THE AUSTRALIAN NAVAL ARCHITECT

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HMAS *Warramunga* about to be moved to the shiplift for undocking on 9 April after her anti-ship missile defence upgrade by BAE Systems at Henderson, Western Australia. *Warramunga* is the first RAN ship to be painted the RAN's new haze grey colour (RAN photograph)

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Cover Photo:

HMAS *Anzac* encountering a milestone of the salt-water variety off the coast of New South Wales recently
(RAN photograph)

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From the Division President

The fact-finding trip to Australia by the RINA President, Bruce Rosenblatt, appears to have been an outstanding success and I thank all of our members who gave so freely of their time to meet him and demonstrate the whole range of industries in which we are involved. I know that Bruce found it well worthwhile and took back a glowing message of the Australian capability to both the UK and the USA, where he has very many contacts in the industry. Bruce was also able to attend our AGM in March, which is reported elsewhere in this issue, and was able to welcome our new Council members Matthew Williamson and Jesse Millar. Both have been active within their RINA Sections and are typical of many RINA members who manage to somehow find the time to organise and manage our technical activities. Thank you to them, and also to the retiring members Mike Mechanicos and Jon Pattie for their work over the past two years.

There are interesting times ahead in the naval industry and several recent Government announcements are of interest to naval architects. Firstly, the RINA Australian Division submission to the ongoing Senate Inquiry into Naval Shipbuilding has clearly been noticed, and the Government has announced an investigation into how they can address the "Valley of Death" occurring in between naval contracts, which inevitably results in a loss of skills as well as difficulties in coping with naval contracts which all occur at the same time. The press release announcing this investigation used many of the words that we had used in our submission. We will continue to represent our member's interests in this area.

Secondly, the Government has announced a plan to run down the DMO, and to pass all responsibilities for their work back to the Defence forces. I know that there are many who could never understand why such work left the Defence forces in the first place (I might guess that it was a misguided following of the USA approach) and perhaps this return to Defence is to be welcomed as it appears to me to eliminate a potentially dangerous disconnect between the naval users and the technical concept designers.

Thirdly, the Government has released a report by the RAND Corporation which was commissioned by the Department of Defence, covering the future difficulties of naval shipbuilding in Australia. This is covered in more detail by the Editorial to this edition of *The ANA*, but I would like to make the comment that I have several reservations about the past work of RAND, and the current report is no different — it makes little, if any, reference to the future submarine project, for example, although this must have a giant impact on our surface warship construction capability. Another example of my reservations about their investigation is their previous (2011) report for Australia, *Australia's Submarine Design Capabilities and Capacities — Challenges and Options for the Future Submarines*, which explored, amongst other things, the sources of graduate naval architects for the industry. Their report mentions the Australian Maritime College, the University of Adelaide, the University of Melbourne, the University of South Australia, Flinders University, Monash University, Deakin University, the Royal Melbourne Institute of Technology, Swinburne University, and the University of Melbourne, but completely failed to discover or mention the University of New South Wales, one of only two Universities in Australia offering a degree in naval architecture at that time. I do not understand why our Government commissions reports from persons based overseas with apparently little knowledge of our defence industry when there are many more knowledgeable persons here in Australia. We should shout loudly to keep this type of work here.

Enough griping from me. If you have any comment on any aspect of the future of naval shipbuilding in Australia, then please contact the secretary or myself. Wishing you all a rewarding three months before the next issue of *The ANA*.

Tony Armstrong

Editorial

On 16 April, the Government released a report by the RAND Corporation (RAND) entitled *Australia's Naval Shipbuilding Enterprise – Preparing for the 21st Century* which had been commissioned by the Department of Defence's White Paper management team. The study by RAND is intended to inform the decision-making process as Defence grapples with the question of whether Australia should build the RAN's future warships in Australia or buy them from overseas. RAND points out that the issue is complex and that 'policy leaders need to gain an enterprise-level understanding of shipbuilding which brings together the capability requirements, available resources, and the future composition of the Australian shipbuilding and ship-repair industrial bases'.

The RAND report asserted that 'historically, Australia has acquired warships from overseas', citing the guided missile destroyers *Perth*, *Hobart* and *Brisbane* and the first four FFGs. That is not correct. Whilst a significant number of the RAN's warships have been built overseas, those were usually ships beyond the capability of the Australian industry, or second-hand ships obtained by purchase or gift. The experience of World War II, when there was an urgent need to re-establish an industry which had been allowed to decline to almost nothing during the 1930s, prompted a continuous post-war program of warship construction in Australia which continued into the 1970s. Whilst that program, contracted 'at cost', subject to Treasury-imposed spending restrictions and continuous modifications, could hardly have been described as efficient, it achieved its principal aims — to sustain naval shipbuilding (and support) capability in Australia and to provide the RAN with high-quality ships adapted to the navy's specific needs, albeit predominantly overseas designs modified in Australia.

The RAND report assessed the total number of people spread in the Australian naval shipbuilding and repair industries at some 7950 employees — employed by a relatively large number of organisations but with ASC accounting for about half the total.

The problem which Australia faces is the gap between the completion of the program to construct the air-warfare destroyers and the start of the planned future frigate project to replace the Anzac-class frigates. Based on current projections, it is likely that the demand on the naval shipbuilding industry will fall to zero (excluding small

programs like the Pacific Patrol Boat project) with significant implications for the future frigate project. In effect, the industry would, once again, have to build up capacity and capability from virtually nothing in the face of expectations of world-class performance.

The report considers a number of options to mitigate this looming problem, but concludes that little can be done to avoid the gap which is now foreseen. However, it also concludes that a healthy and cost-effective shipbuilding industrial base could be sustained in the long term by a continuous build strategy delivering a major surface combatant about every 1.5 years. In the short term it may be difficult to sustain more than one domestic shipbuilder of large warships and the report notes the costs and risks of having more than one. If it is the national objective to have more than one, then adequate productive work must be provided.

To those of us who have been around for a long while, and have experience in the naval shipbuilding industry, all this appears to be self evident. Moreover, there have been many studies and reports over the years which have reached similar conclusions. If evidence is required of the beneficial effect on industry performance of a program of significant size and continuity, then the Anzac frigate program is an example — ten ships over a period of 17 years — which built on the experience of the construction of the last two FFGs. The Anzac-frigate project certainly had its challenges in the early years but it became regarded as one of Australia's most successful naval shipbuilding projects.

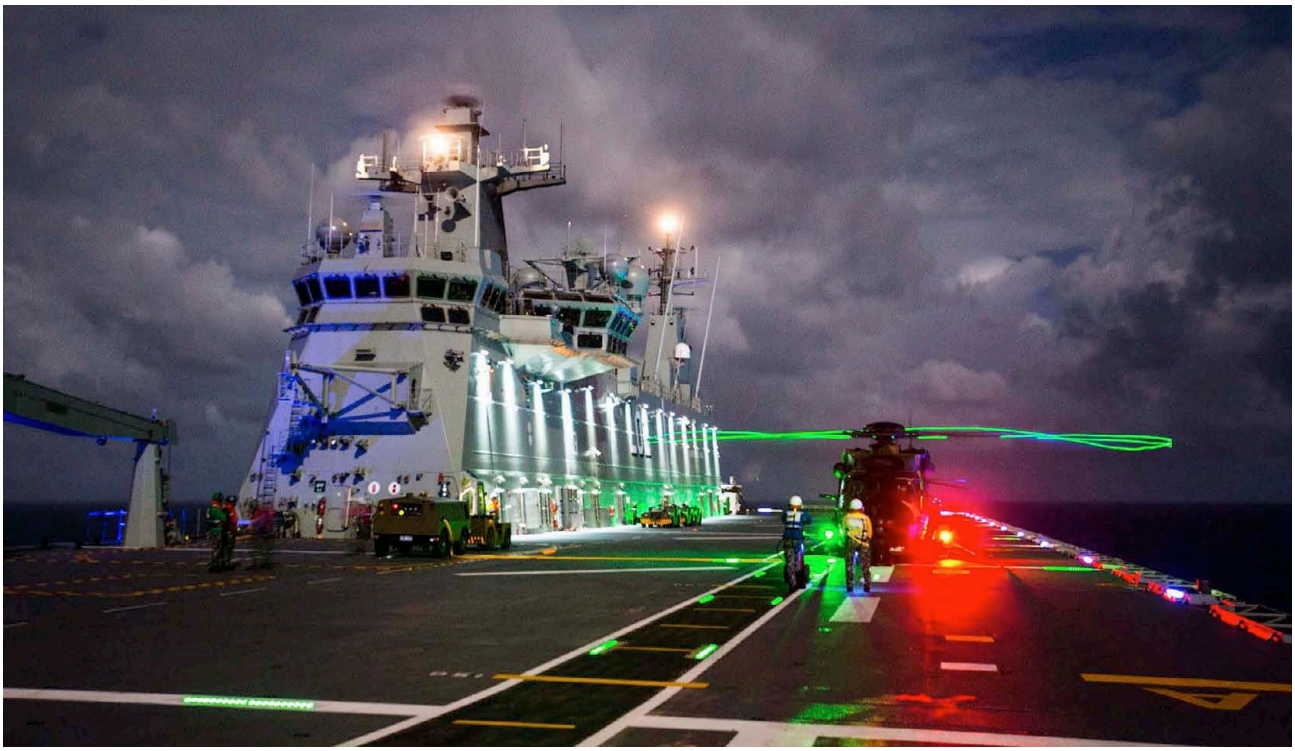
The RAND study also examined the cost premium of building warships in Australia compared to a number of other nations. Noting the difficulty of making such comparisons, and the significant influence of exchange rates, the report concludes that Australian-built warships are 30 to 40 percent more costly than their US-built counterparts, but also notes that the premium could be reduced if Australia were to institute and adhere to a consistent production pace and demand for warship construction — a steady and predictable production process for future projects. I suspect that our industry may question the assessed premium, particularly it were given the opportunities presented by continuity of demand and orders.

The RAND report provided some interesting comparisons of labour costs across a number of nations including Australia, United States, Japan, Italy, the United Kingdom, Spain, Denmark, Korea and Estonia. Whilst the latter is included because of that country's participation in a recent Danish project the others, compared on a similar cost basis, indicate that, taking the US as having an index of 1, Australia is the second most expensive at 1.34 after Denmark at 1.36. For comparison the indices for Spain and Korea are 0.75 and 0.58 respectively. These factors cannot be ignored when making international comparisons of industry productivity.

The RAND study also addressed the question of why we should build warships in Australia. Despite concluding that the economic benefits are unclear, it also concluded that 'Controlling critical production offers wider strategic benefits and flexibility. It would avoid dependence on foreign sources; enable performance of ship alterations, modernisations and life-of-class maintenance; and support in-country suppliers.' I doubt that many of us who are working, or who have worked, in the industry would disagree. Some observers may comment 'Well, you would say that, wouldn't you', but I can't help thinking that the views of experienced practitioners should carry considerable weight.

The authors of Australia's next Defence White Paper face significant policy challenges. We await the outcome with interest.

John Jeremy



A Royal Australian Navy MRH90 helicopter on the flight deck of HMAS *Canberra* in preparation for night flying off the coast of Queensland during April
(RAN Photograph)

LETTERS TO THE EDITOR

Dear Sir,

I enjoyed reading Kim Klaka's contribution to the February 2015 issue of *The ANA*, "Why do Yacht Designers fit T-bulbs to the Keels of Modern Racer-cruisers?". Kim raised some design considerations related to yacht keels that I would never have contemplated, as I am sure was the case for other casual readers.

The section of Kim's discussion which particularly attracted my attention was the influence of the longitudinal position of the bulb on twist of the fin. Kim noted that, since an L-bulb has its centre of gravity well behind the centre of twist of the fin, it will induce twist in the fin when the yacht heels, unlike a T-bulb where any fin twist will likely be negligible.

Kim continued to discuss how this would affect the span-wise angle of attack on the keel and, hence, the centre of pressure, and then he touched on the potential advantage of the keel generating more side-force in comparison to the hull as a result of such twist. However Kim then worked on the assumption that twist is detrimental to yacht performance, and estimated how this might be affected by variations in fin thickness.

My understanding is that, regardless of whether a hull is deep, fat or slender, it will invariably be a less-efficient side-force generator (in terms of L/D ratio) than any keel (or fin) with a reasonable aspect ratio and foil profile. Given that that is the case, twist generated over the keel (if fitted with a T-bulb) as the yacht heels may well result in a net overall *reduction* in total resistance for a given side-force due to the reduced leeway on the hull. To take advantage of this effect, it may be necessary to design a keel such that any such twisting is concentrated at the root rather than the tip, which certainly presents a structural design challenge!

To more-accurately assess the potential advantages (or penalties) of keel twist due to bulb longitudinal position, CFD analysis of a combined hull and keel would likely be necessary, ideally with fluid-structure interaction automatically included in the computations. That is beyond me but perhaps other readers are up to the challenge!

Martin Grimm

And Kim Klaka replies…

Dear Sir,

Martin's comments are, as always, thought-provoking.

This issue of the effect of keel twist has been the subject of much discussion between model-yacht designer Graham Bantock and myself. I am of a view not so different from Martin, that twist could be beneficial for performance through reduced leeway angle on the main hull. Graham, however, points out that the benefits of canting centreboards (with the same design aim of reduced leeway angle) are not evident when put into practice.

He also raises an interesting point not touched on in my letter: he has found that keel twist can affect hull balance adversely, which is detrimental to performance (especially in radio-controlled model yachts). I went for the conclusion that twist is detrimental to performance because it is a worst-case scenario, i.e. it yields numbers supporting the idea that T-bulbs are faster. Therefore I could not be found biased in my overall conclusion that T-bulbs are not sufficiently faster than L-bulbs to overcome the time lost untangling from craypots. The old adage that "You need to know the answer to engineering calculations before you start doing the sums" needs an extra clause — "You also need to do the sums in a way that will convince the disbelievers of your answer." As to Martin's idea of having keel twist at the root, that is a structural challenge I am definitely not willing to take on!

Kim Klaka

Dear Sir,

The Brazil Solar Challenge is a boat race in which the only power supply for the engine is sunlight and the teams are composed of undergraduate students only. The origin of the idea came from the Frisian Solar Challenge which takes place in The Netherlands. The Brazilian team, from UFRJ (Universidade Federal do Rio de Janeiro), was designing a boat to compete in the Solar Splash, another competition which takes place in the United States, when it was invited to participate in the Dutch challenge. After finishing the race in seventh place out of 48, the team was very excited to bring the idea to Brazil, and they had the support of their Dutch hosts to do so.

The first edition of the Brazil Solar Challenge was in October 2009, and it has been happening every year since then. These days, the challenge has nine teams, from seven different universities, competing. The main purposes of the competition are to encourage the development of technologies related to solar energy used in vessels, and to create connections between the teams, aiming for information exchange. In the future, the promoters of the event want it to become one of the stages of an amplified international circuit, not limited to Europe or Brazil.

The idea of the challenge is insightful for many reasons: it provides the students with the chance to practise the theory learned in class (which gives them the opportunity to be more prepared when starting their careers); it stimulates the interaction of different areas (the UFRJ team which went to the Frisian Solar Challenge comprised students of naval architecture, electronic engineering, electrical engineering and industrial design); and it stimulates research in the area of renewable energy resources.

Bernardo Bessone
UNSW Student

Dear Sir,

I would like to provide some information about the recent and ongoing development of the sail technology used in the last fleet of America's cup boats, the AC45 and AC72 catamarans which were first launched in 2011. The technology is not limited to just America's Cup boats, but is appearing in other designs of racing-class yachts. It was pioneered in the 1990s in smaller dinghy-class boats, before its application to larger yachts. [*The C-class catamarans have been using wing sails since at least 1961* — Ed.]

Although heavily regulated by class rules, these boats use what is known as a wing sail. It is essentially a wing, like that on an aeroplane, attached to the boat but with aerodynamic features differing from those of an aeroplane wing—most notably a greater ability for adjustment to conditions. It

utilises exactly the same principles, making use of several control surfaces as well as the ability to extend or retract the size of the wing depending upon the conditions experienced.

The largest noticeable difference from a conventional sail is the rigid nature of the wing. This creates many drawbacks, as the sail must be removed in undesirable conditions, and practical storage resulting in its use being limited to high-end racing applications, such as the America's Cup boats.

The sail uses its shape to create faster airflows in some regions and slower in others, thereby creating the lift needed to move to boat forward. However, unlike a traditional aeroplane wing which provides lift in one direction, a wing sail must have the ability to provide lift in two main directions when the boat is on opposite tacks. In order to do this, the sail must have adjustable camber; that is, the ability to adjust the long sweeping curve on each side of the sail. To increase lift, the curvature of the downwind (leeward) side of the sail is increased. Furthermore, in some designs the aft portion of the wing is often a control surface which can be rotated or moved at a different angle to the rest of the wing in order to control the way the air flows off it. It is a common misconception that the fixed or 'rigid' nature of the sail is 'completely fixed', assuming that there is no movement at all in the sail, and adjustments are achieved by movement of the sail as a whole. This is entirely untrue and, as discussed, there are many different points for adjustment within the structure.

It is my belief that the applications of this technology could really be pushed and extended. They could be used to provide more-efficient and greener propulsion to all different kinds of vessels, mostly over long distances under the right seagoing conditions. This could be especially effective if both the retracting and a furling equivalent design could be produced and, furthermore, a design that is autonomously controlled.

James Johnston
UNSW Student

NEWS FROM THE SECTIONS

ACT

On Thursday 20 November 2014 John Jeremy gave a presentation entitled *Replenishment Ships for the RAN* at the AMSA offices in Braddon, Canberra. Following on from John's review of *Replenishment Ships for the RAN* in the August 2014 edition of *The ANA*, the ACT Section invited John to give a presentation on this subject, and we are thankful that he obliged. The meeting attracted one of the largest attendances for the ACT Section in recent years. John spent most of his working life at Cockatoo Dockyard in Sydney, starting as an apprentice draughtsman in 1960 while studying naval architecture at UNSW. He became Technical Director of the dockyard in 1976 and was Managing Director/Chief Executive from 1981 to 1991 including during the period in which one of the RAN's two existing replenishment ships, HMAS *Success*, was built at the yard.

John reviewed the long history of replenishment ship acquisition for the RAN, which he noted had been characterised by change and delay. John concentrated, in particular, on the protracted acquisition process which eventually led to the construction of HMAS *Success* to replace HMAS *Supply*. His presentation extended to the current-day project to replace the existing RAN replenishment ships. John's presentation attracted a diverse range of questions as well as recollections from those who attended. The meeting was followed by a pleasant informal dinner with John at the Bent Spoke Brewery near the AMSA offices.

On Wednesday 11 February 2015, the Australian Society for Defence Engineering hosted a meeting at Engineering House in Canberra at which Commodore Rob Elliott gave a presentation on *The Royal Australian Navy's Future Frigate Program — SEA5000*. A number of RINA members also attended. CDRE Elliott is the Director General Maritime Development within the Capability Development Group of the Department of Defence and has responsibility for managing the Royal Australian Navy's future capability requirements and generating the associated business cases for Government consideration. He discussed the proposed acquisition of eight future frigates, which are intended to be larger and more capable than the RAN's current Anzac-class ships as announced in the Defence White Paper 2009 and reiterated in the 2013 Defence White Paper. CDRE Elliott noted that the future frigates are not simply intended as replacements for the Anzac Class. They are to have a strong emphasis on submarine detection and response, with an integrated sonar suite which includes a long-range active towed-array sonar. It is also envisaged that they would be capable of embarking a combination of naval combat helicopters and maritime unmanned aerial vehicles.

The ACT Section Committee held a meeting on Tuesday 24 February 2015, primarily to develop the 2015 technical program. An approximate schedule has been developed in association with the Nautical Institute, and is likely to include presentations on the IMO Polar Code, the new Australian maritime radio VHF data exchange system, an update from the IMO sub-committee on Ship Design and, possibly, also the Federal Government's Pacific Aid Programs related to provision of small vessels to regional nations.

On Thursday 19 March 2015, Caitlin Hoey gave a presentation entitled *The use of AUVs and Acoustic Sonar in Seabed Analysis* at the Campbell Park Offices. Caitlin is a naval architect who recently joined the Navy Platform Systems section of the Navy Engineering Division of the Department of Defence after completing her naval architecture degree at the AMC last year. Caitlin discussed her thesis project which was focused on developing and testing a methodology for the use of automated underwater vehicles (AUVs) and acoustic sonar in the detection of urchin barrens on the coast of Tasmania. Urchin barrens are area of bare rock where the population growth of sea urchins has been so great as to cause destructive grazing of kelp beds which had been attached to the rock. The project involved both conducting a seabed survey with the DSTO Gavia AUV and developing and validating a methodology for the processing of the acoustic data from the AUV sonar to estimate the extent of such urchin barrens. It was necessary to distinguish areas of healthy kelp growth from

areas destroyed by urchins exposing bare rock as well as identifying the sandy seabed where kelp would in any case not exist. Sonar returns therefore needed to be correlated against video footage of the same areas. Caitlin outlined some of the complications encountered during the project and how they were managed. The longer-term aim of this methodology is to allow quantitative monitoring of the rate of urchin damage to the kelp beds over time. This would assist in identification of critical areas and assessing the effectiveness of urchin-control methods.

The AGM of the ACT Section was held on 14 April 2015 at the Campbell Park Offices. Reports for the preceding year were presented by the Chair and Treasurer (via the Chair). Both were reviewed and accepted. The Chair's report prompted discussion on the RINA contribution to the Senate Committee investigating naval shipbuilding, and Rob Gehling outlined the submissions which had been made. There was also some discussion on the Continual Professional Development (CPD) requirements of RINA.

In accordance with section rules, Bruce McNeice stood down as Chair following his two terms. Tom Dearling was willing to take on this role and was duly elected. Ray Duggan, Joe Cole and Claire Johnson continue in their roles as Vice Chair, Secretary and Treasurer respectively. Caitlin Hoey has joined the Committee and has taken on the role of Assistant Secretary. Warren Smith has also joined the committee. Existing committee members who continue on the committee are Richard Dunworth, Martin Grimm and John Lord. Bruce also indicated his intention to step down from the committee for now. He thanked everyone for their work and in turn he was thanked for his energy in sustaining the activities of the section during his tenure.

Martin Grimm

Victoria

The Section welcomed the President of RINA, Bruce Rosenblatt, during his visit to Australia and New Zealand in late February. He visited the Defence Science and Technology Organisation (DSTO) at Fishermans Bend, had an informal evening with members and a tour of Melbourne CBD and Southbank on the weekend.

Two RINA/IMarEST Technical Meetings were held in February and April.

In February Dr Reza Tagipour of Intecsea gave a presentation entitled *Design of a River Mooring — including Consideration of the Effect of Passing Ships*. Reza is a lead naval architect (supervising engineering specialist) with Intecsea, a division of the Worley Parsons Group in Melbourne.

The presentation described analytical studies carried out on a mooring berth. Induced loads and motions were calculated for representative vessels moored at the berth which is located in a river channel.

The channel was modelled assuming a prismatic geometry. Loads induced on the moored vessel were then calculated using the ROPES software. These loads were then used with ANSYS AQWA software for a series of dynamic mooring simulations of the moored vessel. The passing-induced mooring-line tensions, fender reactions, and vessel motions, velocities and accelerations at the moored ship's manifold were evaluated for a series of load conditions and mooring designs. The effects of changing some of the passing-ship-related parameters on the mooring loads and motions were also evaluated and discussed briefly. Finally, the risks associated with damage of a single line were reviewed and the means to mitigate these risks commented upon.

In April Martin Rowan and John Gilbert of the Maritime Division of DSTO gave a presentation entitled

Scientific and Technical aspects of the 2014 Maritime Archaeological Assessment of HMAS AE2 in the Sea of Marmara.

This presentation was very topical as 25 April was the 100th anniversary of HMAS AE2's penetration into the Sea of Marmara and her eventual loss in action.

Andrew Mickan

New South Wales

Annual General Meeting

The NSW Section held its seventeenth AGM on the evening of 4 March, following the March technical presentation and the Australian Division AGM in the Harricks Auditorium at Engineers Australia, Chatswood, attended by nineteen with Alan Taylor in the chair. This attendance equalled the previous record set in 2002 (the first year for which records are available).

Alan, in his third Chair's Report, touched on some of the highlights of 2014, which included nine joint technical meetings with the IMarEST (Sydney Branch), with attendances varying between 61 (for Sean Langman's presentation on *The Quest for Speed under Sail*) and 9 (for Eric Clarke's presentation on *Advances in Slow-speed Marine Diesel Engines*), with an average of 29. Overall, the attendances were similar to the previous year's figures of 56–17 with an average of 30. The attendance at Sean Langman's presentation was a new record since Engineers Australia moved to Chatswood in June 2006. In October last year, Engineers Australia started using a new system for recording presentations, and a limited selection is now recorded and placed on the Engineers on Line website. Details of how to access all previous recordings are given on the RINA/NSW Section/Webcasts website and in each issue of *The Australian Naval Architect*. SMIX Bash 2014 was successful and was attended by 200, including a number of national and international guests. For the first time, we used the Trybooking website for online bookings, and it worked well.

Adrian Broadbent presented the Treasurer's Report. As at 31 December 2014 (the close of our financial year), we had a $747 balance in the Section account. The Australian Division partly reimburses us for the Section's share of the monthly technical meeting costs, including a selection of video recordings. The remainder of the costs are funded from our Social account to bring the Section Account to a float of about $300 at the end of the year.

The present committee members have all agreed to serve for a further term in their current positions, so there is no need for an election and the NSW Section Committee for 2015 remains as it was for 2014:

Chair	Alan Taylor
Deputy Chair	Valerio Corniani
Treasurer	Adrian Broadbent
Secretary	Anne Simpson
Assistant Secretary	Nathan Gale
Auditor	Sue-Ellen Jahshan
TM Program Coordinator and Website	Phil Helmore
Members	Craig Boulton
	Graham Taylor
	Rob Tulk

The NSW Section is represented on the Australian Division Council by Craig Boulton (Treasurer) and Adrian Broadbent (NSW nominee).

RINA President's Visit

The President of RINA, Bruce Rosenblatt, visited the Australian and New Zealand Divisions in February and March. His visit to the NSW Section in Sydney included the following:

On 4 March Bruce visited ASO Marine Consultants accompanied by the Chair of the NSW Section, Alan Taylor.

He then attended the March meeting of the Australian Division Council of RINA, the March technical presentation of the RINA/IMarEST in Sydney, the Annual General Meeting of the Australian Division of RINA, and the Annual General Meeting of the New South Wales Section of RINA.

Following the presentation and the round of meetings, Bruce was taken to dinner at the New York Grill in Chatswood by the members present of the Australian Division Council and the New South Wales Section Committee.

Dinner at the New York Grill
From left: Valerio Corniani, Graham Taylor, Bruce Rosenblatt, Nate Gale, Alan Taylor, Craig Boulton, Tony Armstrong, Rob Gehling, Adrian Broadbent, John Lord and Phil Helmore
(Photo courtesy New York Grill)

On 5 March, Bruce went sailing on Sydney Harbour accompanied by crew John Jeremy, Alan Taylor, Rob Gehling, Adrian Broadbent and Craig Boulton on Craig's yacht, before flying out of Sydney on 6 March.

Bruce Rosenblatt (R) sailing on Sydney Harbour with (clockwise) Alan Taylor, Rob Gehling, Adrian Broadbent and Craig Boulton
(Photo John Jeremy)

President's Address

Following the conclusion of the AGM of the Australian Division of RINA in Sydney on 4 March, Bruce Rosenblatt addressed those present, saying that there have been two major changes in RINA, in the area of governance, and in the location of headquarters.

