THE AUSTRALIAN NAVAL ARCHITECT

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NUSHIP *Canberra* arriving at Fleet Base East on 31 October 2014 to prepare for comissioning on 28 November (RAN photograph)

THE AUSTRALIAN NAVAL ARCHITECT

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Cover Photo:

Incat Tasmania's recently-completed 70 m fast crew boat *Muslim Magomayev* on trials
(Photo courtesy Incat Tasmania)

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From the Division President

It seems somewhat ironical that I headed my last column *A time for change?* That was certainly prophetic for me as I regret that, for personal reasons, I have had to step aside from the Presidency several months earlier that had been my intention when I took on this current year. I have thoroughly enjoyed the challenges of the past two-and-a-half years and hope that I have contributed in some small way to advancing the objectives of our Institution and highlighting the profession of naval architecture within Australia. I have been very ably supported during that time, and know that I am handing the reigns over to a good team now headed by Dr Tony Armstrong who has been my sounding board on most of the issues which have come before us in recent times.

One matter which I am extremely pleased to report is the finalisation of the amended text of the RINA/Engineers Australia Agreement of Cooperation which has just been agreed and should be signed by the time you read this edition of *The ANA*. The main feature of the amendment is the updating of the Reciprocal Recognition for Membership which, I know, a number of you have been awaiting for some time now. If it is not quite available as this edition goes to press, it should be available very shortly thereafter and we will ensure that it is promptly distributed via your Section secretaries.

So it just remains for me to thank you all for your support and to ensure you of mine through the interesting years ahead of us. Hopefully I will be able to play a more active part again before too long.

With my best regards,

Jim Black

Outgoing President Jim Black with incoming Presdent Tony Armstrong on 24 September 2014

It is the nature of our profession that there are times when life can be extremely busy, and juggling priorities gets out of hand. I have watched this happening to Jim (our immediate past-President) over the past few months and it was obvious that the stress was beginning to tell on him, so I was not surprised when he advised me that he was going to have to resign from his duties as President of the Australian Division or risk his performance at work. It takes some skill to make such decisions for both your own sanity and the good of the Institution, so I admire his judgement for coming to his conclusion.

Over the past year Jim had generally been in the habit of discussing his RINA tasks with me in my capacity as Vice-President so, when Jim resigned, there were no matters of which I was unaware. The position of Vice-President exists to deal with these sorts of issues, so I offered to take over the remaining period of Jim's Presidency until the next AGM in March. At the Council meeting in October this offer was accepted and extended until 2015, and Martin Renilson offered to take on the Vice-Presidential duties.

I have been an active member of RINA since about 1975, attending the technical meetings in Sydney (1975–89) and Perth (1990–2014) on a regular basis, taking part in RINA conferences, refereeing technical papers for publication in the *Transactions*, and I have been a member of the High-Speed Vessel Group (a RINA sub-committee) since its inception. Although I am now retired from full-time work, I am still involved in all of these RINA activities and keep close to our industry.

Our immediate issues for the next twelve months include finalisation of the joint agreement between RINA and Engineers Australia, which Jim has been helping with, responding to the Senate inquiry into naval shipbuilding in Australia, assisting where possible with what appears to be a difficult transition to a single national jurisdiction, and making RINA more visible in Australia. I will work with our Vice-President, Secretary and Council to get the best for our members on these and other matters. Feel free to contact me on fastships@spin.net.au if you have any pressing RINA issues.

Tony Armstrong

Editorial

One of the features of a vacuum of information is the proliferation of rumours. The Royal Australian Navy's future submarine project is a case in point. To the public eye, very little appears to have been happening over the last couple of years — an impression which is, hopefully, quite false but, inevitably, snippets of information emerge from which conclusions are rapidly drawn. The emergence of the Japanese Souryu-class submarine as a possible contender for the RAN's new submarine illustrates. Of course, there is no smoke without fire, and other emerging suggestions include the possible construction of the new submarines overseas noting, as we are being frequently reminded, that the support of the submarines through life is a sizeable task in itself which will employ many people for decades.

There are also those who suggest that we simply purchase submarines 'off the shelf' to an existing design, despite many reminders that the Australian requirements inevitably mean a large, long-range diesel-electric submarine of which there are few examples anywhere. The environment in which our submarines operate that dictates this need is well known to those in the submarine business, but it is not understood by much of the Australian public. Similarly, the magnitude of the tasks of designing, building and supporting a modern submarine is well understood by those in the business, but not by the public. There is a need for a more-informed public debate on these issues.

As the Minister for Defence, Senator David Johnston,

pointed out in his address to the Submarine Institute of Australia's biennial conference in Fremantle recently, the recent RAND Corporation study completed for the Department of Defence estimated that a team of around 1000 naval architects, engineers and draughtsmen would be required to design a new submarine, and assembling that team here and overseas would take many years. Lest anyone think that this estimate is wildly inaccurate, the US Navy recently started work on the design of a new submarine to succeed the Virginia-class nuclear attack submarines, yet the first of class is not expected to become operational until 2044, about 18 years after the first of Australia's new submarines should have gone to sea.

It appears inevitable that the RAN's future submarine will be the development of some existing design. Whilst the plan to build that submarine in Australia appears to be wavering, they should be built here. It has been pointed out that we successfully supported the Oberon-class submarines throughout their life without building them here, but we benefited from a number of key people who moved to Sydney from the builders, bringing with them intimate knowledge of the submarines and their design philosophy. We could also call upon the support of the parent navy, the Royal Navy, for technical support for most of their operational lives. The new RAN submarines are likely to be unique and the RAN will be the parent navy. We will have to rely upon our own resources and these are best hard won through a local construction program of, at least, most of the new submarines.

The Minister hinted in Fremantle that the number of new submarines may be fewer than the twelve previously announced and said that it is important that 'Australia proceed into the design phase as soon as practicable'. Hopefully the information vacuum will be filled when the 2015 Defence White Paper emerges.

I cannot help but be reminded of a statement by an Australian Prime Minister some decades ago when he said 'One thing is absolutely certain, we have not yet made up our minds'.

John Jeremy

LETTERS TO THE EDITOR

Dear Sir,

In light of the incident in which the South Korean ferry *Sewol* sank on 16 April 2014, I would like to highlight the importance of maintaining the competency level of each crew member on board commercial vessels, and to take the Australian National Regulatory System as a benchmark.

Sewol, which was carrying 476 passengers, sank when the inexperienced Third Mate, who was on the helm, was trying to navigate a sharp corner off the south-western island of Jindo. *Sewol* was overloaded, and stability issues caused a sudden shift of the cargo during the turn. In the midst of the chaos, the captain's indecisive decisions, and the crew abandoning the ship before the passengers had evacuated, led to more than 300 people being dead or missing. In the wake of the incident, the South Korean Prime Minister offered his resignation, holding himself responsible for the government's poor response to the incident and admitting to poor regulations within the maritime industry.

Currently, the Australian Maritime Safety Authority is the National Regulator of the new National System, while the NSW Roads and Maritime Services acts under delegation from the National Regulator. The recent reform in the National System for domestic commercial vessels helps to set consistent standards and provide unified regulations for Australian waters, while NSW Roads and Maritime Services undertakes the tasks of certification of applicants, compliance, and ensuring competency of individuals. The current marine certification regime requires individuals to meet minimum sea-service requirements, pass medical fitness requirements, pass first-aid certification requirements, complete a training course approved by the Australian Maritime Safety Authority, and pass an assessment set by a National Regulator-approved examiner.

These basic regulations are the minimum to ensure safety on the water, and I urge other countries to adopt a similar approach to the Australian National System. Only through the tightening of regulations can accidents be prevented and a sense of security be given to the passengers.

Alvin Lim
UNSW Student

Dear Sir,

The future is an exciting place. Life will be easier in the future. We will do things faster, we will experience more without travelling as far, we will travel further without using as much energy. Tomorrow, millions of Australians will go to work, unwittingly (for most) making the country and the world a more-efficient place to live.

For a long, long time, Australians have worked in the energy industry. From the Snowy Mountains Scheme to the mining industry (coal and uranium) and the coal-seam-gas boom we have been experiencing lately, energy (arguably) runs Australia's economy.

While reading the February 2014 issue of *The ANA*, I realised that the marine industry is not isolated from the energy-efficiency hype which has swept the globe in recent years. Phrases like 'reduced fuel consumption' and 'significantly more efficient' in the recount of Eric Clarke's *Advances in Slow-speed Marine Diesel Engines*, stick out like certain canine anatomy to the energy-conscious, such as myself.

Those low-hanging energy catch-phrases started me thinking about innovative methods of propulsion rather than efficiency improvements in current methods of making watercraft move. A quick Google search, and I discovered underwater gliders. Being a spring chicken in the marine industry, I think these little things are amazing.

Currently the only gliders operating are AUVs which use ballast and CG or CB variations to move through the water. Wings on the vessel transform the vertical motion into horizontal motion, propelling the AUV in a saw-tooth profile with very little power consumption.

By all accounts, underwater gliders have revolutionised our

ability to map our oceans and monitor various properties including temperature, salinity (through measuring conductivity), currents, and chlorophyll fluorescence. Their ability to efficiently cover thousands of kilometres without refuelling makes them invaluable to marine research.

Whilst there are many underwater glider projects in countries all over the world, being Australian, I wish to bring to your attention the Australian National Facility for Ocean Gliders (ANFOG). This is a facility of the Australian Integrated Marine Observing System (IMOS) and is responsible for the operation and maintenance of the ocean glider fleet. Their website shows data on four active gliders, including a map showing (for each) the path explored so far, the last position, the starting and last surfacing time. Most interestingly, it displays the number of dives the vehicle has made.

Further, as with any promising piece of technology, military applications have been realised and versions have, no doubt, been developed for tracking ships and submarines.

This is something I would enjoy getting into. Maybe it could be applied on a larger scale with more applications than just surveying our vast oceans. Who knows? The future is an exciting place.

Jake Luschwitz
UNSW Student

HMA Ships *Anzac* and *Arunta* sail through King George Sound on their way to commence Exercise Distant Shores after taking part in the Albany Convoy Commemorative Event from 31 October to 2 November 2014
(RAN photograph)

THE AUSTRALIAN NAVAL ARCHITECT

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

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

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

NEWS FROM THE SECTIONS

ACT Section

On 3 June 2014, Tim Lyon, formerly with the Department of Defence including in a consulting capacity, gave a presentation on *The Development of the Aircraft Carrier* at Russell Offices. Tim's light-hearted and entertaining review examined the key innovations in the evolution of aircraft carriers, from when warships first launched and recovered aircraft, through to the current nuclear-powered aircraft carriers and included a brief history of the RAN's use of aircraft carriers.

The Section Committee met on 10 July and again on 23 October 2014 to discuss nominations for the Walter Atkinson Award, options for the forthcoming technical and social program, and to consider inputs to a planned RINA Australian Division submission to the Senate Economics References Committee review on the future of Australia's naval shipbuilding industry.

On 12 August 2014 Captain Iain Kerr BA, Principal Nautical Adviser within the Navigation Safety and International Division of the Australian Maritime Safety Authority (AMSA), gave a presentation *Sailing Ship Stability* at Campbell Park Offices. The presentation focused on the seafarers' perspective of stability for large sailing ships. Following an introduction outlining his sailing-ship experience, Iain reviewed the main types of large sailing ships, including several attractive conversions from other ship types, before addressing stability considerations. Iain then outlined some more-significant large sailing-ship losses or near misses related to the loss of stability. He then outlined existing sailing-ship stability criteria and measures which the crew can take to ensure the safety of sailing ships when underway. In particular, Iain noted that it was not possible to rapidly reduce sail power in large square-rigged ships, so it was critical to plan ahead for the worst expected wind conditions when setting sails.

On 29 October 2014 Dr Matt Garratt, Senior Lecturer at the School of Engineering and Information Technology at UNSW Canberra, gave a presentation on research which he and students at ADFA have undertaken in the field of autonomous helicopter dynamics, sensing and control. Dr Garratt has been with UNSW at ADFA since 2001 as a lecturer, having previously worked for Navy on helicopter-ship interface matters. The research work has been wide ranging and included autonomous launching and recovery of smaller UAV rotorcraft from a moving platform simulating the deck of a ship, examining means of securing the rotorcraft to the deck, laser range-finding systems to measure relative distances, and the used of beacons and video-camera-based object recognition for use during approach and landing on a deck. Various rotorcraft have been used over the years to support these research projects, originally a Yamaha RMAX with an all-up mass of about 100 kg but, subsequently, smaller and more convenient to operate craft including a Vario XLC powered by a turbine engine, a modified Hirobo RC helicopter powered by a lithium battery, and, most recently, an AscTec Pelican quadcopter.

Martin Grimm

Victoria

Visit of Chief Executive

We have recently had Trevor Blakeley, CEO of RINA, visit our section. He was here from Monday 29 September to Wednesday 1 October. He was able to meet with current members of RINA, talk to new starters and graduates about the benefits of becoming a member as well as introducing them to the steps to becoming chartered through RINA. He visited Jacobs, BMT Design & Technology, BAE Systems, Engineers Australia and QinetiQ on Monday 29 Septemnber. He met with DSTO staff at Fisherman's Bend, AMOG Consulting and ThyssenKrupp Marine Systems on Tuesday 30 September. Overall, he was very pleased with how his visit went, and was expecting well over 20 new members as a result.

Technical Meetings

We have been having regular joint technical meetings with IMarEST as follows:

Searching for a Green Ship in a Blue Ocean

In October 2013 Nicholas Lawrence of Rightship made a presentation on *Searching for a Green Ship in a Blue Ocean.*

Submersible and Underwater Vehicle Designs

In February 2014 Ron Allum of Ron Allum Deepsea Systems made a presentation on *A New Approach to Submersible and Underwater Vehicle Designs*.

