had been under development since 1945. The missile stowage and handling spaces occupied a large proportion of the ship, but they had the advantage of familiar technology, flagship capability, the ability to carry a helicopter and a combined steam and gas-turbine power plant.

Of the American contenders, the Charles F. Adams class design was the most developed and the capable of those on offer. The design and production of these ships had a high priority in the US and they had been ordered before the Tartar missile had even been test fired. Powered by an advanced steam turbine plant of 70 000 SHP (52 199 kW) the 4525 ton (4607 t) full-load displacement ships were 437 feet (132.42 m) long overall, 47 feet (14.24 m) in beam and, in addition to Tartar, were fitted with two 5-inch (127 mm) Mk 42 automatic guns, modern radar and fire control systems, the ASROC anti-submarine missile and close-range torpedoes.

A switch to the United States for naval ships was a major change to contemplate, but the weapons of the American

HMAS *Vendetta* and HMAS *Vampire* (background) after their modernisation at Williamstown Dockyard in the early 1970s
(RAN Historical Collection)

The County-class guided missile destroyer HMS *Devonshire*
(Photo John Jeremy)

The Australian anti-submarine guided missile Ikara being launched from HMAS *Perth*
(RAN Historical Collection)

DDG were clearly superior to the British ships and the first US ships would enter service earlier. The Admiralty were asked if they could modify the County-class design to incorporate the US weapons, but declined as the work would interfere with UK programs. Finally the US ships were cheaper and the US government also offered an interest-free loan for their purchase. The decision was clear and the selection of the Charles F. Adams design for the RAN was announced on 29 June 1961.

A significant modification to the RAN ships was the installation of the Australian-designed Ikara anti-submarine guided missile in place of the inferior ASROC. A third ship was approved on 22 January 1963 and the RAN was on the way towards achieving the goal of having half its escorts fitted with surface-to-air guided weapons. The figure would be achieved with the planned fitting of Tartar to *Voyager* but her loss raised the option of a fourth DDG. In the event, the RAN acquired *Duchess* from the RN as an interim replacement and two more frigates, *Swan* and *Torrens*, were ordered instead.

HMAS *Perth* was completed in July 1965 and HMAS *Hobart* was commissioned in December the same year. The third ship, HMAS *Brisbane*, was commissioned in December 1967. They were an outstanding success in service and a great technological step forward for the RAN. The ships proved capable of useful modernisation and, whilst the Tartar missile was not exactly brilliant, the more-effective Standard missile which succeeded it could be accommodated in the same magazine and launcher. Their success is demonstrated by their long lives of 34 to 35 years.

The RAN's experience during the period of Malaysian/Indonesian confrontation in 1963–65 suggested that there was a need was for a number of fast simply-armed ships, smaller than the conventional destroyer, which could back up patrol craft for anti-infiltration and patrol work. With the traditional links to the Royal Navy, discussions were held with the RN to see if it might be possible to jointly develop such a ship for both navies. Unfortunately there were too few common requirements to make that practicable, and the RAN developed the design independently.

HMAS *Hobart*, one of the three US-built guided missile destroyers which proved to be outstandingly successful in RAN service
(RAN Historical Collection)

As work continued throughout 1967 and 1968, it became clear that the new ship, known as a light destroyer (DDL) would be needed to replace, rather than supplement, the navy's existing destroyers as they reached the end of their lives and the concept changed from up to twenty ships of about 1500 tons (1527 t) to six ships of around 2100 tons (2138 t). Based on a common hull and machinery, the DDLs were intended to have several versions with slightly different armament for different roles.

A contract for the preliminary design was placed with Y-ARD (Australia) Limited in early 1970. By this time the ship had already grown from the 2100 tons of the previous year, and it grew further during the preliminary design phase. By 1972 the ship had reached 4200 tons (4276 t) with a length of 425 feet (128.78 m) and a beam of 48 feet (14.55 m). It was a highly-capable general-purpose ship armed with one modern 5-inch (127 mm) gun, the US Tartar surface-to-air missile and two helicopters. The increased cost meant that the number of ships had fallen from six to three and all were planned to be built in Williamstown. An extensive modernisation of that yard was begun for the purpose.

By mid 1973 some naval staff were expressing doubts about the wisdom of proceeding with the DDL, particularly as the proposed weapons fit was the almost same as that of the US Navy's guided missile frigate (FFG) then planned for construction in large numbers (the main difference was the gun). The Naval Board reluctantly accepted the naval staff advice that the FFG would be better value and the government needed little persuading to cancel the project in August 1973. Following a further review of available options, the FFG was selected for the RAN and an order was placed in the United States for the first two ships, *Adelaide* and *Canberra*, in August 1974.

In January 1971 the US Navy had begun a program to build 50 ships then known as Patrol Frigates (PF) — to join the fleet between 1977 and 1983. They were essentially escort ships, built to protect navy replenishment and amphibious ships, military and merchant cargo ships and tankers. Their primary roles were to detect and attack submarines, to destroy anti-ship missiles and aircraft, and to destroy enemy surface ships.

The Australian light destroyer (DDL), cancelled in 1973
(RAN image)

The large number of ships needed had a major influence on the design. Many compromises were made to reduce cost with the aim that the ships should not cost more than $US50 million each in 1973 dollars. A single screw, no ASROC, a small 76 mm gun and gas turbines for propulsion all helped to keep the crew down — to a planned 176. To reduce production cost, the details of the design were simplified and standardised across all builders. For the first time, the lead yard, Bath Iron Works, was a participant in the detailed design process to ensure that the ships were designed for production. Whilst lacking ASROC, the ships were able to carry two modern anti-submarine helicopters, which was a great advance over previous escort designs. The size of the ship was similar to the DDL — displacement about 3600 tons (3665 t), 445 feet (134.85 m) long and 45 feet (13.64 m) in beam — and the installed power was 40 000 SHP (29 828 kW) for a maximum speed of about 28 kn.

Despite what many regarded as significant deficiencies, the patrol frigate, reclassified as guided missile frigate (FFG) was a considerable success. Seventy one ships were built in two variants — short hull and long hull — rivalling the numbers of the British Type 12/Leander design. Fifty one were built for the USN, six for Spain and 8 for Taiwan. The RAN acquired six — four built in the US (*Adelaide*, *Canberra*, *Sydney* and *Darwin*) and two in Australia, at Williamstown (*Melbourne* and *Newcastle*).

Following the decommissioning of the Australian DDGs, the FFGs have taken over the role as the navy's destroyers — providing the fleet's main air-defence capability. However the FFG was never regarded by the US as a front line warship. In US service, many have been relegated to

One of the RAN's 'stand-in' destroyers, the guided missile frigate HMAS *Sydney*
(RAN photograph)

reserve training duties or sold to friendly nations. The Mk 13 GMLS has been removed from US ships as the Standard SM 1 missile has passed its use-by date.

The continued operation of the FFGs has been very important for the RAN, and a major upgrade has been completed on four of the RAN ships. The changes include fitting for the Standard SM 2 missile, a Mk 41 VLS with eight cells for the evolved Sea Sparrow missile, updated radar and sonar, and an Australian-developed combat system upgrade.

So where are we after 100 years of Australian destroyers? If we ignore the blurred difference between destroyers and frigates like the Anzac-class, Australia now has only four surrogate destroyers. In due course the Anzacs will be replaced by a larger and more capable ship and perhaps it is time to forget any distinction between destroyers and frigates as their roles converge.