By way of governance, RINA previously had an Executive Committee and a Council. This has changed to having a Board of Trustees and a Council. The Board of Trustees comprises twelve people and focusses on strategic issues (such as technical committee structure and new committees), while the Council focusses on technical issues. With the Board limited to twelve people it is nimble, and can do things quickly.

For the location of headquarters, RINA bought out the lease on the previous building, which would have had no value after another 25 years. This enabled them to buy a smaller building, refurbish it to the latest requirements, and put

£100 000 in the bank, giving them significant financial stability.

He has had a fantastic trip around the Australian Sections and the New Zealand Division, and has come to know much more about the marine industry there. Everyone has been most generous with their time. He has visited Perth, Adelaide, Melbourne, Auckland and Sydney, and has seen a lot of the industry — which is different in the different places. He now has an understanding of the political issues, and the big-picture view.

As a result, he will be better able to look after the interests of the far-flung Divisions.

Committee Meetings

The NSW Section Committee met on 9 February and, other than routine matters, discussed:

- SMIX Bash 2014: Final finance figures not yet available, as one sponsor has not yet paid, and one sponsorship has ended up in the Australian Division account! However, projections are for a small surplus. Numbers were down somewhat on previous years, with a head count of about 200. The Trybooking website worked well and made the job of the financial controller much easier.
- Technical Meeting Program 2015: We have presentations lined up for March and April, and are investigating presentations for June and August. IMarEST is investigating presentations for May, July and September.
- Visit of RINA President: Arrangements made for visit to a Sydney consultancy, then attend March technical presentation, Australian Division AGM, NSW Section AGM, dinner, and sailing on Sydney Harbour.
- Recording of Technical Presentations: With limited finance for recordings, we need to agree with IMarEST which presentations should be recorded.

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

- SMIX Bash 2014: Accounts are being finalised, with projections for a small surplus.
- SMIX Bash 2015: *James Craig* has been booked for Thursday 3 December for SMIX Bash this year.
- TM Program 2015: Presentations are being canvassed for the remainder of the year.
- Electronic Banking: Online banking has been arranged and signatories to the account are being updated.

The next meeting of the NSW Section Committee is scheduled for 26 May.

Resistance Prediction for Trimarans

Raymond Fagerli, a graduate of UNSW Australia, gave a presentation on *Resistance Prediction for Trimarans* to a joint meeting with the IMarEST attended by thirteen on 4 February in the Harricks Auditorium at Engineers Australia, Chatswood.

Introduction

Raymond began his presentation by describing trimarans as a multihull vessel comprising a main hull flanked by two smaller side hulls (also called amahs). Apart from the usual hydrostatic coefficients, trimarans are characterised by the spacing of the side hulls from the main hull, *s/L* (where *s* is the distance between the centrelines of the side hulls and *L* is the waterline length of the main hull), and the stagger of the side hulls, *d/L* (where *d* is the distance of the LCB of the side hulls forward of the transom of the main hull).

Trimarans are not new—they were used by the Polynesians and other Pacific islanders almost 4000 years ago. They have a number of advantages over monohull craft: they have shallower draft and narrower beam for individual hulls and so reduced wavemaking, as well as wider overall beam and so larger deck area and higher stability.

The best method of predicting resistance of a trimaran is by tank testing. However, this takes time and costs significant money. There are no known methods for numerically predicting the resistance of trimarans from the hull design parameters as there are for monohulls and catamarans. This undergraduate thesis project set out to develop such a method.

Combined Methods

The first approach was to consider the trimaran as comprising two components:

- a main hull whose resistance would not be affected to any great extent by the proximity of the side hulls; and
- two side hulls whose resistance would be significantly affected by the proximity of the main hull; this could be treated as a catamaran with demihull spacing equal to twice the distance from a side-hull centreline to the maximum waterline beam of the main hull.

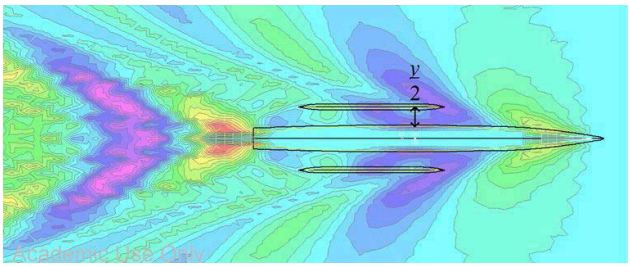


Figure 1 Spacing of side hulls for catamaran configuration (Image courtesy Raymond Fagerli)

The resistance of the main hull, it was theorised, could be determined using the method of Holtrop (1984). The resistance of the side hulls could be determined using the method of Insel and Molland (1991).

For the main hull, in the usual notation:

$$R_{T,MAIN} = (1 + k)R_F + R_{APP} + R_W + R_B + R_{TR} + R_A$$

We are not interested in appendages, bulbous bows or correlation allowances at this stage, so this reduces to

$$R_{T,MAIN} = (1 + k)R_F + R_W + R_{TR} = (1 + k)R_F + R_R$$

For the side hulls in catamaran configuration:

$$C_{T,CAT} = (1 + \beta k)C_F + \tau C_W$$

where C_F and C_W are for one side hull, β is Insel and Molland's viscous interference factor, and τ is their wave interference factor. β was given as a graph to a base of *s/B* ratio for discrete values of *L/*B ratio, and τ was given as a graph to a base of Froude number for discrete values of *s/L* ratio and *L/B* ratio.

Molland et al. (2013) subsequently published an equation for $(1 + \beta k)$:

$$(1 + \beta k) = 3.03(L/\nabla^{1/3})^{-0.4}$$

and Jamaluddin et al. (2013) published equations for τ of

the form

$\tau = c(s/L)^{-f}$

where coefficients c and f were given at discrete values of Froude number.

So, the resistance of the side hulls can be calculated as

$R_{T,CAT} = \frac{1}{2}\rho S v^2 C_{T,CAT}$

and the resistance of the trimaran is then

$R_{T,TRI} = R_{T,MAIN} + R_{T,CAT}$

A developmental trimaran hullform which had been tank tested by QinetiQ was obtained as a basis, and the approach outlined above applied. The results are shown in Figure 2.

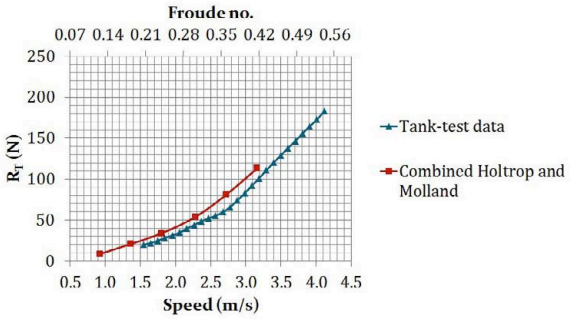


Figure 2 Combined Holtrop and Insel & Molland methods compared to tank-test data
(Image courtesy Raymond Fagerli)

The combined method agrees only reasonably (at best) with the tank test data, and a number of problems became apparent:

- The Holtrop equations were derived from the results for displacement vessels, and the maximum Froude number is limited to about 0.4, where the basis hull was tested to 0.54 and many modern trimarans operate at up to 0.9.
- In addition, the prismatic coefficients, L/B and B/T ratios of modern trimarans tend to be outside the range of the Hotrop equations.
- The Insel and Molland viscous and wave interference factors were given at discrete values of s/L and L/B ratios, and this meant time-consuming interpolation. A surface equation could possibly have been fitted to the viscous interference factors, but the wave interference factors were distinctly wavy and not conducive to fitting a surface equation.
- As a result, there are few discrete points on the graph for the combined method, and these cannot represent any humps or hollows in the resistance curve at all well.

For these reasons, the combined method was abandoned, and another approach sought.

The Slender-Body Method

It was found that there was no published resistance data for a systematic series of trimarans. Since a good basis hull was already available, it was decided to check whether the slender-body method (based on Michell's 1898 thin-ship theory) in the Maxsurf Resistance software could match the tank test data. If so, then the basis hull could be used as a parent for a whole systematic series to be run in the Maxsurf Resistance slender-body towing tank.

Michell's thin-ship theory calculates the energy in the free-surface wave pattern to give R_W, to which is added the viscous resistance, and this has been found to give good results for symmetrical slender hulls. Doctors and Scrace (2003) tested two different trimarans and found excellent agreement between the thin-ship theory and tank-test data. They also found that the thin-ship theory worked better with smaller side hulls, as there was less interference.

The basis trimaran was set up in Maxsurf Modeler, with 2021 offsets for the main hull and 304 offsets for each side hull. However, the side hulls were symmetrical about their own centrelines below the waterline but, above the waterline, non-symmetrical, in that the inboard sides sloped inwards towards the main hull. This cannot be handled by the thin-ship theory, so the problem was solved by mirroring the outboard sides of the side hulls about their own centrelines to make them symmetrical. It was considered that this would have little or no effect on the calculated resistance, as the change was all above the DWL.

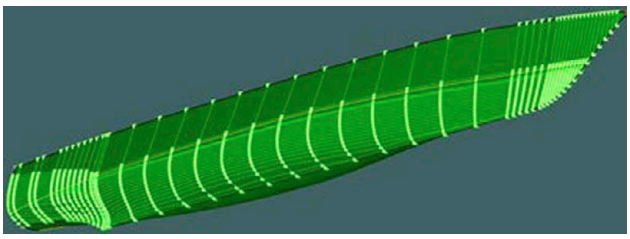


Figure 3 The main hull in Maxsurf Modeler
(Image courtesy Raymond Fagerli)

Figure 4 The side hulls in Maxsurf Modeler
(Image courtesy Raymond Fagerli)

Figure 5 The side hulls made symmetrical in Maxsurf Modeler
(Image courtesy Raymond Fagerli)

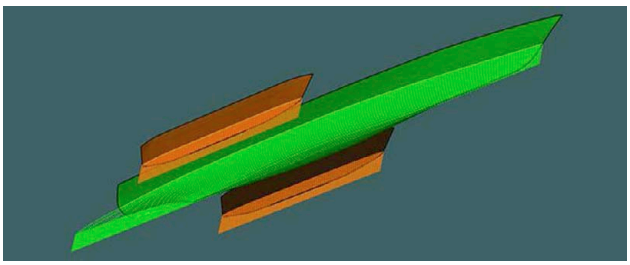


Figure 6 The slender-body mesh in Maxsurf Resistance
(Image courtesy Raymond Fagerli)

The Maxsurf model was then run using the slender-body method in Maxsurf Resistance, and the results are shown in Figure 7.

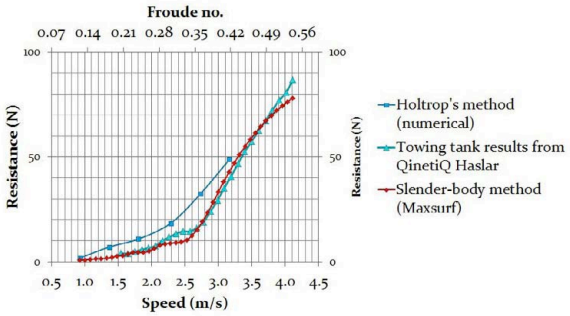


Figure 7 Comparison of slender-body method with tank-test results
(Image courtesy Raymond Fagerli)

It is immediately apparent that the slender-body method gives a good result over most of the range, with small deviations at Froude numbers of 0.28–0.35 and above 0.49. However, it gives a significantly better fit than the combined Holtrop and Insel & Molland methods.

Systematic Series

It was felt that the results from the slender-body method for the basis hull were good enough to proceed with a systematic series using the basis hull as a parent. The parameters selected for variation were the length/beam ration L/B, slenderness ratio $L/\nabla^{1/3}$, spacing of the side hulls s/L, and stagger of the side hulls d/L.

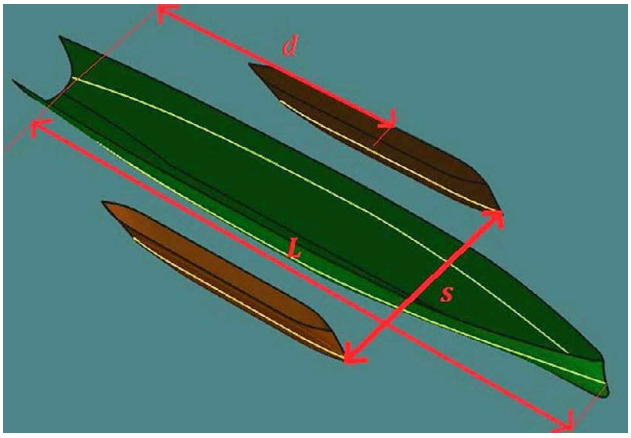


Figure 8 Spacing and stagger variables for systematic series
(Image courtesy Raymond Fagerli)

The limits of the series are as follows

Item	Minimum	Parent	Maximum
Fn	0		1.0
L/B	8.7	11.3	22.9
$L/\nabla^{1/3}$	8.0	9.32	11.0
s/L	0.15	0.18	0.30
d/L	0.10	0.35	0.60

The displacement of the side hulls was not varied in this series, because this was considered to have a vanishingly-small effect on resistance, the positioning of the side hulls (by way of spacing and stagger) having a much greater effect. The side hulls comprised 4.3% of the parent vessel displacement.

The slenderness ratio was changed by changing the length/beam ratio, so these two parameters were not independent. Each main parameter was given five discrete values over the range, making a systematic series of 125 models. This series was run through the slender-body method in Maxsurf Resistance, which gives results at 40 speeds over the specified range, and a total of 5000 data points.

A regression equation was then sought for the non-dimensional residuary resistance R_R/W using the commercial software program CurveExpert. Little success was had with polynomial attempts, with low values of the correlation coefficient R^2. However, good results had previously been obtained for catamarans using a van Oortmerssen (1971) type equation, so an equation of this type was tried using the parameters shown.

$$\frac{R_R}{W} = \left(a_0 + a_1\frac{s}{L} + a_2\left(\frac{s}{L}\right)^2 + a_3\frac{L}{\nabla^{\frac{1}{3}}} + a_4\left(\frac{L}{\nabla^{\frac{1}{3}}}\right)^2 + a_5\frac{d}{L} + a_6\left(\frac{d}{L}\right)^2 + a_7\frac{d}{\nabla^{\frac{1}{3}}} + a_8\frac{ds}{L^2}\right) \times e^{\frac{-0.0036\left(\frac{L}{\nabla^{\frac{1}{3}}}\right)^2 Fn^2}{9}} + \left(a_9 + a_{10}\frac{s}{L} + a_{11}\left(\frac{s}{L}\right)^2 + a_{12}\frac{L}{\nabla^{\frac{1}{3}}} + a_{13}\left(\frac{L}{\nabla^{\frac{1}{3}}}\right)^2 + a_{14}\frac{d}{L} + a_{15}\left(\frac{d}{L}\right)^2 + a_{16}\frac{d}{\nabla^{\frac{1}{3}}} + a_{17}\frac{ds}{L^2}\right) \times e^{\frac{-0.0036\left(\frac{L}{\nabla^{\frac{1}{3}}}\right)^2}{Fn^2}} + \left(a_{18} + a_{19}\frac{s}{L} + a_{20}\left(\frac{s}{L}\right)^2 + a_{21}\frac{L}{\nabla^{\frac{1}{3}}} + a_{22}\left(\frac{L}{\nabla^{\frac{1}{3}}}\right)^2 + a_{23}\frac{d}{L} + a_{24}\left(\frac{d}{L}\right)^2 + a_{25}\frac{d}{\nabla^{\frac{1}{3}}} + a_{26}\frac{ds}{L^2}\right) \times e^{\frac{-0.0036\left(\frac{L}{\nabla^{\frac{1}{3}}}\right)^2}{Fn^2}} \times \sin\left(\frac{1}{Fn^2}\right) + \left(a_{27} + a_{28}\frac{s}{L} + a_{29}\left(\frac{s}{L}\right)^2 + a_{30}\frac{L}{\nabla^{\frac{1}{3}}} + a_{31}\left(\frac{L}{\nabla^{\frac{1}{3}}}\right)^2 + a_{32}\frac{d}{L} + a_{33}\left(\frac{d}{L}\right)^2 + a_{34}\frac{d}{\nabla^{\frac{1}{3}}} + a_{35}\frac{ds}{L^2}\right) \times e^{\frac{-0.0036\left(\frac{L}{\nabla^{\frac{1}{3}}}\right)^2}{Fn^2}} \times \cos\left(\frac{1}{Fn^2}\right)$$

Figure 9 van Oortmerssen-type equation for R_R/W for trimarans
(Image courtesy Raymond Fagerli)

When the results for the systematic series for R_R/W were run through CurveExpert with the equation in the format shown in Figure 9, an R^2 value of 0.9978 was found, indicating a very good fit of the equation to the data. This can also be seen in the figures comparing the equation with the slender-body method and the tank test data for the parent hull.

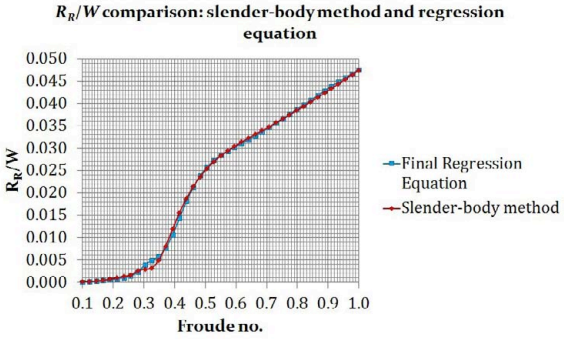


Figure 10 Comparison of regression equation with slender body methodfor R_R/W of parent hull
(Image courtesy Raymond Fagerli)

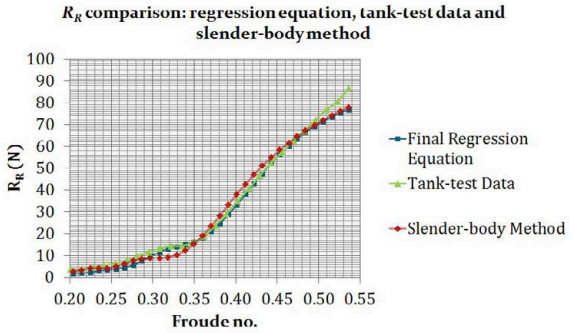


Figure 11 Comparison of regression equation with tank-test data for R_T of parent hull (Image courtesy Raymond Fagerli)

One of the interesting things to note about the graph of total resistance is that the regression equation follows the tank-test data better than the slender-body method from which it was derived! It is surmised that this is because the van Oortmerssen-type equation has sine and cosine terms built in to attempt replicate any humps and hollows in the R_R curve, and these are having the desired effect.

The method should not be used where the displacement of the side hulls comprises a large fraction of the total displacement (e.g. larger than 10%).

Some of the findings of Doctors and Scrace (2003) are relevant here:

- interference effects can equate to ±40% of the total residuary resistance
- larger hull separation causes a reduction in resistance; and
- decreased stagger causes a reduction in resistance.

Testing

The acid test is, of course, to test the method on a vessel which was not in the original series. A second trimaran which also had experimental results was therefore obtained from elsewhere industry. Unfortunately, some of the hullform parameters were slightly outside the range of the series, the main one being the displacement of the side hulls in the load condition amounting to 14.2% of the total vessel displacement, but the vessel was run through the regression equation anyway. In the lightship condition, the side hulls comprised 8.9% of the total vessel displacement. The results are shown in Figures 12 and 13. It can be seen that, for the lightship condition, the regression equation is a much better fit to the experimental data.

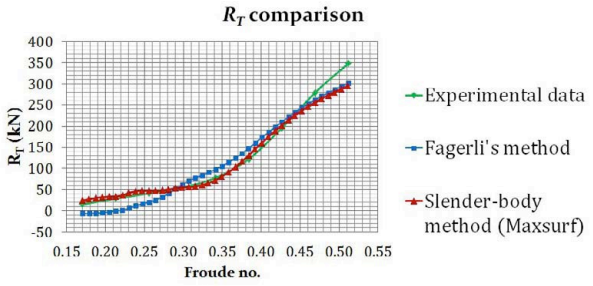


Figure 12 Comparison of regression equation with slender-body method and experimental data for R_T of industry hull in load condition (Image courtesy Raymond Fagerli)

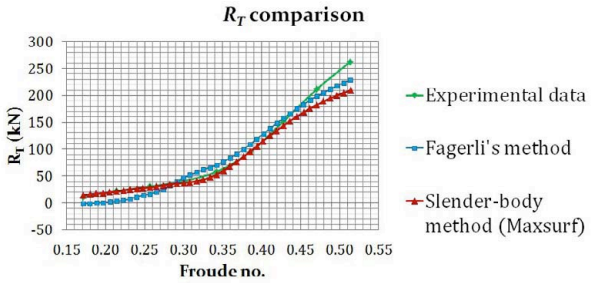


Figure 13 Comparison of regression equation with slender-body method and experimental data for R_T of industry hull in lightship condition (Image courtesy Raymond Fagerli)

It can also be seen that the slender-body method fits the experimental data better than the regression equation over most of the range, but that the regression equation does a better job than the slender-body method above a Froude number of about 0.45. Better results may have been obtained by the regression equation if the vessel parameters had all fitted within the systematic series.

Conclusions

The combination of the Holtrop and Insel & Molland methods does not give a good estimation of the resistance of a trimaran. The systematic series developed here has come up with a regression equation for R_R/W which gives a good estimation for preliminary design purposes (before the hullform is known in detail) and, for the vessel tested, is conservative. In general, the slender-body method gives good results if the hullform is known in detail.

This project was a first attempt at a systematic series of trimarans, and can be extended to cover a wider range of the parameters already tested (especially the stagger which has a big effect on wavemaking interference), and to vary other parameters, such as the length and displacement of the side hulls, the prismatic coefficient of the main hull, the beam/draft ratio of the main hull.

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

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Dry Docking a Cruise Ship in Australia

Peter Little, Senior Vice President Fleet Operations for Carnival Australia, gave a presentation on *The Dry-dock Challenge: Docking a Cruise Ship in Australia* to a joint meeting with the IMarEST attended by fifty-four on 4 March in the Harricks Auditorium at Engineers Australia, Chatswood. This was the third-best attendance of the 79 technical meetings held since Engineers Australia moved to Chatswood in June 2006.

Introduction

Peter began his presentation by saying that he began his career as a cadet marine engineer on cargo vessels, and worked his way up to Chief Engineer. He has been in the cruise industry since 1991, and now has responsibility for the ship and shore operations of Carnival Australia in the region.

Carnival Corporation is the largest vacation company in the world, and the largest cruise operator. The company is dual listed on both the New York and London stock exchanges, has an annual turnover of USD 15.8 billion, more than 100 ships in service, and carries more than 8.5 million passengers annually.

Carnival Australia is a regional subsidiary of Carnival Corporation , the operating unit for P&O Cruises Australia, and the operational service provider for locally-deployed Carnival-brand businesses. The company also provides commercial service support for six other brands operating or sourcing market locally, including Cunard, Princess Cruises, Holland America, and Seabourn.

Australia is the fastest-growing cruise market globally, having experienced an annual average growth rate of 21% since 2002. In 2013, over 833 000 Australians took a cruise holiday, and the milestone of one million annual Australian cruise passengers should be reached by 2016.

The major destinations currently covered by the group include Australia, Papua New Guinea, Solomon Islands, Vanuatu, New Caledonia, Loyalty Islands, Fiji, Tonga and New Zealand.

This year will see nine ships based in Australia year round: five for P&O Cruises, three for Princess Cruises, and one for Carnival Cruise Lines. Approximately 18 000 Australians are cruising in the region every day of the year!

The Dry-dock Process

Peter then showed a video of the dry-dock process for the docking of *Pacific Dawn*. The video is available on YouTube at https://www.youtube.com/watch?v=DtKlrz3_ONo.

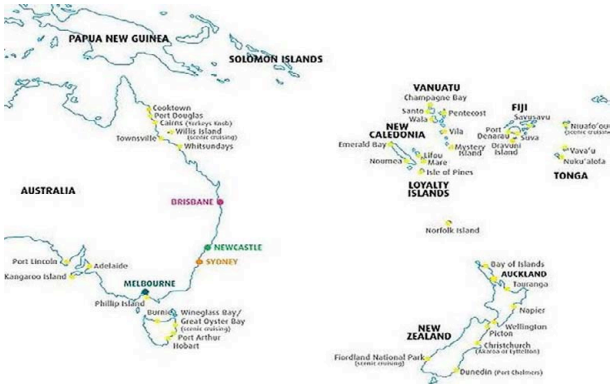
0600 *Pacific Dawn* arrived at the Brisbane Cruise Terminal and unloading baggage began

0800 Passengers began disembarkation

1500 Vessel moved to the dry dock

1800 Caisson moved into position and dewatering began

There is an absolute minimisation of down-time to maintain



Major destinations currently covered by the group
(Image courtesy Carnival Australia)

the service schedules of the ships. The operation takes lots of planning, and there is little margin for error. However, the Brisbane dry dock has now closed, and this leaves only one dry dock in Australia capable of docking cruise vessels, presenting a new challenge for cruise-ship operators.

Pacific Dawn
(Photo from Wikipedia website)

Contribution to the Local Economy

The economic contribution to the local economy of dry docking is significant. At Carnival's current rate, dry-docking of cruise ships is worth in the region of $15 million to $20 million annually to the Australia economy. There is the potential to treble over the next 5–6 years should we dock our domestic trading ships in Australia. Each docking event creates hundreds of Australian manufacturing and marine-based jobs.

Commercial Planning

Dry-docking is required twice in every five years for current passenger vessels. Out-of-service planning starts at least two years out. Cruise itineraries for vessels are on sale 18 months out. Voyages are manipulated to bring ships as close to the dry-dock facility as possible, thereby minimising out-of-service time. In Australia, that sees ships having to come to Sydney regardless of the home-port location. Days out-of-service for a docking are determined by the scope of work and so fluctuate between 12 and 14 days presently.

Technical and Refurbishment Planning

All maintenance and refurbishment is managed by Carnival's Technical Services Department. The technical scope is continually developed over the ship's life and is an organic process. Obsolescence is a significant issue and can have a material impact on the planning. Dedicated project managers on both sides (i.e. the owner and the shipyard) have ensured our success.

Hotel refurbishment is managed via a dedicated team working closely with the Carnival brand. In general, the ships go through major upgrades every five years or so, with an interim refurbishment in each cycle. Life extensions take place when ships are transferred between brands or at around 12–15 years. This process tends to be market driven, however, and so is not hard and fast.

Specifications are prepared between six and nine months out from the docking. We use a dedicated refit-planning module to capture all technical works, prepare specifications and generate the project plans. It is usually the unforeseen events (e.g. an issue with underwater equipment, such as tailshafts or rudders) which catch you in the end, because planned works tend to go according to the schedule.

Here Peter showed another video, giving some of the detail of the work done on *Pacific Dawn* at her docking in Brisbane. The video is available on YouTube at https://www.youtube.com/watch?v=yrMHTAI_k6s.

There were 650 contractors involved, with 580 crew still on board and 200 shipyard workers involved. They removed the propellers for servicing, as well as the stabilisers (which had to be removed on an angle due to space limitations in the dock) and the bushings, bearings and seals were renewed. The spider is a wheeled piece of equipment which attaches to the vessel via suction, and crawls around under guidance, removing all paint back to bare metal in preparation for re-coating. In the engine room, work was done on the fuel tanks, main bearings were replaced, and the turbochargers were overhauled. There are 29 main circuit breakers on board the vessel for power distribution, and each one has a mass of 415 kg!