Fatigue Life Assessment of the Armidale-class Patrol Boats

In May 2014 Teresa Magoga of the Defence Science and Technology Organisation made a presentation on *Fatigue Life Assessment of the Armidale-class Patrol Boats*.

The Royal Australian Navy (RAN) operates a fleet of 14 Armidale Class Patrol Boats (ACPBs) which are constructed from marine-grade aluminium alloys. Fatigue is one of the most-critical failure modes in determining the life-of-type of an aluminium naval vessel.

The Defence Science and Technology Organisation (DSTO) is conducting a research program into the structural integrity of aluminium naval vessels. The program incorporates the development and application of advanced numerical modelling and simulation tools, experiments on scale models, and full-scale trials. As part of this research program, DSTO has installed a structural monitoring system onboard one of the ACPBs.

In this presentation, the method of estimating the fatigue life of the ACPB using onboard monitoring data was discussed. Strain time records were signal conditioned, and then reduced to stress spectra using the rainflow counting method. The cumulative damage theory and Eurocode 9 fatigue resistance data, was then applied to the stress spectra to estimate the fatigue damage incurred at strain-gauge locations. After identification of critical areas of the structure via finite-element analysis, the stress ratios between the strain gauge locations and the critical areas were determined. The stress ratios were then applied to the stress spectra measured at the strain-gauge locations to determine the fatigue life at the critical joints of interest. Lastly, to inform the structural

and operational management of the vessel, the operational profile (e.g. vessel speed, sea state and loading condition) was related to the structural response.

High-level Capability Analysis of Submarine Platforms

In July 2014 Karl Slater of the Defence Science and Technology Organisation made a presentation on *High-level Capability Analysis of Submarine Platforms*.

The procurement of a new class of submarines is a significant undertaking for any country. As with all major procurement projects, the correct definition of the requirement set and a clear understanding of the cost drivers serve to de-risk the entire program. Further to understanding the cost drivers, procurement agencies must be able to dissect proposals put forward by industry to enable comparative assessments to be made.

The Australian Defence Science and Technology Organisation (DSTO) is currently developing an Integrated Platform Systems Model (IPSM) to enable high-level performance analysis of submarine platforms to be carried out across multiple design configurations and option sets offered by different manufacturers. An application of this work is research into the influence of changing operational requirements on sub-system integration risks, design trade-offs, and the flexibility of different configuration options. DSTO has worked with QinetiQ GRC to develop a fully-parametric generic submarine design within the Paramarine naval architecture design suite which is representative of a modern SSK and is capable of being remotely modified by the DSTO IPSM tool. This presentation described the background and scope of the project, and outlined how such modelling can be used to analyse and asses the high-level capability of submarine platforms.

HMAS AE2 Maritime Archaeology Assessment 2014

In August 2014 Roger Neill of the Defence Science and Technology Organisation and Ian MacLeod of the Western Australian Maritime Museum made a presentation on *HMAS* AE2 *Maritime Archaeology Assessment 2014*.

Project Silent Anzac is being under taken by the AE2 Commemorative Foundation (AE2CF) Ltd, to protect, preserve and tell the story of the World War I Australian submarine, HMAS *AE2*.

Following an Assessment Phase which was completed in mid-2008, the AE2CF developed a joint proposal setting out a plan to implement agreed measures, including a further expedition to Turkey — the MAA14.

These proposals were accepted by the Australian and Turkish Governments and the MAA14 was largely funded by an Australian Government grant announced in the May 2013 Federal Budget as part of the Centenary of Anzac Commemoration Program.

The AE2CF assembled a team of volunteers with expertise in submarine engineering, afloat operations, maritime archaeology, naval history, conservation of steel shipwrecks (Dr Ian MacLeod and colleagues from the WAMM), marine science and a ROV (Dr Roger Neill and colleagues from DSTO) from Australia, USA and Turkey. The ROV supplier, SeaBotix, and DSTO also provided a significant amount of in-kind sponsorship and support.

Ian and Roger gave a presentation on the MAA14, planning, execution and assessment.

Overview of the Maritime Labour Convention 2006 (MLC 2006)

In October 2014 Tim King of the Australian Maritime Safety Authority made a presentation on *Overview of the Maritime Labour Convention 2006 (MLC 2006)*.

An International Labour Organisation (ILO) Convention has been developed and agreed by governments, shipowners and seafarer representatives. This is the first international convention encompassing the living and working conditions, and social rights, of seafarers worldwide. This agreement first came into force on 20 August 2013.

It is interesting to note that the first international legislation addressing social justice concerns in the work place, was developed by and implemented in one of the world's oldest and change-averse professions. Also, that it was developed, negotiated, agreed and implemented by all parties in record time for an international convention of any kind.

The presentation covered the following:

- What is MLC 2006?
- Why is it needed?
- The implications this convention has for seafarers and shipowners.
- Progress/results/examples found during ship inspections carried out one year after it came into force.

Andrew Mickan

New South Wales

Committee Meetings

The NSW Section Committee met on 18 August and, other than routine matters, discussed:

- SMIX Bash 2014: The registration form is now available, and has been circulated; online registrations are being trialled via the Trybooking website. Sponsors are being sought.
- Visit of RINA Chief Executive: Plans were put in place for a meeting of the NSW Section Committee, followed by a workshop on working towards chartered status, and dinner, to coincide with the visit of the Chief Executive in September.
- Visit of RINA President: Bruce Rosenblatt will be visiting Australia in February/March next year, and will be vising the sections. Our March technical meeting will be on Wednesday 4 March, as will our AGM, following which the NSW Section Committee will take Bruce Rosenblatt to dinner.
- Engineers Australia OH&S Course: Engineers Australia has asked all of their affiliates to undertake an online OH&S course—this applies to the whole NSW Section Committee.

The NSW Section Committee also met on 22 September, with the Chief Executive, Trevor Blakeley, in attendance and, other than routine matters, discussed:

- Free Introductory Membership: Membership of RINA is free for the first year, and may be obtained by contacting Trevor Blakeley directly at tblakeley@rina.org.uk; friends and prospective members can be so advised.

- Recording of Technical Presentations: Engineers Australia records selected technical presentations made to RINA (NSW Section) and IMarEST (Sydney Branch) for webcasting; all of the recorded webcasts, together with hotlinks to each one, are listed on the NSW Section of the RINA website and in each issue of *The ANA*.
- SMIX Bash 2014: Sponsorships are coming in, with more to be confirmed. Registration this year is via the Trybooking website and is working satisfactorily so far.
- TM Program 2015: Presentations canvassed for 2015, with a list of authors to be approached.

Following the meeting on 22 September, the NSW Section Committee dined with the Chief Executive, Trevor Blakeley, at the Shanghai Stories restaurant in Chatswood.

Trevor Blakeley and NSW Section Committee at Shanghai Stories dinner. Clockwise Trevor Blakeley, Alan Taylor, Nate Gale, Craig Boulton, Graham Taylor, Sue-Ellen Jahshan, Anne Simpson (Photo Phil Helmore)

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

- Recording of Technical Presentations: Engineers Australia started using a new system for recording presentations on 1 October 2014, using three cameras and a hand-held microphone, with an audio technician in attendance. The details, including access for RINA members, are still being worked out.
- SMIX Bash 2014: Most sponsors have committed, with a few still to come; registrations are coming in, and the Trybooking website is working well; raffle prizes are being arranged.
- TM Program 2015: A presentation has been arranged for March, further suggestions were made, and authors are being canvassed.
- Visit of RINA President: Following receipt of the President's itinerary, visits to industry will be offered in addition to the technical presentation, AGM and dinner.

Reliability-centred Maintenance in a Maritime Environment

Rob Gay, Director of PriceWaterhouse Coopers, gave a presentation on *Reliability-centred Maintenance in a Maritime Environment* to a joint meeting with the IMarEST attended by twenty-nine on 4 June in the Harricks Auditorium at Engineers Australia, Chatswood.

Reliability-centred maintenance is a structured discipline which ensures that systems and equipment achieve their inherent reliability by specifying maintenance which is both technically feasible and worthwhile in terms of risk and economics.

Historically, maintenance schedules have been drawn up on the recommendations of manufacturers, who may have little concept of the maritime environment, and use the traditional thinking that all equipment life is based on a "bath-tub" curve.

This presentation challenged the traditional thinking and provided a different perspective for the maritime environment.

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

45 m Shallow-draft Pusher Tugs

Neil Edwards, Principal of Edwards Marine Services, (EMS) gave a presentation on *45 m Shallow-draft Pusher Tugs Building at Uzmar Shipyard in Turkey for South America* to a joint meeting with the IMarEST attended by thirty-two on 2 July in the Harricks Auditorium at Engineers Australia, Chatswood.

Introduction

Neil began his presentation by saying that Brazilian steel maker Vale' owns and operates an iron-ore mine at Corumbá in the west Brazilian state of Mato Grosso du Sol. The mine was owned until September 2009 by Rio Tinto and has large deposits of very high grade ore with an iron content of between 54 and 63%. The ore is in a form much desired by smelters.

The only problem is that the mine is a long way from the coast and the only viable means of transporting the ore is by barge along 2500 km of the Rio Paraguay and Rio Parana river systems to the Port of San Nicolás de los Arroyos, a port on the western shore of the lower course of the Paraná River in Argentina. It has a water depth of 10.36 m, and is capable of serving large vessels coming upstream from the Atlantic Ocean through the Río de la Plata.

Vale' has entered into a contract with Brazilian logistics company Hidrovias do Brasil for transport of the ore from the mine at Corumbá to Port San Nicolas. The first eight vessels have been guaranteed work for 25 years. 144 barges have also been constructed in China. There are two barge types, those with a form of bow for the front row of the convoy, and the others bluff square-ended for the following rows.

There are other operators on the river system but their vessels are much less sophisticated. Hidrovias set out to be the premier operator of high-quality vessels providing an efficient, safe and reliable ore-transport service. They contracted Robert Allan Ltd (RAL) of Vancouver, Canada, to design a new generation of pusher tugs and barges (and a floating dock to maintain them) and set a new standard on the river system.

The vessels are being built by Uzmar Workboat and Tug Factory in Izmit, Turkey.

EMS was contracted as the owner's representative on site.

Background

RAL had originally commenced work on this project in 2006 for Rio Tinto and had proposed more-conventionally-propelled quadruple-screw vessels but, in 2008, the

project was shelved and the mine then sold in 2009. The project was actually well advanced, with some barges already under construction and some propulsion-system equipment already purchased, when cancelled. Exit costs were not inconsiderable. EMS had been engaged to oversee construction of many of the pushboats, so it is satisfying now to see the project come to fruition.

The project was revived in 2011 by Hidrovias and RAL was engaged to carry out preliminary concept design work, which encompassed fuel consumption and route analysis, CFD simulations, crash-stop and propulsion-system review, and model testing in Vienna.

Design Parameters

Some design parameters were set by the mine owner, Vale', rather than Hidrovias or Robert Allan.

This is a specialised service where the pusher tugs with barges must traverse an inland waterway with changing characteristics from season to season, varying river depths and navigational hazards. Paramount of course is draft, as there is a maximum operating draft of 2.6 m to avoid bottom contact, and a minimum draft of 2.1 m to ensure propeller and side-shell-mounted grid-cooler immersion. Mass was monitored throughout construction, with every variation evaluated in relation to additional mass; inevitably there was some growth, but this was kept to a minimum to allow optimisation of bunker loading. Bunkers are available at different places along the river and at different pricing. Bunker capacity is 504 m^3 HFO plus 30 m^3 MGO, and ballast 406 m^3. In operation this means that, as fuel is consumed, ballast must be added. If all three engines are run at full load, consumption can run close to 30 m^3 per day. The river also has bridges over it so there is also an air-draft limitation of 14 m and the mast can be lowered to achieve this.

There is no specific technical reason that I am aware of as to why diesel-electric propulsion was selected, other than that I believe Vale' had a preference for this system. When Rio Tinto owned the mine, conventional propulsion was selected and, I believe from a crew operational perspective, this may have been preferable as the vessels have a relatively high degree of electrical-system complexity. Crew training, particularly engineer training, has been a priority. The propulsion system is controlled by a sophisticated power-management system. With just one generator running, all three thruster throttles can be set to maximum and, within just over two minutes, the other two generators will start, come on the board, and accelerate the drives to maximum.

Operation on HFO has an obvious advantage in cost and, as the vessels will average over 6000 running hours per annum, the savings over operation on MGO are significant. HFO has one other advantage in that it has limited application elsewhere and is not as readily on-sold if the crew should decide to do so. Fuel management is somewhat involved and there is more information on that later.

The vessels achieved speeds of over 12 kn on trials, while service speeds with laden barges need to be approximately 6 kn in order to achieve a 24–28 day return voyage cycle for the 5000 km trip.

Azimuthing thrusters give the vessels excellent manoeuvrability and the nozzles provide approximately a 10% fuel saving over open propellers. But the service area is a river with lots of logs and other debris floating in it at times, so the propulsion system must be able to cope with this and some important considerations were made to limit damage to the system if a log jammed a propeller, and to apply a different strategy if log jams became a big issue. There is all the usual overload protection in the propulsion electrical system but it was thought that, with the large rotating mass and inertia of the propulsion motor, more needed to be done, and so a Voith safeset is fitted in the motor-to-thruster shafting, and is set to release at 1.2 times full-load torque. So, in the event of the propeller being jammed, the safeset will release and the motor can run down without serious shock. Reset of the safeset is not unlike any other oil-injection coupling and, with the right kit and experience, takes only 30–45 minutes to reset (you still have to remove the log). A comprehensive co-ordination study was also carried out to ensure that the electrical propulsion system was optimal and all system components were suitably rated and protected.

The propulsion motors are driven by three water-cooled variable-frequency drives manufactured from ABB components by local electrical company Elkon.