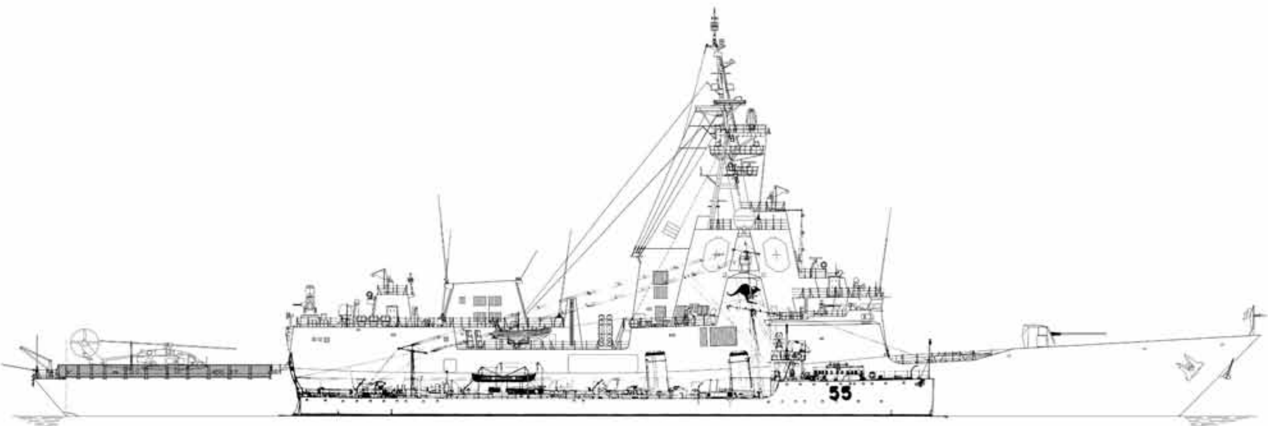
One of the most challenging Defence projects in Australia at present is the construction of the three Hobart-class air-warfare destroyers being built in Adelaide which are due to enter service between the end of 2014 and late 2016. The capability of these ships will be vastly superior to anything the RAN has had so far and, whilst they are called destroyers, they have many characteristics we might associate with a cruiser. They are quite large ships, about 6300 t displacement at full load, 146.7 m long overall with a beam of 18.6 m. They will be propelled by a combined diesel and gas turbine power plant with twin screws for a speed of about 28 kn. Fitted with the Aegis combat system, they will be armed with a fully-automatic 5-inch (127 mm) gun capable of firing extended-range ammunition, SM 2 and ESSM surface-to-air missiles (and capable of firing SM6 missiles), Harpoon missiles, MU90 torpedoes, and carry a helicopter. A Phalanx CIWS will be fitted. The complement will be about 180, although accommodation will be provided for 234.

Arguably, the Hobart-class ships will be the most powerful warships ever to have served in the Royal Australian Navy.

Australian destroyers have changed a great deal in the last century. What will the ships of 2110 look like? We can no more predict that than the designers of the first HMAS *Parramatta* could have predicted the next HMAS *Hobart*.

References

Many sources were consulted for the preparation of this article. In particular the author acknowledges that parts have been drawn from Jeremy, J., *The Island Shipyard: Shipbuilding at Cockatoo Island 1870 to 1987*, prepared for the Sydney Harbour Federation Trust, 2006.



The first Australian destroyer HMAS *Parramatta* (1910) alongside the future air-warfare destroyer HMAS *Hobart* (2014)
(AWD profile courtesy Department of Defence)

MORE SECTION NEWS

ACT

On 28 February 2011 Richard Dunworth, the Stability Technology Manager within the Directorate of Navy Platform Systems of the Department of Defence provided a presentation on *Using Potential Energy for Static Stability Analysis*. This presentation was originally given at the Pacific 2010 International Maritime Conference in January 2010 but was repeated for ACT section members who had not had an opportunity to attend the conference. Some years ago, Richard had been involved in the analysis of the intact and damaged stability of a number of concrete gravity structures. These structures, either square or rectangular in plan, were found to require stability analysis in multiple axes and the technique of potential energy analysis was developed to perform omni-directional analyses. The presentation demonstrated the application of the method to the analysis of landing craft stability, including the effects of inundation over the bulwark into the cargo well. In a simulation of a flooding event due to damage, a large number of potential energy analyses at closely-spaced time intervals, with progressive flooding, were assembled to demonstrate an example of a diagonal capsize over the stern quarter.

The annual general meeting of the ACT Section was held on 18 March 2011. John Colquhoun provided the Chairman's report for the past year and Tim Lyon reviewed section finances. Proposals for technical meetings for 2011 were also discussed. John Colquhoun and Kerry Johnson, whilst remaining on the committee, stood down from their respective positions as Chairman and Secretary, and Martin Grimm and Richard Milne were elected to these positions. Kerry will assist the Secretary when necessary. Peter Hayes and Tim Lyon remain as Vice Chairman and Treasurer respectively. The other ongoing committee members were John Lord, Bruce McNeice and Ian Laverock (who is also on Division Council). A graduate representative will also be sought to join the committee. A schedule of technical meetings will be developed at the next committee meeting.

Martin Grimm

SUBMARINES IN AUSTRALIA'S FUTURE MARITIME STRATEGY

The following is an edited version of a speech given by Rear Admiral James Goldrick, AM, CSC, RAN, on 11 November at the Submarine Institute of Australia Conference in Fremantle, Western Australia in November 2010 [1].

My intent is to outline some key aspects of the role of submarines within Australia's future maritime strategy. I will explain how submarine capabilities will be significant to every element and stage of the implementation of that strategy. Let me add three riders. First, I do not intend to focus on detailed scenarios, but on concepts. Second, my discussion, so far as it relates to technology, will focus on what is available or nearly here. This is because it is the ability to exploit technology that provides capability and, however 'pure' the strategic concepts, their execution is defined by the extent and limits of the capability available. Third, I intend to focus on the warfighting roles of military forces in discussing submarines and national strategy. If we think of the span of maritime tasks as encompassing diplomatic, constabulary and military roles [2], it is clear that submarines find most of their work — though not all — in the military and higher-stakes diplomatic aspects.

The 2009 Defence White Paper

The 2009 Defence White Paper, *Defending Australia in the Asia Pacific Century: Force 2030* [3], lays down a clear requirement for the Australian Defence Force (ADF) to 'control our air and sea approaches against credible adversaries ... to the extent required to safeguard our territory, critical sea lanes, population and infrastructure'. This strategy does not entail a purely defensive or reactive approach. If necessary, Australia intends to conduct proactive combat operations against an adversary's military bases, staging areas and forces in transit. Our operations will be conducted to achieve as precise an application of force as possible in ways that the adversary is not expecting.

This is not a strategy of denial, but one of control. Increasing recognition of the importance of sea control has been a feature of the progressive development of Australian strategic thought and policy over the last decade. Of particular note, the White Paper specifically mentions not only territory but 'critical sea lanes', in which Australia has an interest. This interest was very recently reaffirmed by the Minister for Defence at the ASEAN-Plus meeting. The White Paper deliberately does not prescribe exact boundaries of action but, declares that operations will be carried as far from Australia as possible [3].

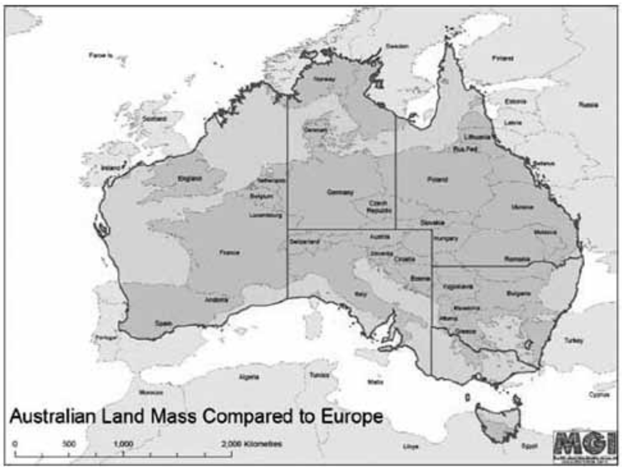
The White Paper lays out other aspects of our Defence strategy which will depend significantly upon our maritime capabilities, particularly at the higher level. These include the ability 'to contribute to military contingencies in the Asia-Pacific region, including ... assisting our Southeast Asian partners to meet external challenges, and to meeting our alliance obligations to the United States'. East Asia lives by seaborne trade, its population resides by or near the sea, there is increasing dependence upon offshore resources and our dependence upon the quality of the maritime environment remains critical. Thus, it is highly likely that calls for Australian involvement in a contingency would have a significant, if not a predominantly maritime, element. Many of the requirements of such contingencies in terms of naval operations could well be similar, whether the situation involves the defence of Australia or our wider interests.