Propeller removal
(Photo courtesy Carnival Australia)

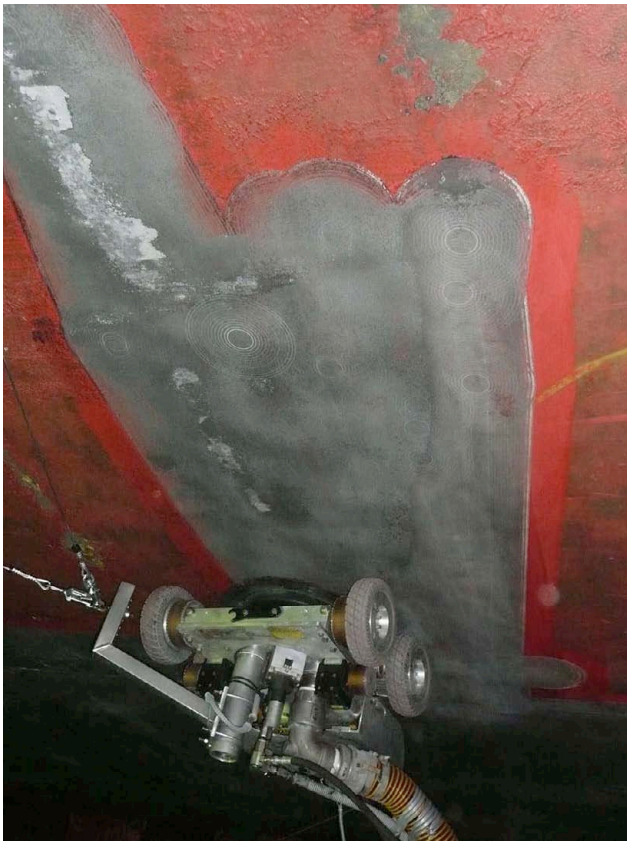
Scope of Work

The average scope of work for a dry docking is significant, and includes hotel outfitting, specialist technical works, and standard docking maintenance. There is usually around 150 fully-loaded maintenance projects. A total local workforce of around 300 is sourced from the maritime industry. This local workforce is supplemented with international specialists. Investment can be anywhere between $10 million and $50 million per ship.

During a dry docking, we try to achieve the following;

- Statutory Works: Hull works, underwater paint, underwater machinery and classification and regulatory-authority works.
- Upgrades and Obsolescence Management: Propulsion upgrades, main-engine works, electrical network maintenance, and navigation upgrades.
- Standard Maintenance: Lifesaving, general mechanical, hotel and electrical equipment, steel repairs, and painting of hull and superstructure.

Stabiliser shaft
(Photo courtesy Carnival Australia)



Spider removing antifouling paint on ship's bottom
(Photo courtesy Carnival Australia)

Underwater paint coating is key to our fuel conservation efforts, as fuel consumption is our biggest single cost. Stabilisers are required to be in top working order due to the local operating environment, as passengers like the ship *not* to move in a seaway! The underwater manoeuvring gear needs close attention due to the operating profile of the fleet.

There are three different examples of hotel revitalisation and maintenance-type work:

- General Repairs and Maintenance: Soft furnishing works, and carpets.
- Brand Refurbishment: Major public room/space conversions, and major colour palette changes.
- Re-branding: Taking a ship under one particular brand and re-working it to create a new product offering.

These are non-standard tasks for a dry-dock operator, and are specialist niche works usually requiring European/Asian/US-based resources. This is similar to what you would expect ashore with the reworking of a hotel. However, the marine and regulatory arrangements are very different, and this includes materials meeting IMO specifications, and SOLAS and Fire Safety Code requirements.

Brand refurbishment works include the addition of new livery and installation of new carpet. One such is the major conversion of the current *Lido* Buffet into *The Pantry* food-court, major refurbishment of the *Waterfront* restaurant, teak deck refurbishment/replacement, open deck repairs and standard cabin refurbishments on board *Pacific Dawn.* Here Peter showed a number of slides illustrating the areas in "before" and "after" configurations.

Exploring Current Trends and Barriers

Ships are getting larger, dry-dock capacity in the region is shrinking, the maritime workforce and support industry is reducing, time out-of-service is getting shorter, scope of work is continuing to grow, and cost pressures are increasing.

In exploring the trends we see that, in 1990, Carnival's largest cruise ship operating in the Australian market was 22 000 GRT, 168 m long and carried 700 passengers. By 2000, the standard was 70 000 GRT, length 245 m and 1700 passengers. Today the standard ship size is 86 000 GRT, length 300 m and 2700 passengers.

Barriers to success include:

- There is only one dry-dock in operation nationally which has the size and capability to perform cruise-ship dockings.
- The alternative is Singapore, which is not always commercially suitable for the domestic brands.
- The ship-repair industry in Australia is in decline, which makes it difficult for the one remaining dry-dock to supply sufficient skilled labour force on demand

Dry-dock needs are on the increase. More ships in the region means that more dockings will be required. For our local fleet, that is 18 dockings in five years, or three or so per year. Consideration must be given to the development of alternative dry-dock facilities, because there are currently limited dry-dock options in Australia. Therefore we require somewhere in the region of 40 dock days per year. Our needs are further increased by the ad-hoc emergency dockings which, unfortunately, occur from time to time.

Issues specific to docking in Australia include the facts that there is a complicated visa processes for all overseas contractors, there are limited local resource for core skill requirements, and limited capabilities of shipyards which are unable to handle significant upscaling of scope due to lack of qualified resources.

Time out-of-service is reducing. Average days out of service for a scheduled docking in 1990 was between 14 and 20 days, with incremental annual lay days. The average today is between 12 and 14 days per cycle with no lay days. Ships less than 15 years old are also able to operate under the in-water survey (IWS) program, pushing cycles out to five years. Cost pressures are increasing globally.

How are We Making it Work?

Despite the regional barriers we have prevailed this far, but the trend is not sustainable. The following have contributed to success so far:

- Relationships: We have built key business relationships with dry-dock operators over the years. Without these we could not have survived in the region.
- Royal Australian Navy: The RAN has worked with us on a number of occasions to ensure our success in the tourism industry, usually with dock space or access to their base.
- Core Support Network: We have built up a global core of specialist suppliers to service our needs here in Australia. Some of them are local and some from abroad. Without their efforts we could not have achieved what we have achieved in recent times.
- Dedicated and Experienced Shore Management Team: The skills and leadership of the local team in Australia has been a feature of our success.

Summary

There have been small steps forward. Recent changes to Government legislation (via the Customs Act) and the unintended consequences of importation threatened to unwind our whole dry-dock operation. Context was essential in convincing Government of the dry-dock value proposition and the economic upside which is leading us on a path to legislative reform. The first steps of reform are on the horizon, but there is some way to go to build a more-sustainable and competitive future for docking in the region.

The availability of dry-dock facilities in more than one location is key to the future needs of the cruise and shipping industries.

The Government needs to look to other developed nations and streamline the visa process for skilled specialist workers.

Dockyards need to be able to perform basic functions in a cost-effective manner. At this stage they are not as competitive as other yards in the world.

Without the skills, the dockyards will cease to exist. The government needs to realise the importance of the maritime cluster and the development of the Australian maritime industry if it is to survive the current continuing decline.

Questions

Question time was lengthy and elicited some further interesting points.

The problems are equally distributed between lack of dock facilities and lack of skilled people.

A large floating dry dock is not the answer, as there is insufficient infrastructure, and you need somewhere to put it. The skills are equally significant.

Cruise vessels these days are designed for a 30-year life. However, operators need to be careful in the disposal of the vessel, and the sunset strategy is not clear. There is a limited

number of shipyards capable of building ships that Carnival would buy, and so they keep the vessels running for as long as they economically can.

The classification requirement is for two dry dockings in five years for passenger vessels. However, safety certificates require annual renewal, so annual underwater inspections (in-water surveys) are done by divers.

The dock in Western Australia is being extended to take vessels up to 180 m in length. However, the smallest cruise ship currently operating in Australian waters is 245 m, and so all are too large for WA.

Fuel is the single biggest cost for cruise-ship operators, so they are constantly working on improving their fuel efficiency and environmental performance. They invest a lot of money in fluoropolymer coatings and propeller-boss cap fins, because the main electrical load is for propulsion, and anything that they can improve hydrodynamically is beneficial. They need to monitor the fuel consumption rate instantaneously on board, and so have invested in fuel flow meters. Cars typically have these, but ships generally don't. They are also working on variable-speed fans for hotel and machinery-space ventilation. There are lots of small pieces in the puzzle of how to improve overall, including optimising itineraries.

Satellite links with the ship for monitoring purposes is an issue, and basically at dial-up speed. For some things, they can diagnose faults from ashore, but not energy consumption—yet. The problem is getting the bandwidth required, because guests chew it up by wanting FaceBook available to them 24/7!

The IMO's Energy Efficiency Design Index and Energy Efficiency Operational Indicator will force operators into re-engineering their ships, by removing old equipment and installing new more-efficient equipment. New ships are generally efficient. Unfortunately, there is a Green Index for some ships available online, but this is based on data published from the build of the ship, is not necessarily true, and takes no account of subsequent improvements, so take no notice of it! Cruise vessels are in a different landscape compared to other vessels, and innovations stand up pretty well. Carnival Corporation has the only fleet-based program around scrubber technology to reduce the emissions.

Carnival Corporation has a design department ashore in Southampton, UK. They didn't have it 20 years ago, but they certainly do now. Since 2008, their ships have become very fuel efficient, and engine manufacturers are improving the efficiencies of their engines all the time.

They have considered LNG as a fuel, and some passenger vessels have already gone that way. The problem here is that there is still no regular supply of LNG in this region. However, most engines that they fit now are for dual fuel, and so they may eventually be on LNG.

Cruise vessels often use aluminium alloys in the construction of their superstructures, but Peter has not yet seen extensive use of composites.

As far as Australian dockyards go, Thales often deals with Navy ships but less often with commercial vessels, and so they have fewer skills in this area. Peter would like to see the continued building of relations, and skills on commercial vessels.

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

Peter Little (R) accepting his certificate and wine from Geoffrey Fawcett (C) and Len Michaels
(Photo courtesy Carnival Australia)

Side Lifting Foil on *Wild Oats XI*

Warren "Skip" Miller, Senior Design Engineer, Composites Consulting Group, gave a presentation on *Side Lifting Foils and Support Structure on* Wild Oats XI to a joint meeting with the IMarEST attended by thirty on 1 April in the Harricks Auditorium at Engineers Australia, Chatswood.

Introduction

Skip began his presentation by showing a video of the start of the 2014 Sydney–Hobart Yacht Race, and looking at the differences between the vessels. *Comanche* has a beam of 27 ft (8.23 m), while *Wild Oats XI* has only 18 ft (5.49 m), a massive difference. In general, *Comanche* has more hullform stability and so can carry more sail, giving more power. *Wild Oats XI* is now ten years old, and needs stability from other sources to be able to maintain competitive speed. She has had modifications every year to help her go faster.

Composites Consulting Group (CCG) is an independent DIAB Group company which has extensive engineering and manufacturing experience in composites. They offer a complete specialist consulting service in all areas of composite materials and applications. However, they can bring in consultants if required, such as for resin transfer moulding (RTM) processes.

Skip himself is a naval architect who came to Australia ten years ago, and worked for SP High Modulus in Mona Vale before joining CCG.

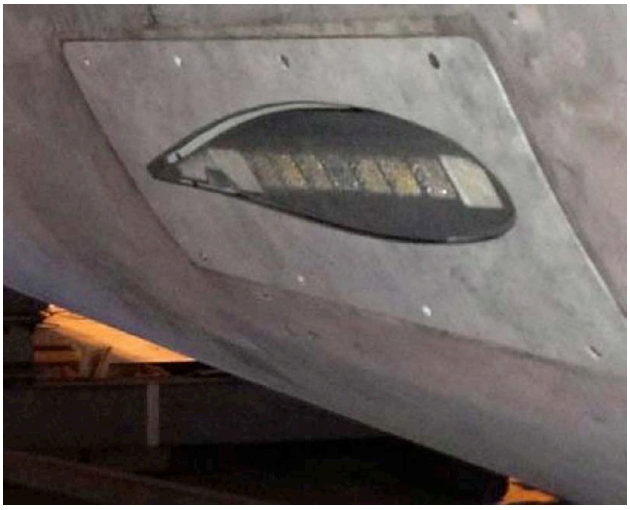
The Problem and Solution

Wild Oats XI at the commencement of this project was eight years old. At high speeds, the boat tends to sail down by the bow, and lacks stability compared to newer, wider hulls such as on *Loyal* (ex *Speedboat*), *Ragamuffin* (ex *Maximus*) and *Comanche.*

The solution was to fit a lifting board projecting to the leeward side of the vessel. This involved a considerable number of consultants:

- Paul Bieker for the side board (Dynamic Stability System foil) design and engineering;
- Core Composites for the side board fabrication;
- Steve Quigley (One2three Naval Architects) and Giorgio Provinciali for CFD, balance, trim and stability;
- Nick McGarry for C-designs, bearings and actuators;
- McConaghy Boats for the case construction and total final installation; and
- Composites Consulting Group for the case and support structure engineering.

Side lifting foil on *Wild Oats XI*
(Photo courtesy Composites Consulting Group)



Hull plate for side lifting foil on *Wild Oats XI*
(Photo courtesy Composites Consulting Group)

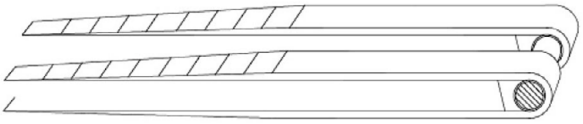
Construction of side lifting foil on *Wild Oats XI*
(Photo courtesy Composites Consulting Group)

The Tool Box

The tool box of the composites engineer includes all of the following: panels (for bulkheads and shells), beams, unidirectional tapes, strap laminates and hoop tapes, shear plies, tray laminates, solid laminates and abutments, and last but not least, good old bolting.

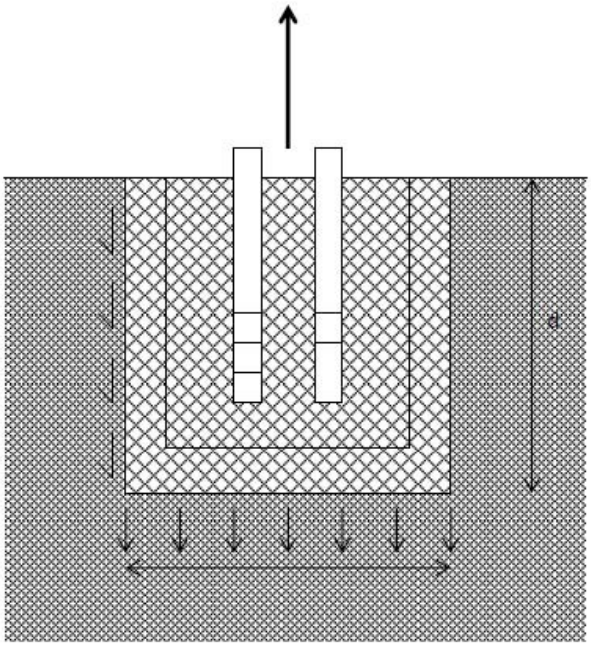
One of the advantages of composites (over metals) is that you can use unidirectional tapes which give strength in the direction needed. Carbon fibres have a UTS of 1400 MPa, compared to high-tensile steel of 1000 MPa. However, there are lots of places to come unstuck. For example, the strength of unidirectionals falls off markedly for more than 2º off load alignment.

Strap laminates and hoop tapes are a very efficient piece of structure excelling in carrying axial loads.



Strap laminates and hoop tapes
(Image courtesy Composites Consulting Group)

Shear plies typically place the fabric at ±45º, and lose strength away from 45º, but they are good for distributing point loads to the hull, e.g. at the chain plates.

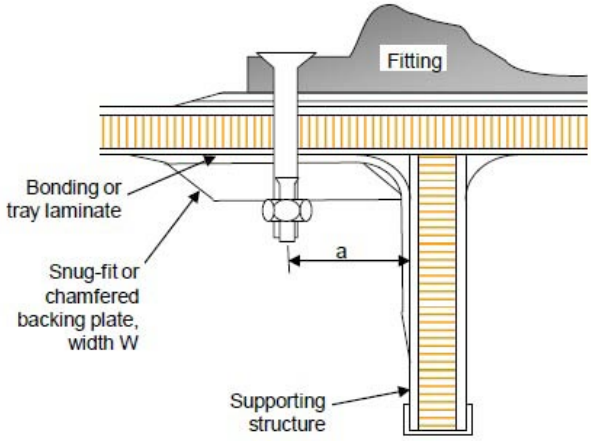


Shear plies
(Image courtesy Composites Consulting Group)

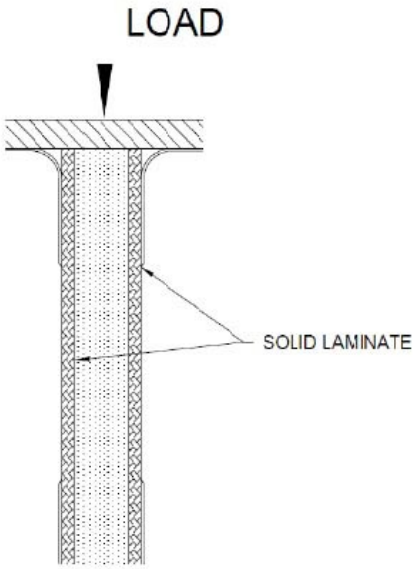
Tray laminates and bolted joints allow you to pull something away from something else, e.g. the keel bolts or anchor winch on deck.

Loads

What are the loads; what do they mean, and what sort of criteria apply? In general, they had to design for the primary vertical load on the foil for lifting or stabilising, the reverse vertical load for bow diving, and the grounding load for hitting the ground or a sunfish or other object in the water. For the grounding load, it was assumed that the vessel would



Tray laminates and bolted joints
(Image courtesy Composites Consulting Group)



Solid laminate and an abutment
(Image courtesy Composites Consulting Group)

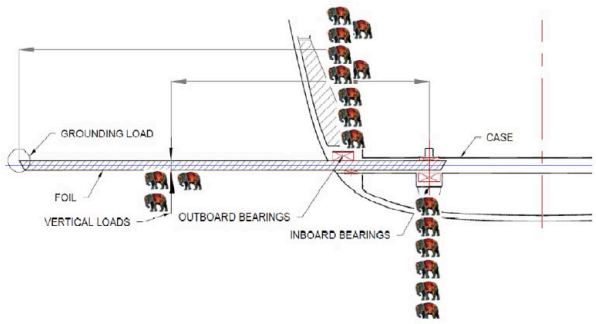
pivot around the end of the board so the load would be less than that which it takes to break the board

Paul Bieker gave them the loads. As composite engineers, they have several approaches to deal with the loads. One way is to multiply the steady-state load by a safety factor of 3.375, which is similar to the DNV factor of 3.3. This gives them a load to use as an ultimate or breaking load. Using this method, the ratio of dynamic load to static load is 1.5×1.5 = 2.25. This so-called limit load is considered the load at which micro-cracking occurs, i.e. the resin suffers cracking, which is irreversible and similar to yield in a ductile material. The aim is to design the structure so that the lifting foil breaks at a point where microcracking is just occurring in the structure. This way, it is clear that the structure is still safe and a foil can be replaced.

Here Skip showed a slide of the side lifting load on the board, and the resulting loads on the inboard and outboard bearings, in terms of elephants!

The loads are reacted by two sets of bearings inside the hull which support the foil. The load is amplified due to the necessarily large support span. Since the width of the board is limited to the width of the hull (so it completely disappears when not in use) it is most efficient to space the bearings as far outboard as possible (and use mirrored sets port and starboard).

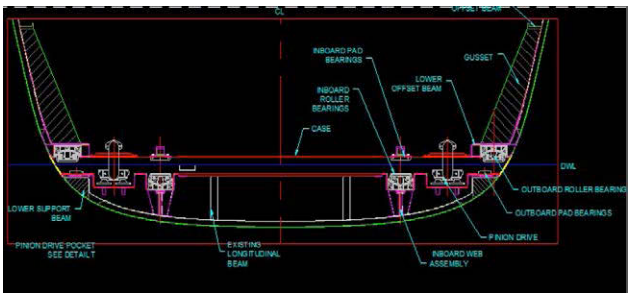
By moving the bearings outboard, more foil is exposed creating greater lift, but the load is further amplified in the bearings.



Loads
(Image courtesy Composites Consulting Group)

Case Assembly

The board is located in the 1000 mm space between the keel bulkhead and the mast bulkhead, so they had those bulkheads for primary support. There are holes in the sides of the hull, between the chain plates and the floors, and seals port and starboard with the board in a case. The board is deployed on the leeward side and is most useful at about 15º heel. There is hydraulic gear and a rack for the deployment. They could have used pinch rollers, a common method, but would then have needed shear webs in the board to resist those loads, and so didn't do it that way. The fork in the road has to do with whether you want to be able to deploy the board while moving. The system they came up with is fully automatic, meaning that the board can be deployed at any speed at the touch of a button. All of the case was fabricated at Mona Vale, and installed at the dock at Woolwich.

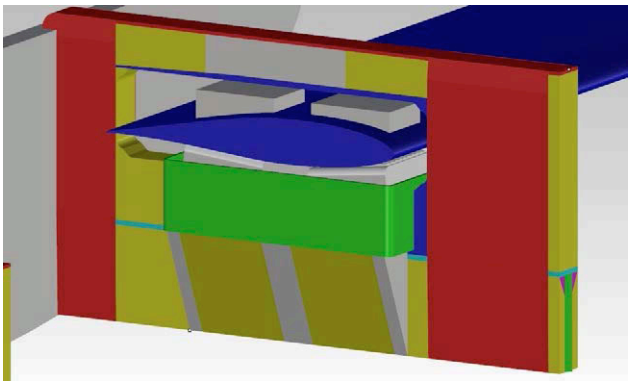


Section through case centreline showing arrangement
(Image courtesy Composites Consulting Group)

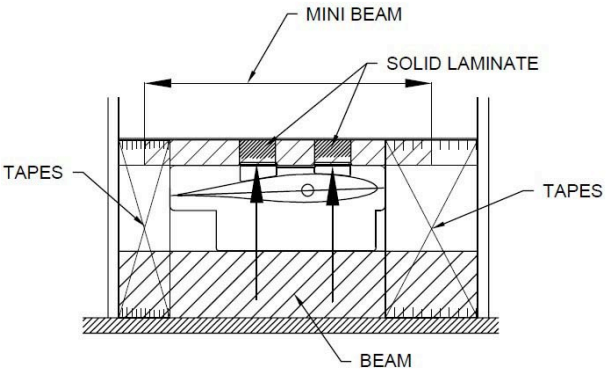
Inboard Bearing Support

There was insufficient time to analyse the structure using finite-element methods, so they had to do it all from first principles.

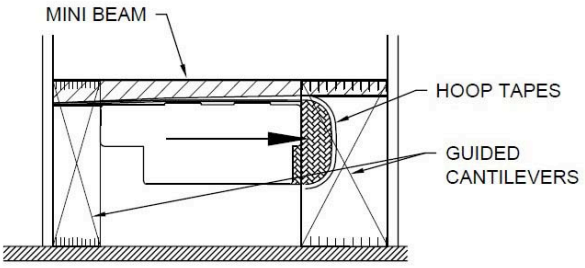
The inboard bearing support turned out to be something like a stack of pancakes. To cater for the primary vertical load, they transferred the load to the bulkheads fore and aft via a beam below the board and, to spread the load to the beam they used solid carbon plates in abutment wrapped in shear plies to achieve the needed adhesion. For the reverse vertical load they needed a beam above the board to transfer the load to the bulkheads. The load paths for the unidirectionals in the beams needed to be within 2º, and vertical tapes at the sides distributed both loads to the top, bottom and sides as well. For the grounding load, they used hoop tapes around the side of the unit which take load in abutment into a large bush, which bears into the hoop tapes..



Inboard bearing structure
(Image courtesy Composites Consulting Group)



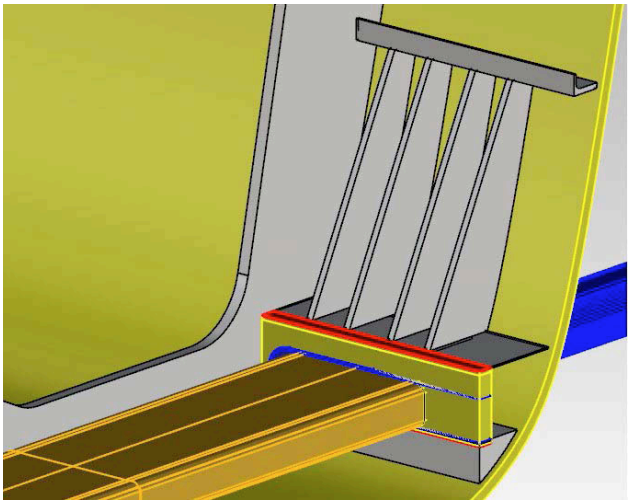
Inboard bearing reverse vertical load
(Image courtesy Composites Consulting Group)



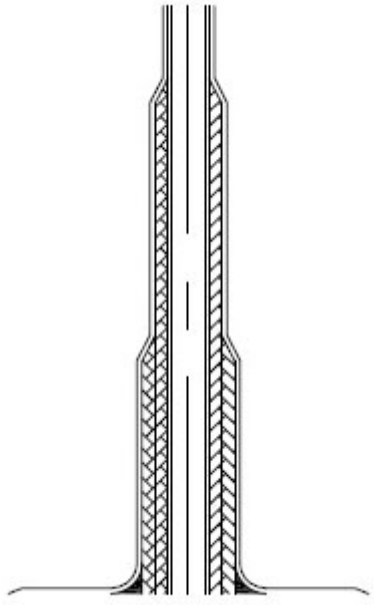
Inboard bearing grounding load
(Image courtesy Composites Consulting Group)

Outboard Bearing Support

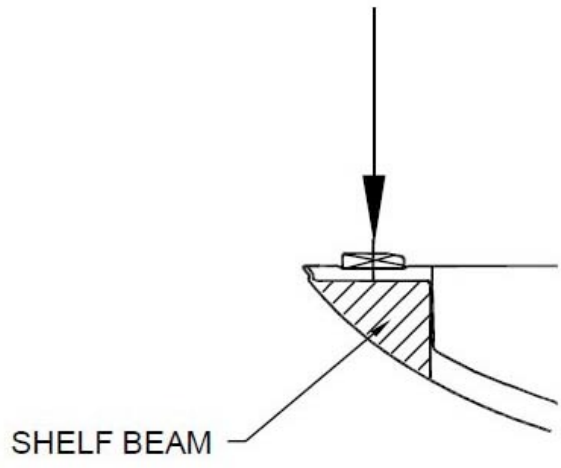
The outboard bearing support was more interesting, but easier to analyse. The primary vertical load was catered for with four big webs, extending from the beam up to a hull stringer, to transfer the load to the hull side. Each web is a Nomex honeycomb-cored panel with a combination of solid laminate to take the loads in abutment and unidirectional tapes to spread the load along the length of the webs. For the reverse vertical load they inserted a shelf beam below the board and extending between the bulkheads. For the grounding load they used hoop tapes again.