The barges are rafted up 4×4 with a maximum convoy length of 290 m and deadweight of 41 000 t. The vessel's power requirement was primarily driven by local river regulations in South America, which dictate that the pusher tugs must be capable of stopping a laden convoy within two convoy lengths. There is an emergency crash-stop function which, when activated, reduces RPM on the port and starboard units, rotates them and increases speed again. While this is occurring, the master must control the RPM and rotation of the centre thruster to the astern position. This system is interconnected with the GPS and will not engage at speeds below 1 kn.

As far as manoeuvrability goes, the river system is, in effect, all close-water navigation. The vessels, as usual, have echo sounders in the wheelhouse with a transducer fitted in the hull, but this does not provide the depth at the front of the barge convoy. So the vessels are fitted with two portable sounder transducers with 300 m extension cables which are mounted at the front of the convoy. Additionally, two workboats are also fitted with sounders, and these can also be used.

The vessels have facilities for a crew of 16, and fresh-water production using main engine waste heat of 10–12 t per day.

Class and Flag

The flag state is Paraguay. Paraguay does not have a sea border, but does have marine regulations for the river system, but a copy of these proved very hard to obtain — with several Sao Paulo/Asuncion trips and meetings for Hidrovias, and then only in Spanish. A team from the Paraguayan administration did come to Turkey for the first vessel. The vessels are registered in Asuncion, rather than in Brazil, mainly for commercial reasons. Brazil has an act similar to the US Jones act, so if registered there, then the vessels would also have to be built there and crewed with Brazilian nationals.

The ABS river rules were considered the most appropriate for this class of vessel, but the builder had a strong preference for Bureau Veritas who have a plan-approval office in Istanbul, Turkey.

Although well above 500 GT, the vessels comply in many respects with SOLAS, although not required to. The vessels were designed in compliance with ABS plan approval for the notation ✠A1, Towing vessel, River service, ✠AMS, and for construction with BV ✠ I 5 IN(0.6) Z, Pusher, ✠ MAVH, and were designed and fitted for ACCU/UMS, but not certified for that notation.

Principal Particulars

Principal particulars of the tugs are

Length OA		45.6 m
Beam, moulded, extreme		16.5 m
Depth moulded		4.0 m
Draft	minimum	2.1 m
	maximum	2.6 m
Air draft maximum		14.0 m at 2.1 m draft
Capacities		
	Heavy fuel oil (HFO)	504.8 m^3
	Marine gas oil (MGO)	29.6 m^3
	Potable water	33.9 m^3
	Ballast	406.6 m^3
	Lube oil, main engines	6.3 m^3
	Used oil	4.8 m^3
	Oily water	7.3 m^3
	Sludge	25.0 m^3
	Coolant drain	4.2 m^3
	Black water	12.5 m^3
	Water	12.5 m^3

Propulsion System

The propulsion system details are

Main engines	3×Wärtsilä 9l20 each 1800 kW at 1000 rpm coupled to ABB alternators, 3 phase, 690 V AC, 50 Hz
Fuel	380 cst heavy fuel oil
Variable-frequency drives	Elkon/ABB, 690 V AC, Hz variable to 60
Drive motors	3×ABB electric motors rated at 1600 kW at 1800 rpm
Propulsion units	3×Schottel srp 1215 CuNiAl 4-bladed propellers, 2.150 m diameter
Shafting	Centa flexible coupling and Voith safeset

Machinery selection was completed prior to EMS involvement with the project, but I believe Wärtsilä engines were selected for their track record and performance running on HFO. Personally, from a maintenance perspective, I would have opted for a larger-bore model with fewer cylinders.

Although the type of drive was selected early on, there was debate well after the contract was signed as to whether ABB would supply the whole electrical propulsion package, or whether ABB components would be used in a system supplied by Elkon, the local supplier in Turkey. The owners preferred ABB due to support in South America, but the yard persuaded them to use Elkon as they were more familiar with them and agreed to supply a Spanish-speaking engineer in Paraguay for six months.

The propulsion motors are driven by three water-cooled Elkon/ABB variable-frequency drives.

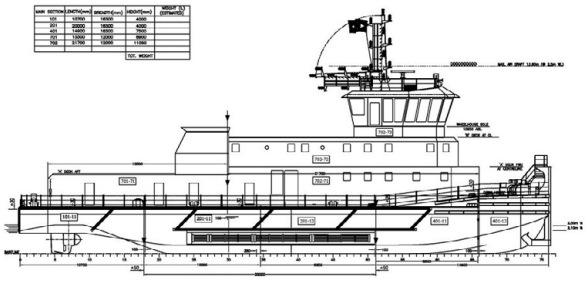
The main engines, generators and propulsion motors were all manufactured in China. The owner and shipyard representatives attended factory-acceptance tests for the first shipset. Propulsion units were built in Germany. The variable-frequency drives were constructed by Elkon at Tuzla, near Istanbul, in Turkey. Elkon are a part of the very large Dutch electrical company, Imtech.

Machinery

All the vessel's machinery is cooled by grid coolers arranged along the port and starboard vertical sides of the pushers. Much of the waste heat is used to heat the HFO tanks and maintain their contents in a pumpable state, and to generate domestic fresh water with two low-temperature fresh-water generators fitted in the auxiliary machinery space. As the vessels are never going to be more than 12 n miles off the coast, a UV steriliser is fitted to treat the condensate for human consumption.

Waste heat from the main engines is also used to heat the HFO bunker tanks, which are fitted with finned heating coils. A "boiler" is fitted, fired on MGO and is essentially a hot-water heater, rather than a boiler for vessel cold starts. All HFO lines are fitted with electrical heat tracing.

The vessels are fitted with a fuel-treatment plant, consisting of primary filters, two HFO purifiers, one MGO purifier, and a fuel booster unit which, when I was at sea, was called a viscorator. Three LO purifiers, one for each engine, are also fitted.



Profile of 45 m pusher tugs
(Drawing courtesy Robert Allan Ltd)

Bow section block under construction
(Photo courtesy Neil Edwards)

Construction and Delivery

The vessel was constructed in sub-blocks and blocks which were then assembled to form the vessel. Uzmar can transport blocks of up to 250 t using their own cranes and low loader.

The vessels are not capable of operation in the open sea and are shipped from Turkey to Argentina two at a time on a heavy-lift ship. The first two vessels are in service already and the second two left the yard in July.

Wheelhouse block under construction
(Photo courtesy Neil Edwards)

Aft section block under construction
(Photo courtesy Neil Edwards)

Port quarter of first vessel ready for launch
(Photo courtesy Neil Edwards)

Bow of first vessel on floating dock ready for launch
(Photo courtesy Neil Edwards)

Launching of first vessel
(Photo courtesy Neil Edwards)

Vote of Thanks

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

Ballast Water Treatment

Selwyn Oliveira, Marine and Diesel Manager of Alfa Laval Australia, gave a presentation on *Ballast Water Treatment* to a joint meeting with the IMarEST attended by twelve on 6 August in the Harricks Auditorium at Engineers Australia, Chatswood.

Introduction

Selwyn began his presentation by asking the question "Why do we need ballast water management?" While ballast water is essential for safe and efficient modern shipping operations, it poses serious ecological, economic and health problems due to the multitude of marine species carried in ships' ballast water. These include bacteria, microbes, small invertebrates, eggs, cysts and larvae of various species. The transferred species may survive to establish a reproductive population in the host environment, becoming invasive, out-competing native species and multiplying into pest proportions. The spread of invasive species is now recognised as one of the greatest threats to the ecological and the economic well-being of the planet.

IMO's BWM Convention

The IMO's Ballast Water Management Convention will enter into force 12 months after ratification by 30 states, representing 35 per cent of world merchant shipping tonnage. Currently, 40 states have ratified the convention, representing just over 30% of world shipping tonnage.

The implementation schedule is shown in the following table.

Constructed year		BW Capacity (m^3)	New schedule
Before 2009		Between 1500 and 5000	1st IOPP renewal survey after entry into force of the Convention
		Less than 1500 or greater than 5000	1st IOPP renewal survey after the anniversary date of delivery of ship in 2016
2009 or after		Less than 5000	1st IOPP renewal survey after entry into force of the Convention
	Between 2009 and 2011	5000 or more	1st IOPP renewal survey after the anniversary date of delivery of ship in 2016
	After 2011	5000 or more	1st IOPP renewal survey after entry into force of the Convention

IOPP = International Oil Pollution Prevention

The US Coast Guard has its own schedule for the BWM Convention, shown in the following table.

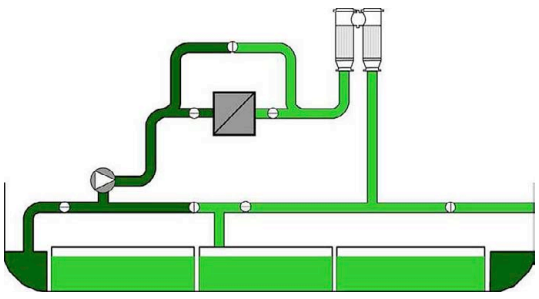
	Vessel's ballast water capacity	Date constructed	Vessel's compliance date
New vessels	All	On or after 1 December 2013	On delivery
Existing vessels	Less than 1500 m^3	Before 1 December 2013	First scheduled drydocking after 1 January 2016
	1500 - 5000 m^3	Before 1 December 2013	First scheduled drydocking after 1 January 2014
	Greater than 5000 m^3	Before 1 December 2013	First scheduled drydocking after 1 January 2016

The BWM Convention requires:

- a ship-specific Ballast Water Management Plan approved by the Administration on board;
- a Ballast Water Record Book on board;
- Ballast water exchange (Regulation D-1);
- an approved ballast water treatment system (Regulation D-2); and
- an International Ballast Water Management Certificate.

Alfa Laval's PureBallast 3.0

Alfa Laval has developed a ballast water treatment system over a period of 15 years, and this system does not require the use of chemicals.



Working principle of PureBallast system
(Image courtesy Alfa Laval)

For ballasting operations, the incoming sea water is first filtered, and then neutralised in the AOT reactor before passing into the tanks. For deballasting, the water from the tanks bypasses the filter, but passes through the AOT reactor for another neutralisation before being discharged overboard.

The AOT Reactor

The Advanced Oxidation Technology reactor uses UV light and catalysts to produce radicals which neutralise micro-organisms. Radicals have a life-time of micro-seconds (all reactions take place inside the AOT reactor). The system creates no toxic residuals (IMO has given final approval of active substance G9). Among the advantages of the AOT system are that it neutralises micro-organisms instantaneously, and that radicals are effective even in waters containing sediments.

The design of the reactor has been optimised for turbulence in the flow and for adjustable power levels, with a UV sensor.

The material of construction is SMO 254, a high-alloy austenitic stainless steel which has been specially developed for sea water applications, and has significantly higher corrosion resistance than 316L Stainless steel.

AOT reactors have been developed with capacities of 300 m^3/h, 600 m^3/h and 1000 m^3/h. Principal particulars of the three sizes are

Item	300 m^3/h	600 m^3/h	1000 m^3/h
Weight (kg)	230	320	330
Height (mm)	1138	1172	1282
Volume (L)	80	100	190
Flange (JIS A/DN)	200	250	350

PureBallast AOT 1000 m^3 reactor
(Image courtesy Alfa Laval)

Selwyn then showed a graph of power consumption, which showed 100% power at start-up and at low UV transmittances (up to 60%), but reducing to 50% power at 80% transmittance and above. Sea water normally has transmittances in the range of 55–90%, and so the units operate at less than 100% power for most of the time. The system operates on 400–440 V AC and 50/60 Hz. Power consumption is as follows

Item	300 m^3/h	600 m^3/h	1000 m^3/h
Lamps (kW)	10×3	20×3	16×6
Minimum power (kW)	18	33	53
Maximum power (kW)	33	63	100

The lamp-drive cabinets have vibration dampers (which increase reliability and lifetime), a fan with automatic rotation speed control, cooling by circulating air cooled by LT water (so that there is no dirty air in the cabinet and it operates at a lower temperature), and a leakage detector. The maximum temperatures are: air in cabinet 40°C, cooling water 38°C, and engine room 55°C. The dimensions of the lamp-drive cabinets are

Item	300 m³/h	600 m³/h	1000 m³/h
Height (mm)	2000	2000	2000
Width (mm)	900	1350	1350
Depth (mm)	500	600	600
Mass (kg)	250	370	400

Hydac Filter

The Hydac filter holds 50 µm mesh conical filter candles. It has an automatic backflush capability for cleaning-in-place, and a flexible arrangement of inlet and outlet. It uses unfiltered water for backflushing operations, and has a low backflush flowrate. Only 1.5 bar pressure is needed for backflush.

PureBallast Hydac filter
(Image courtesy Alfa Laval)

Cleaning-in-place Unit

The Cleaning-in-place (CIP) Unit cleans the AOT reactor from scaling/build-up. It removes calcium chlorides and metal ions, and maintains AOT reactor performance over time. There is no scratching of quartz glass sleeves, and is a fully-automated process after ballasting/deballasting operations. The CIP liquid is re-used, is bio-degradable, and lasts for up to one year.

PureBallast Cleaning-in-place unit
(Image courtesy Alfa Laval)

Control System

The PureBallast control system uses a graphical user interface, with visual and audible alarms, and is easy to operate. There are options for integrating into the ship's control system via Modbus, and for remote-control panels.

Type Approvals

IMO type approval has been obtained via classification society DNV GL on the basis of land-based testing at tha Danish Hydraulic Institute in Denmark and on-board testing on the Wallenius Lines' vessel MV *Turandot*, a PCTC (pure car/truck carrier) which was retro-fitted with a 1000 m³/h system at the Remontowa shipyard in Gdansk, Poland. The Type Approval Certificate was issued on 6 June 2014.