The following discussion provides an over-view of those requirements without attempting to break them down into a 'national' or a 'coalition' situation. That said, it is appropriate to highlight the reality of Australia's strategic geography, summed up by Geoffrey Blainey's phrase 'the tyranny of distance'. Whether the military problem is within the immediate vicinity or further afield, **any** Australian military capabilities must possess substantial range and endurance to accomplish their tasking. Dealing with this reality is one of the central challenges we face in determining the form and size of the future submarine, just as it is for our surface and air assets. It is not something which is well understood by all in the strategic studies community or the media. Indeed, it is arguable that one of the key problems with Australian strategic thought is not so much that it has often been 'continental' rather than 'maritime', but that it has been unconsciously founded in northwest European ideas of distance with consequential assumptions about strategic and operational reach and what is needed to achieve them.

Submarines and the Network

What will be the submarine's place in the implementation of the declared strategy? It is important to dispel one popular misunderstanding about the nature of submarine warfare — a misunderstanding relating as much to submarine history as it does to their present and future. Submarines have seldom been 'independent' in action. Certainly, in terms of tactical engagements, this has often been the case. But submarines in reality have **always** been elements of networked forces and able to exploit their full potential **only** through their access to the knowledge network. Because of their nature, submarines benefit most from information which can be provided without the need to endanger their covert situation. This is particularly true for conventional submarines because of their more limited ability than nuclear-powered units to reposition themselves to exploit opportunities. The better the picture that a submarine possesses, the more likely it is that it will be in the right place at the right time.

The 'network' underlay both the Allied and the Axis submarine campaigns of World War II and it underlay the long and still largely-unknown undersea campaign of the Cold War. The network underlies, and will become even more critical to the execution of, any operations which the ADF may undertake in the future. Submarines are, of course, also key contributors to the network through their own capacity to gather information, but providing such information, even with access to the most sophisticated of low-probability-of-interception communication systems,



The Tyranny of Distance

also carries certain risks of detection. In many circumstances, submarines work best when they can draw quietly from a comprehensive surveillance, reconnaissance and intelligence picture which is externally provided.

Submarines and the Maritime Campaign

Submarines will have a vital contribution to make through all the elements of the maritime campaign, and here numbers do count. Whatever the contingency, it is clear that there will be demands from many directions.

As a situation develops, submarines will not only be able to act as intelligence gatherers, but also as potential signals of national resolve; signals which have the advantage of being ambiguous, which can imply a high degree of determination, but which do not irrevocably commit a government to the use of force. Both these missions place a premium on range and, particularly, endurance. The latter is not simply a matter of fuel capacity, but one which involves a whole range of other factors, from equipment sustainability through to individual and collective human stamina. Such missions also benefit significantly from the greater unit availability possible in a large force, because the known presence of one submarine in a particular area does not mean that other localities are necessarily safe for the potential adversary.

It is worth noting that submarines are more valuable as components of a balanced force. Their ability to complicate an adversary's problem is all the greater when there are other complicators – such as airborne and surface assets. The cumulative effect of complication may either confine or completely eliminate an adversary's options.

Submarines and Sea Denial

Submarines can thus contribute to the achievement of sea denial — preventing the adversary from using the sea for their own purposes — particularly if the opposition's undersea warfare capabilities are limited. If direct action is required, then submarines are potential minelayers, insertion platforms for special forces, or land-attack missile firers — and a ship at a wharf or aircraft on a runway can be targeted in the same way as buildings and permanent infrastructure. If the enemy does sail, then the submarine can deploy torpedoes or anti-ship missiles. The more options that are available to the boat, the more effective it can be in closing off options to the enemy — a strong argument for a significant weapons capacity.

Submarines and Sea Control

In our strategic concept, denial will have a role but, generally, one that is a subset of sea control. And again, submarines have other parts to play in achieving the degree of control which will be required to use the sea for our own purposes. If necessary, they can provide cover for other forces by surveilling and patrolling focal areas. Their ability to remain covert for extended periods is particularly useful in these circumstances, as is their ability to develop a high level of understanding and awareness of what is taking place in the surrounding water mass. In sufficient numbers and operating in coordination, submarines may provide similar coverage for relatively large sea areas, acting to cover the flank of other operations.

Submarines also have much to offer when operating in direct cooperation with surface forces. Better communications, precise navigation systems and improved sensors are creating new opportunities for achieving direct support. Given the likely developments in networking, greater integration of surface, air and sub-surface assets is likely to be a key theme of future operations.

Submarines and Maritime Power Projection

As a launch platform for land-attack missiles and special forces the submarine is a unit for power projection in its own right. But my own view is that submarines will tend to deploy these capabilities more to ensure the free access of other forces into a designated area. They have particular strengths in dealing with anti-access forces, as well as assisting with precursor environmental assessment. Again, numbers count because such operations may be required not only within the intended locality into which, for example, a land force may be inserted, but further afield, to deal with forces which might otherwise intervene. Some operations can certainly be sequenced and separated, but the dynamic nature of maritime operations often means that denial, control and projection activities are taking place at the same time — and, if necessary, for extended periods.

Conclusion

This survey of the roles of submarines and their place in Australia's future maritime strategy has necessarily been broad brush. Nevertheless it should be clear that submarines form a key part of the execution of that strategy. Submarines represent an integral and abiding component of any defence force which seeks to exert any real measure of influence and control over conflict at sea, but it must be remembered that the maritime environment is too complex for any single asset, however sophisticated, to provide a universal answer.

References

1. www.submarineinstitute.com.

2. *Australian Maritime Doctrine: RAN Doctrine 1*, SPC-A, Canberra, 2010, Chapter 10.

3. Department of Defence, *Defending Australia in the Asia Pacific Century: Force 2030*, Canberra, 2009, p. 53.

Reproduced from Semaphore*, Issue 11, December 2010, published by the Sea Power Centre — Australia.*

ShipConstructor 2011 R2 Released

The latest release of ShipConstructor CAD/CAM software offers performance enhancements and new tools to speed up the ship design and construction process.

ShipConstructor Software Inc. is promoting the ShipConstructor 2011 R2 release of its AutoCAD based program as a continuation of its strategy of being the most intuitive and efficient of all the major shipbuilding-specific CAD/CAM applications.

"Shipbuilders have told us that slow, inefficient, complicated programs are unacceptable," said ShipConstructor Software Inc. CEO, Darren Larkins. "In both mature and emerging markets, shipbuilders need to quickly find and train staff. They are also under increased pressure to increase efficiencies, so we have deliberately constructed software which we believe is the easiest to learn and use."

ShipConstructor 2011 R2 New Features

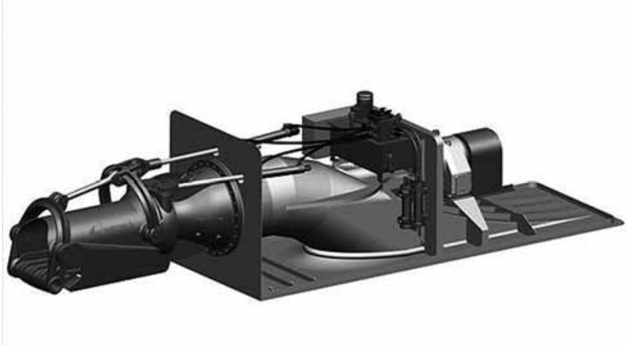
- Increased Speed — Less time spent waiting. Assembly and arrangement drawing creation and updating performance has been improved by up to 50%.
- Batch Updating of Production Drawings — Increased user efficiency by allowing updating of multiple production drawings in a single operation.
- Project Equipment List — Allows management and reconciliation of the project master equipment list to the 3D model in ShipConstructor.
- Improved Change Management — ShipConstructor's Associative DWG technology has been leveraged to improve change management. More undo options are available.
- Updatable Twisted Stiffeners — Shrinks the design spiral between Hull and Structure. Allows updating of twisted stiffeners in structure drawings with changes from hull drawings without having to re-export the part.
- Reports by Model Drawing — Enables easier work-in-progress reports by generating reports for content within individual model drawings.