Outboard bearing structure
(Image courtesy Composites Consulting Group)



Detail of web connection for outboard bearing support
(Image courtesy Composites Consulting Group)



Shelf beam for outboard bearing support
(Image courtesy Composites Consulting Group)

With the loads, everything is transferred back to the hull. The hull itself is a box beam, with flanges top and bottom and the hull sides acting as shear webs. The big question is what happens with the big hole in the hull on either side between the keel bulkhead and the mast bulkhead? This is the most highly stressed area of the hull, with the mast, keel, rigging, etc. all applying loads in the same area. It needed reinforcing to cater for the cut-outs from the side lifting boards, and so they ran unidirectional tapes up the hull sides.

Conclusion

This was an interesting job for Composites Consulting Group, particularly as it involved almost all of the tools in a composites engineer's toolbox. These tools proved to be an effective method, given a clear idea of the loadpaths, to solve complex structural detail problems. The project involved a large number of people but was, ultimately, successful.

Questions

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

The board has to go from side to side, and so they used a straight board. They did not consider a curved or dihedral planform, as that would have provided too much complication and increased the build time.

The board is used when broad reaching and free running. When all boats are sailing downwind, *Wild Oats XI* can sail deeper. She uses the board for both stability as a DSS, and for lifting the bow.

The board is not a symmetrical section; rather it is an unsymmetrical NACA section, having a chord of 600 mm. There is 650 mm between the inboard and outboard bearings, and 3.5 m of board projects from the side of the vessel. The short spacing between the bearings gives rise to the large bearing loads.

Finite-element analysis at ply level is more nuanced, but it needs experience to check the details. You can spend a week checking, and find problems. Classical fibreglass hull design is fairly straightforward, but load paths in a race boat are not straightforward.

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

Phil Helmore

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 for remaining 2015 (with exceptions noted) is as follows:

3 Jun	Doug Matchett, Senior Naval Architect, Australian Maritime Safety Authority *AMSA's Marine Surveyor Accreditation Scheme*
1 Jul	IMarEST
5 Aug	RINA
2 Sep	IMarEST
7 Oct	No meeting; Pacific 2015 events
3 Dec	SMIX Bash

FAST 2015

The thirteenth International Conference on Fast Sea Transportation (FAST) will be held on 1–4 September in Washington, DC, USA, the nation's capital. Since their inception in Trondheim, Norway, in 1991, the FAST conferences, held every two years, have been the world's leading technical conferences addressing fast sea transportation issues.

The aim of the conference is to promote world-wide cooperation among scientists, engineers and operators who are concerned with all aspects of the high-speed maritime industry. The FAST Conference program for 2015 will focus on high-quality papers and invited keynote lecturers. A thorough review process, of both abstracts and full manuscripts, will be used to select papers whose originality, relevance, timeliness, and significance meet the standards FAST attendees have come to expect. The conference will be conducted in the English language.

The conference website is at www.sname.org/fast2015. For further information, please contact Ms Alana Anderson by email aanderson@sname.org or phone +1-703-997 6705.

Pacific 2015 IMC

The next Pacific International Maritime Conference, organised by the Royal Institution of Naval Architects and the Institute of Marine Engineering, Science and Technology and held in conjunction with the Pacific International Maritime Exposition and the Royal Australian Navy's Sea Power Conference, will be held in Sydney on 6–8 October 2015 to coincide with Navy Week, and will be held at an all-new venue: the Sydney Exhibition Centre at Glebe Island. The change in dates from the traditional January–February timeslot is a result of the success of Pacific 2013, which was held in October 2013 to coincide with the Royal Australian Navy's Centenary celebrations and International Fleet Review on 4 October. In consultation with the Royal Australian Navy, the biennial Pacific International Maritime Exposition will in future coincide with Navy Week during the first week in October.

The new Pacific 2015 venue, Sydney Exhibition Centre at Glebe Island, has deep-water berths alongside it. In conjunction with Sydney Ports Corporation, arrangements are being made to allow RAN and visiting warships to berth directly adjacent to the exposition and this will make it quicker and more convenient to attend ceremonial events or undertake ship visits.

Conference delegates, exhibitors, and trade visitors will be able to get to Glebe Island by car or bus, or by ferry direct from Circular Quay and Darling Harbour, enabling them to enjoy the experience of one of the world's great natural harbours.

Details and Registration

Full details of registration costs and entitlements are available on the IMC conference website, www.pacific2015.com.au/international-maritime-conference. Conference registrations are now open.

For further information regarding the Pacific 2015 International Maritime Conference contact the Conference Secretariat at imc2015@amda.com.au, phone +61 (0)3 5282 0543 or fax +61 (0)3 5282 4455.

Contract Management for Ship Construction, Repair and Design

Fisher Maritime's widely-respected three-day training program, *Contract Management for Ship Construction, Repair and Design*, will be available in Brisbane on 4–6 November and in Melbourne on 10–12 November 2015.

This program is a lessons-learned one, not a theoretical course on contract management. It bears a lot of "scar tissue" from marine contractual disasters. It is designed for:

- Project Managers (Yards and Owners)
- Contract Managers and Specialists
- Newbuilding Shipyards, Repair Yards
- Fleet Managers
- General Managers of Shipyards
- Financial Managers (Yards and Owners)
- Ship Conversion Specialists
- Naval Architects, Marine Surveyors
- Federal, State, and Provincial Agencies
- Ferry Operators (Public and Private)
- Naval Shipyards
- Owner's Representatives
- On-Site Representatives
- Major Equipment Vendors
- Marine Superintendents
- Consultants and Attorneys

The presenter, Dr Kenneth Fisher, is recognised worldwide as the leading authority on the development and management of complex contracts and specifications for ship construction, conversion, repair, and design. He is author of the 2004 RINA publication, *Shipbuilding Specifications: Best Practices Guidelines*, and of the 2003 SNAME publication, *Shipbuilding Contracts and Specifications*. As an arbitrator, expert witness, consultant, and instructor for nearly 30 years, he brings clarity and organization to an otherwise-complex set of management requirements unique to the maritime industry.

For details of topics covered, visit www.fishermaritime.com/publications/pdf/cm.pdf, and for registration, visit www.

The Royal Institution of Naval Architects

Institute of Marine Engineering, Science & Technology IMAREST

ENGINEERS AUSTRALIA

PACIFIC 2015
International Maritime Conference

Sydney Exhibition Centre @ Glebe Island, Sydney Australia

6-8 October 2015

CONFERENCE REGISTRATION NOW OPEN...

Registrations are now open for the PACIFIC 2015 International Maritime Conference. Full details of registration costs and entitlements are available on the conference website. **www.pacific2015.com.au/international-maritime-conference**

An impressive list of keynote speakers has been assembled for the conference program.

Tuesday 6 October	1000-1030	**Australian Defence Materiel Reform** ***Mr Harry Dunstall***, Acting Chief Executive Officer, Defence Materiel Organisation
Tuesday 6 October	1030-1100	**United Kingdom Defence Materiel Reform** ***Mr Bernard Gray***, Chief of Defence Materiel, United Kingdom
Wednesday 7 October	0830-0900	**Enterprise Naval Shipbuilding Plan** ***Rear Admiral Mark Purcell***, RAN, Head Maritime Systems, Defence Materiel Organisation
Thursday 8 October	0830-0900	**United States Naval Science and Technology Strategy** ***Dr Patricia Gruber***, Technical Director of Office of Naval Research Global, United States of America

KEY DATES

- Refereed Paper Submission ***22 June 2015***
- Full Paper Submission Deadline ***13 July 2015***
- Early Bird and Presenter Deadline ***10 August 2015***
- Conference ***6-8 October 2015***

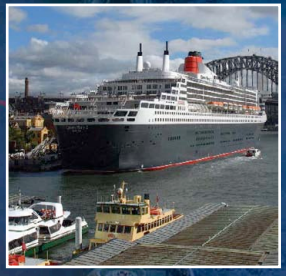
Organised by The Royal Institution of Naval Architects, The Institute of Marine Engineering, Science and Technology, and Engineers Australia, the Pacific 2015 International Maritime Conference will coincide with the prestigious Royal Australian Navy Sea Power Conference, Navy Week celebrations in Sydney and the ***PACIFIC 2015*** International Maritime Exposition which is organised by Maritime Australia Limited.

The conference program will be conducted in two streams of parallel sessions and will cover the following topics:

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

Register at
www.pacific2015.com.au/international-maritime-conference




For further information contact the ***PACIFIC 2015*** International Maritime Conference Secretariat at:
PO Box 4095, Geelong VIC AUSTRALIA 3220 **Phone**: +61 (0)3 5282 0543 **Fax**: +61 (0)3 5282 4455 **Email**: imc2015@amda.com.au

fishermaritime.com/projecttraining/registration.html and click on the button for *Register for our Aust/NZ Programs*.

Basic Dry Dock Training Course

DM Consulting's Basic Dry Dock Training is a four-day course which covers the fundamentals and calculations of dry docking. The next course in Australia will be held on 1–4 February 2016, in Melbourne.

The course begins with the basics and safety concerns, and progresses through all phases of dry docking: preparation, docking, lay period, and undocking. The course ends with a discussion of accidents and incidents.

It 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 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.

Topics to be covered include:

- Basic dry docking community terminology
- Calculations
- Safe dry docking procedures
- Lay period
- Undocking evolutions
- Docking Plans
- Docking and undocking conferences
- Hull boards
- Vessel stability
- Incidents/accidents

For further information and to register please see www.drydocktraining.com/

Joe Stiglich, the course leader, is a retired naval officer, qualified NAVSEA docking officer and holds a master's 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 dry docking industry and acts as a consultant for ship repair companies.

CLASSIFICATION SOCIETY NEWS

New DNV Report on LNG as Ship Fuel

Liquefied natural gas (LNG) as ship fuel is now a proven and available solution. While conventional oil-based fuels will remain the main fuel option for most existing vessels in the near future, the commercial opportunities of LNG are interesting for many newbuild and conversion projects. But taking the leap to LNG can only be made on the basis of the best possible information and a thorough analysis of your needs, both today and in the future.

DNV GL's new report, *LNG as Ship Fuel: The Future Today* has been developed to assist operators in working with all the relevant factors that come into play, based on our experience with this young technology in newbuilding, conversion projects and advisory services related to the design, construction and operation of LNG-fuelled vessels. The new report provides extensive information on the most important topics in the sector, including:

- LNG today and tomorrow
- Alternative fuels for shipping
- LNG — The right option?
- LNG as fuel on a newbuild MR Tanker
- Retrofitting cruise ships to LNG by elongation
- LNG fuel tank concept for large vessels
- Innovating for safer and sustainable shipping
- Gas as ship fuel
- 2014 —Status for LNG as ship fuel
- Making sense of LNG containment system innovations
- Engines for gas-fuelled ships
- LNG in the USA

DNV GL believes that the groundwork has been laid for LNG to thrive in the shipping and transport sectors, and invites you to come and take the next steps together with us.

ReVolt

Taking current technology to the extreme, DNV GL has developed a revolutionary concept for an unmanned, zero-emission, shortsea vessel. Named *ReVolt*, this vessel is 60 m long and is fully battery powered and autonomous — it requires no crew! This is a new shipping concept for the short-sea segment which offers a possible solution to the growing need for transport capacity.

The EU road network is already suffering from congestion and the population growth in urban areas will lead to a demand for transportation which exceeds the capacity of existing roads. To alleviate these issues, governments all over the EU are trying to move some of the freight volume from roads to waterways. However, profit margins in the short-sea shipping segment are small.

The innovative ship concept, *ReVolt*, is the result of a multi-disciplinary, team-based development project at DNV GL supported by Transnova, Norway, and is based on an assessment of current requirements along short-sea routes. The vessel will operate at a speed of 6 kn with a range of 100 n miles and a cargo capacity of 100 TEU.

With no crew, there is no need for crew facilities such as the vessel's superstructure. The resulting increase in loading capacity and low operating and maintenance costs mean that, compared to a diesel-run ship, *ReVolt* could save up to USD 34 million during its estimated 30-year lifetime, saving more than USD 1 million annually.

ReVolt is a vision for the future and will not be built until several of the technologies involved have matured. However, it could conceivably be built and operated using current technology. It is intended to serve as an inspiration for equipment manufacturers, shipyards and shipowners as they endeavour to develop new solutions for a safer and more-sustainable future.

ReVolt was initiated as a research project in August 2013 and launched externally a year later. It will continue — and

be extended — to involve land-based charging facilities and capacities, as a research project within DNV GL. For the purpose of testing the autonomous capabilities of *ReVolt*, a 1:20 scale model has been built. Through collaboration with the Norwegian University of Science and Technology (NTNU), this model will serve as test bench in researching sensor fusion and collision avoidance for autonomous surface vehicles. This competence project will run for three years from the third quarter of 2015.

Rendering of DNV GL's *ReVolt*
(Image from DNV GL website)

Getting Ready for Changes to ISO 9001 and 14001:2015

In March 2015, DNV GL Software and Business Assurance launched specific 'safety-related' campaigns throughout Australia and New Zealand. With the impending introduction of new workplace legislation throughout NZ as well as the imminent changes to ISO standards 9001 and 14001, this will be the first of its kind and a rare opportunity for DNV GL Software and Business Assurance to provide insight into how they can provide businesses with a strategic advantage when it comes to safety and compliance.

The campaigns will be followed up by a series of complimentary seminars throughout ANZ aimed to be insightful and focussed, with subject matter experts from our enterprise risk team, business assurance and software providing practical information with respect to effective practices and solutions.

To register your interest, advise Sean Flynn at sean.flynn@dnvgl.com with the subject ISO Update Seminar.

Ensuring Compliance with 2015 Sulphur Limits

From 1 January 2015 onwards, vessels are required to comply with stricter sulphur limits within Emission Control Areas (ECAs). To overcome the challenges of making the change-over, DNV GL experts have compiled a set of guidelines for ship-owners and operators. The publication *Sulphur Limits 2015 — Guidelines to Ensure Compliance* provides detailed information on the important topic of ECAs and switching to Marine Gas Oil (MGO). In addition, they developed a Fuel Change-Over (FCO) Calculator, which can be tested as a trial version.

The publication and calculator may be downloaded from https://www.dnvgl.com/maritime/low-sulphur-operation.html.

Jonathan Abrahams

LR and UK P&I Club Launch Three New Pocket Checklist Mobile Apps

Marine Fire Safety, Marine Pollution Protection and Port State Control pocket checklist apps are now available to download now for iPhone, iPad, and Android devices. Existing apps (ILO MLC and ISM & ISPS pocket checklists), have been hugely popular with more than 22 500 downloads

LR and the UK P&I Club have released three new pocket checklist mobile apps to help owners and operators comply with international convention requirements and reduce the risk of port state control detentions.

The Marine Fire Safety pocket checklist app includes a list of where deficiencies are most-commonly found, and certificates and documents that must be carried on board. The Marine Pollution Prevention pocket checklist app highlights the most-common deficiencies listed by the MARPOL Annexes to help ensure compliance. The Port State Control pocket checklist app identifies the most-common causes of ship detention to reduce the risk of ships being detained.

The apps enable ships' crews and their managers to easily view necessary legislative and regulatory requirements, save multiple checklists, check off completed activities, add essential notes and/or images and send completed checklists via email.

LR has now produced six pocket checklists (five of which are mobile apps) in a series which addresses regulatory

compliance requirements which have been well received by the marine industry worldwide. The existing ILO MLC and ISM & ISPS pocket checklist apps also featured in Marine Insight's list of top 10 mobile apps for seafarers.

The iOS apps can be downloaded from the App Store at http://apple.co/18ObG16. The android apps can be downloaded from the Google Play Store at http://bit.ly/lloydsapps.

Alan Williams

New LR Guidance Notes for Calculating Explosion Loads in the Oil and Gas Industry

Lloyd's Register's *Guidance Notes for the Calculation of Probabilistic Explosion Loads* provide recommended practices to help engineers, operators and designers to define blast and explosion loads to control and mitigate risk measures in offshore operations. The new guidance notes provide information on how to establish explosion loads based on probability considerations of different operating oil and gas scenarios.

To maximise safety in offshore operations, structures and equipment that could be subjected to blast pressures need to be designed for accidental blast loading. This approach by Lloyd's Register allows for a detailed examination and assessment through a range of probabilistic risk assessment techniques, which help companies to predict possible explosion scenarios.

Joar Dalheim, VP Technology at Lloyd's Register Energy, said "By using these *Guidance Notes* with our *Rules for Offshore Units*, companies can simplify and streamline their design appraisal process to give them a fast and highly cost-effective solution."

A wide variety of measures can be used by companies operating offshore to prevent, control and mitigate the effects of explosions. Whilst the emphasis should always be on explosion prevention (e.g. through prevention of leaks or elimination of ignition sources), the possible accumulation and ignition of a flammable hydrocarbon-air mix cannot always be eliminated.

The Lloyd's Register methodology can be applied to any offshore unit where gas explosion hazards are possible. It also includes special guidance on how to handle leak scenarios from Liquefied Natural Gas (LNG) plants, which can be caused by 'flashing' of cryogenic liquids into the atmosphere, such as LNG and Liquefied Petroleum Gas.

The new *Guidance Notes for the Calculation of Probabilistic Explosion Loads* work alongside the Lloyd's Register's *Rules for Offshore Units*. These rules provide the oil and gas industry with confidence that their assets are designed and constructed to internationally recognised standards.

Guidance Notes for the Calculation of Probabilistic Explosion Loads may be downloaded at www.lr.org/guidance-notes.

Paul O'Connor

First LNG-powered Ferry to Operate in North America Delivered

The 133 m LNG-fuelled ferry *F.A. Gauthier* was delivered recently at Italy's Fincantieri Castellammare di Stabia shipyard. It will be the first LNG-powered ferry to operate in North America. The vessel is the first in a series of gas-fuelled vessels built to LR class for the Canadian operator Societe des traversiers du Quebec. With a capacity for 800 passengers and 180 vehicles, the ferry is also the first LNG-powered ferry to be built in Italy.

The ferry, which is fitted with an ultra-compliant, low-emission, dual-fuel LNG and diesel system, will enter service at Matane in the Canadian province of Quebec.

"This hi-tech vessel meets all the maximum standards to deal with environmental pollution and is also certified as ice class in compliance with an integrated bridge system notation as well as a dynamic propulsion system", said Claudio Percivale, LR's Senior Surveyor in Charge for the project.

This project was covered in detail in LR's *Gas Technology Report* in November 2013.

World's first Methanol-powered Ferry Delivered

The newly-converted *Stena Germanica*, the world's first methanol-powered ferry, was given a rousing reception in both Gothenburg and Kiel—the two end-cities of its route—when it was delivered at the end of March. By using methanol as its main fuel, the revolutionary vessel, which is owned and operated by the Swedish ferry operator Stena Line, will be able to reduce her emissions of sulphur by 99%, NOx by 60%, particulates by 95% and CO_2 by 25%, thus complying with the latest ECA regulations on its Baltic Sea route.

The launch follows a €22 million EU-funded refit overseen by surveyors from Lloyd's Register at Rementowa shipyard in Gdansk, Poland, between January and March. During the refit, a collaboration between Stena Line, Finnish engine-maker Wärtsilä, the ports of Gothenburg and Kiel, methanol specialist Methanex Corporation, and ship designer ScandiNAOS, the ro-pax vessel was fitted with dual-fuel methanol and diesel injection nozzles on its Wärtsilä engines.

Stena Line's Managing Director, Carl-Johan Hagman, said "We are very enthusiastic about methanol's possibilities and it has the potential to be the maritime fuel of the future. We want to pursue change and development in the shipping sector and, with *Stena Germanica*, our environmental impact will be completely different to what the industry has seen before."

Anders Hofnell, LR's Marine Business Development Manager for Sweden, said "It has been challenging, inspiring and a privilege to be part of this world-first ferry for methanol as a marine fuel. *Stena Germanica* is classed by Lloyd's Register, and we were able to manage the risk and safety assessments for an alternative, risk-based design and plan approval for this project by very-close co-operation from project colleagues at our offices in Denmark, Italy, Canada, the UK and Sweden, as well as cutting-edge expertise from throughout the world.

Pierre de Chateau Thierry

FROM THE CROWS NEST

New Book on *Submarine Hydrodynamics* by Martin Renilson

This book adopts a practical approach and presents recent research together with applications in real submarine design and operation. Topics covered include hydrostatics, manoeuvring, resistance and propulsion of submarines. The author briefly reviews basic concepts in ship hydrodynamics and goes on to show how they are applied to submarines, including a look at the use of physical model experiments.

The issues associated with manoeuvring in both the horizontal and vertical planes are explained, and readers will discover suggested criteria for stability, along with rudder and hydroplane effectiveness. The book includes a section on appendage design which includes information on sail design, different arrangements of bow planes and alternative stern configurations. Other themes explored in this book include hydro-acoustic performance, the components of resistance and the effect of hull shape.

Readers will value the author's applied experience as well as the empirical expressions which are presented for use at the preliminary design stage. A wide range of state-of-the-art material is included, and there are over fifty references to recent publications in the field.

Intended for advanced students and professionals working in the specialised field of submarine hydrodynamics, this book brings theoretical and practical knowledge together in one comprehensive work that is particularly valuable to the submarine hydrodynamicist.

Submarine Hydrodynamics is published by Springer, and can be obtained in paperback form or as an e-book from www.springer.com/gp/book/9783319161839 for €49.99.

Phil Helmore

RAN Sea Power Centre Publications

The Sea Power Centre — Australia has reduced the print run of their various publications but they are available on-line and readers are encouraged to download them directly. Publications which are available include:

King-Hall Navy History Conference Proceedings

- Kathryn Young and Brett Mitchell (eds), *The Commonwealth Navies — 100 Years of Cooperation: Proceedings of the King-Hall Navy History Conference 2009.*
- John Perryman and Andrew Forbes (eds), *Australian Naval Command and Leadership in Recent Operations: Proceedings of the King-Hall Navy History Conference 2011.*

These are available at www.navy.gov.au/media-room/publications/king-hall-naval-history-conference-proceedings.

Sea Power Conference Proceedings

- Andrew Forbes (ed), *Combined and Joint Operations From the Sea: Proceedings of the RAN Sea Power Conference 2010.*
- Andrew Forbes (ed), *The Naval Contribution to National Security and Prosperity: Proceedings of the RAN Sea Power Conference 2012.*
- Andrew Forbes (ed), *Naval Diplomacy and Power Projection; Proceedings of the RAN Sea Power Conference 2013.*

These publications are available at www.navy.gov.au/media-room/publications/sea-power-conference-proceedings.

Cape-class patrol boats fitting out at Austal's Henderson shipyard in Wesgtern Australia
(Photo courtesy Austal)

GENERAL NEWS

Incat Tasmania's Latest Ship Delivered to Japan

The latest delivery from Incat Tasmania, *Akane*, an 85 m high-speed wave-piercing catamaran ferry arrived in Japan in early April.

Built at the Incat shipyard at Prince of Wales Bay, Hobart the vessel completed sea trials in late March. The vessel went into service in April with Sado Kisen, a long-standing ferry operator in Japan.

Akane will operate from the Niigata and Naoetsu ports on the west coast of Japan to the Sado Island ports of Ogi and Ryotsu. Sado Island is the sixth-largest island of Japan in area — its rich history and relaxed rural atmosphere make Sado one of the major tourist destinations in the Niigata Prefecture.

Sado Kisen currently operates a conventional fleet and *Akane* will be Sado Kisen's first high-speed passenger/car carrier.

The 85 m vessel has capacity of 692 persons (passengers and crew) on a single passenger level and the vehicle deck can carry a combination of trucks and cars or, in car-only mode with the nine hoistable mezzanine decks used, can carry 151 cars.

Incat Chairman, Robert Clifford, said "*Akane* is Incat's third delivery to Japan and we are pleased to see the increasing interest in high-speed vessels from this part of the world. It is especially rewarding to see a vessel headed for service with such a long-established and prestigious operator as Sado Kisen."

Nine hydraulically-operated mezzanine decks provide Sado Kisen with the flexibility to cater for a full tourist load of passenger cars at peak times and to carry trucks, vans and cargo loads as required. The vehicle deck has 13 t axle load (single axle, dual wheel) in the truck areas of 4.6 m clear height and 2 t axle load on the remainder of the vehicle deck and 0.8 t (single axle single wheel) on the mezzanine decks. Cars and trucks access the vessel using two folding ramps over the stern.

Car drivers and their passengers can enter the passenger space via an elevator, or two forward internal staircases, one a more-traditional staircase and the other a sweeping spiral staircase winding from the vehicle deck to Tier 2. There are also all-weather stairs located aft both port and starboard leading to the aft viewing area behind the main passenger cabin. Walk-on passengers will enter at the mezzanine level using dedicated passenger doors, either port or starboard, depending on the port at which port the vessels berths.

The main passenger and forward executive areas offer tourist- and business-class seating in forward, midship and aft lounge areas decorated with an under-the-sea theme. Custom-designed wool carpet features seahorses, fish and aquatic plant life, and wall panels and signage continue the marine theme. Beurteaux Ocean Club seating in the aft and midship lounges are in a range of colours reflecting the red, orange, blue, teal and gold of the carpet design.

As with all Incat vessels, the immediate impression when entering any section of the passenger cabin is one of a light

The business-class lounge area in *Akane*
(Photo courtesy Incat Tasmania)

airy, open-plan area where all passengers have outside views.

The forward executive lounge offers 180 degree panoramic views, sumptuous beige leather seating and two intimate lounge areas. The central amenities section of the superstructure divides the passenger cabin, with port and starboard seating sections having close and handy amenities for passenger comfort. Moving aft is the main passenger area and outdoor viewing deck.

Catering for a tourist market, the vessel's interior fit-out includes a shop and information desk, first-aid room, children's play area, and pet room. Galley and crew rooms are also located amidships. Reverse-cycle heat pumps ensure that all passenger and crew areas are maintained at comfortable temperatures throughout the year.

The ship achieved over 37 kn loaded with 470 t deadweight during sea trials. To facilitate an early departure, the trials were conducted with enough fuel to travel from Hobart to Japan. No lightship trial was conducted; however the vessel will operate at approximately 40 kn with 200 t deadweight, and faster should it ever be in the position to travel light.

Akane's striking livery features a stylised image of the Toki bird, the Japanese crested ibis, flying along each side of the hull, and their white bodies, red and orange wings and red faces will certainly attract attention. The Toki is an endangered species but, following a captive breeding program, is being reintroduced to Sado Island and is an attraction for visitors to the area.

The catamaran is powered by four resiliently-mounted Caterpillar C280-16 marine diesel engines rated at 5650 kW each at 100% MCR. The engines drive four transom-mounted steerable Wartsila LJX 1100 SR waterjets via four Reintjes VLJ 6831 gearboxes.

All four waterjets are configured for steering and reverse and are fitted with outboard hydraulic steering and reverse actuators. Flexible couplings are fitted between engines and gearboxes, and Wartsila shafting from gearbox to waterjet.

Akane has four Caterpillar C9 marine diesel generators rated at 250 kW each, 440 V 60 Hz, 3 phase, 4 wire distribution with neutral earth allowing 256 V single phase and

Akane at speed during trials
(Photo courtesy Incat Tasmania)

The bridge in *Akane*
(Photo courtesy Incat Tasmania)

transformers to supply 100 V domestic appliances. There are two main switchboards, one in each ante room.

The highest level of the vessel is the bridge area with its forward-facing control positions for the captain, navigator and engineer. The wheelhouse has 360 degree visibility over the aerodynamic structure, an aft-facing docking console and CCTV monitors are fitted to assist with docking. From the bridge all the ship's systems can be monitored and controlled. State-of-the-art navigation, communication and electronic systems including Furuno radar systems are fitted, with all equipment in compliance with the HSC Code.