For US Coast guard approval, type-approval testing has been performed according to EPA ETV protocol at DHI in Denmark, and surveyed by DNV GL. DNV GL has been appointed as an Independent Laboratory by the USCG, with DHI as a sub-laboratory. Alfa Laval has applied for USCG Type Approval.

Advantages of PureBallast

The PureBallast system is chemical free. It is therefore

- safe for the crew;
- safe for the vessel, i.e. no corrosion;
- environmentally friendly;
- no chemicals are stored on board;
- no hold time in ballast tanks; and
- independent of water quality and salinity.

Innovations mean that power consumption has been reduced by 40%, there is reduced maintenance cost, improved operation based on real-life experience, it is easier to install the electrical system, and PureBallast EX can be used for tankers and LNG/LPG vessels.

The leading energy efficiency means that the maximum power consumption is 100 kW per 1000 m³/h, and there is automatic power regulation.

The leading biological performance means that it handles UV transmittance down to 42%! There is no limitation on salinity or temperature. The system has been tested and approved in all three water qualities: sea water, brackish water and fresh water.

The system is easy to install:

- The concept is modular and few components allows for flexible installation.
- There are extensive installation manuals and drawings.
- Local support is provided on all major shipyard markets.
- Finally, there is experience from numerous vessel types at dozens of yards

The installation is flexible. A PureBallast 3.0 1000 m³/h system would require an AOT Reactor, Lamp Drive Cabinet, Control Cabinet, Filter and a CIP unit. This would require an engine-room footprint for components of about 4.5 m². The Lamp Drive Cabinet can be placed up to 150 m from the AOT Reactor.

The system is easy to operate. It has an easy-to-use interface. It is designed for real-life operation, with limited maintenance. Training programmes are available.

Alfa Laval has had over 70 years of marine experience, and they intend to be around for a long time to come! Sales and service are available all over the world.

Questions

Question time was lengthy and elicited some further interesting points.

There is (as yet) no test kit for on-board testing of ballast water for compliance; it can only be done in a laboratory ashore.

It was claimed that it is hard to check that ballast water exchange has actually been done. However, it was pointed out that this can be done by comparing the logbooks from the bridge and engine-room — any discrepancy flags suspicion!

The lamps are housed on the outside of the AOT reactor, so that they can be changed easily.

Some vessels carry only fresh-water ballast and, of course, for these vessels there is no problem. Expect to see more of these in the future.

It was pointed out that the International Chamber of Shipping, which represents 87% of the world fleet, has objected to the Ballast Water Convention.

The PureBallast system can be designed into any new vessel. Retro-fitting to existing vessels is the major problem. Some companies are already offering containerised modules to fit on deck. All three Alfa Laval units will fit in an 8 ft × 8 ft × 20 ft container.

There are, of course, many issues to consider, including additional cost, mass, space, and stability.

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

Performance of Propellers

Phil Helmore, Naval Architecture Stream Coordinator of the University of New South Wales, gave a presentation on *Performance of Propellers in Off-Design Conditions* to a joint meeting with the IMarEST attended by thirty on 3 September in the Harricks Auditorium at Engineers Australia, Chatswood.

Introduction

Phil began his presentation with a proem, for the non-naval architects, on how naval architects think about propellers. Between the engine-manufacturer's MCR power and RPM, there are losses due to de-rate for tropic conditions, engine-driven auxiliaries, gearbox and shafting (bearings and sterntube), resulting in a lower power being delivered to the propeller. The power delivered to the propeller at the shaft rate of rotation enables the calculation of the torque delivered. The propeller itself operates in water which is influenced by the ship's wake, and so the speed of advance of the propeller is different to the speed of the ship. Naval architects typically use the Taylor wake fraction, w_T, to describe this effect, and the thrust deduction fraction, t, to describe the effect of the loss of thrust due to operating in the wake, or "behind ship" condition.

Data on the performance of series propellers is typically given as curves of thrust and torque coefficients, K_T and K_Q, to a base of advance constant, J. However, many propeller series have had polynomials derived from regression analysis of the data and, in concert with personal computers, take the labour out of lifting values from charts.

Off-design Conditions

Marine screw propellers are usually designed for a particular operating condition. This determines the propeller particulars: type or series, diameter D, pitch ratio P/D, number of blades z, and expanded blade area ratio A_E/A_O.

However, for a number of vessels, there is also interest in the performance of the propeller in a different operating condition.

Tugs, for example, usually have their propellers designed for the bollard-pull condition. However, they also need to ascertain the performance of such a propeller in the free-running condition to check that the required speed will be met on trials.

Trawlers may have the propeller designed for the free-running condition, and then need to check the performance when trawling at a low speed. Trawlers could also have the propeller designed for trawling at a low speed, and then need to check the performance when free running. Alternatively, the propeller could be designed for a speed somewhere between trawling and free running, and then need to check the performance both trawling and free running.

High-speed craft, merchant vessels and many others often

have their propellers designed to absorb 85% of the MCR power at the MCR rpm, to allow for higher resistance when the hull is fouled, in heavy weather or high sea states. This allows the engine to develop higher rpm and maintain speed under those conditions.

In order to analyse the performance in off-design conditions, we need to know the output power characteristics of the engine. This is usually given by the engine manufacturer in the form of a data sheet showing a graph of power vs rpm and, sometimes, a table of values of power vs rpm. As a rule-of-thumb, the high-idle (no-load) rpm for a diesel engine is about 110% of the MCR rpm, and this defines the governor run-out curve.

The general procedure is to take the characteristics of the propeller as designed and then to calculate the brake power demanded by the propeller at a different operating speed of the ship for, say, three different operating engine rpms. When these are plotted as a curve against the engine power output curve, the intersection gives the rpm reached and the power required to reach those rpm. This, of course, can be automated in a computer program if the engine output power is known as a function of rpm, but the principle is the same.

Tug

As an example, consider a 30 m ASD tug designed for a 40 t bollard pull. The engines were 2×Daihatsu 1287 kW @ 720 RPM MCR driving through propulsion units with 2.68:1 reduction ratio. The propellers designed had the following particulars: Ka series, D = 2.2 m, P/D = 0.9214, z = 4 and A_E/A_O = 0.668 to prevent cavitation. Total Pull = 2×212.6 kN = 2×21.68 t = 43.36 t.

Now, to check the performance when free running, the brake power demanded by this propeller at 11.5 kn and 720, 740 and 760 rpm was calculated and plotted against the governor run-out curve for the engine, resulting in an intersection at 742 rpm and brake power required of 1107 kW. The pull available was 2×87.9 kN = 175.8 kN. The total resistance of the vessel at 11.5 knots was 167.7 kN, so 11.5 kn would be achieved. To find the top speed *actually* achieved would require further information on the total resistance vs ship speed.

Trawler

As an example, consider a 23 m prawn trawler with a Caterpillar engine of 317 kW @ 1225 RPM MCR driving through a gearbox with 4.0:1 reduction ratio. The propeller, designed for the free-running condition at 10 kn, had the following particulars: Ka series, D = 1.37 m, P/D = 1.3542, z = 4, A_E/A_O = 0.687 to prevent cavitation. The pull available at 10 kn was 32.5 kN.

Now, to check the performance when trawling, the brake power demanded by this propeller at 4 kn and 1200, 1150 and 1100 rpm was calculated and plotted against the output power curve for the engine, resulting in an intersection at 1149 rpm and brake power required of 302 kW. The pull available when trawling was 44.5 kN.

However, as an exercise, it was instructive to check other design conditions. Design speeds of 4 kn (trawling) and 7 kn were investigated, with the following results.

		Trawling		Free running	
Design Speed	P/D	ERPM	Pull (kN)	ERPM	Pull (kN)
10	1.3542	1149	44.5	1225	32.5*
7	1.3048	1191	45.6	1233	30.9
4	1.2702	1225	46.6*	1239	29.6

It will be noted that the propeller designed for either trawling or free running has the best performance at the designed condition, but poorer performance at the off-design condition. However, the propeller designed for the in-between speed performs reasonably well when either trawling or free running. Of course, the propeller can be designed for a speed anywhere in the spectrum between trawling and free running to slant the performance as desired.

Other Craft

High-speed craft, merchant vessels and many others often have their propellers designed to absorb 85% of the MCR power at the MCR rpm, to allow for higher resistance when the hull is fouled, in heavy weather or high sea states. This allows the engine to develop higher rpm and maintain speed under those conditions.

There are two typical conditions to be investigated:

- To find the ship speed and rpm achieved when the increased resistance due to fouling/sea sate etc. is known. This is solved using the general procedure outlined in the section on *Off-design Conditions* above, and as applied to the tug and trawler.
- To find the ship speed achieved when using a higher or lower rpm with a clean hull and propeller and no sea state. This is solved by selecting the ERPM required, selecting three ship speeds, calculating the pull available at this ERPM at each speed, then plotting the pulls against the curve of total resistance vs speed, and the intersection gives the speed achieved at this ERPM

Maxsurf Motions provides an estimate of the additional total resistance in waves. One authority in Australia uses an additional 0.1% of total resistance added per day. Molland et al. (2011) suggest an additional 2–3% per month of frictional resistance. Holtrop and Mennen (1978) give an equation for the addition to the correlation (but effectively frictional) resistance coefficient due to hull roughness, where a mean apparent amplitude of 150 μm is considered to be that for a new ship, freshly painted. Double the mean apparent amplitude, and the increase starts to become significant.

There is much interesting work being done on the effects of coatings on propellers, because K_T and K_Q depend on the state of surface. As surface roughness and/or fouling increases, K_T decreases and K_Q increases. It has been found that, while coatings have an initial roughness greater than that of a polished propeller, coatings maintain overall smoothness for longer, and so many operators are now painting their propellers. Mosaad (1986) and ITTC (1978) both give equations for the change in drag coefficient on a propeller due to roughness and, hence, the changes in K_T and K_Q. The results seem to be similar, but Mosaad's equations take more details into account and are to be preferred.

An example of the calculations had been applied to a patrol vessel in an undergraduate thesis project, where the speeds achieved by the vessel were 21 kn with clean hull and propeller, 20.6 kn with hull and propeller one year out of

dock, but 20.7 kn with hull one year out of dock and propeller freshly cleaned by divers.

Vote of Thanks

The vote of thanks was proposed by Noel Riley, and carried with acclamation.

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Holtrop, J.A. and Mennen, G.G.J. (1982), An Approximate Power Prediction Method, *International Shipbuilding Progress*, v.29 n.335, July.

ITTC (1978), *Performance and Propulsion: 1978 Performance Prediction Method,* International Towing Tank Congress.

Molland, A.F., Turnock, S.R. and Hudson, D.A. (2009) *Ship Resistance and Propulsion*, Cambridge University Press, New York

Mosaad, M.A. (1986), *Marine Propeller Roughness Penalties,* PhD Thesis, University of Newcastle-upon-Tyne, Naval Architecture and Shipbuilding Department, Newcastle-upon-Tyne.

Workshop on Working towards Chartered Status

Trevor Blakeley, Chief Executive of the Royal Institution of Naval Architects, presented a workshop on *Working towards Chartered Status* to a meeting attended by twenty-four on 22 September in the Harricks Auditorium at Engineers Australia, Chatswood.

This workshop was aimed at those members who are working towards chartered engineering status with RINA. It covered the requirements for chartered status, appropriate activities, mentoring, when to submit applications, etc., and discussed continuing professional development while working towards chartered status. This helped to better define what is required of graduates, especially in areas where the RINA guidance notes can be interpreted in a variety of ways.

The Chief Executive was available before, during, and after the Workshop to answer individual queries, discuss details and provide advice.

Corporate membership of RINA provides a professional qualification which is internationally recognised as demonstrating the achievement of the highest standards of professional competence and integrity. Membership also provides a wide range of benefits.

On gaining Corporate Membership, members may apply for registration as a Chartered Engineer (CEng), Incorporated Engineer (IEng) or Engineering Technician (EngTech), depending on academic achievements, professional development and experience.

Members who are Chartered Engineers may also apply to be entered on the register of European Engineers maintained by the Federation Europeene d'Associations Nationales d'Ingenieurs, allowing them to prefix their name with Eur Ing. No further interview is required.

There are four phases to gaining corporate status: Academic Qualification, Professional Competence, the Application, and, finally, the Professional Review, which involves both a Report and an Interview. The Professional Review certifies that the academic qualification and the professional competence have ben achieved.

Further details are available in the documents *The Routes to Chartered Membership*, and *Guidance on Applying for Corporate Membership* available on the RINA website under Membership.

LNG as Marine Fuel

Graham Taylor, Principal of Taylortech, gave a presentation on *LNG —The New Marine Fuel?* to a joint meeting with the IMarEST attended by nineteen on 1 October in the Harricks Auditorium at Engineers Australia, Chatswood.

Graham's presentation was the first to undergo a trial by Engineers Australia of a new webcast recording system, using three cameras and a hand-held microphone, with an audio technician in attendance. The details, including access for RINA members, are still being worked out.

It is expected that Graham's presentation will be written up in the February 2015 issue of *The Australian Naval Architect.*

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

Phil Helmore

Tasmania

The 2014 midyear RINA/IMarEST technical meeting was held at the Australian Maritime College. Ken Hannah, Head of Engineering, BAE Systems, gave a presentation entitled *An Overview of the Landing Helicopter Dock (LHD) — the Largest Warships ever to be constructed for the Royal Australian Navy.*

In Ken's words:

"The Canberra-class amphibious assault ship displaces about 27 000 t and will provide the Australian Defence Force with one of the most capable and sophisticated air-land-sea amphibious deployment systems in the world. NUSHIP *Canberra*, which will be officially commissioned by the navy later this year, is able to land a force of over 2000 personnel by helicopter and water craft, along with all their weapons, ammunition, vehicles and stores. Currently it is being tested by BAE Systems, the company which built it, along with some members of its new crew."