Wärtsilä Introduces New Waterjet Series

Wärtsilä has introduced a new series of waterjets which enhances Wärtsilä's competitive range of stainless steel jets to include all sizes from 510 mm to 3250 mm. This makes Wärtsilä the only supplier serving both midsize and the lower range of large Waterjet applications with a single product. The new series is aimed particularly at the high-speed ferry, high-speed patrol craft, and customised yachting segments.

The new high-performance Wärtsilä waterjets feature a number of significant competitive advantages and are designed for long-term, reliable performance. This is achieved through the use of high-quality materials for structural parts, and the wide use of stainless steel in the jet construction. Although aluminium is a widely used and accepted material for jet fabrication, the Wärtsilä solution utilises abrasion-resistant stainless steel to conserve the carefully-designed shape of the stator blades in order to retain high levels of fuel efficiency. The impeller and shaft are also constructed from stainless steel. These features not only deliver continuous high performance, but also notably reduce short-term maintenance requirements.

"This enhanced midsize waterjet series makes Wärtsilä extremely competitive for a vast array of high-speed vessel applications. The ease of installation, the reliability, and the overall attention to detail that these waterjets incorporate, puts them at the forefront of developments in this field," said Aaron Bresnahan, Vice President, Special Vessels Segment, Wärtsilä Ship Power.



The cost-competitive, easy-to-install Wärtsilä package for a shaft power of up to 4500kW
(Image courtesy Wärtsilä)

Strong focus on development

The new series of Wärtsilä waterjet comes in a fast and easy 'plug and play' installation module which offers owners and shipyards lower installation costs and simplified build schedules. The packaged delivery has inlet duct shapes optimised for different hull forms, thus freeing the yard from the responsibilities of inlet duct construction. The integral inlet duct designs were thoroughly researched by Wärtsilä's Computational Fluid Dynamics Department to achieve the optimal hydrodynamic properties.

Another key element of the Wärtsilä solution is that the hydraulic system has no oil-retaining elements protruding outside of the vessel's transom. This not only eases maintenance, but is important from an environmental point of view. Wärtsilä is committed to the development of environmentally-sound solutions in all its activities. As with all Wärtsilä products, this waterjet design series is fully supported by Wärtsilä's global service network which ensures rapid response regardless of the vessel's location.

In 2006, Wärtsilä introduced its line of axial flow waterjets which today are in operation in many over-100 m monohull, catamaran and trimaran designs. The largest 26 000 kW jets are driven by the latest generation of gas turbines. While maintaining the excellent hydrodynamic properties and extended cavitation margins of the large axial waterjet designs, Wärtsilä's new midsize series represents a cost-competitive, easy-to-install package for a shaft power of up to 4500 kW.

Wärtsilä Ship Design and Propulsion System for Malaysia

Wärtsilä has signed a contract with Nam Cheong Dockyard of Miri, Malaysia, which will build a Wärtsilä Ship Design (WSD) multi-purpose platform supply vessel (MPSV). This WSD 800 MPSV is the first in a new series of Wärtsilä designs being marketed as a total solution, including all relevant systems as well as the ship design.

The total solution concept of the WSD 800 MPSV design includes four gensets. These produce more than 6 MW of electric power, which is in turn distributed via Wärtsilä's patented Low Loss Concept for diesel-electric propulsion, to two Wärtsilä main azimuth steerable thrusters aft, and two tunnel thrusters forward, and to provide all necessary electric power onboard. The WSD 800 MPSV has an overall length of 81.6 m, a beam of 18.4 m, and a summer draught of 6.8 m.

The vessel, which is scheduled to be launched and commissioned by the autumn 2012, will be owned by Bumi Armada, the largest owner and operator of offshore support vessels in Malaysia. It will serve the region's offshore oil industry, and its design includes a Remote Operated Vehicle mezzanine deck, crane, and a large 800 m^2 deck area.

Wärtsilä provides a variety of ship designs for merchant, offshore and special vessels, to both ship owners and shipyards. Wärtsilä's offering covers the full range of ship design disciplines, including naval architecture, as well as structural, electrical, outfitting mechanical and piping engineering. The offering ranges from simple, low-cost, proven standard designs, often with a full equipment package, to advanced customized designs based on client-specific requirements.

Wärtsilä has put extensive focus on the development of ship design during recent years, including maximising the efficiency of hull lines, integrating the latest equipment technologies, and tailoring designs to meet operational profiles. This total solution approach was a major factor in Wärtsilä being awarded this contract. The design also supports the shipyard's requirements for seamless construction in co-operation with a single supplier.

Wärtsilä Ship Design has a strong global presence with operations in 10 countries. In line with Wärtsilä's strategy, Wärtsilä Ship Design's global operations align the company closer to the needs of its customers, including both owners and shipyards. The company's design capabilities mean that Wärtsilä is able to enter into dialogue with customers at an earlier stage, which results in being able to offer more competitive solutions.

ShipConstructor and IFS North America Enhance Integration

ShipConstructor Software Ltd and IFS North America are partnering to enhance the integration between their respective applications.

ShipConstructor provides shipbuilding CAD/CAM software based on the familiar AutoCAD program, and IFS offers a project-based ERP system designed to support the asset lifecycle including design, fabrication, construction, procurement, aftermarket support, and financials, all of which are typical in shipbuilding. The majority of the US Navy's future fleet is being modelled with ShipConstructor software, while shipbuilders such as Damen Shipyards and Babcock utilise IFS Applications, an Enterprise Resource Planning (ERP) solution.

Both companies support interoperability with multiple vendors, and this agreement between the two companies is seen as an addition to the work the companies have already done to integrate with other competing applications.

This relationship is a natural evolution for both organisations. ShipConstructor and IFS have a long history of collaboration in the United States National Shipbuilding Research Program (NSRP) and both companies have several common clients such as Austal and Todd Pacific Shipyards.

"Both of our organizations are committed to providing solutions that best meet client needs," said Darren Larkins, CEO of ShipConstructor Software Inc. "We want to enhance interoperability and integration to provide greater benefit to shipbuilders."

Wärtsilä and Aker Solutions develop High-performance Turbine-installation Vessel

Wärtsilä and Aker Solutions, the international oil and gas services company, have agreed to combine their fields of expertise to develop a new and environmentally-sound concept for offshore wind-farm installation vessels. According to the contract, which was signed earlier this year, Wärtsilä will provide the new installation vessels with the ship design, electrical power generation, propulsion machinery and high-end automation, whilst Aker Solutions will supply the jacking system. Wärtsilä, together with Aker Solutions, will also offer a 24/7 global support service for maintenance, repairs, and component supply to the vessels.

The two companies have selected the best technologies for this custom-designed installation vessel, which enables a highly-efficient way of setting up offshore wind-power generation. The three Wärtsilä 6L34DF and two Wärtsilä 9L20DF dual-fuel engines, which will provide main and auxiliary power for the vessel, can operate on liquefied natural gas (LNG) with low emissions. Similarly, heat from the engine cooling system will be utilised to generate drinking water, and to supply hot water for use by the crew. The accommodation heating on board will also use the same heat source, while absorption chiller units will provide air conditioning during summer months.

Aker Solutions has applied its in-depth knowledge of the offshore drilling market to develop a continuous hydraulic jacking system for truss legs, which has been customized for high-performance turbine-installation vessels. This jack system has great benefits with regard to redundancy, and has a robust design for operations in harsh environments.

The new vessel concept will be marketed as a complete package. It will fulfil the industry's requirements for large deck space, sufficient crane capacity, year-round and all-weather operational capability, and cost-efficient operating systems. It is designed for operating in the International Maritime Organisation's emission control areas (ECAs).