A Naiad active ride-control system is fitted to maximise passenger comfort. The system combines Incat-manufactured active trim tabs aft with a retractable T-foil located at the aft end of the centre bow. The T-foil system comprises a foundation structure built into the centre bow, a hinged deployable steel T-foil and hydraulic actuation system allowing the T-foil to be stowed for normal operation but deployed in heavier seas. The system combined with the Incat hull and centre-bow design ensures MSI (Motion Sickness Incidence) is reduced in higher sea states by reducing pitch, roll and heave, the major contributors to passenger discomfort.

Four marine evacuation stations, from Tasmanian company LifeRaft Systems Australia, each capable of serving up to 200 persons under normal evacuation, are located on Tier 2 passenger deck (two port and two starboard). Two SOLAS semi-rigid inflatable dinghies, each with an 18.6 kW motor, are located outboard adjacent to the superstructure. Lifejackets, fitted with lights and whistle devices, are provided in accordance with international regulations for passengers and crew, including children.

The Hobart-based company, CBG Systems, supplied the lightweight structural fire-protection system aboard *Akane*, including fire doors and dampers. To protect all moderate and high-risk spaces, the Rapid Access Composite system is used across the vehicle deck, with CBG Lightweight panels used for engine room and below-deck bulkheads and deckheads. The fire-protection system meets all the demands for lighter weight and faster installation/removal for this type of craft. The vessel is fitted throughout with a range of fire-detection and safety systems, CCTV cameras, and zoned fire-sprinkler systems and hydrants protect engine rooms, vehicle decks and passenger areas.

Austal Delivers Sixth Cape-class Patrol Boat

On 3 May Austal Limited delivered *Cape Leveque*, the sixth of eight Cape-class patrol boats being built for the Australian Customs and Border Protection Service under a $330 million design, build and in-service support contract.

Cape Leveque is named after the northernmost tip of the

Dampier Peninsula in the Kimberley region of Western Australia.

Austal's Chief Executive Officer, Andrew Bellamy, said that with three quarters of the Cape-class fleet now delivered, Austal continued to demonstrate its credentials as a partner of choice for government defence-vessel programs.

"The on-time delivery of *Cape Leveque* and continued efficiencies across the program reinforce Austal's capability to reliably build and sustain naval and border protection vessels," Mr Bellamy said.

"Our team at the Henderson shipyard have again demonstrated their ability to meet contracted timeframes. Delivering on time ensures that the Australian Customs and Border Protection Service can reliably continue to deliver on the Border Protection obligations it undertakes to the Commonwealth of Australia."

The fifth Cape-class patrol boat, *Cape Jervis,* was delivered in March. The remaining two Cape Class vessels are moving into the final stages of construction and will be delivered progressively through to late 2015, in line with the contract.

Austal Launches *Gabrielle Giffords* (LCS 10)

On 25 February Austal USA successfully launched the future USS *Gabrielle Giffords* (LCS 10). *Gabrielle Giffords* is the third of ten 127 m Independence-variant LCS-class ships Austal has been contracted to build for the US Navy as prime contractor following a $3.5 billion block buy in 2010. The Independence-variant Littoral Combat Ships (LCS) are aluminum trimarans, capable of being outfitted with reconfigurable payloads (mission packages) which can be changed to support mine countermeasure, anti-submarine and surface warfare missions.

The launch of *Gabrielle Giffords* was a multi-step process which involved lifting the 1600 t ship almost 1 m in the air, moving it approximately 121 m onto a moored deck barge adjacent to the assembly bay — using transporters provided by Berard Transportation — then transferring the LCS to a BAE floating dock, *Drydock Alabama*. The floating dock was submerged with LCS 10 entering the water for the first time. The ship is now moored in the Mobile River in front of Austal USA's facility, where it will undergo final outfitting and activation before sea trials and delivery to the Navy.

The LCS program is in series production at Austal USA with eight ships currently under construction or in the pre-construction phase. *Jackson* (LCS 6) was preparing for sea trials in March/April; *Montgomery* (LCS 8) was christened in November and is also preparing for sea trials later this northern summer; over 85 percent of *Omaha's* (LCS 12) modules are erected in final assembly and construction is well underway in Austal's Module Manufacturing Facility (MMF) on *Manchester* (LCS 14) and *Tulsa* (LCS 16). *Charleston* (LCS 18) has just started with work in the router shop cutting the initial material for construction in the MMF. Long-lead-time material procurement has started for *Cincinnati* (LCS 20).

Austal, as prime contractor, is teamed with General Dynamics Mission Systems (GD-MS) for the Independence-variant LCS program. GD-MS is the ship systems integrator, responsible for the design, integration and testing of the navigation, C4I, and aviation systems.

The future USS *Gabrielle Giffords* (LCS10) being transferred to a barge for launching at BAE Systems floating dock (Photo courtesy Austal)

Austal Delivers Fifth JHSV

On 15 April Austal announced that it had successfully delivered USNS *Trenton* (JHSV 5) to the US Navy. USNS *Trenton* is the fifth JHSV built by Austal at its shipyard in Mobile, Alabama, under a 10 ship, US$1.6 billion contract.

Austal Chief Executive Officer, Andrew Bellamy, said that the delivery of USNS *Trenton* to the US Navy is a strong reminder of the significant progress that Austal has made through operational improvements at the US shipyard since construction commenced on JHSV 1.

"The JHSV program continues to mature with each successful delivery," Mr Bellamy said.

"We have received many positive reports about how the first four JHSVs have been performing in the fleet, and we are encouraged about the future of the JHSV program."

Austal will deliver a further five JHSVs from its shipyard at Mobile, Alabama, with three currently under construction.

Defence Facilities Development for Darwin

An $18 million project to construct a multi-user barge ramp facility in Darwin has been referred to the Parliamentary Standing Committee on Public Works, the Parliamentary Secretary to the Minister for Defence, Darren Chester, announced on 4 March.

Mr Chester said that the facilities, at East Arm Port in Darwin, would provide the Royal Australian Navy with the logistic support capability for the new LHDs and amphibious vessels.

"The multi-user barge ramp facility is a joint initiative between the Department of Defence and the Northern Territory Government," Mr Chester said.

"The works will include a hardened barge ramp, a marshalling area located adjacent to the ramp, and a roadway to link the barge ramp to an existing staging area, and are essential to enable the operation of Navy's amphibious vessels in the Darwin area."

"This investment will bring economic benefits for local industry in the Northern Territory and provide additional capability to other marine operators under commercial arrangements," Mr Chester said.

The construction cost is estimated at $18 million, and Defence has agreed to contribute approximately $16 million. The Land Development Corporation will provide existing land, road access and infrastructure estimated to cost $28.5 million to the project.

Subject to Parliamentary approval, construction is expected to commence in mid 2015 and be completed by mid 2016.

First Principles Review of Defence

On 1 April the Government released the First Principles Review of Defence. The Review found that Defence has implemented significant changes and improvements since the 1990s and has a proven record of delivering in the field, on operations and in humanitarian and emergency-support roles at home and abroad.

However, despite Defence's outstanding operational record, it is clear that there needs to be a better balance between operational excellence and organisational effectiveness.

The shortcomings identified by the Review affect all of Defence. These include a proliferation of structures, processes and systems with unclear accountabilities which, in turn, cause institutionalised waste, delayed decisions, flawed execution, duplication, over-escalation of issues for decision and low engagement levels amongst employees in parts of the organisation.

The Review proposed transformational change across Defence to ensure that it can deliver on the future requirements which will be outlined in the Government's forthcoming Defence White Paper.

The Government has agreed — or agreed in-principle — to 75 of the 76 recommendations, which cover four key areas:

- a stronger and more strategic centre able to provide clear direction and contestability of decision making, along with enhanced oversight of resources and monitoring of organisational performance;
- an end-to-end approach to capability development with a robust and tailored investment-approval process and a new 'smart buyer' arrangement for the acquisition and sustainment of defence capability;
- improved delivery of corporate services with a focus on enterprise approaches, integration and customer-centric practice, including a new approach to estate management; and
- a planned and professional workforce with a strong performance management culture at its core.

The Review outlined a two-year implementation plan, with key milestones, which provides high-level direction for Defence.

Implementation of these recommendations will be led by the Secretary and the Chief of the Defence Force and will commence immediately, with the majority of changes implemented within two years.

An external Oversight Board will monitor the progress of implementation. The Board will be chaired by Mr David Peever, who also chaired the Review, and will include the other members of the Review team — the Hon. Robert Hill AC, the Hon. Lindsay Tanner, LTGEN Peter Leahy AC (Retd.) and Mr Jim McDowell — and one additional member.

This Oversight Board will provide regular updates to the Government and assist the Department with presenting annual progress reports to the Government.

There are four recommendations which have received in-principle agreement. These recommendations relate to:

- increasing the approval thresholds for capability development projects;
- ceasing the use of net personnel operating costs (NPOC);
- increasing the thresholds for referring proposed works to the Parliamentary Standing Committee on Public Works and changes to other budget operating rules; and
- disposal of estate.

The Government has placed reasonable caveats on how and when these recommendations will be implemented. For example, any disposal of Defence estate will be assessed on a case-by-case basis, following the emerging requirements of the Force Structure Review and Defence White Paper.

The Government did not agree to the recommendation

relating to the Defence Science and Technology Organisation becoming part of the new Capability and Acquisition Group at this time. However, it has explicitly stated that this recommendation will be further considered as part of the annual updates on implementation progress.

The First Principles Review of Defence can be found at: www.defence.gov.au/publications/reviews/firstprinciples/Docs/FirstPrinciplesReview.pdf

The Way Ahead for the Future Submarine Program

At the end of February the Government announced the acquisition strategy for the Future Submarine Program. This announcement sets out further details of the competitive evaluation process which will be undertaken by the Department of Defence.

The process outlined by the Government is intended to provide a pathway for Australian industry to maximise its involvement in the program, whilst not compromising capability, cost, program schedule or risk.

The Government expects that significant work will be undertaken in Australia during the build phase of the future submarines including combat system integration, design assurance and land-based testing. This will result in the creation at least 500 new high-skill jobs in Australia, the majority of which will be based in South Australia.

The Future Submarine Program is the largest Defence procurement program in Australia's history and represents an investment of the order of $50 billion in Australia's security. These costs will be subject to refinement through the competitive evaluation process. A significant proportion of this investment will be spent in Australia during the lifetime of the future submarines.

As part of this competitive evaluation process, the Department of Defence will seek proposals from potential partners for:

- pre-concept designs based on meeting Australian capability criteria;
- options for design and build overseas, in Australia, and/or a hybrid approach;
- rough order-of-magnitude costs and schedule for each option; and
- positions on key commercial issues, for example intellectual property rights and the ability to use and disclose technical data.

In addition to this, the Government has endorsed a set of key strategic requirements for the future submarines:

- range and endurance similar to the Collins-class submarines;
- sensor performance and stealth characteristics which are superior to the Collins-class submarines; and
- the combat system and heavyweight torpedo jointly developed by the United States and Australia as the preferred combat system and main armament.

Defence has advised the government that, for Australian industry to have the best opportunity to maximise their involvement in the future submarine program, it needs to work with an international partner.

Based on work completed by Defence, France, Germany, and Japan have emerged as potential international partners.

All three countries have proven submarine design-and-build capabilities and are currently producing submarines.

France, Germany and Japan will be invited to participate in this competitive evaluation process which will assess their ability to partner with Australia to develop a future submarine which meets our capability requirements.

The Department of Defence will invite potential international partners to seek opportunities for Australian industry participation in the future submarine program.

The competitive evaluation process will help the Government balance important considerations including capability, cost, schedule, and risk. Interoperability with our alliance partner, the United States, will also be a fundamental consideration.

The competitive evaluation process will take around ten months, after which an international partner will be selected for Australia's future submarine program. Further details about Australian industry involvement are also expected to be known at that point.

The competitive evaluation process will ensure that capability, cost, schedule, and key strategic considerations, along with Australian industry involvement, are carefully and methodically considered, and avoid unnecessary delays to the future submarine program.

The Department of Defence will soon be holding industry briefings to inform Australian industry about the process and how they can engage with potential international partners.

An expert advisory panel will also be appointed to oversee the competitive evaluation process. Further details about this will be announced once individual appointments are confirmed.

Tenders called for Pacific Patrol Boat Replacements

In early March the Government announce the release of the Request for Tender (RFT) for the replacement Pacific Patrol Boats under the Pacific Maritime Security Program, Project SEA3036 Phase 1.

The patrol boats are expected to cost some $594 million in addition to through-life sustainment and personnel costs estimated at $1.38 billion over 30 years.

As part of Australia's continued commitment to maritime security in the Pacific region, this project involves the construction in Australia of up to 21 steel-hulled replacement patrol vessels.

With the existing Pacific Patrol Boats soon approaching their end-of-service life, the Government has committed to replacing the fleet with new vessels. This will assist Pacific Island countries to continue to take an active part in securing their own extensive exclusive economic zones.

The replacement vessels will be larger and more capable than the current fleet. They will also have greater seakeeping ability, habitability and endurance, and will be updated for the contemporary operating environment.

Replacement patrol boats have been offered to all current participating states including Papua New Guinea, Fiji, Tonga, Solomon Islands, Tuvalu, Kiribati, Samoa, Vanuatu, Federated States of Micronesia, Palau, Republic of Marshall Islands, Cook Islands, as well as new member, Timor-Leste.

These vessels will also continue to be complemented by a comprehensive program of training, maintenance and operational support for our regional partners.

The RFT will be an open tender for both the procurement and sustainment of the replacement vessels, along with sustainment of the current Pacific Patrol Boats until their end of life, as well as the new Tongan landing craft medium (LCM).

Under the essential requirements of the RFT, the replacement vessels will be built in Australia, and be of steel hull construction.

The key requirements are:

- designed and constructed to commercial standards;
- simple and cost-effective to own, operate and maintain;
- weapon systems will not be fitted, but allowance made to military standard;
- speed of greater than 20 kn at top of Sea State 4;
- range of greater than 2500 n miles at 12 kn with 20% burnable fuel remaining;
- mission duration of 20 days;
- length up to 40 m;
- capable of operating to top of Sea State 4;
- accommodation for 19 crew with 23 berths; and
- an embarked sea boat which will be capable of a speed of greater than 20 kn, operating to top of Sea State 4, and with a crew of six (eight crew desirable).

Following this tender process, the Government expects to make further decisions about this project nearing the end of 2015.

RAND Report on Naval Shipbuilding

On 16 April the Government released a comprehensive report into the Australian naval shipbuilding industry, *Australia's Naval Shipbuilding Enterprise — Preparing for the 21st Century* by the RAND Corporation.

The Government commissioned RAND in September last year to conduct a detailed review of the Australian naval shipbuilding industry.

The report makes clear that the so-called 'valley of death' cannot be overcome; however, the Government has said that it is prepared to invest in the skills and knowledge base of the Australian naval shipbuilding industry, and is prepared to commit to a long-term investment to make sure this important industry enjoys a future in Australia and that these critical skills are maintained.

To this end, the Government says that the naval shipbuilding industry must be prepared to work constructively with the Government. The sustainability and viability of naval shipbuilding in Australia must be predicated on major reform of the industry and significant productivity improvements, as well as improvements to Defence's acquisition and sustainment processes.

The RAND report found that:

- Australia could sustain a naval shipbuilding industrial base by carefully managing a continuous shipbuilding strategy in the longer-term, with a regular pace of delivering the new ships. However, this would need to be premised on reform of the Australian naval shipbuilding industry and significant improvement in productivity.

- Australian naval shipbuilders can sustain an 18–24 month pace of large ship construction starts if Defence carefully manages its acquisition program and keeps the future frigates operational for 25 to 30 years.
- The gap between the completion of the air-warfare destroyer project and the start of the future frigate project cannot be overcome, but the impact could be lessened.
- The cost of building naval ships in Australia is 30–40 per cent greater than United States benchmarks, and even greater against some other naval shipbuilding nations. Australia is currently one the most expensive places to build naval vessels. This premium can be reduced by improved productivity through:
    - Establishing a consistent production and build demand.
    - Selecting a mature design at the start of the build and limiting the amount of changes once production begins.
    - The necessity of ensuring a well-integrated designer, builder and supplier team.
    - Matching the industrial base structure to demand.
    - Ensuring there is visionary leadership provided by company management.

The RAND report is available on the Department of Defence website at: www.defence.gov.au/Whitepaper/Links.asp and the RAND Corporation's website at: www.rand.org/pubs/research_reports/RR1093.html.

Support for Gas Turbines

In April Defence signed an in-service support contract for maintenance and logistics support services for the gas turbines which power the Royal Australian Navy's Adelaide- and Anzac-class frigates.

General Electric International Incorporated will provide depot-level maintenance for the gas turbines, as well as program management and on-site field service support throughout the life of the contract.

Having one service provider will streamline the maintenance process for the gas turbines that power the frigates, increasing contractor responsibility and accountability.

The contract, valued at more than $50 million, is anticipated to last for up to six-and-a-half years, and includes access to a global supply chain, knowledge transfer to 'up-skill' RAN personnel and is expected to ensure the retention of Australian and New Zealand suppliers.

Six New Incat-built Ferries to be Launched by the New Year

Incat Tasmania staff will be hard at work over the next nine months with six ferries to deliver by early in 2016.

On 2 May Incat Chairman, Robert Clifford, said "An order announced today, for four new ferries for Manly Fast Ferry in Sydney, added to the two ferries currently already under construction for NBMA Thames Clippers in the UK is good news for over 300 workers at the Hobart shipyard, and it is expected that this number will increase over the next few months."

Manly Fast Ferry has ordered two 24 m fast catamarans and two 33 m fast catamarans to service Manly and Sydney's northern beaches. Operating on a frequent daily service, the vessels will carry commuters in peak hours and a mix of locals and tourists during off-peak times. The service is expected to be popular with visitors to Sydney showcasing Sydney's spectacular harbour and ocean views.

Designed by Sydney company, One2three Naval Architects, the 24 m ferries (Incat hulls 78 and 79) will have capacity for 260 passengers plus crew, with indoor and outdoor seating on both the main passenger deck and upper deck where the bridge is located.

The larger 33 m ferries (Incat hulls 80 and 81) will carry 375 passengers, again with a mix of undercover and outdoor seating.

All four ferries will feature a kiosk, provide bicycle and surfboard racks, wheelchair access, with toilet facilities on board. Work on the ferries will commence as soon as final construction drawings are available.

The Hobart shipyard is well advanced with construction of two 35 m passenger ferries destined for the River Thames in London, Incat hulls 075 and 076.

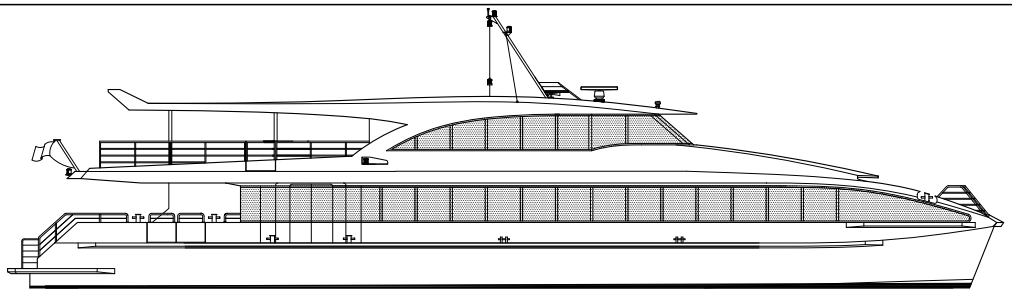
Robert Clifford said "The role of the vessels is to provide rapid passenger transport services on the River Thames in central London on various routes ranging from Putney in the west to Royal Woolwich Arsenal in the east."

All six Thames and Manly ferries are designed by One2three – Naval Architects of Sydney, with engineering and construction drawings by Tasmanian company Revolution Design and Incat.

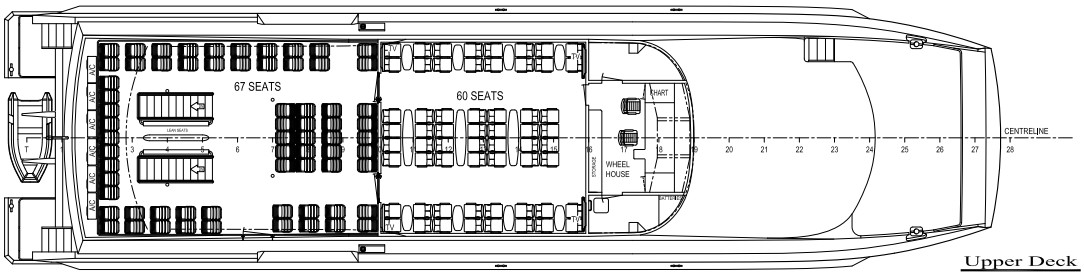
Manly Fast Ferry owner, Richard Ford, said that he is proud of the fact that this project is 100% home grown with all vessel production, including design, engineering and manufacture being completed in Australia by Australian-owned companies. Richard Ford considers Manly Fast Ferry's investment in the development of new high-speed, high-capacity, low-wash purpose-built vessels necessary to further improve transport amenity to the Manly community.

The general particulars of the 33 m ferry are:

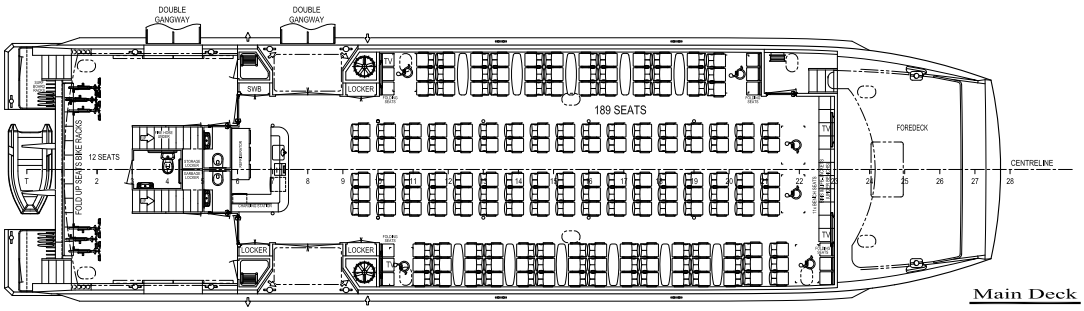
Length OA	33.59 m
Length WL	32.19 m
Beam	9 m
Depth	2.7 m
Draft (max)	1.85 m
Passengers	375 (NSCV 1C) 256 (NSCV 1D)
Crew	4
Fuel	5000 L
Fresh water	2000 L
Sullage	2780 L
Propulsion	
Main Engines	2 × MAN D 2862 LE463 each 1029 kW at 2100 rpm
Gearboxes	2 × Twin Disc Quickshift MGX6620
Propellers	2 × 5 blades, fixed pitch
Service speed	24.9 kn
Class	DNV-GL
Code	NSCV 1C and 1D



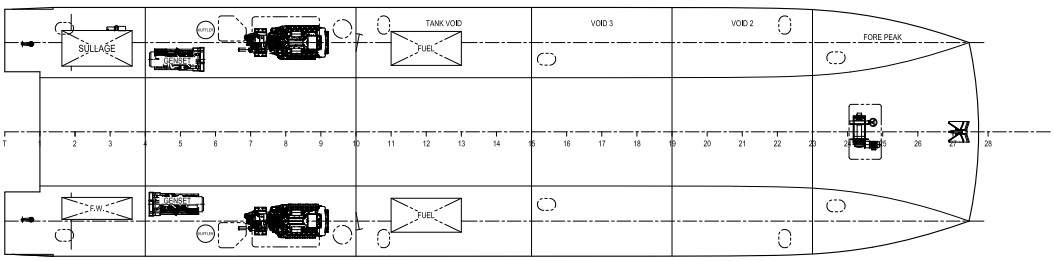
Profile View



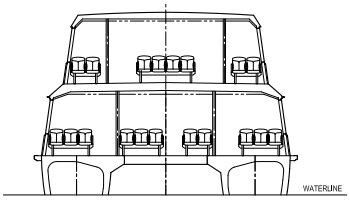
Upper Deck



Main Deck



Below Decks



Typical Section

PRINCIPAL PARTICULARS (APPROX)

Length Extreme	34.04 m	Draft	1.36 m
Length WL	32.19 m	Fuel	2x2500 L
Beam (Overall)	9.00 m	Fresh Water	1x1000 L
Beam (Moulded)	8.50 m	Sullage	1x2780 L
Depth (Moulded)	2.70 m	Total Passengers	375
		Total Seats	320
		Internal Seats	249
		External Seats	79
		Internal Seats - Beurteaux "Diner"	
		External Seats - Beurteaux "Cafe"	

One 2 three NAVAL ARCHITECTS

ONE 2 THREE 33m CATAMARAN 24 APRIL 2015

One 2 Three Pty Ltd | 11 Phillips Rd | Kogarah | NSW | 2217 | Australia | Tel: +61-2-9553-0366 | Fax: +61-2-9553-0344 |design@one2three.com.au

DRAWING # 11005 A1 SHEET SCALE 1:75

General Arrangement of the 33 m fast ferries to be built by Incat Tasmania for Manly Fast Ferries
(Drawing courtesy Incat Tasmania)

US Approves Support for AWDs

The US State Department has approved a possible Foreign Military Sale to Australia for Hobart-class destroyer sustainment and associated equipment, parts and logistical support for an estimated cost of $US275 million.

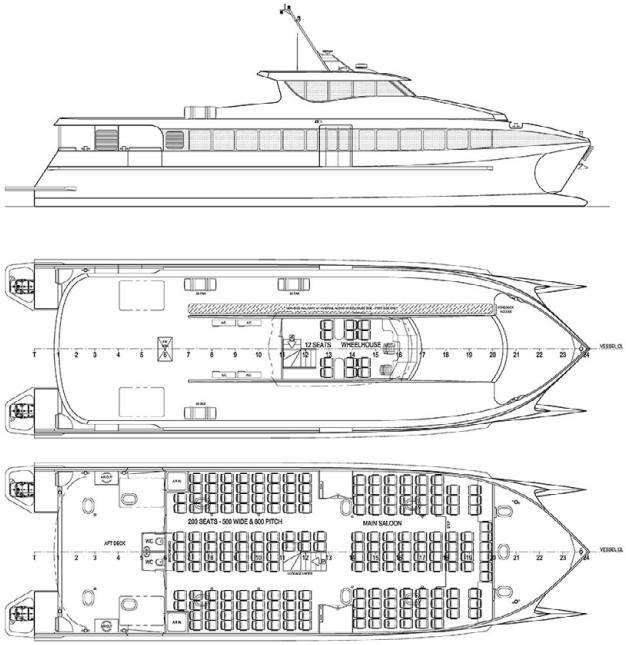
The Australian Government had requested a possible sale of follow-on sustainment support and services in support of three destroyers. The sustainment efforts will include AEGIS computer software and hardware updates, system integration and testing, tools and test equipment, spare and repair parts, support equipment, publications and technical documentation, personnel training and training equipment, aircrew trainer device upgrades, US Government and contractor technical assistance, and other related elements of logistics and program support.

The principal contractor will be Lockheed Martin Mission Systems and Training in Washington, District of Columbia.