The capacity and integrated nature between the three forces of these ships, makes them more than new platforms; they are giving the Australian Defence Forces new capabilities. The missions carried out by Army, Navy and Airforce from these ships will cover the whole range of operations, including humanitarian relief, stabilisation and special recovery. Features such as the 2 m deep dock, multiple fresh water plants, 56 bed hospital and capacity for over 100 containers, make these ships into moving ports for the nearly 3000 complement (which includes the sailors).

At the September RINA/IMarEST technical meeting, Christer Wik of Wärtsilä explained the requirements for Emission Control Areas (ECA) and options to meet these requirements as provided by Wärtsilä. Wärtsilä's history dates back to its beginnings in 1834 as a sawmill and iron-work company. Since then the company has grown enormously and they are a leading player in dual-fuel systems, so much so that there have been 3210 installations resulting in greater than 8 million running hours, demonstrating the reliability and feasibility of these systems. Although dual-fuel systems do provide ECA solutions, Christer also detailed a number of feasible retrofit solutions.

He pointed out that the new emission regulations for marine diesel engines require that new engines meet substantially lower NOx emission limits after January 2016 or later, when operated inside so-called Emission Control Areas, whereas, outside these regions, the emission limits applicable since the beginning of 2011 remain in force. Moreover, Tier III, for the first time, is not only limiting the cycle average value, but also includes additional constraints for the emission levels at the individual points of the test cycle. As a consequence, engines need to be optimised for both sets of requirements using technologies that can be activated when entering an ECA in order to reduce NOx emissions by about 75% throughout the part of the operating range corresponding to the test cycle. Christer presented results from testing of different technology options for fulfilling the Tier III NOx emissions on medium-speed engines including SCR, EGR, wet methods and natural gas. He outlined the strengths and weaknesses of each technology, for fulfilling the demands, as well as regarding implications on engine efficiency, etc.

Jonathan Binns

COMING EVENTS

NSW Section

The fifteenth SMIX (Sydney Marine Industry Christmas) Bash will be held on Thursday 4 December aboard the beautifully-restored *James Craig* alongside Wharf 7, Darling Harbour, from 1730 to 2130. This party for the whole marine industry is organised jointly by RINA (NSW Section) and IMarEST (Sydney Branch). Join your colleagues in the maritime industry and their partners for drinks and a delicious buffet meal on board the unique 19th century iron barque. Cost is $65 per head. Dress is smart casual, but absolutely no stiletto heels!

Those wishing to attend this Sydney Maritime Industry Christmas Party should purchase their tickets through www.trybooking.com. Search for SMIX and follow the prompts. Payment only accepted by Visa and Mastercard.

Alternatively, you may mail your details (including names of guests and your email address for confirmation of booking), together with your cheque, to the RINA (NSW) Treasurer, Adrian Broadbent, at 27 Manning St, Queens Park NSW 2022.

There is a maximum limit of 225 attendees on the James Craig and we have had to turn away members and friends in previous years so you are urged to book early.

ACT Section

Prompted by the article August 2014 edition of *The Australian Naval Architect* on past RAN Replenishment ships projects prepared by John Jeremy, the ACT Section has invited John to speak on this subject at AMSA in Canberra on Thursday 20 November.

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 2–5 February 2015, 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.

"The course was excellent, straight forward and comprehensive. Instruction was great, expected 'death-by-PowerPoint, but was pleasantly surprised. I am better acquainted with dry dock basics after the course and can trust the accuracy of the training based on the extensive experience of the instructors. Thank you! Very informative, very thorough."

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

"Fantastic. Really good course. Personally, I got a lot out of the course and will certainly recommend it to my work colleagues."

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.

"Very informative. Subject matter which was dry, was taught without being boring. Class was great, learned a lot! Thank you."

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

HPYD5 Conference

The 5th High Performance Yacht Design Conference will take place on 9–11 March 2015 in Auckland, New Zealand. This coincides with the Volvo Ocean Race Auckland Stopover, and the conference venue will be central to the boats and all the activities on offer.

Papers will be presented on a wide range of topics relating to the design of high-performance power and sailing yachts, including:

- foil performance and design of foil-borne craft
- wing sails
- structural design and analysis
- performance prediction
- wind tunnel and towing tank testing
- computational methods
- hull and appendage design

Final papers were due on 1 October 2014, and all papers are being reviewed by an international technical panel. Abstracts are now available on the conference website, and registration is open.

An exciting development is that an agreement has been reached with SNAME (Chesapeake Section) and Ecole Navale (Innov'Sail) to provide a coordinated rolling three-year program of high-quality yacht technical conferences.

See www.hpyd.org.nz for more details and/or to register.

Pacific 2015 IMC

The next Pacific International Maritime Conference, 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 Pacific 2015 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.

Held every two years, the Pacific International Maritime Exposition will continue to host two headline events, the RAN Sea Power Conference and the International Maritime Conference (IMC), as well as an extensive portfolio of specialist maritime business and technical seminars and symposia.

Navy Week provides an opportunity for the Royal Australian Navy to promote the importance of maritime trade and naval power to Australia's physical, environmental and economic well-being and security. Maritime Australia Ltd is proud to be able to support these aims by organising a world-class industry exposition, according to its CEO, Mr Ian Honnery. "As a not-for-profit foundation, our purpose is to support the development of Australia's maritime industry capacity, both naval and merchant. This has a direct bearing on Australia's national security as well as our economic prosperity," Mr Honnery said.

In 2011–12 Australia's maritime trade was worth over AUD $400 billion a year, with exports growing at over 6% a year, according to official figures. To help secure Australia's maritime security and trade into the next generation and beyond, the Royal Australian Navy plans to acquire new submarines, frigates, supply ships and patrol boats worth some AUD $70 billion.

"The Pacific International Maritime Exposition is a showcase for the maritime industry, both naval and merchant, in one of the fastest-growing regions in the world. It attracts exhibitors, high-level official delegations and influential trade visitors from around the globe. This exposure to global opportunities is especially important for Australia's innovative marine industry SMEs. In essence, by bringing the world's maritime industry to Australia, we take Australian companies to the world," Mr Honnery added.

"Running Pacific 2015 and its successors during Navy Week in October every two years will benefit everybody involved."

The new Pacific 2015 venue, Sydney Exhibition Centre at Glebe Island, has deep-water berths alongside. 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.

Initial details are on the website www.pacific2015.com.au.

PACIFIC 2015
International Maritime Conference

Sydney Exhibition Centre @ Glebe Island, Sydney Australia

6-8 October 2015

PRELIMINARY ANNOUNCEMENT AND CALL FOR ABSTRACTS

The Royal Institution of Naval Architects

Institute of Marine Engineering, Science & Technology IMAREST

KEY DATES

- Abstract Submissions Open: ***10 November 2014***
- Registrations Open: ***17 February 2015***
- Abstract Submission Deadline ***9 March 2015***
- Author Acceptance Notification ***6 April 2015***
- 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 and the Institute of Marine Engineering, Science and Technology, 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
- Naval Ship Technology
- Submarine Technology
- Commercial Ships Operations
- Maritime Safety
- Maritime Environment Protection
- Offshore Resource Industry

Abstract submissions open from 10 November 2014 and prospective authors are invited to submit an abstract relating to the conference program topics in accordance with the instructions on abstract format and guidelines available on the conference website menu.

Abstracts are to be submitted online

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

CLASSIFICATION SOCIETY NEWS

New Containership Rules and Guidance from LR

A decade-long and on-going research programme has developed a clearer understanding of the forces imposed on ship structures. Lloyd's Register's updated Containership Rules came into effect in July 2014 and these new rules are supported by Lloyd's Register's ShipRight Procedures covering whipping and springing analysis. Following the ShipRight Procedure will enable the granting of new Lloyd's Register class notations ShipRight WDA: Whipping Design Assessment procedure, and ShipRight FDA (SPR): Springing Fatigue Design Assessment procedure, to enhance the response of ships' structures which are subject to springing and whipping at sea.

While the basic rules which underpin containership structural strength are well established, as ship sizes increase new challenges have emerged, making continued research into the implications essential.

Modern containerships have very large deck openings, long fine hullforms, a large bow flare (the projection of the forward deck outwards above the waterline) and operate at fairly high operational speeds (roughly 18 kn or more). They must, of course, meet the structural strength and fatigue requirements imposed by all sea conditions.

Lloyd's Register's research on large containerships has been ongoing over the past decade and includes a full-scale measurement programme conducted over five years on a large containership. This research has helped to identify the challenges faced by builders and operators of such ships and ensure that the ships' structures are properly designed and remain within acceptable limits throughout their operational lives. More generally, Lloyd's Register's research and operational experience has provided the tools to properly and effectively assess the forces involved in large containership operation and thereby provide the appropriate rules and guidance.

New designs approved by LR have progressively benefitted from the output of this research and development.

Lloyd's Register's Marine Director, Tom Boardley, commented "Ship safety is our main role as a classification society. You can't have efficient ships unless they are also structurally safe. We have invested heavily in research and we have the depth of expertise in our hydrodynamics and structures teams to address this challenge."

At SMM in Hamburg in September, LR released its Marine Technology Report, *The Future of Shipping: Issue 01, New Generations of Large Containerships*. This report, available on request, details the background work and science of understanding the forces involved in large containership design and operation.

LR Introduces Standard for Clarity on Levels of LNG-fuelled Preparedness

To justify design and production requirements, capex investment and operational planning, LR's Gas Fuelled Readiness (GR) notation, with levels A, S, T, P and E (M, A, B and I), gives real meaning to options for 'gas readiness'.

In response to industry demand for clarity over options for gas readiness, Lloyd's Register has established clear standards describing different levels of readiness to use gas as a marine fuel. While LNG as fuel has been adopted in projects which make commercial sense already (like northern European ferry routes), most deep-sea players who are interested in the potential of gas-fuelled operations are not yet ready to commit to LNG fuel, but want to have the option to adopt gas as a fuel in the future built into newbuilding projects.

Moreover, those looking at a gas-fuelled future will have varying appetites for levels of investment and preparedness, based on clarity over their options at the newbuilding stage, and then through operational life.

Luis Benito commented "We identified a blocker to progress in this area and listening to, and working with, shipyards and owners we have developed this notation, with clearly-identifiable levels, to enable technical and contractual decisions as to what different levels of gas readiness mean.

"This means that shipyards can be clear about what they are offering, and buyers know what they are getting—and at what price. This is a vital tool for agreement at the contract stage for levels of readiness which also allow contracts to be flexible if the owner wants to make changes at agreed opportunities, even during construction."

GR is a descriptive notation, and will form part of LR's rules for gas-fuelled ships, and so reflects all safety and operational requirements to meet global standards for gas operations. LR's Technical Committee members will be able to review the GR descriptive notation. Luis Benito said "The fact that this notation has already been reviewed by yards and owners—and will be further examined in our committees and revisited every year—is a real strength and demonstrates that the full insight of the shipping industry has been involved in the development process.'

Details of the gas-fuelled readiness notations are as follows:

GR Assigned to ships other than LNG carriers, detailing the aspects of design and construction which are prepared for gas fuel operation in accordance with the Lloyd's Register Rules and Regulations.

The level of gas-fuelled readiness is structured in a flexible manner through the following associated characters denoting:

A That approval in principle has been achieved for the basic design.

S Necessary structural reinforcement and materials have been installed.

T Gas storage tank is in place.

P The gas fuel piping arrangements are installed.

E Those engineering systems (Main engine(s), Auxiliary engines, Boilers, Incinerators, etc.) being also gas fuelled.

For example, the descriptive note GR(A, S, E(M,I)) indicates that, in accordance with the LR Rules and Regulations for the Classification of Natural Gas Fuelled Ships in force on date of contract for construction for the vessel in question:

the full design of the gas fuel system has been appraised and approved in principle; the vessel structure is reinforced to support the proposed gas storage tank, but the gas fuel tank and associated arrangements are not yet installed; and the main engine and incinerator are approved, certified and installed ready for gas fuel operation.

Woodside Names Lloyd's Register Energy as Global Inspection Provider

Lloyd's Register Energy has been chosen by Woodside as one of its global inspection providers. The new contract will help to ensure that the components and equipment which Woodside procures globally meet quality expectations.

Woodside is the largest independent oil and gas company in Australia. Under the three-year contract, Lloyd's Register Energy will provide surveillance inspection, expediting and auditing services. The contract also includes two one-year extension options.

The successful nomination for delivering worldwide inspection services comes after a similar nomination of global inspection support for Japanese energy company INPEX for its high-profile Ichthys LNG project in western Australia.

"Our focus on providing high-quality worldwide inspection services, along with our proven success with INPEX, were major factors in this award from Woodside," said Fotis Kampouris, Vice President of Worldwide Inspection Services for Lloyd's Register Energy.

This latest inspection nomination continues a long-standing relationship between the global giant certification authority Lloyd's Register Energy and Woodside. For more than 25 years, Lloyd's Register Energy has been providing ongoing compliance and risk consulting services to Woodside.

LR Guidance Notes for Fire Loadings and Protection

Offshore fire risk requires a deep understanding and improved safety management on offshore vessels and installations, and ocean-going vessels.

The new Lloyd's Register Energy Guidance Notes, launched at the Offshore Northern Seas 2014 congress in Stavanger, Norway, assist designers, owners and operators of oil and gas equipment on how to assess fire loadings on an installation, and how to protect it against different fire scenarios.

"Protection against fires on board vessels and installations is critical to a safe operating environment," says Joar Dalheim, Lloyd's Register's VP Technology, Consultancy Services. "Our Guidance Notes provide a significant reference document to guide oil and gas designers, owners and operators on different risk-based methodologies to establish what could be at risk, ranging from simple fire-risk issues to highly-technical and complex fire-risk situations."