"This new concept is already generating significant interest among that segment of the industry involved with the installation and maintenance of offshore wind farms. There is a notable demand for a high-technology and fully-integrated installation vessel design having significant environmentally sound features. We are delighted to be in co-operation with Aker Solutions to fill this need that is especially significant in the North Sea area. We expect to get the first orders this year," said Riku-Pekka Hägg, Vice President, Wärtsilä Ship Design.

The market for offshore wind farms is rapidly developing as demand for renewable-energy sources increases. Since Northern European offshore wind farms tend to be in shallow waters of 50 metres or less in depth, so-called jack-up vessels are used for the installation work. At the installation site, the vessel lowers massive legs to the seabed on which the vessel is jacked-up until it is above the waves. A hydraulic grip system is used for this jack-up operation.

The Turbine Installation Vessel can operate in year-round weather conditions with an operational water depth range of 4.5 to 50 m (Image courtesy Wärtsilä)

Wärtsilä Order for new LNG-powered Vessel from Norway

Wärtsilä has been contracted by Kleven Maritime of Norway to design a new LNG-powered Platform Supply Vessel (PSV) for the Norwegian operator Rem Offshore. The scope of the order also includes the propulsion machinery, automation and other equipment for the same vessel.

Wärtsilä is the clear market leader in supplying design and propulsion solutions for LNG-powered PSVs, a position which is further strengthened with this order. Furthermore, this comprehensive scope of supply emphasises Wärtsilä's strong position as a total solutions provider and a system integrator with the ability to offer marine customers a single-source of supply for all their needs. This simplifies and speeds the design and ship building process and reduces the risk of delays.

Rem Offshore's new LNG-powered PSV, the first such vessel for its fleet, will be a Wärtsilä Ship Design VS499 LNG PSV, a state-of-the-art vessel based originally on the successful VS489 LNG PSV design. The ship features outstanding energy efficiency, a unique hull form, fuel flexibility, and exceptional performance in areas such as fuel economy and cargo capacity.

In addition to the complete design of the vessel, Wärtsilä's scope of supply for the new PSV includes the dual-fuel main engines and generating sets, the electrical power and propulsion systems, integrated automation, and the power-management system. The selection of Wärtsilä's dual-fuel (DF) technology, which enables the use of clean gas as the main fuel, is in line with Rem Offshore's ambition to grow its fleet in environmentally-sustainable PSVs. The DF engines can also operate on marine diesel oil if required. The vessel is to be built at the Kleven Verft yard in Norway.

This order represents the third new contract for an LNG-powered PSV within a short period of time that Wärtsilä will design and equip. Wärtsilä's ability to offer total concept solutions that include the design of the vessel, the propulsion plant, electrics and automation, and a host of fuel-saving and environmentally sustainable options, has given the company a notable competitive edge, particularly in the area of specialty vessels such as Gas PSVs.

This Rem Offshore new-build order is further evidence of the growing global demand for Wärtsilä's unique gas-electric propulsion system configuration. This is based on a combination comprising the Low Loss Concept for Electric Propulsion, the Wärtsilä 34DF main engines, and the recently-introduced Wärtsilä 20DF engine.

"The unique combination of our design capabilities and technology strengths enables us to provide a 'big picture' perspective which has real value, particularly in special vessels such as this one," commented Tor Henning Vestbøstad, Sales Manager, Wärtsilä Ship Design.

"The integrated solution, utilising Wärtsilä's dual-fuel engines and Low Loss Concept, means that the customer will have the highest possible redundancy and reliability — and a highly-efficient vessel, for operation in all conditions. The energy efficiency, cargo capacity and overall performance are all outstanding," he adds. Vestböstad also emphasises the company's excellent collaboration with both Rem Offshore and Kleven, which has been an important factor in the success of this project.

The Wärtsilä 20DF engine is the latest addition to the company's complete portfolio of dual-fuel engines. This industry-leading technology offers the marine sector numerous benefits, including the primary advantage of having the flexibility to utilize different fuels. At a time of uncertainty in the cost of liquid fuels, and as environmental legislation becomes increasingly stringent, this flexibility enables the use of cost-efficient and environmentally-friendly LNG as the main fuel. In case of interruption to the gas supply, Wärtsilä DF engines automatically switch to diesel-mode operation without any loss in speed or power output. Single-fuel installations obviously lack this additional level of operational safety.

THE INTERNET

Voith-Schneider Propeller Animation

The Voith Turbo website has an excellent animation of how a vertical-axis propeller works. Visit www.voithturbo.com/media/iVSPVoithSchneiderPropellerProgramm3.exe and set the driving pitch, increase the revolutions slowly, and then change the rudder pitch. The default view of Kinematics shows you both what happens to the mechanism and the subsequent effect on the vessel. Change the view to Hydrodynamic Forces, and you see what happens to the forces as the mechanism rotates.

Geordie Grant

NSCV Arrangement, Accommodation and Personal Safety

The National Marine Safety Committee (NMSC) released for public comment a draft standard on the arrangement, accommodation and personal safety requirements on board commercial vessels. The new National Standard for Commercial Vessels (NSCV) Part C, Section 1—Arrangement, Accommodation and Personal Safety replaces and updates relevant provisions of the Uniform Shipping laws Code Subsections 5E and 5F, and Sections 6, 7 and 18.

NMSC Standards Team Leader, John Henry, said that the draft standard deals with safety issues which all stakeholders can relate to, whether they are commercial vessel designers, builders, owners or operators—and the greater public. "Issues such as the requirements for passenger seating, sanitary arrangements, escape and evacuation routes, and consideration of access for the disabled affect ferry users on a daily basis," Mr Henry said. "Likewise, measures which help avoid accidents, such as requiring adequate field-of-vision from the helm and providing accommodation which will also help avoid crew fatigue, will have a direct impact on public and worker safety".

NMSC's Principal Technical Adviser, Mori Flapan, coordinated the Reference Group composed of government and industry stakeholders which drafted the standard. "The new draft standard replaces a number of the older 1970s standards with modern practices, both within Australia and internationally," Mr Flapan said. "The document also proposes the extent to which the new accommodation standards contained in the International Labour Organisation (ILO) Maritime Labour Convention 2006 are to be incorporated into the requirements of the NSCV".

Safety issues addressed by the standard include minimum clear deck heights, heights for guardrails and bulwarks, the provision of gangways for safe movement on and off the vessel, personal protection, dangerous machinery, and the arrangement of navigation lights and signals.

The release of the draft standard and Regulatory Impact Statement for public comment provides each stakeholder with the opportunity to review the proposals to check that they are relevant and practical.

Mr Flapan stressed that the comments received are taken seriously. "Each comment is considered by a reference group comprising both industry and government representatives," he said. "This is your chance to influence the standards-making process which will shape important aspects of the safety of domestic commercial vessels in Australia for decades to come".

To obtain a copy of the NSCV draft standard C1, please contact the NMSC Secretariat on (02) 9247 2124 or download from the website

www.nmsc.gov.au/index.php?MID=73&CID=70.

[*Mori Flapan made a presentation on the Arrangement, Accommodation and Personal Safety section to a combined meeting of RINA/IMarEST on 20 March; his presentation is written up in the* News from the NSW Section *in this issue of* The ANA–Ed.]

The period for public comment closed on 11 May 2011.

NMSC Secretariat

Amendments to NSCV Equipment Standards Open for Public Comment

Proposed amendments to two of the equipment sections of the National Standard for Commercial Vessels (NSCV) have recently been released for public comment:

- Amendment 1 to Edition 3 of NSCV Part C Section 7A — Safety Equipment; and
- Amendment 1 to Edition 1 of NSCV Part C Section 7C — Navigation Equipment.

Public comment is also sought on the Regulatory Impact Statement (RIS) for the amendment to NSCV Part C7A. There is no RIS for the amendment to NSCV Part C7C as it doesn't impose any additional costs.