Shiang Shin from One2three Naval Architects

Evolution Commercial has delivered *Shiang Shin*, a 28 m wave-piercing catamaran designed by One2three Naval Architects, to Ferry Co. Ltd for operation in Taiwan. The ferry was designed and built under Lloyd's Register classification to SSC Rules for offshore operations, and dual classed with China Registry. Powered by twin MTU 12V2000 engines driving Rolls Royce 40A3 waterjets, *Shian Shin* has a fully-loaded cruising speed of 32 kn. Seating for 200 passengers is provided on the main deck, with an extensive aft external deck given over to transport of luggage and stores. An HSC Code-compliant wheelhouse sits alone on the upper deck, with additional seating capacity for up to 12 crew in addition to the vessels operational crew of three.

Shiang Shin on trials
(Photo courtesy Evolution Commercial)



General arrangement of *Shiang Shin*
(Drawing courtesy One2three Naval Architects)

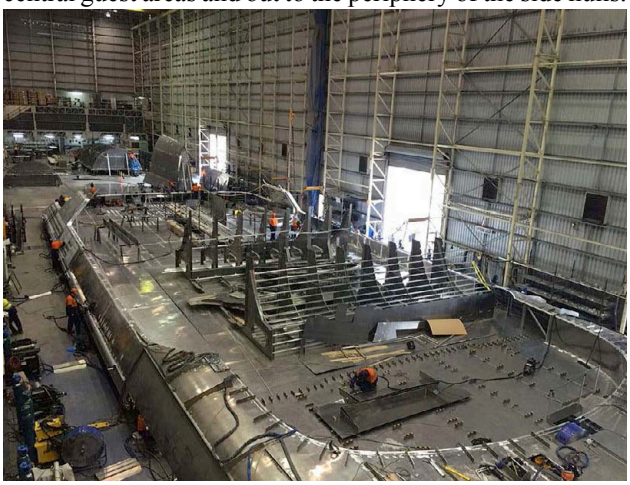
Principal particulars of *Shiang Shin* are

Length OA	30.00 m
Length WL	28.34 m
Beam OA	8.86 m
Depth	3.08 m
Draft	1.19 m
Passengers	200
Crew	3
Fuel oil	9000 L
Fresh water	500 L
Sullage	500 L
Main engines	2×MTU 12V2000
Propulsion	2×Rolls Royce 40A3 waterjets
Speed (service)	32 kn
Generators	2×Kohler 20EOZD single-phase
Construction	Marine-grade aluminium
Flag	China
Class/Survey	Combined CR and LR

84 m Trimaran Luxury Motor Yacht from One2three Naval Architects

Echo Yachts continues full steam ahead on production of the One2three-designed 84 m trimaran luxury motor yacht. The vessel is being constructed using a modular-build method. Six modules are under construction in the hall, making up the midships half of the centrehull. The sundeck module, all 47 m of it, is nearing completion from a fabrication perspective.

An interesting aspect of the design is the vessel's main propulsion—a diesel-electric system has been chosen, comprising twin controllable-pitch propellers linked to electric motors. The main drive train is located in the centre hull. Six cascading gensets are, however, located in the side hulls, shifting noise and ventilation ducting away from the central guest areas and out to the periphery of the side hulls.



Sundeck module under construction
(Photo courtesy Echo Yachts)

24 m and 33 m Catamaran Ferries for Sydney Harbour from One2three

Manly Fast Ferries has confirmed an order for two One2three-designed 24 m catamarans and two 33 m catamarans for operations on Sydney Harbour. The vessels will join the Manly Fast Ferries *Ocean Dreaming II* and *Ocean Rider*, both One2three-designed 30 m catamarans servicing the Circular Quay route.

All four vessels will be built by Incat Tasmania (see Page 33 in this edition) and are due for launch by the new year. These vessels are in addition to the two 33 m One2three-designed low-wash ferries currently under construction at Incat Tasmania for Thames Clippers in the UK.

The two 33 m vessels are designed primarily for the peak-hour commuter route, and feature a passenger capacity of 375 in a mix of interior and external seating. Bicycle and surfboard racks are provided to cater for this demand, with the air-conditioned cabins providing wi-fi, personal device charging stations, laptop connections and kiosk facilities.

The two 24 m vessels will also service the Manly–Circular Quay route due to rising passenger demand. These vessels have a more-flexible arrangement, carrying 260 passengers in commuter service, but also up to 160 passengers for offshore whale-watching and tourist-cruising operations on the harbour.

Rob Tulk

Violet McKenzie from Incat Crowther

Incat Crowther has announced the delivery of a fourth 24 m catamaran ferry to Captain Cook Cruises. Built by Richardson Devine Marine Constructions in Hobart, *Violet McKenzie* joins *Elizabeth Cook*, *Mary Reibey* and *Anabelle Rankin* plying the waters of Sydney Harbour.

The new-generation vessels have proven a hit on the harbor, with a unique combination of robustness and efficiency. Operating in the Sydney Ferries network, the vessels operate in both the low-wash/shallow-water zones on the Parramatta River and across Sydney Heads to Manly. Their reduced running costs make them an ideal stand-by vessel when larger capacities are not required, giving their owner a commercial advantage.

Violet McKenzie features a passenger capacity of 198 with an optimised blend of interior and exterior spaces. The vessel is certified to carry 127 passengers in Class 1C coastal operation and 198 passengers in Class 1D/1E harbour operation. She is the first vessel in operation on Sydney Harbour which is fully AMSA-compliant for Fast Craft II, demonstrating Incat Crowther's expertise in regulatory matters.

The design of the vessel focuses strongly on operational efficiency and safety. Large hinged engine hatches provide ample access to the engine rooms to simplify day-to-day maintenance tasks, whilst the wheelhouse has been optimised for visibility over the boarding areas.

Violet McKenzie is powered by a pair of Scania DI13 070M main engines. The vessel cruises efficiently at 25 kn, with a top speed of 27 kn.

Continuing the tradition of honouring pioneering women in New South Wales, *Violet McKenzie* is a nod to Australia's first female electrical engineer.

Incat Crowther continues to evolve and improve this new generation of vessels, which offers a unique blend of cutting-edge design, low fuel consumption and robustness.

Principal particulars of *Violet Mackenzie* are

Length OA		23.9 m
Length WL		23.5 m
Beam OA		7.20 m
Depth		2.20 m
Draft	(hull)	1.00 m
	(propeller)	1.40 m
Passengers		198 (1D)
		127 (1C)
Crew		3
Fuel oil		2000 L
Fresh water		250 L
Sullage		1500 L
Main engines		2×Scania DI13 070M
		each 368 kW @ 1800 rpm
Propulsion		2×propellers
Speed	(service)	25 kn
	(maximum)	27 kn
Construction		Marine-grade aluminium
Flag		Australia
Class/Survey		NSCV Class 1C/1D

Violet Mackenzie on Sydney Harbour
(Photo courtesy Incat Crowther)

19 m Catamaran Tour Vessel from Incat Crowther

Incat Crowther has announced the commencement of construction of a 19 m catamaran tour vessel by Aluminium Marine in Thornlands, Qld. Offering Incat Crowther's world-leading efficient hullform and robust design, the vessel offers operators a competitive edge in tour operations.

Like all Aluminium Marine vessels, she is being built to a very high standard. The versatile platform can be customised to the operator's requirements, with existing arrangements available for sightseeing, dive tour and passenger ferry operations.

Provisions have been made for the fitment of a bow loading ramp and stern lifting platform.

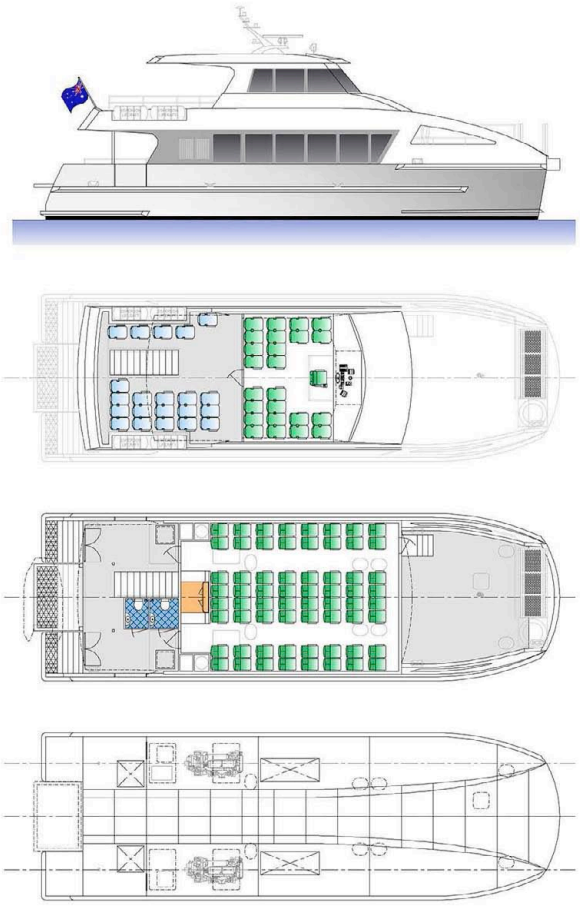
The vessel is compliant with the Australian NSCV for vessels under 24 m in length and 25 kn speed.

The vessel will be fitted with a pair of Yanmar 6HYM-ETE main engines, and will efficiently and comfortably operate at a service speed of 23 kn in the loaded condition.

The vessel is under construction and available for purchase. To enquire about the vessel, please contact Incat Crowther's Sydney office or Aluminium Marine.

Principal particulars of the new vessel are

Length OA		18.9 m
Length WL		18.9 m
Beam OA		6.00 m
Depth		2.2m
Draft	(hull)	0.95 m
	(keel)	1.50 m
Passengers		110
Crew		3
Fuel oil		2400 L
Fresh water		400 L
Sullage		400 L
Main engines		2×Yanmar 6HYM-ETE each 368 kW @ 1950 rpm
Propulsion		2×propellers
Generators		1×TBD
Speed	(service)	23 kn
	(maximum)	25 kn
Construction		Marine-grade aluminium
Flag		Australia
Class/Survey		NSCV Class 1C



General Arrangement of 19 m catamaran tour vessel under construction at Aluminium Marine
(Drawing courtesy Incat Crowther)

Luanda and *Cacuaco* from Incat Crowther

Incat Crowther has announced the delivery of *Luanda* and *Cacuaco* to Instituto Marítimo e Portuário de Angola. The pair of 36 m catamaran passenger ferries, built by Astilleros Armon in Spain, will be operated by subsidiary TMA Express. *Luanda* and *Cacuaco* are the second and third deliveries in a project which included the delivery of two 30 m ferries, *Macôco* and *Panguila* late last year, and includes a 20 m catamaran buoy workboat being constructed by the yard for Instituto Hidrográfico e de Sinalização Maritíma de Angola.

The 265 passenger ferries are IMO HSC Passenger (A) certified and Angola flagged. As with *Macôco* and *Panguila*, *Luanda* and *Cacuaco* feature hard-wearing interiors and simple, practical propulsion packages. They have been designed for efficient long-range operation and low maintenance costs, appropriate to the area of operation. Mechanically-operated fold-down boarding ramps are fitted at the stern quarters, leading directly into the main -deck cabin.

The main-deck cabin features seats for 240 economy-class passengers in forward-facing seats. Toilets (including one handicap-accessible), bar, ticket counter and luggage room are located aft.

The upper-deck cabin seats 72 executive-class passengers, all at tables. A space forward of this cabin houses accommodation for four crew members, and access to

the vessel's raised wheelhouse which affords 360 degree visibility.

The hulls accommodate cabins for a further eight crew members, as well as a galley and mess.

Luanda and *Cacuaco* are each powered by a pair of Caterpillar 3512B main engines, each producing 1379 kW and driving through Rientjes gearboxes. Both vessels performed well on sea trials, reaching top speeds of over 27 kn. The vessels have a service speed of 25 kn.

With these four ferries, Astilleros Armon have completed four high-quality aluminium vessels and reached new markets for Incat Crowther.

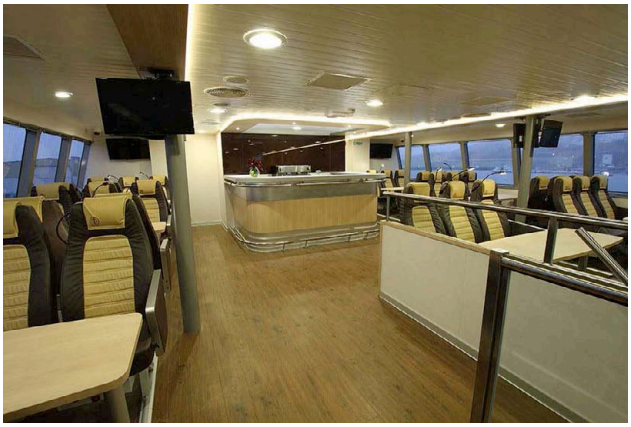
Principal particulars of *Luanda* and *Cacuaco* are

Length OA		36.2 m
Length WL		35.6 m
Beam OA		9.50 m
Depth		3.50m
Draft	(hull)	1.20m
	(propellers)	1.60 m
Passengers		314
Crew		12
Fuel oil		12 278 L
Fresh water		2075 L
Sullage		2938 L
Main engines		2×Caterpillar C3512B each 1379 kW @ 1600 rpm
Propulsion		2×5-bladed propellers
Speed	(service)	25 kn
	(maximum)	27 kn
Construction		Marine-grade aluminium
Flag		Republic of Angola
Survey		ABS ✠ A1, Ⓔ HSC Passenger Craft (A) ✠ AMS,

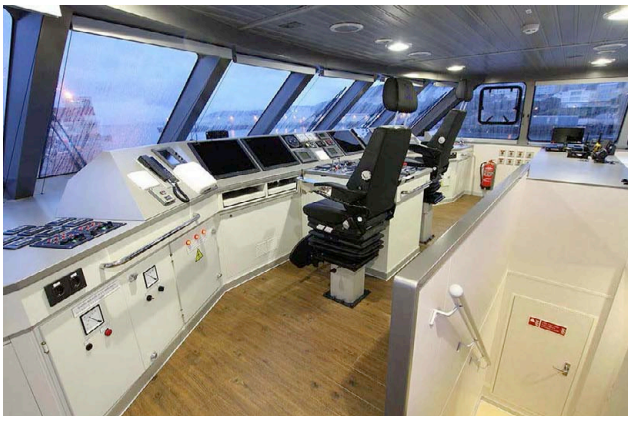
Stewart Marler

Luanda on trials
(Photo courtesy Incat Crowther)

Port quarter of *Luanda*
(Photo courtesy Incat Crowther)



Upper-deck cabin on *Luanda*
(Photo courtesy Incat Crowther)



Wheelhouse on *Luanda*
(Photo courtesy Incat Crowther)

Baru Mucura from Incat Crowther

Incat Crowther has announced the launch and successful trials of *Baru Mucura*, the second in a series of twelve UT4000 monohull fast supply vessels built by ETP Engenharia Ltda. in Brazil. *Baru Gorgona* was the first delivery in the series.

The vessel's design has been optimised to comply with the UT4000 fast supply vessel specification. Ship's fuel is in excess of 40 000 L, with a cargo fuel load of 90 000 L. There is also capacity for 90 000 L of cargo fresh water.

The vessel is dominated by an expansive aft deck of 225 m^2 of usable area, planked with hardwood and protected by sturdy cargo rails.

An additional 30 m^2 of cargo area is provided inside the main deck cabin, allowing for the carriage of items out of the elements, such as food and other supplies. Also housed in the main deck cabin are a wet room and laundry facilities.

The upper-deck wheelhouse includes an aft-facing control station allowing for safe and efficient manoeuvring.

Below decks are six cabins accommodating 11 crew, as well as a mess, galley and bathrooms.

Baru Mucura is powered by a quartet of Cummins QSK 50 main engines, each rated at 1342 kW at 1800 rpm. Propulsion is by way of fixed-pitched propellers, whilst two 112 kW electric tunnel bow thrusters will enhance manoeuvrability. The vessel has a service speed in excess of 21 kn.

Incat Crowther's extensive experience in the offshore supply field has led to the development of class-leading vessels which are rugged, efficient and profitable.

Starboard side of *Baru Mucura*
(Photo courtesy Incat Crowther)

Principal particulars of *Baru Mucura* are

Length OA		48.0 m
Length WL		46.1 m
Beam OA		9.50 m
Depth		4.25 m
Draft	(hull)	1.70 m
	(propeller)	2.10 m
Deck area		225 m^2
Deck strength		3.0 t/m^2
Crew		11
Ship's fuel		44 600 L
Ship's fresh water		9000 L
Cargo fuel		90 600 L
Cargo fresh water		91 000 L
Main engines		4×Cummins QSK 50 each 1342 kW @ 1800 rpm
Propulsion		4×5-bladed propellers
Generators		2×Cummins QSM 11 each 280 ekW
Speed	(maximum)	25 kn
	(service)	21 kn
Construction		Marine-grade aluminum
Flag		Brazil
Notation		✠ 1A1 HSLC (bra) R1 Service 2 E0

Sistac Vitória from Incat Crowther

Incat Crowther has announced the delivery of *Sistac Vitória*, a purpose-built RINa-classed, DP-2 monohull dive-support vessel intended for service in Brazilian offshore waters. The vessel was designed by Incat Crowther in collaboration with the vessel's builder, SeaSafe Barcos Manufacturados SA in Angra dos Reis, Brazil, for Sistac Sistemas De Acesso SA.

Sistac Vitória's generously-sized aft working deck includes multiple A-frame assemblies with integrated winches for ROV and dive-bell launching and retrieving, as well as a knuckle-boom crane for handling deck gear and a small rescue/service vessel. The aft deck also features a lower platform at the stern to facilitate direct access to the sea by diving personnel. Completing the aft deck arrangement is a dive shop and dive-control centre, which is centrally located on the aft deck.

The interior of the main deckhouse includes an emergency generator space, a decompression chamber, office, TV/entertainment room, meeting room, lunch room, galley with generously-sized freezer, cooler, pantry, and three single-berth cabins with ensuite bathrooms for senior personnel.

Below decks are accommodations for the 33 crew and dive personnel, which are designed as two-, three-, and four-berth cabins, each with their own ensuite bathrooms.

A spacious wheelhouse features forward- and aft-facing controls, numerous lockers, a refreshment centre, and two ROV control stations. A large deck ahead of the wheelhouse provides a landing area complying with Petrobras requirements for accommodating a crane-loaded man-riding basket, and for carriage and delivery of supplies and small cargo.

Four Scania DI13 main engines driving Hamilton HM 521 waterjets through ZF 665 gearboxes supply propulsion power to the vessel. Diver safety and manoeuvrability were key drivers in the selection of waterjet propulsion. Station-keeping and manoeuvrability are further enhanced by three Thrustmaster 30TT200 tunnel bow thrusters. Main electrical power is supplied by four Scania DI13 diesels driving 375 ekW gensets.

Sistac Vitória as an SDSV further demonstrates Incat Crowther's capability and expertise in the design of specialised ships for offshore service.

Principal particulars of *Sistac Vitória* are

Length OA		42.5 m
Length WL		38.5 m
Beam OA		9.30 m
Depth		4.25 m
Draft	(hull)	1.85 m
	(propellers)	1.85 m
Personnel		36
Fuel oil		133 000 L
Fresh water		32 600 L
Sullage		6700 L
Main engines		4×Scania DI13 each 410 kW @ 1800 rpm
Gearboxes		4×ZF 665
Propulsion		4×Hamilton HM 521 waterjets
Generators		4×Scania DI13 375 ekW
Speed	(service)	11 kn
Speed	(maximum)	13 kn
Construction		Marine-grade aluminium
Flag		Brazil
Class/Survey		Norman-01/RINa
Notation		✠ C Special Service, DYNAPOS AM/AT R, Diving Support, AUT

Sistac Vitória on trials
(Photo courtesy Incat Crowther)

Security Vessels from Incat Crowther

Incat Crowther has announced a contract to design an offshore commercial oilfield security vessel for Veecraft Marine and its client, UTM Dredging Ltd. Continuing a strong relationship with Veecraft Marine, a premier South African shipyard specialising in quality aluminium vessels, Incat Crowther puts forth the expertise to develop a high-endurance, efficient, yet robust design. Two vessels to this design are under construction, with future orders pending.

Impressive vessel performance is provided by three Caterpillar C32 ACERT engines, each producing 1081 kW at 2300 rpm. The propeller-driven vessel will have a maximum speed of 29 kn. Electrical power is derived from two Caterpillar C4.4 generators and manoeuvrability is enhanced by a Hydro Armor Type 800 bow thruster.

The efficient accommodations arrangement provides generous space for a complement of 8 crew and 14 security personnel in single- and double-berth cabins. The main deck features three double-berth staterooms, two single-berth staterooms, two toilet and shower spaces, a medical room, a large galley and a spacious lounge as well as a separate mess area. Below-deck accommodation includes seven double-berth cabins, two toilet and shower spaces, a laundry room, a large cooler and storage locker. The wheelhouse provides a helm station with two helm seats, a chart table, a communications desk, and seating for 12 passengers or security personnel.

Starboard bow of the security vessel
(Image courtesy Incat Crowther)

External decks provide plenty of space for transportation of supplies and positions for weapons installations. The aft portion of the hull is fitted with a well, fixed with a hydraulically-operated, articulating transom door, for transportation and easy deployment of an 8 m fast rescue craft. The wheelhouse is constructed of Armox 500T steel with bullet-proof windows to provide ballistic protection to NIJ Level III.

Featuring styling cues common to Incat Crowther designs, the vessel has a distinguished look which stands apart from other vessels.

The contract for this commercial security vessel is another testimony of the relationship between Incat Crowther and Veecraft Marine. A commitment to service and innovation has led to yet another customised vessel design suited to meet the needs of an expanding and demanding oilfield security industry.

Principal particulars of the new vessels are

Length OA		35.0 m
Length WL		35.0 m
Beam OA		7.00 m
Depth		3.80 m
Draft	(hull)	2.00 m
	(propeller)	2.30 m
Passengers		12
Crew		8
Security personnel		14
Fuel oil		46 500 L
Fresh water		22 000 L
Sullage		1600 L
Main engines		3×Caterpillar C32 ACERT each 1081 kW @ 2300 rpm
Propulsion		3×propellers
Generators		2×Caterpillar C4.4 50 Hz
Speed	(service)	25 kn
	(maximum)	29 kn
Construction		Marine-grade aluminium
Flag		Nigeria
Class/Survey		BV ✠Hull Machinery Crewboat Sea Area 3

Zach Dubois

Bird's eye view of the security vessel
(Image courtesy Incat Crowther)

Cruising

The summer season continued through late February with visits by *Crystal Serenity, Artania, Diamond Princess, Carnival Legend, Pacific Jewel, Radiance of the Seas, Voyager of te Seas, Albatross, Aurora, Queen Elizabeth, Carnival Spirit, MS Marina, Explorer of the Seas, Celebrity Solstice, Noordam, Sea Princess and Queen Victoria.*

The season wound down through autumn, with return visits in March by many of these vessels plus visits by *Amsterdam, Arcadia, Black Watch, Queen Mary 2, Costa Luminosa, Azamara Quest, and Celebrity Millennium.*

April saw return visits by some of these vessels and added visits by *Pacific Aria* and *Golden Princess*, while May saw some return visits and added a visit by *Insignia.*

Pacific Jewel, Pacific Pearl, Sun Princess and *Carnival Spirit* are the only vessels scheduled for cruises over the winter months until *Diamond Princess* arrives on 27 September to begin the arrivals heralding the next summer season.

Phil Helmore

Queen Victoria moored in Athol Bight in Sydney on 12 March. *Queen Mary 2* was alongside at the Overseas Passenger Terminal at Circular Quay. Both ships sailed on the evening of 13 March with a fireworks display to add to the spectacle of the event
(Photo John Jeremy)

HMAS *Parramatta* ashore at the BAE Systems facility at Henderson where the ship will undergo an anti-ship missile defence upgrade, a docking maintenance availability, and preservation works for approximately the next 12 months.
Partially painted, HMAS *Ballarat*, in the background, will be undocked once her anti-ship missile defence upgrade is completed
(RAN photograph)

EDUCATION NEWS

Australian Maritime College

AMC Students Float Fast-boat Designs

A group of maritime engineering students were hard at work over the summer break producing designs and ideas for fast boats to compete at the international HYDROcontest in Switzerland this July.

Ten members from the student-run AMC Autonomous Technologies Society (AMCAT) were selected to build upon the achievements of the inaugural 2014 crew which finished the competition with the best design award in the lightweight category.

Team AMC spokesman, Mitchell Pearson, said that they would be competing in both the lightweight and heavyweight divisions this year and the boat designs were well on their way to becoming reality.

"We are very excited to be competing at the HYDROcontest for the second time and look forward to once again showcasing our ability, our University and our country on the world stage," he said.

"We don't want to give too much away, but at this stage we can say we'll be entering a hydrofoiling boat again for the lightweight competition and an interesting design for the heavyweight division. Boat construction is planned for mid-March with testing to follow in the months of May and June."

The HYDROcontest, run by the HYDROS Foundation, focuses on the development of technologies which increase the energy efficiency of the vessels of tomorrow and reduces dependence on fossil fuels.

It aims to showcase research and innovation in the area of maritime transport through a series of three challenges: a heavyweight transport vessel that must race with 200 kg of cargo, a lightweight vessel racing with a load of 20 kg, and a long-distance race to determine the most energy-efficient vessel design.

AMC Students Canvas Future Options at Careers Exhibition

In April AMC students had the opportunity to meet with industry representatives and investigate their future career options at the 2015 AMC Careers Exhibition.

The annual event allows stallholders to showcase their organisation, and students to learn more about their prospective employers in a meet-and-greet environment. It is supported by businesses, professional institutions and government agencies from across the maritime sector in Australia.

Participating companies this year included Defence Force Recruiting, ThyssenKrupp Marine Systems Australia, Aztec Analysis, ASC Shipbuilding, BMT Design and Technology, The Nautical Institute, Royal Institution of Naval Architects (RINA), and the Institute of Marine Engineering, Science and Technology (IMarEST) as well as the University's Career Development and Employment service and postgraduate research exhibitors.

AMC Principal, Professor Neil Bose, said that the event reflected the college's close relationship with industry and its ongoing commitment to responding to training needs.

"The AMC Careers Exhibition is an excellent forum for our students to gain some insight into the careers that are ahead of them and for industry representatives to promote their companies and scope out prospective future employees," Professor Bose said.

"AMC is Australia's national institute for maritime training, education and research, offering qualifications across the disciplines of coastal and ocean seafaring, maritime engineering, and maritime business and international logistics. Our course offerings remain relevant to global demands and this is one of the reasons why our graduate employment outcomes are high and in demand world-wide."

University of New South Wales

Student–Staff Get-together

The naval architecture students and staff held a get-together on Tuesday 17 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 fifty-two students spread across Years 1 to 4, including eight from NTNU (Norwegian University of Science and Technology) in Trondheim enrolled in study-abroad courses in Year 4, most of whom attended along with five staff members. A broad mix, and some wide-ranging discussions ensued.

Thesis Projects

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

Ship Wind Heeling Moments

For the stability analysis of ships, one criterion is to consider the action of beam winds where the wind heeling moment is compared to the still-water righting arm. Common assumptions are that the wind heeling moment is constant with angle of heel (AMSA) or decreases from the upright value according to the cosine of the angle of heel. While this may be reasonably valid for slender vessels, for wide vessels and particularly those with shallow draft, the lateral projected area of the ship, and hence wind heeling moment, may well increase as heel angle is increased.