A primary goal for the launch of the new Guidance Notes is to provide direction and criteria which help industry to increase the level of protection against fires on board vessels, mobile offshore drilling units (MODUs), mobile offshore units (MOUs) and offshore installations. It also covers land-based infrastructure.

The new Lloyd's Register Guidance Notes are one of the first of their kind to provide the flexibility on either a prescriptive route to ensure that codes and standards are met, or a risk-based approach depending on the client's objectives. Once in place, it supports what decisions can be taken to reduce the consequences of a fire from potential leaks or ignition scenarios through specific measures for prevention, detection and fire extinguishing. The document also discusses other types of fires including electrical cable insulation fires, diesel fires, and methanol fires.

"Fire and explosion continue to remain one of the top safety hazards for any vessel and its crew," highlights Dalheim. "Minimising risk is critical as the challenges around deeper offshore exploration expand."

Offshore units must comply with fire-safety regulations set out by the national administration in the area where the unit is located and/or country in which the unit is registered. A large part of these new industry Guidance Notes is dedicated to fire-protection principles, fire-mitigation measures and fire response which is an important part of the Fire and Explosion Evaluation (FEE) report, and which would be required for classification purposes. The FEE is intended to be an assessment of the potential fire loadings and blast pressures, based on the specific hazards associated with the general layout of the unit, production and process activities and operational constraints.

In July, Lloyd's Register Energy released a new rule set called Rules for Offshore Units, which require a FEE to be submitted for acceptance.

The new Guidelines are available at www.lr.org/offshorerules

Paul O'Connor

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. The details, including access for RINA members, are still being worked out. Watch this space!

Phil Helmore

GENERAL NEWS

Sustainment Contract for LHDs

A key contract for supporting Australia's new Landing Helicopter Dock ships (LHDs) has been awarded to BAE Systems Australia Defence Pty Ltd.

On 26 September Chief Executive Officer of the Defence Materiel Organisation (DMO), Warren King, announced the contract to support the two LHDs over the next four years.

"BAE Systems will provide a continuity of knowledge and experience as they maintain the LHDs during this vital transition period from the acquisition project to full operational service with Navy," Mr King said.

He said that BAE Systems is best placed to ensure that sustainment requirements of engineering maintenance and supply support for the LHDs are met in an efficient, effective and economical manner.

The LHD Transition In-Service Support Contract has a budget of approximately $220 million over four years.

The majority of the work is expected to take place in Sydney where the LHDs will be based, resulting in the creation of over 40 new jobs.

US Navy Extends Charter of *WestPac Express*

On 6 October Austal announced that the charter of Austal's high-speed vessel, *WestPac Express*, has been extended by the United States Navy's Military Sealift Command.

Under the new contract, the initial charter period has been extended for 10 months, with three option periods. Should all options be exercised, the contract will be valued at approximately $US29.9 million and extend the charter to mid-2016.

Austal's *WestPac Express* has been chartered to the US Navy for the rapid deployment of marines and their equipment in the Western Pacific continuously since July 2001. The ship has achieved in excess of 99% technical availability across this period.

WestPac Express is a 101 m high-speed catamaran which enables up to 900 personnel together with up to 550 t of vehicles and equipment to be moved in a single lift, providing considerable strategic and cost advantages

Westpac Express
(US Navy photograph)

compared to alternative transportation modes. The ship can operate at speeds up to 36 kn.

Austal manages the charter operation, including in-service support, ship management services, and integrated logistics support.

Sale of Austal's Stock Trimaran

Austal announced on 20 August that it has completed the sale of Hull 270, the Company's 102 m trimaran stock vessel, for $61.5 million.

Austal previously announced on 6 January 2014 that it had negotiated an option-to-purchase contract with the Channel Islands' ferry operator, Condor Ferries, which has now been exercised.

Condor Ferries has been operating since 1964 and carries more than 1 million passengers and 200 000 passenger vehicles between France, the UK and the Channel Islands each year.

Hull 270 has been moved to Austal's commercial shipyard in the Philippines for customer modifications valued at approximately $6 million.

Austal's Chief Executive Officer, Andrew Bellamy, said that the significant capabilities provided at Austal's Philippines shipyard had been crucial in securing the additional customisation contract.

The vessel is expected to be delivered for final fit-out to

NUSHIP *Canberra* departing BAE Systems at Williamstown for her base in Sydney and preparation for comissioning on 28 November. Her sistership, *Adelaide* (left) will commence sea trials in the second quarter of 2015
(RAN photograph)

Austal's Hull 270, now sold to Condor Ferries, showing her paces on trials
(Photo courtesy Austal)

Condor's operations in the UK in the first quarter of 2015, and to commence operations in the English Channel by the second quarter of 2015, after a handover period.

Condor's Chief Executive Officer, James Fulford, said: "It is fantastic to be adding this prestigious ship to our fleet. The 102 will offer increased reliability, capacity and comfort for our guests and we are very much looking forward to her arrival in our islands in the spring."

Mr Bellamy said: "It is very pleasing that we have been able to complete the sale of this asset."

"The sale of the stock boat further strengthens Austal's balance sheet by liberating cash that will be used to reduce infrastructure-related debt. It provides significant additional capital flexibility for the company as we focus on winning new work and delivering on our significant order book."

Incat Tasmania Completes World's Largest Fast Crew Boat

The 70 m Fast Crew Boat (FCB) was christened *Muslim Magomayev* at a ceremony at the Incat shipyard in Tasmania on Monday 15 September.

The Australian shipbuilder Incat Tasmania has built the vessel for the oil and gas industry in Baku, Azerbaijan.

Caspian Marine Services executives and 12 Azerbaijan crew witnessed 10-year-old Hilary Clifford, granddaughter of Incat Chairman, Robert Clifford, cut the ribbon releasing the champagne.

The vessel is named *Muslim Magomayev* in honour of Azerbaijan's famous opera and popular music singer Muslim Magomayev who died in 2008. Magomayev was a renowned

Incat Tasmania's fast crew boat *Muslim Magomayev* on trials
(Photograph courtesy Incat Tasmania)

entertainer not just in Azerbaijan but in all the former Soviet states, often dubbed as their answer to Sinatra.

This first-of-type DP2 class 70 m vessel is being delivered to Caspian Marine Services to operate fast crew transfers for 150 offshore workers to multiple installations in the Caspian Sea. The high speed of the FCB will allow operational efficiency over helicopter transfer for both passengers and cargo, whilst the semi-SWATH hull design, along with active ride control, will reduce stress on passengers so that they arrive at an oil platform relaxed and fit to work.

Muslim Magomayev has a deadweight capacity of about 200 t and is capable of carrying 150 passengers and 14 crew, along with deck cargo, in up to 40 knots of wind and seas of 3 m significant wave height.

The vessel's 16 m beam was determined by the width of the Volga-Don Canal which it must transit on its delivery from Hobart, Tasmania to Baku in Azerbaijan.

Muslim Magomayev will be the world's largest high-speed crew catamaran operating in the global oil and gas industry. Power is supplied by four 2880 kW MTU engines each driving Hamilton HT 900 waterjets. The design speed was 36 knots with a service speed of 30 knots at full load and 90% MCR. On her first day of trials the vessel comfortably achieved 38.7 knots at a light displacement.

The ship has been constructed of lightweight marine-grade aluminium over the past year at Incat Tasmania's Derwent Park, Hobart, shipyard, with concept design by Incat Crowther of Sydney and production engineering by Revolution Design Pty Ltd (Incat Tasmania's design team). It is the first craft Incat has built to the DNV Clean Design notation, giving it a "Green Passport".

The vessel's electronic installations are extensive, with an expansive wheelhouse to accommodate the range of high-tech systems required for the dynamic positioning.

Crew transfer is completed primarily by the Amplemann system, a stabilized access platform providing a stable deck and gangway to safely transfer between the offshore platform and the vessel. The access platform compensates for the vessel's motion by using six hydraulic cylinders. The FCB will hold station with four control stations each utilizing Hamilton Jet's MECS control system integrating with a DNV DYNPOS-AUTR dynamic positioning system. This system provides improved safety during crew transfers in conditions up to sea state 4.

Principal particulars of *Muslim Magomayev* are

Length OA	70.0 m
Length WL	67.6 m
Beam OA	16.0 m
Depth	6.00 m
Draft (hull)	2.00 m
Personnel	150
Crew	14
Fuel oil	50 000 L
Fresh water	10 000 L
Grey water	5000 L
Black water	3000 L
Main engines	4×MTU 16V4000 M73L each 2880 kW @ 2050 rpm
Propulsion	2×Hamilton HT-900 S waterjets
Speed (service)	30 kn
(maximum)	38 kn
Generators	4×CAT C18 ACERT 550 ekW
Bow thrusters	4×TH300MLR azimuth retractable
Dynamic positioning	Kongsberg K-Pos DP-21
Ride-control system	Active T-foil, interceptors and yaw stabilisers
Construction	Marine-grade aluminium
Flag	Azerbaijan

Trenton (JVSV 5) emerging from Assembly Bay 3 at Austal USA's shipyard
(Photo courtesy Austal)

Trenton returning to Austal after floating at BAE Systems
(Photo courtesy Austal)

Austal USA Launches *Trenton* (JHSV 5)

On 30 September Austal USA successfully completed the launch process of *Trenton* (JHSV 5) — the second Joint High Speed Vessel (JHSV) launched by Austal in 2014. The 103 m high-speed catamaran is part of a 10-ship program worth over $US1.6 billion.

The launch of *Trenton* was conducted in a multi-step process which involved having Berard Transportation transfer the ship from Assembly Bay 3 at Austal's Mobile shipyard onto a Crowley deck barge, which was then towed to BAE Systems Southeast Shipyard. The next day *Trenton* was transferred onto BAE's dry dock *Alabama*; it was then floated and returned to Austal's facility where it will undergo final outfitting and activation before sea trials and delivery to the US Navy in the northern spring of 2015.

Austal USA's President, Craig Perciavalle, complimented the launch team by saying, "It's amazing just how efficient this complex launch process has become." He continued "It's a true testament to the hard work and incredible teamwork by all parties involved."

JHSV 5 is now one of four Austal-built US Navy ships moored in the Mobile River, joining *USNS Fall River* (JHSV 4), *Montgomery* (LCS 8), and *Jackson* (LCS 6).

Craig Perciavalle added, "With the delivery of *USNS Millinocket* (JHSV 3) back in March, *USNS Fall River* (JHSV 4) last week and now the launch of *Trenton*, the JHSV program is truly mature and progressing as promised. I am honoured to work with so many dedicated shipbuilders here at Austal who should be very proud of this accomplishment."

Construction is well underway on *Brunswick* (JHSV 6) which began final assembly in the, now vacant, Assembly Bay 3 in October, and construction began on *Carson City* (JHSV 7) earlier in September.

Austal Delivers Third Cape-class Patrol Boat

Austal delivered *Cape Nelson*, the third of eight Cape-class patrol boats, to the Australian Customs and Border Protection Service in September.

Austal's Chief Executive Officer, Andrew Bellamy, said that the delivery further demonstrated Austal's ability to deliver fleet builds of complex vessels in accordance with contracted timeframes.

"Our team at the Henderson shipyard have again demonstrated their ability to meet contracted timeframes. Delivering on time ensures that the Australian Customs and

Cape Nelson
(Photo courtesy Austal)

Border Protection Service can reliably continue to deliver on the Border Protection obligations it undertakes to the Commonwealth of Australia," Mr Bellamy said.

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

Keel Laying Ceremony for Patrol Boat at Austal WA

The Assistant Minister for Immigration and Border Protection, Senator the Honourable Michaelia Cash, participated in a keel-laying ceremony on 10 October for the eighth Cape-class patrol boat for the Australian Customs and Border Protection Service at Austal's Defence Facility in Henderson, Western Australia.

Senator the Honourable Michaelia Cash, Austal Australia President, Graham Backhouse, Austal Vice President Defence, Davyd Thomas and Customs and Border Protection acting National Director, Ian Laverock at the keel-laying ceremony
(Photo courtesy Austal)

The vessel, *Cape York*, named after the northernmost point on the Australian continent, is the last of the eight vessels being designed, constructed and sustained by Austal under a contract valued at approximately $330 million which was awarded in August 2011.

The first three Cape-class patrol boats have already been successfully delivered and the fourth vessel, *Cape Sorell*, was undergoing sea trials for delivery by the end of the year. All eight vessels of the current production run are on track to be delivered by August 2015.

The keel-laying ceremony is a time-honoured shipbuilding tradition where three specially-minted coins are placed under a keel block as a symbol of good fortune and to bless the

ship. These coins will be removed just prior to the patrol boat's launch.

The three coins for the *Cape York* keel-laying ceremony were placed by Assistant Minister Cash, Austal's Vice President Defence, Davyd Thomas, and Customs and Border Protection acting National Director, Ian Laverock.

At the ceremony Assistant Minister Cash commented on the significance of the occasion and commended Austal's contribution to the program.

"This is an important milestone for both Customs and Border Protection and Austal, and it is a positive example of the strong working relationship between industry and Government," Senator Cash said.

"The Cape-class design and construction has benefited from Austal's world-leading skills."

Austal Australia's President, Graham Backhouse, noted the highly collaborative effort between Austal and Customs and Border Protection, and the significance of the program to Austal and its benefits to the nation's economy and border protection.

"The Cape-class program is a great testament to the spirit of enduring relationship between Austal and the Australian Customs and Border Protection Service," Mr Backhouse said.

"It is a program of work which underpins Austal's strategy as a global defence prime contractor of ships, systems and support. It's a program that contributes widely to our nation's economy through hundreds of highly-skilled jobs in Western Australia alone, with many more employed far and wide. It's a program that provides our nation with an unrivalled border force capability. It's also a program of some $330 million investment by the Government which has enabled Austal to drive significant productivity efficiencies across the current production run to a greater level than originally thought possible."