The proposed amendment to NSCV Part C Section 7A will allow this section to be applied to existing vessels, and specifies the timeframe for the phase-in of different requirements based on practical considerations.

The proposed amendment to NSCV Part C Section 7C modifies the carriage requirements for Automatic Identification Systems (AIS). It was always envisaged that this element of the standard would be reviewed in the light of experience with this relatively new technology, and the proposed changes represent a relaxation of the current requirements.

The links to the draft standard, draft regulatory impact statement and comment templates are at: www.nmsc.gov.au/nmsc_and_you/...COMID=1&CID=70.

The public comment period closes on 24 June 2011.

Clarification/Correction Amendments Issued for Five Standards

With the published sections of the National Standard for Commercial Vessels (NSCV) now being applied around Australia, the National Marine Safety Committee (NMSC) has implemented a process to deal with minor matters requiring correction, without changing the technical content of the standard. Often these modifications are simply to clarify the intent of the standard. A new series of minor amendments were approved at the meeting of the NMSC in March and have now been included in the following Sections of the NSCV, which are available on the NMSC website, www.nmsc.gov.au:

- NSCV Part B — General Requirements
- NSCV Part C Section 3 — Construction
- NSCV Part C Section 4 — Fire Safety
- NSCV Part C Section 5A — Machinery
- NSCV Part C Section 5B — Electrical

The details of the specific changes to each section are available by clicking on Amendment 1 or, in the case of NSCV C3 Amendment 2, in the right-hand column next to the relevant section on the NSCV summary page at www.nmsc.gov.au/index.php?MID=16&CID=97.

Tech e-News, 29 April 2011

MULTIPLE DOCKINGS IN WESTERN AUSTRALIA

In June this year, in a first at Henderson, four RAN vessels were docked ashore at the same time.

The Collins-class submarines HMAS *Collins* and HMAS *Farncomb* were in the ASC facility, having been lifted from the water in the floating dock. The photo above shows the former in the covered building, and the latter being transported on self-propelled motorised trailers at the ASC outdoor hardstand.

The Anzac-class frigates HMA Ships *Anzac* and *Arunta* were next door in the BAE Systems facility, having been lifted from the water on the shiplift and transported by a rail and turntable system. Also as a first, they were facing in opposite directions
(Photos courtesy Hugh Hyland)

Australian Division Council

The Council of the Australian Division of RINA met on Wednesday 30 March 2011. In the absence of the President, the meeting was chaired by the President-elect, Prof. Martin Renilson. Significant matters raised or discussed during the meeting were as follows:

Divisional Officers

As the term of the current Council was due to end at the closure of the Annual General Meeting later in the day, Prof. Renilson thanked retiring Council members for their contributions. He noted that John Jeremy had served for several decades and hoped that he, together with Jim Black, Peter Crosby and Graham Taylor would see their way clear to rejoin Council in future.

Following the call for nominations in the November issue of this journal, Council confirmed Mr Tim Lyon's re- election and appointed Sam Abbott, Danielle Hodge, Craig Hughes, Jon Pattie and Mark Symes to the remaining vacancies. The appointments of Ms Hodge and Mr Symes remain subject to their membership being upgraded or successful amendment of the Division's by-laws.

Council also elected Dr Armstrong as its Vice-President for the coming two years.

Tele/video Transmission of Technical Meetings

Council noted that Tim Holt's presentation to the March meeting of the NSW Section had been successfully recorded and posted on the Internet. It agreed to fund the recording of John Jeremy's presentation to that Section later on the day of the Council meeting.

Senate Inquiry into Defence Procurement

In response to a written invitation from the Senate Standing Committee on Foreign Affairs, Defence and Trade, Council agreed that a submission should be submitted to reflect the interests of all members and the profession as a whole, while encouraging individual members to make their own submissions. Members were subsequently invited to contribute to the Division's submission which was lodged about two weeks after the meeting.

Sponsorship/Advertising for *The ANA*

In light of the lapse in long-term sponsorship arrangements for this journal, Council considered means of covering the budget shortfall required for *The ANA* to continue in its present form. It was agreed that various companies would be approached to advertise, the campaign being coordinated by the Secretary. First results appear in this edition and the Division appreciates these contributions.

Amendment of By-Laws of the Division

Council approved draft amendments to the By-Laws for submission to a Special General Meeting at a date and time to be arranged by the President and Secretary. (The SGM was subsequently arranged in association with a Technical Meeting of the Tasmanian Section on 19 May and all members issued with the Notice of Meeting and an Absent Voting Slip by email through their Section Secretaries).

Single National Jurisdiction on Maritime Safety

Although there was little progress to report at the time of the meeting, a subsequent meeting with AMSA is covered in the president's column earlier in this issue.

Next Council Meeting

The next meeting is scheduled for 8 June, by teleconference based in Canberra.

Rob Gehling
Secretary

Young Achiever Wins National Award

Austal naval architect, Byron Walpole, was presented with the prestigious Australian Industry and Defence Network (AIDN) 2011 National Young Achiever of the Year Award at a defence industry ceremony held in Canberra in February.

Mr Walpole was the recipient of the Western Australian Young Achiever Award in late December 2010 and, as a result, was entered into the National competition, which recognises the achievements and potential of individuals within the defence industry.

Byron Walpole (centre) after the award ceremony
in Canberra in February
(Photo ADM — Leigh Atkinson)

Mr Walpole, from Hilton, Western Australia, has been instrumental in extending Austal's impressive naval architecture credentials as a result of his substantial input into the designs of the US Navy Joint High Speed Vessel (JHSV) and the US Navy Littoral Combat Ship (LCS).

Mr Walpole was lead designer on the Austal LCS project, a unique and innovative trimaran warship with multi-mission capability.

The first Austal LCS was delivered to the US Navy in December 2009, with a second due for delivery in mid 2011. The US Navy recently awarded Austal a contract to build a third LCS with options for a further nine over the following five years. Austal is also contracted to build five JHSVs with the US Department of Defence holding options for a further five vessels.

Since joining Austal in 2002 as a naval architect, Mr Walpole has participated in the design of several state-of-the-art naval and patrol vessels.

Austal Chief Operating Officer, Andrew Bellamy, congratulated Mr Walpole, noting that the award was well deserved.

"Mr Walpole's significant contribution to Austal has helped cement our position as a leading designer and builder of vessels for the domestic and international defence sector," said Mr Bellamy.

"During his eight years with Austal, Mr Walpole has been instrumental in the design of the Armidale-class patrol boat, the LCS and the JHSV which, together, have earned the company more than $A2 billion in revenue.

"Mr Walpole's demonstrated leadership capabilities, experience and innovative designs have been of great value to Austal, and we are proud that his contribution has gained industry recognition."

Mr Walpole said he was pleased that his contribution to both Austal and the shipbuilding industry had been recognised at both a State and National level.

"I am very proud to have been acknowledged for my contribution to the design of some of the world's most advanced naval vessels, and look forward to continuing to pioneer and develop improved solutions for defence shipbuilding," said Mr Walpole.

Mr Walpole has a Bachelor of Engineering (Naval Architecture) from the Australian Maritime College in Tasmania and is an Associate Member of the Royal Institution of Naval Architects.

NAVAL ARCHITECTS ON THE MOVE

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

Ryan Ayres has moved on from Burness Corlett Three Quays Australia, and has taken up a position as a naval architect with Robert Allan Ltd in Vancouver, BC, Canada.

Tom Bromhead has moved on from Mannum Boat Haven and Slipway and has taken up a position as a naval architect with Incat Crowther in Sydney.

Nick Browne has moved on from Lloyds Register and has taken up a position with Practising Naval Architects in Hobart.

Nichola Buchanan has moved on from American Express and has taken up a position as a naval architect with Burness Corlett Three Quays in Sydney.

Greg Croaker has moved on from Mobil Oil Australia and taken up a position with Quality Logistics Services Australia in Melbourne

Tom Dearling has move on from Austal Ships and has taken up a position as a naval architect with Strategic Marine in Fremantle, developing new designs for the company.