Cameron Edwards is conducting an investigation to check the wind heeling moment calculated numerically using a traditional approach but considering the actual lateral profile of the ship at each heel angle (calculated from a model of the vessel in a CAD program such as Rhino or AutoCAD). These results are being compared to the results of wind-tunnel model tests on a representative model which has already been tested in the UNSW wind tunnel.

Retro-fitting Hydraulic Deck Cranes to Fishing Vessels

A recent trend is to fit hydraulic deck cranes to fishing vessels, due to their high lifting capacity and ease of use, and so replace the traditional mast-and-boom arrangement for handling the fishing gear and catch. These cranes are often fitted elsewhere on the deck, and not necessarily in an area designed for the job, with little being known of the structure

underneath required to resist the loads and moments which will be applied.

Sam Henson is conducting an investigation into the fitting of a typical crane to a typical fishing vessel, forward of the transom on the aft deck. He has modelled the original structure and conducted a finite-element analysis which showed that the original structure by itself could not support the loads and moments. He has then proceeded to model structure which can cater for the new loads, and Maxsurf is being used to check the implications for stability and trim.

NAVL3610 Industry Visits

The Year 3 students in NAVL3610 Ship Hydrostatics and Practice have continued the usual industry visits accompanied by David Lyons and Phil Helmore.

On 11 March we visited HMAS *Choules*, berthed at the East Dock Wall at Garden Island. After being welcomed on board, the visiting party was split into two groups for the round of the ship. One group went aft to see the "cool" stuff first: the MCR and the DCS, the Dock Control Room with a view over the dock and the vehicle deck, the Converter Room, Motor Room and the Propulsion Unit Space. We saw the AFFF tank, the main DG space with the Wärtsilä 8 and V12 engines and gensets, the dock and vehicle deck, the galley and servery, Junior Sailors' Mess, laundry, sick bay, Senior Sailor's Mess and Recreation Space, one-, two- and four-berth cabins, the bow-thruster compartment, bridge, container deck, floating cranes, the RAS point, the vehicle- provisions- and ammunition-lifts, and the main engine exhausts. The students have learned a whole range of terminology and all were impressed with the view from the high bridge, the diesel-electric propulsion and the aziumthing pods, and the amount of redundancy built in to the ship.

On 1 April we visited Thales Australia at Garden Island, where the Acting Dockmaster, Monika Lemajic, gave us a run-down on the docking operation and the significance of the docking drawings and the information they contain, especially as they apply to HMAS *Stuart*. After issuing us with safety hats and glasses, Monika then took us on a tour of the dock, explaining the method of docking and the operation of the caissons. We then went down onto the dock floor where HMAS *Stuart* was docked, and she explained the underwater features of the vessel and the arrangement of the dock blocks to suit. Back on the topsides, we met Mark Edgecombe at the entrance to the Pump House and he led us on a tour of it, showing us over the main pump area, the pumps, accesses, bomb-proofing, and one of the valve pits. From there we were escorted to the Drawing Office, where Peter Swain gave us a run-down on who Thales is, what they do, and some of the interesting jobs which have been done at Garden Island, such as the removal and replacement of the auxiliary machinery and the installation of the VLS on the FFGs.

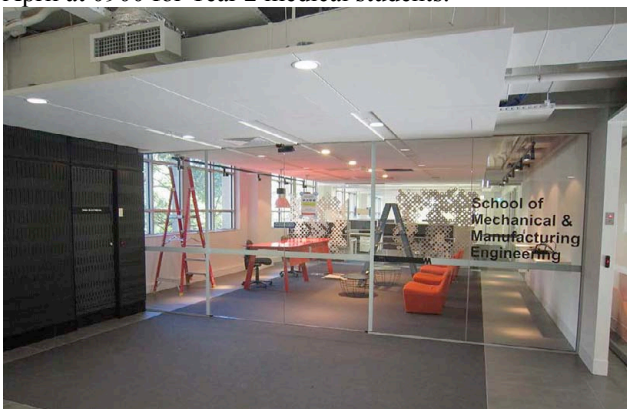
On 15 April we visited Incat Crowther, where Sam Foster gave us an introduction to the vessels which they design, including catamaran passenger ferries, crewboats, supply boats, wind-farm service vessels, etc. He then showed us some of the designs in detail, and the constraints and features which go to making a design challenging or, at least, interesting. This included the drawings which have to be prepared, the finite-element modelling which is done and the resistance and seakeeping analysis and model testing. Cameron Edwards, a current UNSW student, then gave us a run-down on some of the many jobs he was given in his first months at Incat Crowther, some of the things which made the projects "interesting", and how his degree has fitted him for the practice of ship design.

On 22 April we visited One2three Naval Architects, where Steve Quigley gave us some insights into the company, the type of work that they do and the vessels they design by way of a PowerPoint presentation. This included demonstrations of some of the software used in the design process, which includes Maxsurf for hull modelling, AutoCAD for drawing, Rhino for superstructure modelling, Workshop for plating, ShipConstructor for construction details, material lists, etc., and NavisWorks for 3D visualisation. Raymond Fagerli, a recent graduate of UNSW, then gave us some insights into how it feels to be thrown in at the deep end after graduating.

Post-graduate and Other News

Building Progress

Progress on renovation of the Mechanical and Manufacturing Engineering (MME) tutorial building was delayed somewhat by CATS having booked the new 350-seat lecture theatre for classes following the mid-semester break in Semester 1. As a result, Richard Crookes Constructions had to concentrate effort on getting this ready for lectures, and fell behind on the fit-out of other levels and areas. However, the 350-seat theatre on Levels G and 1 of the link wing was completed on time, and the first lecture was held there on Monday 13 April at 0900 for Year 2 medical students.



New school office
(Photo Phil Helmore)

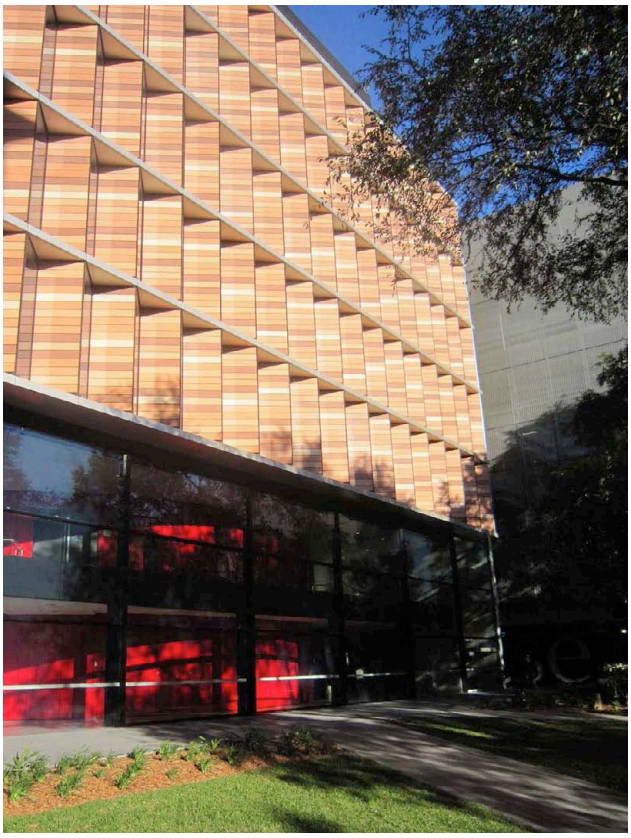
Rear of the new 350-seat theatre on Level 1
(Photo Phil Helmore)

Good progress continues to be made in the rest of the project. The research spaces on Levels 2, 3 and 4 of the tutorial building are complete and the CSE and MME computer labs are awaiting the installation of their 350 computers. The Level 5 warm shell in the south end of the laboratory building is complete and has the most amazing views to the airport and beyond. The installation of air conditioning and other mechanical services for both buildings is underway.

Work in the north end of the laboratory building is also progressing well. A new floor surface has been selected after the issues encountered with the surface laid in the south end. Internal fit-out is underway in the north end and the remedial work on the refrigeration laboratory is almost complete. The large panes of glass have been installed into the canopy structure at the Mall end of Willis Lane. Paving of Willis Lane is complete. Plans to decant the School back into the new and renovated buildings are in place and the decant is expected to occur in the break between semesters.

Phil Helmore

New 350-seat theatre in use
(Photo Phil Helmore)



The link wing from the John Lions Garden, showing the terra cotta tiles on the façade, and the rear of the new 350-seat theatre
(Photo Phil Helmore)

THE PROFESSION

AMSA's Marine Surveyor Accreditation Scheme

The Australian Maritime Safety Authority (AMSA) is currently seeking applications from naval architects and marine surveyors competent to work as domestic commercial vessel surveyors around the country. AMSA worked in close conjunction with RINA during the two-year development of this scheme and is keen to see RINA members take part. There is currently no fee for application or interview.

The scheme allows accredited persons the ability to plan approve, conduct initial and periodic surveys, and surveys of associated marine systems. Both government and private surveyors fall under the scheme.

The Marine Surveyor Accreditation Scheme, managed by AMSA as the National Regulator, ensures that people are competent to conduct and provide survey reports for domestic commercial vessels under the Marine Safety (Domestic Commercial Vessel) National Law Act 2012 (National Law).

The regulation amendment commenced on 2 January 2015 and is administered by AMSA. This mechanism developed from a recent amendment to the regulation, Marine Safety (Domestic Commercial Vessel) National Law Amendment (Surveyor Accreditation) Regulation 2014, which is available from www.comlaw.gov.au/Details/F2014L01541.

The scheme includes some important features:

- a cost-neutral approach, providing existing government and non-government surveyors with a simple renewal process to allow them to continue to work;
- a direct route for new government surveyors into the accreditation scheme, based on existing delegates recruitment and employment practices;
- a straightforward route for new non-government (private) surveyors to achieve accredited status, with a career path for surveyors who upskill; and
- robust and transparent governance mechanisms which include auditing and centralised coordination of the scheme which will ensure a high quality of output in order to maintain the integrity of the national system.

For further information on how to make an application or to request an information session in your area, contact AMSA at dcvsurvey@amsa.gov.au.

Further information on how to apply and work within the scheme can be found in the *Marine Surveyors Accreditation Guidance Manual 2014* which is available on the AMSA website at www.amsa.gov.au/domestic/surveyors-manual.

Adam Brancher
Manager Standards and Operations
Domestic Vessel Division, AMSA

Qualification of Drydocking Facilities

Before any facility can be used to drydock Department of Defence vessels, those facilities need to be assessed and, if found suitable, formally "qualified" for that purpose.

Drydocking of vessels can be necessary to carry out planned or unplanned maintenance. Dockings are high-risk activities which require unique considerations, including the stability of the vessel, the cradle-support arrangements, the transfer mechanism if the vessel is to be moved to a hardstand ashore, the adequacy of the hardstand and extreme environmental loadings, such as high winds (as can be experienced in Darwin, for example) and earthquakes (like the Newcastle earthquake of 1989).

There are several types of dry-docking facilities used by Defence, such as graving docks, floating docks, slipways, ship-lifts, travel-lifts, and cranes. Some dockings involve a combination of the prime contractor undertaking the vessel's maintenance and a common-user facility which provides the docking/undocking services for several adjacent maintenance contractors.

Certification is the independent verification by an appropriate third-party that the infrastructure is capable of functioning to its design. Classification societies can provide certification that the design, construction and maintenance of dry-docking facilities comply with an acceptable set of rules. However, in the main, class certification considers the structural aspects of a facility and does not take into account some other key Defence requirements. Facility qualification is the assessment of the equipment, systems, processes and personnel of a dry-docking facility, to provide confidence that they meet specified requirements and are therefore acceptable for Defence use.

Unfortunately, accidents have occurred during the dry-docking of vessels. Many of these have resulted in damage to, or loss of, a vessel as well as human injury and death. Consequently all contracts for the drydocking of Defence vessels require that dry-docking facilities are appropriately qualified.

By way of background, qualification of dry-docking facilities used by United States Navy vessels is a rigorous process and there are mandatory inspection checklists for all structures and systems applicable to the facility type which must be completed to provide evidence of compliance prior to qualification.

The Australian requirements are based on the USN standard; however, they are less prescriptive. They identify the key areas required for qualification and allow the facility management to determine the appropriate objective quality evidence (OQE) required to demonstrate compliance. The key areas are:

- adequacy of the facility for its given purpose;
- maintenance of the facility;
- operational, emergency and security procedures for the docking/undocking;
- qualifications and experience of key personnel undertaking dry-docking activities, and
- quality procedures meeting the requirements of ISO 9001.

For qualification, the facility management must first submit an application to the Department of Defence. The application must detail how the facility meets each of the requirements and must contain appropriate OQE in support. The application will be assessed, including by site visits. A recommendation on the suitability of the facility will then be made along with any validity date.

When a qualified facility is due for an extension beyond the stated expiry date, the facility management must make a new submission for re-qualification. This submission must confirm that the information provided for the previous qualification is still current or identify any areas which differ. This re-qualification submission is then assessed to determine whether the facility continues to meet the requirements and is acceptable for continued use.

Hugh Hyland

THE INTERNET

Webcasts of NSW Section Technical Presentations

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

All of the recorded webcasts up to 30 September 2014, together with hotlinks to each one, are listed at

www.rina.org.uk/NSWwebcasts.html.

On 1 October 2014, Engineers Australia started using a new system for recording presentations, using three cameras and a hand-held microphone, with an audio technician in attendance. Webcasts are placed on the Engineering on Line (EoL) website at www.engineeringonline.com. The first presentation to be recorded with this new system was Graham Taylor's presentation on *LNG —The New Marine Fuel?* on 1 October, and the presentation is up on the EoL website at www.engineeringonline.com/video/xjkrsdrf/lng-the-new-marine-fuel. Details of how to access this recording were given in the February 2015 issue of *The Australian Naval Architect.*

However, Engineers Australia has now discontinued using the new recording method and the EoL website for regular monthly presentations, and has resumed using Mediavisionz. We are waiting for advice on accessing recordings made in 2015. Watch this space!

Phil Helmore

INDUSTRY NEWS

Incat Crowther opens Office in Europe

Incat Crowther has announced the opening of an office in Southampton, England. The office has been created to support a growing European client base and meet the demand for Incat Crowther's products and services in the region.

The Incat Crowther Group has continued to experience significant growth. This is a result of a strong track record, robust and innovative vessel designs and consulting services. The office in Southampton is a reflection of this growth and is the third new office opened in recent years (following Lafayette, USA, and Rio de Janeiro, Brazil). The European office will initially offer design and support for specialised high-speed aluminium ships including passenger vessels, and specialist vessels for the offshore and renewables markets.

As Incat Crowther has grown, the head office in Sydney has developed scalable, universal and robust business systems resulting in ISO 9001:2008 certification in 2012. The European office capitalises on the capability and expertise of the Incat Crowther Group, by using well-established cloud-based systems and procedures to deliver services locally with the quality and customer service which is core to the Incat Crowther culture. Incat Crowther understands the increasing demands of specialised vessels and the short time frames in which accurate engineering solutions need to be presented.

Dan Mace, General Manager, Incat Crowther Europe, said "Incat Crowther's presence in the European region is crucial to our commitment to providing high-quality, responsive services to our clients".

The European office is already supporting several large projects. These include the recent delivery of four passenger ferries and one specialist support vessel built at Astilleros Armon in Spain, a wind-farm service vessel in final stages of construction at MMS Ship Repair, a multi-purpose vessel recently delivered by Supacat to James Fisher Marine Services, and two new passenger vessels under construction for service in Africa.

BMT Design & Technology Selected To Participate In DSTO Panel

BMT Design & Technology (BMT), a subsidiary of BMT Group Ltd, has been appointed to the newly-formed Defence Science and Technology Organisation (DSTO) panel for Scientific, Engineering and Other Technical Services. This appointment will draw on BMT's expertise to assist DSTO's research and development efforts in a number of areas including mechanical engineering, blast physics, and electronic warfare and radar technologies.

DSTO is the Australian Government's lead agency for delivering scientific advice and innovative technology solutions for Defence and national security.

The newly-established panel will assist service providers by streamlining administration and standardising contractual arrangements. Other government agencies and defence groups, including the Defence Materiel Organisation (DMO), may also access the panel for delivery of relevant services.

BMT has been appointed to the DSTO Scientific, Engineering and Other Technical Services Standing Offer panel to provide assistance in ten areas of expertise being:

- Analysis.
- Blast Physics.
- Electronic Warfare and Radar Technologies.
- Human Science.
- Mechanical Engineering.
- Modelling and Simulation.
- Naval Platform Engineering.
- Operations Research and Analysis.
- Systems Engineering and Analysis.
- Trial Management Support.

Gordon MacDonald, Managing Director of BMT Design & Technology, said "Selection to this panel across so many areas confirms our position as one of Australia's leading maritime and naval consultancy firms. Our engineers are looking forward to contributing to DSTO's valuable program of research."

HydroComp NavCad® Premium Released

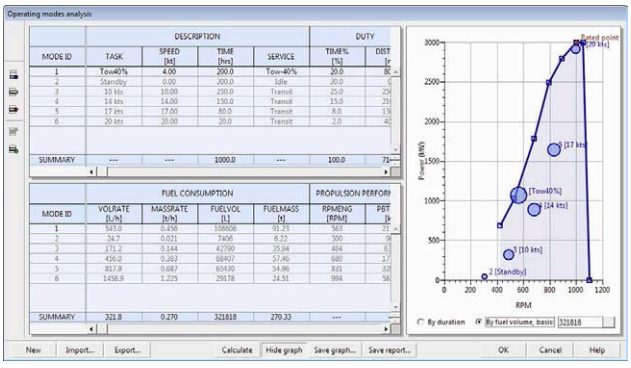
HydroComp NavCad has been the gold-standard for resistance and propulsion prediction for nearly three decades. A significant new upgrade is now available for the NavCad "power user" wanting to employ a greater level of analytical capability. Offered as an optional "Premium Edition" upgrade, these special new capabilities are a significant addition to the existing hydrodynamic analysis features in the standard NavCad.

NavCad will now be available in the well-known Standard Edition and the new Premium Edition. The Premium Edition will include these new significant capabilities:

Scripting (macro) API: An easy-to-use scripting language provides convenient batch-processing capability.

Connect as resistance and propulsion solver: Run NavCad from third-party software as a calculation engine (i.e. coupled solver), such as from your own spreadsheets or simulation tools, or from partner CFD, hull design or loading software.

Operating-modes analysis: A comprehensive duty-cycle operating-modes analysis module predicts total fuel consumption, engine load metrics, and key performance indicators for a variety of different user-defined operating mode definitions (e.g. Transit, Towing, Idle).



Operating modes analysis
(Image courtesy HydroComp)

Station distribution (for Prismatic Wave Drag)

(Image courtesy HydroComp)

Wave-theory resistance prediction: Longitudinal distributions of sectional area, waterplane, and area centroid are used to predict residuary resistance using a novel implementation of wave-theory code. Validation studies indicate exceptional quality and behavior for a broad range of hull types.

Floating network license: All Premium Edition licenses will include (or be upgraded to) a "one concurrent user" floating Workgroup License.

For more information visit the special NavCad Premium page at www.navcad-premium.com.

BMT Design & Technology Celebrates Ten Years

In March BMT Design & Technology (BMT D&T), a subsidiary of BMT Group Ltd, the leading international maritime design, engineering and risk management consultancy, celebrated ten years in business. Established in 2005, BMT D&T is recognised as one of Australia's leading independent defence and maritime consultancies.

Drawing on the pedigree of BMT Group, BMT D&T was established to help support the Australian naval and maritime sectors. Over the last ten years, the company has developed a reputable indigenous capability, structured to meet the technical challenges of Australia's current and future naval fleet.

To meet its customers' requirements, BMT Design & Technology has, over the years, partnered with other BMT companies and many local Australian businesses and consulting firms. This teaming approach has ensured consistent, value-for-money solutions with an optimum mix of skill sets and experience being made available to the customer.

Managing Director of BMT Design & Technology, Gordon MacDonald, said "Our approach has always been to grow a highly-skilled and experienced Australian capability and deliver a world-class service to the defence industry. We maintain stringent quality standards focusing our attention on recruiting the very best engineers, helping them to develop their careers to align with the competence necessary to support the ADF."

This approach has led to significant pieces of work being won by BMT. In 2012, it oversaw the delivery of the Coles Review, which involved the examination of all commercial, operational, sustainment and management issues around the Collins-class submarine and proposed initiatives to improve performance. In 2011–12, the team also undertook life-of-type extension, risk and financial assessments for all Royal Australian Navy surface fleet classes, providing the knowledge necessary to make future fleet program decisions.

Other major pieces of work include supporting the platform systems elements of the technical and logistic evaluation of tenders for the air-warfare destroyer program, providing significant safety-management services for the LHD and LHD watercraft acquisition programs, as well as leading the double hulling of HMAS *Success* from concept design through to design for production and supporting the subsequent refit in Singapore.

Over its ten years, the company has also delivered 13 of its reputable Submarine Engineering and Design Courses to engineers based in Australia, reinforcing its commitment to further developing local capability.

BMT Group Sector Director for Defence, David Bright, said "Delivering ten years of sustained success in Australia is a great achievement. The team's commitment to training local people to world-class standards has unquestionably contributed to this achievement."

BMT Design & Technology currently has offices in Melbourne and Canberra and continues to support a range of Defence and commercial maritime programs.

Wärtsilä and Clean Marine Energy offer Ship Owners "Scrubber Finance"

Wärtsilä and Clean Marine Energy (Europe) Ltd (CME) have announced the landmark signing of the shipping industry's first collaboration agreement which will provide a convenient funding solution to drive the uptake of exhaust-gas cleaning technology. The move is intended to ease the financial burden on ship owners seeking to install scrubber systems in order to meet sulphur emissions legislation.

The financing solution, similar to those prevalent and proven in the building environment space, enables a ship owner to repay the cost of the scrubber system installation via a fuel adder, i.e. a fuel premium on the price of heavy fuel oil (HFO) by which the ship owner repays the cost of installing the scrubber. This provides a return from the differential between HFO and marine gasoil (MGO) for a period of four to six years, depending on price spreads. This means that ship owners do not have the burden of meeting the up-front capital expenditure, which is typically between $US3 million and $US 12 million per vessel. This investment is often difficult to pass on to charterers whereas, with CME financing, the fuel adder charge can be easily passed on until such time as the scrubber system is paid for. The concept therefore minimises the impact on the owner's balance sheet, banking and security arrangements.

Juha Kytölä, Vice President, Wärtsilä Environmental Solutions, said: "This funding concept enables ship owners to increase the value of their asset without taking on additional debt, thereby making it easier to achieve long-term compliance with increasingly-stringent environmental legislation. Wärtsilä is proud to be at the forefront of developing innovative solutions aimed at assisting customers

to reduce both their operational costs and their environmental footprint. This collaboration agreement with CME is one more example of this philosophy."

Pace Ralli, Co-founder and Director of CME (Europe) commented: "The shipping industry is faced with a number of environmental regulations right now, often with a significant capital burden. Despite lower fuel costs, there is an even greater spread between HFO and MGO; as much as 90% in some cases. This allows us to inject capital to pay for the installation of a scrubber, allow the ship owner some of the benefits of continuing to burn HFO and still take out a return. In addition, the asset value improves, while the ship owner is compliant with new tighter ECA regulations. We see the CME solution as filling a gap in the financing of the latest scrubber technology. CME and Wärtsilä can provide the financed installation and maintenance of a scrubber through CME's Emissions Compliance Service Agreement (ECSA)."

The International Maritime Organization (IMO) introduced legislation which became effective at the beginning of 2015 restricting emissions of sulphur oxides (SOx) from ships operating in restricted Sulphur Emissions Control Areas (SECAs) to 0.1%. Sulphur levels of 0.5% will be applicable globally, when the broader legislation enters into force in either 2020 or 2025. The European Commission has mandated that the 0.5% sulphur limit will be applicable in European Union waters from 2020.

There are currently three available options for owners to meet these regulations; by using low-sulphur fuel, which is far more expensive than conventional marine diesel; converting to gas-fuelled operation (LNG); or installing scrubber systems which enable conventional fuel to be burned. Wärtsilä is an industry leader in both dual-fuel engine technology that allows the use of liquefied natural gas as fuel, and scrubber systems that remove SOx emissions from conventional marine diesel fuel.

Queen Mary 2 to use Wärtsilä Wastewater Treatment Systems

Wärtsilä announced in February that *Queen Mary 2* is being fitted with a Wärtsilä advanced wastewater treatment system. This installation will enable the vessel to fully comply with the IMO's requirements concerning the prevention of pollution from ships. The Wärtsilä Hamworthy Membrane BioReactor (MBR) solutions are designed to facilitate the management and treatment of both 'grey' and 'black' wastewater, and to monitor discharges to the sea. The contract was awarded by Cunard Line during the third quarter of 2014.

Cunard's 2620-passenger capacity *Queen Mary 2* entered service in 2004 and was designed with the aim of reducing the vessel's impact on the environment through more efficient management of waste. The existing on-board system is now due for replacement and two Wärtsilä Hamworthy MBR 16 systems have been selected to maintain the ship's high environmental standards.

"Environmental performance is of ever-increasing importance throughout the marine industry, but especially so for cruise ships and ferries. Wärtsilä's in-house know-how and broad experience in wastewater treatment and management systems for ships were crucial factors in the

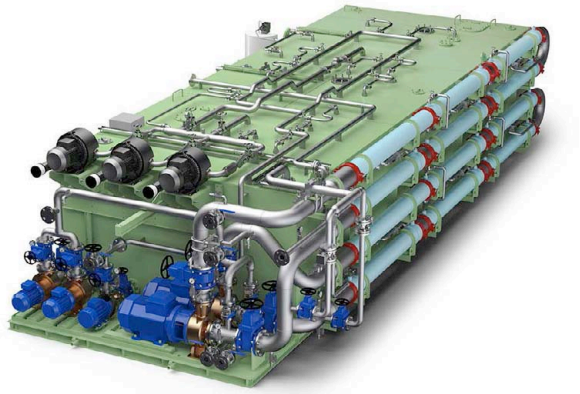
Queen Mary 2 in Sydney in March 2015
(Photo John Jeremy)

award of this important contract," said Juha Kytölä, Vice President, Environmental Solutions, Wärtsilä Ship Power.

Queen Mary 2 is powered by four Wärtsilä main engines.

Wärtsilä Hamworthy Membrane BioReactor Systems

Wärtsilä's innovative MBR system is an evolution of the company's proven sewage-treatment technology for handling grey- and black-water waste. The company has over 30 years' experience in wastewater treatment and in meeting the waste handling needs of the marine industry. The technology is an advanced wastewater treatment process based on biological degradation and membrane separation. It delivers the highest quality discharge without requiring any addition or generation of chemicals hazardous to the maritime or shipboard environments. The Wärtsilä Hamworthy MBR is capable of meeting both current and anticipated effluent quality standards.



A Wärtsilä Hamworthy Membrane BioReactor
(Image courtesy Wärtsilä)

Wärtsilä and Carnival Corporation Agreement to Pilot Technologies and Systems to Optimise Operations

Wärtsilä and Carnival Corporation, the largest cruise company in the world, have partnered to optimise engine-room operations aboard the company's fleet of 101 ships across its nine global brands.

Wärtsilä's solutions will be tested in pilot projects in which Wärtsilä's technologies and systems will be installed on several of Carnival Corporation's vessels. The technologies and systems include engine control and monitoring systems and safety and fuel efficiency packages as well as Wärtsilä's Asset Performance Optimisation Solution.