Cape Jervis Launched at Austal

The fifth Cape-class patrol boat, *Cape Jervis*, was launched by Austal at Henderson, Western Australia, on 17 October.

Cape Jervis
(Photo courtesy Austal)

Austal Australia's President, Graham Backhouse, said: "The launch of *Cape Jervis*, on time and in accordance with a demanding production schedule, is a great testament to the productivity and efficiency of our workforce. Achieving these timeframes is only possible through combined efforts and close collaboration with the Commonwealth and our industry partners."

Cougar II from One2three Naval Architects

Following the successful delivery and integration of MV *Kingfish* into the Whitsunday Cruises fleet operating out of Hamilton Island (see *The ANA*, August 2013), Whitsunday Cruises' sister company, South Sea Cruises, commissioned a new purpose-designed 24 m passenger ferry, MV *Cougar II,* for tourist operations in Fiji.

Cougar II was built by Aluminium Boats Australia and operates primarily as a transfer ferry, servicing the outer islands in the Fiji group and providing transit services for visiting cruise ships. Shore facilities are limited and, in many cases, passengers and luggage are transferred to long boats for access to the island beaches. The aft deck is dedicated to long-boat boarding from the swim platforms and to provision of large luggage-storage spaces.

The vessel is configured for 200 passengers, with 129 seats in the main-deck air-conditioned cabin. A further 87

Cape Jervis with *Cape Sorell* and *Cape Nelson* in the background
(Photo courtesy Austal)

passengers are seated on the upper deck, with a large canopy providing protection from the elements. Seating is arranged in conversational groups with tables scattered throughout the open spaces.

A pair of Yanmar 6AY-WET engines rated for 670 kW brake power at 1938 rpm drive Veem propellers via Yanmar YXH-240 gearboxes.

Cougar II was delivered on her own bottom from ABA in Brisbane to Fiji.

Principal particulars of *Cougar II* are

Length WL	25.0 m
Beam moulded	7.6 m
Passengers	200
Crew	3
Fuel oil	2×2500 L
Fresh water	1×1000 L
Sullage	1×1000 L
Speed	25.5 kn at full load displacement

Cougar II
(Photo courtesy One2three Naval Architects)

Cougar II alongside *Diamond Princess*
(Photo courtesy South Sea Cruises)

Fantasea 8 Seasons from One2three Naval Architects

Fantasea Adventure Cruising commissioned One2three Naval Architects to develop a new-generation design for their Sydney Harbour operations. The flagship vessel, *Fantasea 8 Seasons*, built by Marine Engineering Consultants in Coomera, Qld, has commenced operations on Sydney Harbour as a charter vessel in time for the busy summer season.

The design brief was to provide for multiple modes of operation, with flexible and rapid conversion between modes to take advantage of market demand. Operational areas extend from the upper reaches of the Parramatta River (provision of a hinged mast) through to 30 n miles offshore. The vessel's layout offers configuration options

Fantasea 8 Seasons
(Photo courtesy One2three Naval Architects)

for weddings, corporate functions, networking events and tours, offshore whale watching and even ferry operations.

An innovative feature of the vessel is a full-length retractable targa roof on the sky deck, providing covered protection to enable the seats to be used as revenue seats during inclement weather. At the touch of a button, the roof retracts, opening up the Sydney skyline and allowing guests to enjoy 360° sights of the night sky, fireworks, and iconic Sydney Harbour views, such as the Harbour Bridge, or just solar access to Sydney's sunshine. Retractable side screens provide for a full open-air experience.

The vessel is configured for 195 guests offshore and up to 220 inside the harbour, rain, hail or shine. Passenger access is provided to the foredeck, aft deck and upper sky deck, as well as the air-conditioned main cabin. A substantial bar/servery is located at the forward end of the main cabin to cater for any charter event.

One2three Naval Architects invested considerable hours with the Fantasea Brisbane and Sydney teams, reviewing operational aspects for each of the diverse service modes. Vertical integration across the company from the deckhand making wharves through engineering and maintenance right up to the charter-services booking team and senior management captured valuable data for inclusion in the design. A key outcome of this collaborative approach was inclusion of wide boarding gates located immediately under the wheelhouse bridge wings, affording excellent vision and direct communication with the deckhand during berthing and embarkation. On entry to the vessel, passengers are immediately drawn to the servery area and from there towards main-deck seating and access to the retractable sky deck.

Fantasea 8 Seasons' two Yanmar engines comfortably achieved a ferry-mode cruise speed of 20 kn fully loaded at just 340 kW brake power each side. In fully-loaded charter mode she operates at 10 knots with each engine consuming just 18 L/h.

Destined for Sydney Harbour, the vessel's name reflects local Aboriginal history, where the seasons are measured, not by lunar cycle, but by natural events.

Principal particulars of *Fantasea 8 Seasons* are

Length	25.0 m
Beam moulded	7.9 m
Passengers	220
Crew	3
Fuel oil	2×2000 L
Fresh water	1×1000 L
Sullage	1×1600 L
Main engines	2×Yanmar 6AY-WGT each 441 kW at 2100 rpm
Speed	23.0 kn at full load displacement
Range	440 n miles at 20 kn fully loaded

Brett Irwin from One2three Naval Architects

The second vessel in a three-boat order has been delivered to the Queensland Water Police by Brisbane's Aluminium Boats Australia yard. *Brett Irwin* is the fifth patrol catamaran from One2three to commence patrol operations along Queensland's extensive coastline.

Brett Irwin was commissioned in a moving ceremony reflective of the QPS traditions — the vessel is named in honour of Constable Brett Andrew Irwin, who was tragically killed just 12 months after enlisting whilst on duty on 18 July 2007.

Designed and approved by DNV GL to patrol-boat standards, *Brett Irwin* is certified for 16 persons to 200 n miles offshore.

Like her previous sister vessels, *Brett Irwin* is configured with four 2-berth cabins in the hulls, allowing patrols of up to two weeks duration, and can accommodate up to 28 personnel on shorter-duration voyages. Each vessel is equipped with a fresh-water maker, a sewage treatment plant and WC and shower facilities on each deck, in addition to an impressive array of electronic and communications equipment. With a long coastline, Queensland's police boats are increasingly being called on to serve as incidence-command posts, highly-mobile temporary police stations and communication bases in addition to their traditional roles of search-and-rescue, law enforcement, and providing a visible presence.

The catamarans are fitted with two MTU Series 60 diesels

rated at 615 kW brake power each, giving the vessels a cruising speed of 20 kn at 60% MCR with a 700 n mile range. Sprint speed is in excess of 26 kn. A feature of the vessels is the ability to launch and retrieve a 6.2 m pursuit RHIB (which is housed on the aft deck between the hulls) under a range of sea conditions,. The vessel is beautifully finished by ABA and one could be forgiven for thinking that the hull and superstructure are completely anodised, such is the finish and clear protective coating applied to her topsides.

Principal particulars of *Brett Irwin* are

Length		24.0 m
Beam moulded		7.8 m
Passengers		24
Crew		4
Fuel oil		2×5000 L
Fresh water		1×1500 L
Sullage		1×1500 L
Main engines		2×MTU Series 60 each 615 kW at 2300 rpm
Speed	(cruise)	20 kn
	(sprint)	> 26 kn
Range		> 1000 n miles
Class		DNV GL

Brett Irwin
(Photo courtesy One2three Naval Architects)

84 m Luxury Motor Yacht from One2three

In exciting and positive news for the Australian marine industry, One2three Naval Architects has announced the commencement of construction at Echo Yachts in Henderson, WA, of a One2three-designed 84 m motor yacht — the largest motor yacht to be built in Australia. At 84 m length, with a massive 19.5 m beam and of trimaran hullform, the superyacht is an exciting vessel, due for delivery in 2017.

Echo Yachts was formed specifically to undertake production of the 84 m aluminium superyacht and an accompanying LOMOcean-designed 48 m FRP shadow boat. Construction of both vessels is taking place at the site of Evolution Commercial in Western Australia.

Evolution Commercial is currently completing fabrication of a One2three-designed 28 m wavepiercer for Taiwan. This project has enabled Evolution to increase their staff numbers to 80 in order to undertake the Echo Yachts projects.

The design of the innovative 84 m vessel is well underway, split between the One2three Sydney and on-site Perth offices.

Principal particulars of the new vessel are

Length	84.0 m
Beam	19.5 m
Depth	8.5m
Guests	28
Crew	Up to 56
Fuel oil	125 000 L
Fresh Water	25 000 L
Black/grey water	17 000 L
Propulsion	Diesel electric
Speed	18 kn
Range	5000 n miles
Builder	Echo Yachts
Designer	One2three Naval Architects
Stylist	Sam Sorgiovanni Designs
Class	DNV GL
Flag State	Cook Islands

Rob Tulk

Mary Reibey and *Annabelle Rankin* from Incat Crowther

Incat Crowther has announced the launch of *Mary Reibey* and *Annabelle Rankin*, the second and third in a series of 24 m catamaran passenger ferries for Captain Cook Cruises. Built by Richardson Devine Marine Constructions, the vessels follow on from *Elizabeth Cook*, launched late last year.

Elizabeth Cook proved an immediate success with her blend of efficiency and robustness. She currently operates in the Sydney ferry network including the low-wash/shallow-water zones on the Parramatta River, and across Sydney Heads to Manly. The team at Captain Cook Cruises and Incat Crowther are pleased to demonstrate a single class of vessel which is commercially and technically successfully operating throughout the entire Sydney Harbour network.

During the development of this new class of vessel, efforts were made to reduce through-life operating costs, including a focus on low fuel usage and reducing ongoing maintenance costs.

Mary Reibey and *Annabelle Rankin* feature passenger capacities of 198 with an optimised blend of interior and exterior spaces. The operational design focus on safety, specifically pilothouse visibility, has further improved the new vessel.

Starboard side of *Annabelle Rankin*
(Photo courtesy Incat Crowther)

Large hinged engine hatches provide ample access to the engine rooms for day-to-day maintenance tasks.

The vessels are certified to carry 127 passengers in 1C coastal operation and 198 passengers in 1D/1E harbour operation.

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

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

Principal particulars of the new vessels are

Length OA		23.9 m
Length WL		23.5 m
Beam OA		7.20 m
Depth		2.2m
Draft	(hull)	1.00 m
	(propeller)	1.40 m
Passengers		198 in 1D 127 in 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/1E

Starboard bow of *Mary Reibey*
(Photo courtesy Incat Crowther)

Swissco Spring and *Swissco Leopard* from Incat Crowther

Incat Crowther has announced the delivery of a second pair of 36 m monohull crewboats from Cheoy Lee to Singapore-based operator Swissco Holdings. *Swissco Spring* and *Swissco Leopard* follow on from the highly successful *Swissco Puma* and *Swissco Cheetah*.

The design features 94 m^2 of aft cargo deck, capable of carrying 50 t. The main-deck passenger compartment features 70 seats, beverage counter, luggage racks and a pair of heads. Forward doors allow direct access to the foredeck for bow transfer of personnel.

Mary Reibey from astern
(Photo courtesy Incat Crowther)

Below decks, the vessels accommodate 10 crew in six cabins. Crew bathroom, laundry, galley and mess are situated aft of these cabins.

The vessels are powered by three Cummins KTA38M2 main engines, each producing 1007 kW at 1900 rpm and driving through Twin Disc MGX6690SC gearboxes to fixed-pitch propellers. The hull shape was refined through CFD analysis, giving the vessels a service speed of 24 kn and a top speed of over 27 kn.

An additional two 36 m monohull crewboats are under construction at Cheoy Lee for Swissco Holdings.

Continuing a long relationship between designer and builder, Incat Crowther has also announced that Cheoy Lee is currently building a pair of 40 m monohull crewboats. These vessels, to be delivered to an undisclosed operator, are an evolution of the 36 m vessel offering increased capability and capacity.

Principal particulars of *Swissco Spring* and *Swissco Leopard* are

Length OA		36.0 m
Length WL		34.7 m
Beam OA		7.60 m
Depth		3.65 m
Draft	(hull)	1.50 m
	(propellers)	2.30 m
Passengers		70
Crew		10
Cargo deck area		94 m^2
Cargo deck capacity		50 t
Fuel oil		57 400 L
Fresh water		21 250 L
Main engines		3×Cummins KTA38M2 each 1007 kW @ 1900 rpm
Gearboxes		3×Twin Disc MGX6690SC
Propulsion		3×Fixed-pitch propellers
Speed	(service)	24 kn
	(maximum)	27 kn
Generators		2×Cummins 80 ekW
Bow thruster		1×Thrustmaster 75 kW
Construction		Marine-grade aluminium
Flag		Panama
Class/Survey		ABS

Stewart Marler

Swissco Spring delivered by Cheoy Lee
(Photo courtesy Incat Crowther)

Design Study Contracts for Navantia

On 23 October the Defence Materiel Organisation and Navantia signed a contract for a Risk Reduction Design Study for the SEA 5000 program for the RAN's future frigates.

The contract was signed at the DMO offices in Canberra by Francisco Barón, Director of Navantia Australia and Patrick Fritzpatrick, Director of DMO Naval Programs. The management and coordination of the activities within this contract will take place in Navantia's recently-opened offices in Adelaide.

The work to be undertaken under the contract, which will last approximately 9 months, is intended to analyse the impact of the installation of the Australian CEA phased-array radar and a SAAB command-and-control system in Navantia's F105 frigate, as well as the accomplishment of specific Australian requirements.

A contract has also been signed between DMO and Navantia for the Risk Reduction Study Design of the RAN's new replenishment ship (AOR) as part of SEA1654.