Shaun Denehy has taken up a position as Engineer at the Towing Tank and Model Test Basin at the Australian Maritime College in Launceston.

Liam Finegan has taken up a position as a naval architect with Tansu Design in Istanbul, Turkey, designing and building 30–40 m semi-displacement motor yachts. Friends can find out more about the company at www.rizatansu.com.

Ben Healy has returned from an extended holiday travelling in the USA and has taken up a position with Sinclair Knight Merz in Melbourne.

Chia How Khee, a recent graduate of the University of New South Wales, has taken up a position as a naval architect with Orwell Offshore in Singapore.

Simon Orr has moved on from Babcock Integrated Technology (Marine) in Newcastle-upon-Tyne, UK, and has taken up a position as a naval architect with Lightning Naval Architecture in Sydney.

Craig Singleton has moved on from EMP Composites and has taken up a position as a Senior Mechanical Engineer with GHD in Nowra, NSW.

Jaime Sotelo has moved on within the Transfield organisation, and has taken up the position of Quality Manager with Transfield Services (TS) Rail in Adelaide.

Matthew Stevens has moved on from the Centre for Maritime Engineering and has taken up a position as a naval architect with the Amphibious and Afloat Support System Program Office of the Defence Materiel Organisation in Sydney.

Belinda Tayler has moved on from BMT Design and Technology and has commenced consulting in naval architecture and project management as BT Marine in Sydney.

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

Phil Helmore
Mark Symes

THE AUSTRALIAN NAVAL ARCHITECT

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

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

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

FROM THE ARCHIVES

LST TO LPA

The evolution of the ships which became HMAS *Manoora* and KMAS *Kanimbla*

John Jeremy

World War II presented military planners with new challenges which resulted in the development of several new types of craft and ships. Not long after the fall of France in 1940 it was clear that a large number of vessels would be needed to transport the thousands of men and all their supporting materiel, from food and ammunition to trucks and tanks, across open sea to foreign shores if Europe was ever to be released from German occupation.

Conversion of merchant ships into infantry landing ships, and the design and construction of many of the necessary smaller craft began in Britain in 1940. In November 1940 studies began into the means of transporting tanks and heavy vehicles by sea and landing them on beaches anywhere in the world. To reduce the lead time inevitable for such ships, three tankers of the Maracaibo class, which had a shallow draft, were selected for conversion. They were fitted out to carry twenty 25.4 t tanks and to discharge them by means of a bow ramp which could be extended through a bow door once the ship had beached. The conversion of these ships took about four to five months and, whilst they were not ideal for the purpose, they enabled many features to be tested for incorporation in future designs.

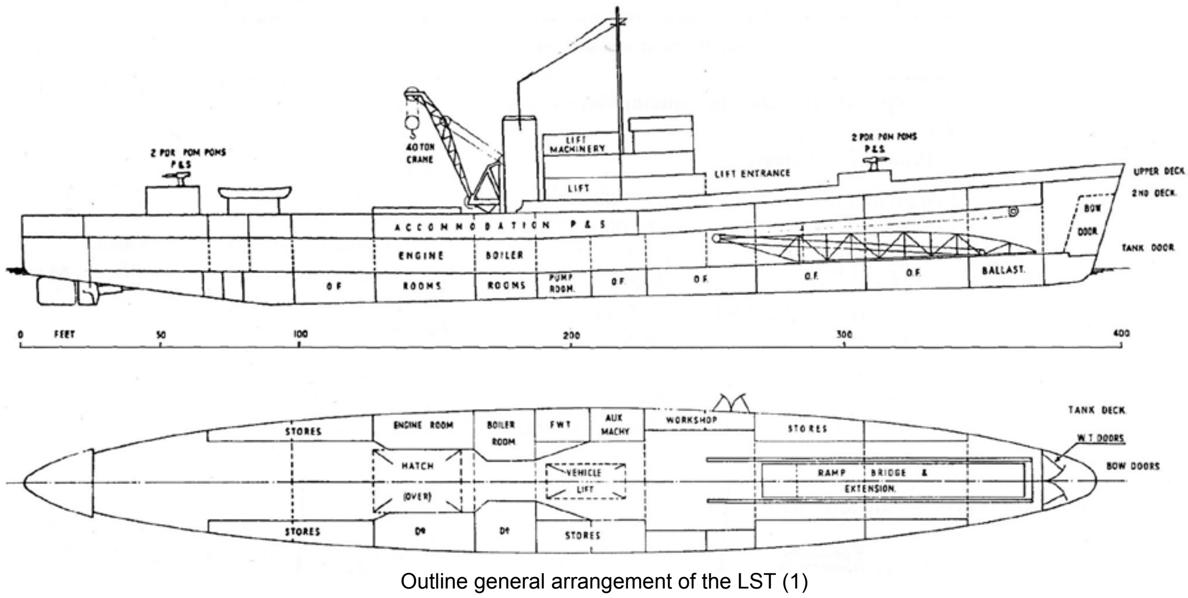
At the same time, a new design was prepared for a somewhat faster ship of similar size. The increase of speed from 10 knots to about 17 knots meant that the blunt bow fitted to the converted tankers was unsuitable, and a more ship-shaped bow was provided. It was fitted with electrically-operated vertically-hinged doors behind which an upwardly-hinged watertight door was fitted to maintain watertight integrity. From behind the door, a brow about 36 m long could be extended to the shore or to a 26 m long causeway which was also stowed at the forward end of the vehicle deck. The brow was articulated to manage uneven beaches and could carry loads up to 40 t. The ships, known as Landing Ship Tank Mk 1 [LST (1)] were 121.2 m long overall with a beam of 11.4 m. The deep displacement was about 6000 t and they were propelled by steam turbines of 5220 kW for a speed of 16.25 knots. Three ships were built to this design — HM Ships *Boxer*, *Bruiser* and *Thruster*.

The Boxer-class ships proved to be too complicated and expensive to be built in large numbers and, in 1941, sketch designs were prepared for a simpler ship which could be built in the very large numbers needed for an invasion of Europe. It was clear, however, that British industry could not possibly build enough of these ships and the conceptual design was taken to Washington to seek assistance from the US under Lease-Lend Act. The Bureau of Ships further developed the design, and the detailed design was completed by Gibbs & Cox. The first ships were ordered in February 1942.