Wärtsilä's Asset Performance Optimisation Solution maximises vessel performance and ensures that systems are operating at their full capabilities, increasing predictability of maintenance needs and fuel management. The fuel engine package is designed to significantly contribute to reducing fuel consumption.

"Since last summer, teams from Carnival Corporation and Wärtsilä have met regularly to ensure that each of these solutions adds value to the company's fleet," said Bill Burke, Chief Maritime Officer, Carnival Corporation. "Ultimately, our goal is to continuously improve our operations in order to accomplish our number-one priority - providing safe and comfortable voyages for our guests, along with a great vacation experience."

"We have focused on finding an agile and mutually-beneficial way of cooperating and establishing a structure which drives performance in both organisations," said Tomas Hakala, Vice President, Services, Wärtsilä. "We believe this is the beginning of a close and fruitful relationship between Carnival Corporation and Wärtsilä. The valuable insights that we are gaining can also be further utilised with other product families and vessels."

Wärtsilä Asset Performance Optimisation Solution provides users with guidance on obtaining optimal performance from Wärtsilä engines and makes recommendations on how to rectify potential issues. While the service aims to optimise performance, it also finds deviations from normal operating parameters of the engines and equipment. Engine fault sources and emerging operational problems can be rectified before they occur.

BMT Completes Vessel Surveys for Victorian Water Police

BMT Design & Technology (BMT) recently supported the Victorian Water Police with condition surveys on 15 of their fleet vessels.

The task used BMT's proven risk-based survey tool to assess the vessels and develop an estimate of remaining life, for input into a vessel-replacement strategy. The risk-based condition surveying process that BMT utilises can also provide vessel owners and operators with estimated costs and schedules for replacement and maintenance. By establishing a vessel's condition at a point in time and determining a maintenance and replacement strategy, vessel owners are able to reduce the risk to their business and reduce long-term costs.

BMT Design & Technology is continually upgrading its survey tool in line with best practice and changes to local regulations to ensure that its experienced engineers and naval architects offer a range of industry-leading services to the maritime, defence and transport industries.

Gordon MacDonald, Managing Director at BMT Design & Technology, commented "The significance placed on this survey by the Victorian Water Police emphasises the importance of having a thorough and superior condition survey completed. Through understanding the remaining life and operational limits of a vessel, the appropriate maintenance and replacement planning can be implemented, saving time and costs in the long run."

A Victorian Water Police craft at work
(Photo courtesy Victorian Water Police)

HMAS *Canberra* docked down with her stern door down to receive landing craft as a helicopter approaches the ship to land on deck during trials in Jervis Bay during March 2015
(RAN photograph)

HMAS *Success* conducts a dual replenishment at sea with HMAS *Anzac* and HMNZS *Te Kaha* as the ships transit the Mediterranean Sea on their way to Centenary of Anzac commemorations in Gallipoli and Greece
(RAN photograph)

MEMBERSHIP

Australian Division Council

The Council of the Australian Division of RINA met Wednesday 4 March 2015 by teleconference based in Sydney. Our Division President, Tony Armstrong, chaired the meeting which was also attended by the President, Bruce Rosenblatt, as one of the last functions of his tour of the Division.

Some of the more significant matters raised or discussed during the meeting are outlined as follows:

Elections/appointments to Council

The meeting preceded the Division's Annual General Meeting later in the day and thus was the last before the retirement from Council of Mike Mechanicos and Jon Pattie. The President expressed Council's appreciation of their service.

Council was advised that, following the call for nominations in the November edition of *The ANA*, Jesse Millar and Matthew Williamson would be joining Council for the next two years, with the remaining retiring members being re-elected or appointed to the Council.

Australian Naval Shipbuilding and Repair Capability

In preparation for a possible appearance before the Senate Economic References Committee inquiry into naval shipbuilding, Council considered a paper presented to it on this subject. Recognising the complex issues associated with this subject, which could not be resolved through Council's extended discussion of the paper, Council decided to form a committee to give detailed consideration to the paper and recommend appropriate actions.

Surveyor Accreditation under National System for Domestic Commercial Vessels

Council noted that an information session on this subject would be held in Sydney on 16 March as the first of a series of sessions to be held outside Queensland, which had already been covered. It also noted that the National System Mark II would enter force over two years from 1 July 2017.

PACIFIC 2015 IMC

Council received a report indicating that preparations for the Conference were well advanced. Registrations were open and the deadline for submission of abstracts was 9 March 2015.

Walter Atkinson Award for 2015

The Secretary invited Sections to submit nominations of eligible written papers prior to the closing date in mid- July (refer www.rina.org.uk/prizes_and_awards.html). Since no Pacific IMC occurred during the eligibility period for presentation of papers of July 2014 to June 2015, eligible papers would be restricted to those presented to Sections and/or published in *The ANA* during this period.

Financial Report

Council approved the auditor's financial report for adoption by the AGM later in the day.

President's Visit

At the conclusion of the meeting, Bruce Rosenblatt addressed Council on his visit to the Division during which he had:

- attended Section meetings in Perth, Adelaide, Melbourne and Sydney;
- gained an appreciation of the Australian industry including visits to shipyards, the Collins class, ASW, government facilities and related businesses; and
- achieved a good understanding of Australian maritime industry and RINA members' involvement in it throughout the Division.

In closing, Bruce expressed his appreciation to the Division and its members for the time and effort they had put into making his visit so informative and enjoyable. Council, in turn, thanked him for his contribution to the meeting and, more particularly, for the time and effort he had invested in visiting the Division.

Next Meeting of Council

The next meeting of the Australian Division Council is scheduled for Wednesday 24 June at 1300 Western (1500 Eastern) Standard Time.

Rob Gehling
Secretary

First Australian Female Fellow of RINA

Jennifer Knox has pioneered the way for women in merchant shipping since 1991, when she became the second female in Australia to work professionally as a naval architect. [*The first was Gayle Shapcott on her graduation from UNSW Australia in 1979* — Ed.]

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.

24 years later, her continuing achievements have now been recognised by the Royal Institution of Naval Architects (RINA). With its headquarters in the UK, RINA is an international professional institution whose members are involved in the design, construction and maintenance of marine vessels and structures. RINA has more than 10 000 members in over 90 countries, including more than 700 members in Australia.

"A member who is considered to have achieved professional standing in the maritime community and has held positions of superior responsibility may be elected as a Fellow — the Institution's highest class of membership." said Trevor Blakeley, Chief Executive Officer of RINA. "In Australia there are just 68 Fellows and Ms Knox is the only woman".

Jennifer grew up in rural Queensland, over 200 miles away from the coast. She had never sailed before, when a friend persuaded her to help bring a traditional Sarawak sailing vessel back from Borneo in the 1970s. The adventure sparked a passion for the sea and, after several more years sailing private yachts throughout the Indian Ocean and South-East Asia, she returned to UNSW Australia in Sydney to studying engineering and marine design.

Her career since has spanned Australasia and Europe, starting out as the only female naval architect at Garden Island Naval Dockyard in Sydney. She has spearheaded her own consultancy since 1998, during which time she and her team have specialised in complex conversions of container/cargo ships, deep-sea research vessels, and refurbished beloved ferries such as *Spirit of Tasmania* and the New Zealand Interislander fleet.

For more information about Jennifer Knox, her fascinating story and her company, Lightning Naval Architecture, visit www.lna.com.au, www.linkedin.com/in/knoxjennifer, or email design@lna.com.au.

Changed Contact Details?

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

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

RINA London		hq@rina.org.uk
Australian Division		rina.austdiv@optusnet.com.au
Section	ACT	rinaact@gmail.com
	NSW	rinansw@gmail.com
	Qld	m-dever@hotmail.com
	SA/NT	danielle.hodge@defence.gov.au
	Tas	mfsymes@amc.edu.au
	Vic	andrew.mickan@dsto.defence.gov.au
	WA	rina.westaus@gmail.com

Phil Helmore

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

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

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

The Award comprises three components:

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

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

A nomination must be a written paper, first presented either at a RINA Section meeting or RINA-supported conference in Australia, or first published in a RINA-supported publication in Australia (e.g. *The ANA*).

All authors are eligible — Australian or overseas, members or non-members. Papers by multiple authors are eligible.
Nominations of papers published in the period 1 July 2014 — 30 June 2015 must be received by the Secretary no later than 17 July 2015.

For further information visit the Division page on the RINA web site or contact the Secretary at:

Mail:	PO Box 462, Jamison Centre, ACT 2614
email:	rina.austdiv@optusnet.com.au
Phone:	0403 221 631

VALE BOB CAMPBELL

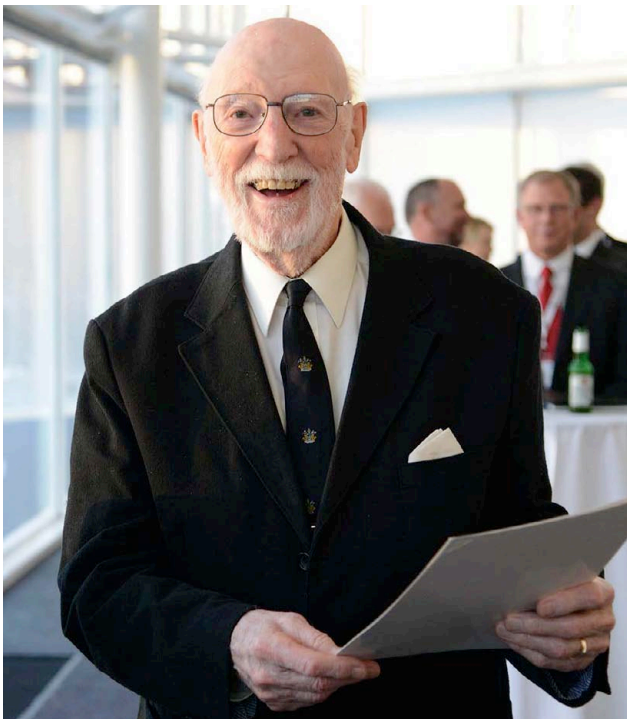
As reported in the February edition of *The ANA*, Robert Campbell passed away on Wednesday 4 February 2015 at the age of 87.

Bob was born in Scotland and studied naval architecture at Glasgow University. Shortly after starting at University he began an apprenticeship as a ship draughtsman with Barclay, Curle & Co at Whiteinch on the Clyde. In the years which followed, Bob gained much experience with the design of merchant ships in the age before computers when the slide rule and Fuller calculator reigned supreme. He spent sixteen years at Barclay Curle and was involved in the construction of some twenty ships for the British India Steam Navigation Company, of which Bob was most proud of the passenger/troopship *Nevasa*. In 1956 he was promoted to the position of Naval Architect with direct control of the design office.

By the 1960s the British shipbuilding industry's future was becoming more uncertain and Bob decided that it was time for a change. After considering a move to Canada, he accepted a position with the Australian Shipbuilding Board (ASB), initially as Assistant Superintendent of Hull Design, relocating to Sydney with his wife and four children. He was subsequently promoted to Controller of Design, responsible for hull, machinery and electrical design and research. At the ASB Bob was involved with the design of many ships ranging from 9 m motor cruisers to 150 m bulk carriers, general cargo ships, passenger ferries and ro/ro ships.

In 1981 the Government decided to transfer the functions of the ASB to the private sector and Bob moved with some key personnel to the Ship Technology Unit, a division of Cockatoo Dockyard Pty Ltd. Bob retired from full-time employment in 1987 although he kept an interest in the industry with some consulting work.

During his time in Australia Bob became very much involved with the activities of the Royal Institution of Naval Architects and became a member of the Branch Council in the late 1960s. He was elected Branch President in 1968, a position he held for some years. He was a member of the



Bob Campbell

Branch/Division Council until 1997, however, he continued to be involved with the organisation of maritime conferences and symposia and was chairman of the organising committee for Sea Australia 2000 held at Darling Harbour in February 2000, the precursor of the present Pacific series of International Maritime Conferences. He continued as a member of the organising committee of these conferences until 2004. He was very proud to receive a certificate acknowledging his over 60 years' membership of RINA at the Pacific 2013 IMC.

Bob was much loved by his large family and highly respected by his colleagues — he will be much missed. We extend our sympathy to his wife Marie and all his family.

John Jeremy

RINA Represented at AOG 2015

This year, for the first time, the Royal Institution of Naval Architects was represented at the Australian Oil and Gas (AOG) Exhibition. The AOG Exhibition and Conference is a prominent annual event in Perth which covers various aspects of the Australian offshore oil and gas industry. The event provides major benefits to the Western Australian economy, with large delegations flying into Perth from around the world. In this 34th year of AOG, thousands of visitors viewed a record of 620 displays by companies from 25 nations, attended 13 different conference streams, or came to catch up with their peers and friends. Several societies contribute to organising this event including the Society of Underwater Technology (SUT) and Subsea Energy Australia (SEA).

In September last year the event organiser, Diversified, was approached by the RINA WA committee members, Yuriy Drobyshevski and Mike Priestly, to discuss an opportunity for RINA to become involved with AOG. In its current scope, the AOG event focuses on the subsea oil and gas sector and doesn't specifically address topics related to offshore structures, especially floating systems. Given that most of the new offshore oil and gas developments involve floating systems and a large number of RINA members in Australia work in this area, there seemed to be an opportunity for RINA to take an active role in the AOG event. AOG organizers Diversified recognised RINA as a prominent professional society in the area of offshore technology in Australia, and offered RINA a stand for this year AOG exhibition.

Over the three days of the exhibition, the RINA stand was quite a busy place with a number of visitors making inquiries related to new memberships, conditions for receiving chartered status, advertising opportunities and offers for technical presentations at RINA monthly technical meetings. The last day of the exhibition was a dedicated Career Day and it was used to provide students with information on career choices related to RINA.

Over the three days the stand was continuously manned by the WA members — volunteers from the WA offshore

and shipbuilding industries. Thanks for keeping the stand and managing various other activities around the event go to Tony Armstrong, Yuriy Drobyshevski, Mike Priestly, Gary James, Tim Brazier, Matthew White, Melvin Loh, Gerard Engel, James Barton, Nick Bentley, Emma Tongue, Mark Evans, Tom Kenyon, Matthew Williamson and Troy Munro and their companies INTECSEA, Woodside, London Offshore Consultants, Crondall Energy, DOF, DNV-GL and Austal Ships for contributing their time to this valuable opportunity for promotion and meeting of professional naval architects. The effort was also well supported by RINA Headquarters with exhibition materials and magazines for the stand.

At next year's event, besides continuing to hold the stand, RINA is planning to be more actively involved and to provide an additional technical content for the AOG conference. This forum is likely to attract professionals (naval architects and structural engineers) in the area of offshore structures and floating systems and to further contribute to the RINA profile as a prominent professional society in the area of offshore technology in Australia. The content may cover both fixed and floating structures, station-keeping systems and processing facilities. Presentations will be invited from the industry, government and research organizations on various aspects of design, construction, operation, and integrity management and decommissioning of relevant assets.

To appropriately address the AOG opportunity, the RINA WA Section Committee has formed a subcommittee led by Yuriy Drobyshevski. The main tasks of this subcommittee are to work closely with RINA Headquarters and AOG organisers on the format of the new RINA stream and to engage the members for presenting, reviewing and chairing the RINA AOG conference sessions.

Vesna Moretti
Yuriy Drobyshevski

The RINA stand at AOG 2015 — (L to R) James Barton, Vesna Moretti and James Fenning
(Photo courtesy Yuriy Drobshevski)

Long Service Award for Hugh Hyland

Hugh Hyland was presented with the Department of Defence Secretary's Award for Long Service (50-years) by the Head of Maritime Systems, Rear Admiral Mark Purcell RAN, at the Defence Plaza in Sydney on 23 March. Hugh joined the RINA in 1967 and has lived in Western Australia for many years
(RAN photograph)

NAVAL ARCHITECTS ON THE MOVE

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

Fred Barrett continues consulting as Fred Barrett Yacht Design and Naval Architecture in Hobart.

James Barton moved on from Tenix in 2008 and, after three years with BAE Systems and three years with American Bureau of Shipping, has now taken up the position of Senior Naval Architect at Woodside Energy in Perth.

Justin Bentink moved on from Austal Ships in 2008 and, after two years with Germanischer Lloyd, and a year with each of American Bureau of Shipping, Defence Material Organisation and Nauta Marine Consultants, in 2011 set up his own marine survey and consultancy, Anchor Marine Services, in Perth.

Nick Billett continues as a naval architect with Sea Life Designs which has been renamed Naval Architects Australia in Brisbane.

Craig Birdsall continues as a surveyor with DNV GL in Sydney.

Roger Blackney has moved on within G.A. Glanville and Co. and has taken up the position of Senior Naval Architect in Cairns.

Tim Brazier moved on from Austal in 2004 and, after a year at Covus Corporation, seven years at DOF Subsea and a short time at AME, in 2013 set up his own consultancy, Brazier Consulting, in Fremantle.

David Bruce has moved on within G.A. Glanville and Co. and has taken up the position of Design Office Manager in Cairns.

Greg Byrne moved on from Sydney City marine in 2013 and, after a year with Rockcrush, has taken up the position of Operations Manager East with BAE Systems in Sydney.

Martin Cabot moved on from Austal Ships in 2005 and, after two years with the Department of Transport in WA, has taken up the position of Lead Design Engineer at DOF Subsea in Perth.

Levi Catton has moved on within ASC Pty Ltd and has taken up the position of Engineering Manager—Newcastle with the Forgacs Resident Team in Newcastle.

Dan Curtis has moved on within the Department of Defence and has taken up the position of Director Base Security and Strategic Planning in Canberra.

Tom Dearling has moved on and has taken up the position of Senior Naval Architect in the growing Land and Maritime Engineering Division at QinetiQ in Canberra.

Scott Hunter has moved on from Oceanlinx and has taken up the position of Project Engineer—Platforms and Moorings at Aquantis Inc. in Santa Barbara, California.

Nick Hutchins has moved on from Team New Zealand and is now consulting as Nick Hutchins Fluid Mechanics in Auckland, New Zealand.

Andrew Joyce has recently co-founded and is now CEO of Found Careers, a company developing a mobile recruitment platform to fix (almost) everything that you hate about recruiting, in Sydney.

Adrian MacMillan has moved on within Woodside Energy and has taken up the position of Integrated Activity Planning Project Manager in Perth.

Bruce McRae moved on from Incat Crowther three years ago and took up the position of Naval Architect at Veem Ltd in Perth.

Lance Marshall has taken up the position of Senior Engineer and Naval Architect at Jacobs Group (Australia) in Melbourne, following the Jacobs Engineering Group acquisition of Sinclair Knight Merz in 2013.

Grahame Parker continues consulting as GPD Australia in Sydney.

Anne Simpson has moved on from the Amphibious and Afloat Support Systems Programs Office (AASSPO) of the Defence Materiel Organisation and has taken up a position as a naval architect with Rolls-Royce/KBR in Sydney, supporting the RAN's new amphibious Landing Helicopter Dock (LHD) class vessels.

Adam Solomons has moved on within London Offshore Consultants (Australia), and has now taken up the position of Managing Director in Perth.

James Stephen continues consulting as J.Q Stephen in Brisbane.

Peter Tomic has moved on from BAE Systems and has taken up the position of Project Coordinator at Echo Yachts in Perth.

Thomas van Peteghem, a graduand of UNSW Australia, has taken up a position as a naval architect at van Peteghem Lauriot-Prévost (VPLP) in Paris until he commences a master's degree in Management of Innovations in September. VPLP is a French-based naval architectural firm founded by Marc Van Peteghem and Vincent Lauriot-Prévost, responsible for designing some of the world's most innovative racing trimarans. Their designs presently hold many of the World Speed Sailing records.

Jonathan Windsor has moved on within the Directorate of Navy Platform Systems in Navy Engineering Division of the Department of Defence and has taken up the position of Assistant Technology Manager Structures in Canberra.

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

Phil Helmore

FROM THE ARCHIVES

THE FIRST HMAS ANZAC

John Jeremy

The Royal Navy's 1915–16 new construction programme included six new destroyers — flotilla leaders fitted out for flotilla commanders as was the practice in the early part of the 20th century. The ships were intended to be repeats of the Kempenfeldt-class leaders which had been built under the 1913–15 programme. The first of the new ships were ordered in February 1915, with others following in July, all to be built by Cammell Laird. The last ship was ordered in December 1915 from Denny Bros. of Dumbarton, Scotland. This ship was to be named *Anzac* in honour of the Australian and New Zealand Army Corps and their work at the Dardanelles.

The design of the new destroyers was based upon HMS *Marksman*, the second ship of the Kempenfeldt class. However, the design was modified to improve seakeeping by raising the height of the forecastle and extending it 13 ft (3.9 m) further aft. To accommodate this extension, the two forward funnels were combined into one. No. 2 gun, which was on a platform between the first two funnels in the earlier ships, was moved to the new deckhouse on the forecastle, superimposed above No. 1 gun. An enclosed wheelhouse and a higher bridge were made possible by this arrangement. The stem of *Anzac* was also given more rake and the bows some more flare to improve seakeeping, although the change was small and it probably didn't make much difference.

The general particulars of the ships as designed were:

Length OA	325 feet (98.48 m)
Length BP	315 feet (95.45 m)
Beam	31 feet 10 inches (9.65 m)
Draught	12 feet 1.5 inches (3.67 m)
Displacement	1660 tons (1690 t) full load
Armament	
	4 × 4 inch (102 mm) guns
	2 × 2-pounder pom poms
	4 × Lewis machine guns
	4 × 21 inch (533 mm) torpedo tubes
Propulsion (*Anzac*)	
	Brown Curtis direct-drive turbines, three shafts
	Power 36 000 shp (26 845 kW)
Speed (max)	34 kn
Range	2500 n miles at 15 kn
Complement	122

These ships were the last British destroyers to be fitted with direct-drive turbines and three shafts. Later designs all had twin screws driven by single-reduction geared turbines until the Daring-class destroyers were designed in 1944 with double-reduction gearboxes.

HMS *Anzac* was launched on 11 January 1917 and was completed on 17 April. On commissioning she joined the 14th Flotilla attached to the Grand Fleet at Scapa Flow. In August 1918 the fleet flotillas ran into severe weather and *Anzac* had her boats stove in and her two smaller funnels so badly damaged that they had to be replaced.

HMS *Anzac* was decommissioned after the war and laid up at Portsmouth. In 1919 she was given to Australia together with five S-class destroyers and was commissioned as HMAS *Anzac* on 27 January 1920. She arrived in Sydney on 29 April 1920.

Most of *Anzac's* service was in eastern and southern Australian waters, although she visited New Guinea in 1924. She was decommissioned on 4 August 1926 but recommissioned on 10 January 1928. She later became the first command of LCDR John Collins RAN, later Vice Admiral Sir John Collins. HMAS *Anzac* was decommissioned for the last time on 30 July 1931 and was placed in reserve. She was sold as scrap on 8 August 1935 and on 7 May 1936 her stripped hull was towed to sea and sunk off Sydney for target practice.

HMS *Anzac*
(RAN Historical Collection)

There was to have been a second HMS *Anzac*, an A-class submarine ordered from Vickers Armstrong at Barrow in Furness, but she was cancelled in 1945.

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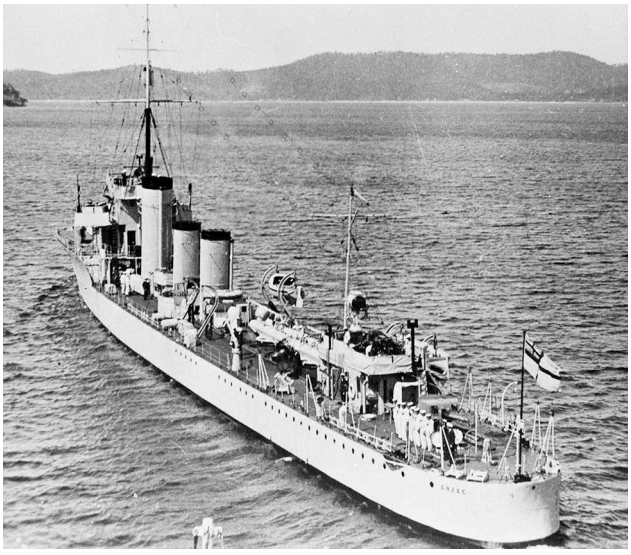
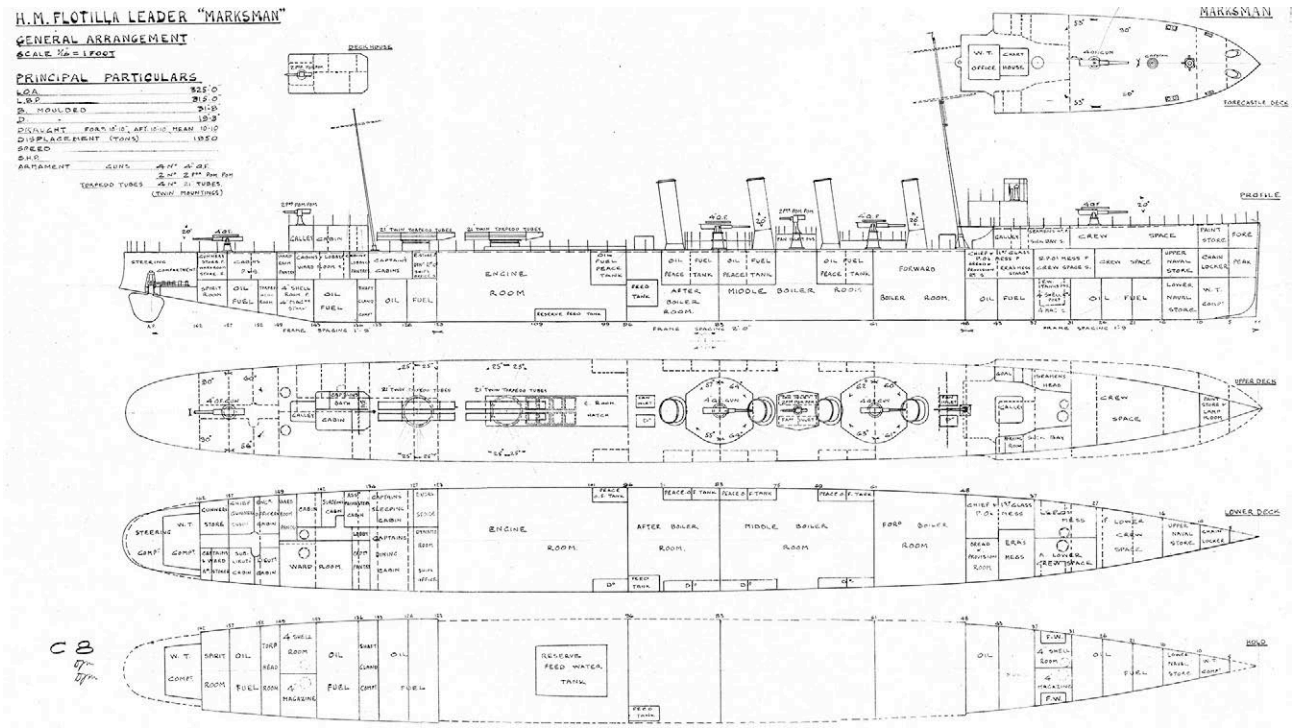


HMAS *Anzac*
(RAN Historical Collection)



The design of the 1915–16 flotilla leaders for the Royal Navy was based on the destroyer HMS *Marksman*
(J C Jeremy collection)

HMAS *Anzac* at Melbourne in the 1920s
(State Library of Victoria)

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