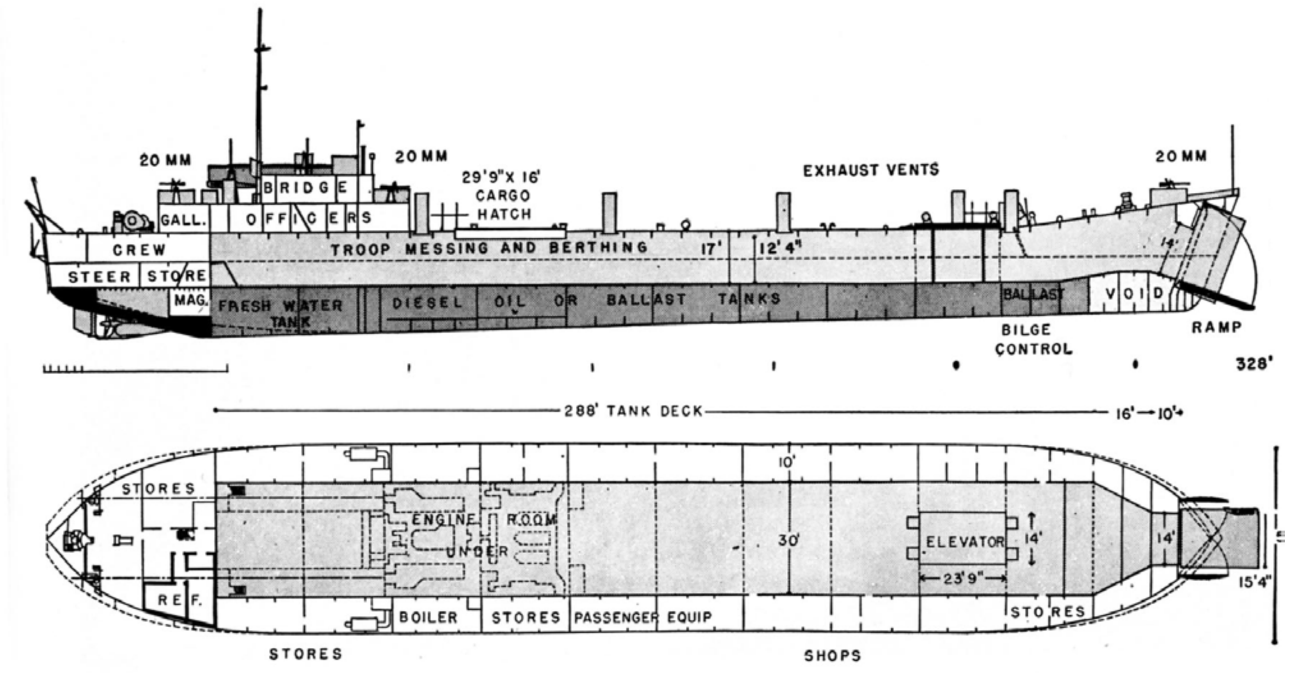
The LST (2) was a much simpler ship than *Boxer* — the displacement was about 3777 t with overall length of 99 m, beam of 15.1 m and beaching draughts of about 1 m forward and 2.9 m aft. The vertically-hinged bow doors were retained, although the bow was much bluffer. Behind the bow doors a hinged ramp, which doubled as a WT door, could be lowered to enable vehicles to drive off. A simple lift was provided so that lighter vehicles could be carried on the upper deck and moved to the tank deck for disembarkation. Troops were accommodated in wing spaces abeam of the tank deck with crew aft and in the superstructure. The ships were propelled by locomotive-type diesels of 2414 kW for a speed of 10 knots. Capacity was similar to that of *Boxer* — 13 tanks, 27 3.05-t trucks and 8 jeeps. The ship's complement was 86 and the troop capacity 177. They were also fitted with assault boats and a light armament of 40 mm guns and 20 mm Oerlikons.

The first LST (2) was completed in November 1942 and by the end of the war 1051 had been built, 115 of which served with British forces.

In 1943 it was decided to begin building similar ships

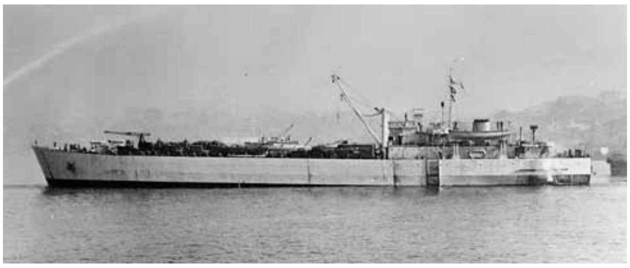


Outline general arrangement of the LST (1)
(Drawing from Trans. RINA 1947)



The general arrangement of the Landing Ship Tank LST (2)
(Drawing from ONI226 — see reference)

The first of many — LST 1 shortly after completion — the first of the LST (2) class
(US Navy photograph)



HMAS *Lae* LST 3035
(Photo RAN Historical Collection)

in Britain and Canada. Known as LST (3), 35 were built in Britain and 36 in Canada. LST (2) was of welded construction but riveting was used for LST (3) and they were propelled by steam turbines of 4100 kW for a speed of 13 kn. The full-load displacement was about 5070 t. Six of these ships were to serve in the RAN, including HMA Ships *Lae*, *Labuan* and *Tarakan*.

The design of these two classes was so successful that it set the pattern for such ships for decades. Indeed, similar ships are still being built today, although generally with better seakeeping characteristics and more speed than the simple LST (2). The design of HMAS *Tobruk* has many of the features of the original LST.

After the war, the US Navy built several new classes of LST with increased power for better speed and with improved accommodation and cargo capacity. The ultimate development of the WWII concept was the US LST 1171 class. Length had grown to about 134 m, beam to 18.8 m and the displacement at full load was about 7940 t. These ships had a speed of 16.9 knots and could carry 634 troops.

By 1957 the need to move troops in fast convoys to reduce the risk from modern high-speed submarines drove demands for much faster LSTs than even LST 1171. The minimum speed was considered to be 20 knots and, to achieve that ,a radically-different hull form was needed. Furthermore, increased capacity was required for heavier tanks and vehicles. Several designs were prepared leading, finally, to a preliminary design (SCB 247) which was completed in August 1964. The design, which became the Newport class (LST 1179), has some similarity to the design of HMS *Boxer*, having a 57.7 m extendable bow ramp for discharging cargo onto a beach or causeway — with the latter carried slung from the side of the ship. The new ships proved to be much larger than originally anticipated. They were 170.6 m long overall with a beam of 21 m and had a designed full load displacement of about 8550 t (with 2036 t of cargo). The beaching displacement was 5359 t with 509 t of cargo. The limiting displacements were 8653 t to maintain speed, 8857 t to maintain structural strength and 8933 t to maintain subdivision standards. They were propelled by six ALCO locomotive-type diesel engines totalling 11 930 kW driving controllable pitch propellers on two shafts for a speed of 20 kn and were fitted with a bow thruster of 596 kW. The complement was 224 and they could carry 400 troops.

Twenty ships were built to this design. By the 1980s, weight growth had reduced their capacity to beach, and some were at or near their subdivision limit. They could no longer carry

USS *Saginaw* off Lebanon in 1982. She later became HMAS *Kanimbla*
(US Navy photograph)

USS *Frederick* with her bow ramp deployed
(US Navy photograph)

the 2036 t of cargo for which they were designed. They turned out to be the last such design for the US Navy, largely because they were an inefficient means of transporting large numbers of troops and cargo to the beachhead. They began to be taken out of service in 1992 and by 2002 all had been decommissioned. Some ships were transferred to the navies of Taiwan, Mexico, Brazil, Chile, Malaysia, Morocco, Peru and Spain. Two, *Saginaw* and *Fairfax County*, both completed in 1971, were bought in 1994 by Australia and commissioned as HMAS *Kanimbla* and HMAS *Manoora*.

Most of the ships transferred to other navies remained relatively unchanged. The Australian ships were extensively modernised and converted to fulfil a new role as amphibious transports (LPA). The conversions were carried out by Forgacs in Newcastle, NSW, and transformed the ships into extremely useful assets for the RAN (for details of the conversion see *The ANA* of February 2000, pages 35–40).

The conversion of these two ships, which were already old when work started in 1996, proved to be much more expensive than expected, with the total project cost rising from \$120 Million to over \$400 million by the time the second ship, *Kanimbla*, was completed in 2000. Despite the cost, the ships have been versatile and useful and they have proved the long-term value of this type of capability which, for the RAN, will be greatly enhanced when the two much-larger LHDs *Canberra* and *Adelaide* enter service in 2014 and 2015.

Manoora and *Kanimbla* are now 40 years old, well beyond the usual life expectancy for a ship of this type. That time has caught up with them should be no surprise, and both will be gone soon. Nevertheless, they have made their mark in the RAN and earned their place in the Navy's history.

References

Baker, R., 'Ships of the Invasion Fleet', *Transactions*, RINA, London, 1947.

Brown, D.K. (Ed.), *The Design and Construction of British Warships — The Official Record: Landing Craft and Auxiliary Vessels*, Conway Maritime Press, London, 1996.

Burgess, P. and White, D., 'Repair and Conversion of the LPA Ships', *The Australian Naval Architect*, Vol. 4 No. 1, RINA Australian Division, February 2000

Friedman, N., *US Amphibious Ships and Craft: an Illustrated Design History*, Naval Institute Press, Annapolis, 2002.

US Division of Naval Intelligence, *ONI226 — Allied Landing Craft and Ships*, 1944, reprinted as *Allied Landing Craft of World War Two*, Arms and Armour Press, London, 1985.

HMAS *Manoora*
(RAN photograph)