The contract signing, held at Garden Island, was attended by RADM Purcell and Patrick Fitzpatrick, both from DMO, the Commercial Director of Navantia, Gonzalo Mateo-Guerrero, and the Director of Navantia Australia, Francisco Barón.

The contract, which will last for approximately 8 months, will analyse the design of the Combat Supply Ship *Cantabria*, built by Navantia for the Spanish Navy, addressing specific Australian requirements.

This study is the first phase of SEA 1654. Two shipbuilders have been shortlisted as potential shipbuilders for the vessels.

On completion of this study phase, the Australian Government will request tenders for the construction of the ships.

Swissco Leopard delivered by Cheoy Lee
(Photo courtesy Incat Crowther)

Cruising

After the winter quiet, with only *Pacific Jewel, Pacific Pearl* and *Carnival Spirit* working out of Sydney, the summer cruise season got under way early on 31 August with a visit to Sydney by *Dawn Princess*, followed in September by visits by these vessels plus *Sun Princess,* and *Carnival Legend.* October moved into a higher gear, with visits by these vessels plus *Rhapsody of the Seas, Celebrity Century, Radiance of the Seas, Volendam, Celebrity Solstice,* and *Oosterdam.* November saw return visits by many of these vessels plus *Amsterdam*. Vessels berthing regularly at the Overseas Passenger Terminal at Circular Quay is a sure sign that the summer cruise season is under way.

Phil Helmore

EDUCATION NEWS

University of New South Wales

Undergraduate News

Open Day

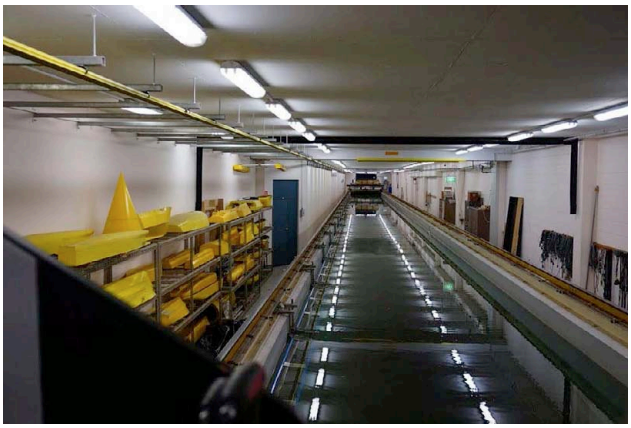
On 6 September, UNSW hosted prospective students at the 2014 Open Day. Despite the inclement weather, the campus was a hub of activity, and the School of Mechanical and Manufacturing Engineering was proud to show off their brand new laboratory facilities in J18 (Willis Annexe) South. Visiting guests were also able to meet current UNSW students and discuss prospective degree programs with staff in the Scientia.

Visit to AMC

On 9 and 10 October the Year 3 students studying Ship Hydrodynamics visited the Australian Maritime College accompanied by Dr Rozetta Payne. The visit was organised by Dr Tim Lilienthal, and UNSW is grateful for AMC's hospitality.

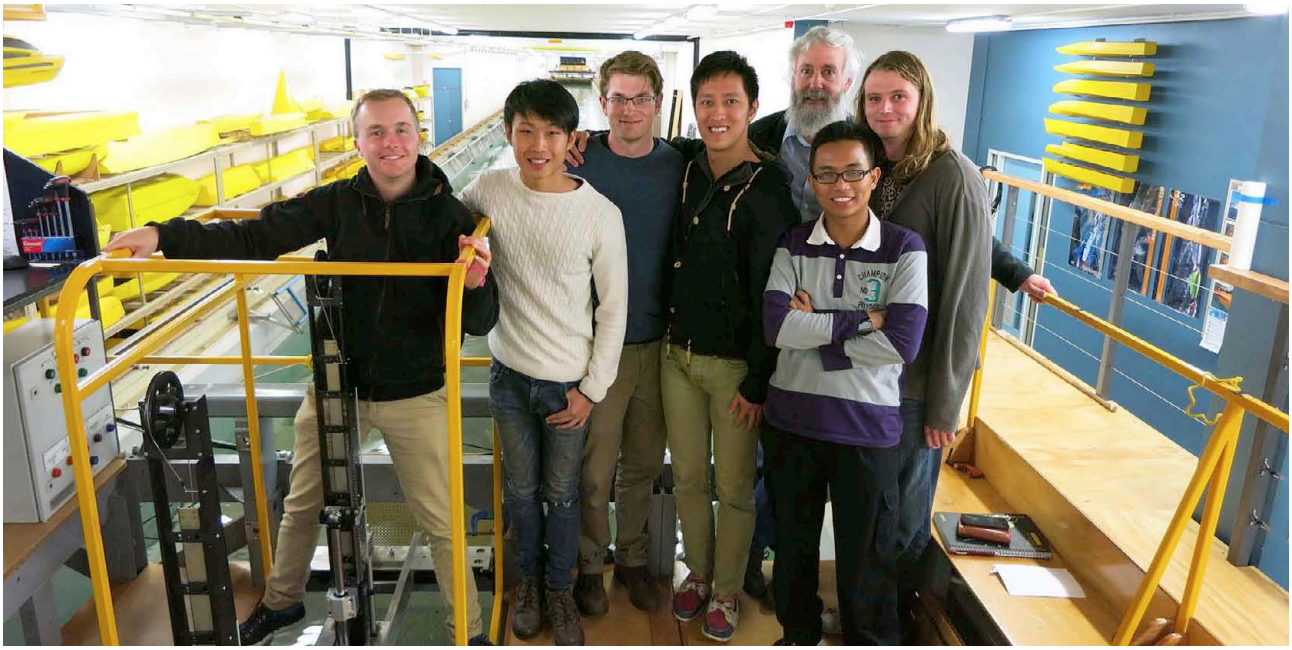
The group conducted resistance tests on a model of the AMC vessel *Bluefin* in the towing tank, supervised by Dr Tim Lilienthal, saw a demonstration of the capabilities of the model basin, and then conducted seakeeping tests on the model of *Bluefin* in the towing tank. Next day they had a presentation on cavitation by Dr Bryce Pearce and were then given a demonstration of cavitation in the cavitation tunnel. They saw ten short presentations by postgraduate students on their research activities, and discussed research opportunities at AMC with Dr Jonathan Binns. They were then introduced to the ship-handling simulator by Mr Damian Freeman.

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

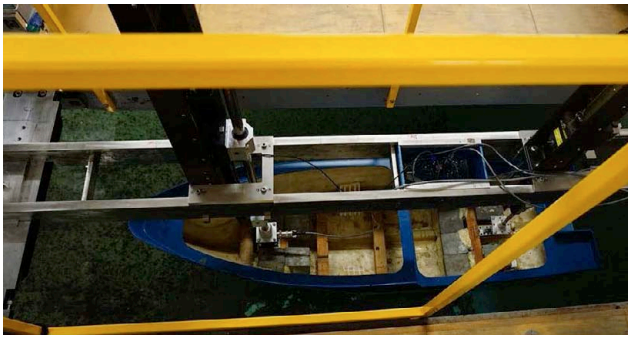


The AMC towing tank
(Photo courtesy Vilde Qvale)

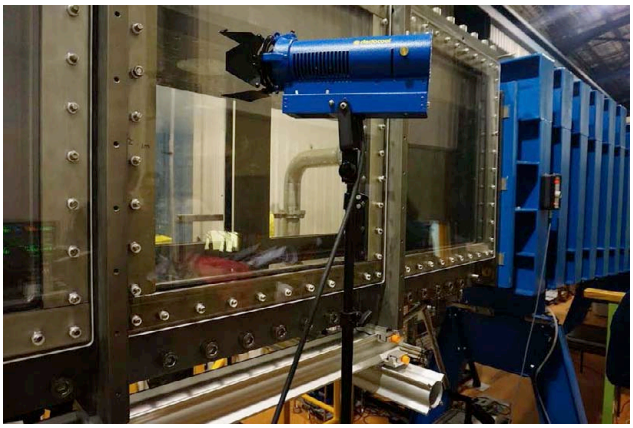
UNSW students Vilde Qvale and Ragni Rørtveit
on the towing-tank carriage
(Photo courtesy Vilde Qvale)



UNSW students Bryce Waters, Alvin Lim, Alistair Smith,
Bing Zheng Ho, Nazrin Fauzi and Sammy Free with
Dr Tim Lilienthal on the towing-tank carriage
(Photo courtesy Alistair Smith)



Bluefin set up and ready for a run
(Photo courtesy Vilde Qvale)



The cavitation tunnel
(Photo courtesy Vilde Qvale)

Captain Ragni Rørtveit in command
in the shiphandling simulator
(Photo courtesy Vilde Qvale)

Thesis Conference

The annual Thesis Conference for Year 4 students was held on 29, 30 and 31 October. The following presentations by naval architecture students were made:

Pranjal Gupta	*Operating an 18th Century Vessel to a 21st Century Standard*
Syahmi Hashim	*Cavitation on Paddle Blades*
James Heydon	*Quantifying the Resistance of Fouled Underwater Paint*
Fergus Hudson	*Automated Drawing of Ship Hullforms*
Asiff Sabri	*Feasibility of Solar Panels for Merchant Vessels*
Dauson Swied	*Investigation of the Hydrodynamic Efficiency of Reverse Bow Shape using 3D printing*
Lucy Xu	*Investigation of Tug Stability Criteria*

RINA–DSTO Award

RINA and the Defence Science and Technology Organisation (DSTO) jointly offered an award of $125 and a certificate for the best presentation at the conference by a student member on a naval architectural project. Assessment was made on the basis of marks awarded by School staff. The award went to Dauson Swied for his presentation on *Investigation of the Hydrodynamic Efficiency of Reverse Bow Shape using 3D printing*. The certificate and cheque have yet to arrive. Congratulations, Dauson!

Graduation Ceremony

At the graduation ceremony on 11 November, the following graduated with degrees in naval architecture:

Raymond Fagerli	Honours Class 1
Ming Fang	
Zijian Gao	Honours Class 2 Division 1

Graduates Employed

They are now employed as follows:

Raymond Fagerli	One2three Naval Architects, Sydney
Ming Fang	H&T Realty
Zijian Gao	Evaluating opportunities in Qingdao, China

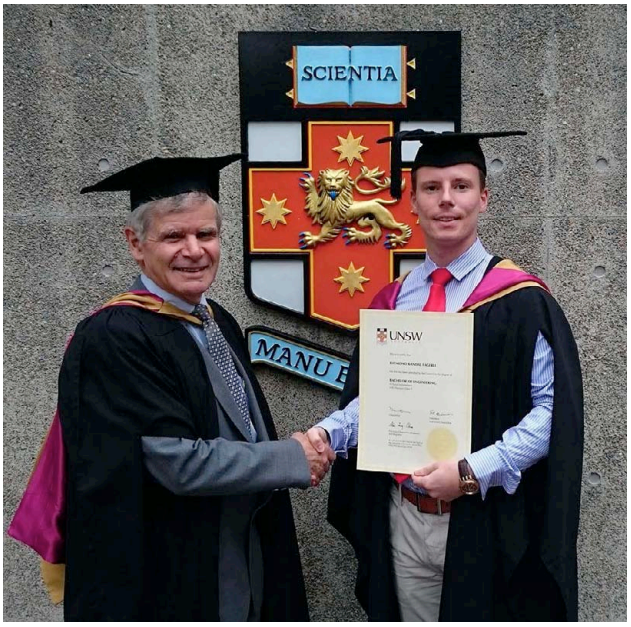
Congratulations, all!

Thesis Projects

Among the interesting undergraduate thesis projects just completed are the following:

Operating an 18th Century Vessel to a 21st Century Standard

The Australian National Maritime Museum's operational vessel, HMB *Endeavour*, has recently completed a circumnavigation of Australia. The vessel is under AMSA Survey and is certified for limited offshore operations. She is a very close replica of the original, albeit with engines



Phil Helmore congratulating Raymond Fagerli after the UNSW graduation ceremony (Photo courtesy Dauson Swied)

and modern amenities, galley, head, fridge and freezer, etc., installed below the cargo deck. Above the cargo deck she is very much as she was in Cook's time.

Pranjal Gupta has investigated the nature and significance of non-compliances, and how best to mitigate the associated risks. In particular, he has completed a finite-element analysis of the standing rigging to check its capability. This is a step along the way towards a documented process for assessing heritage vessels and preparing risk-management plans and operating procedures to ensure safe operation.

Cavitation on Paddle Blades

The propulsive force exerted by a paddle for a dragon boat is thought to be limited by the speed of the paddle through the water and the onset of cavitation at the back of the blade. The maximum force possible for a given paddle area and speed is of interest to those involved in extracting the last millinewton of force possible from each paddle on a dragon boat.

Syahmi Hashim has conducted a literature search without finding much of significance, and followed that with a computational fluid dynamics analysis. This commenced with a two-dimensional model of a flat-bladed IDBF Paddle Specification 202a blade shape, followed by a three-dimensional model deeply submerged and, finally, a three-dimensional model with the blade submerged but the shaft penetrating the free surface. He found that that cavitation is unlikely at paddle speeds likely to be attained in elite dragon boat races, but that ventilation is much more likely.

Quantifying the Resistance of Fouled Underwater Paint

The Royal Australian Navy has an ongoing interest in developing a better understanding of the resistance, and hence fuel consumption, associated with marine growth on the hulls of its ships.

James Heydon has focussed his research on the design of an experimental rig to measure the torque on a rotating cylinder which has an antifouling coating or surface roughness applied, and the type of antifouling paint or surface roughness can be changed at will. The construction and experiments will be the subject of future thesis research. He has followed this up by analysing the resistance attributed to different coatings using computational fluid dynamics, and then the local frictional resistance coefficient for each coating has been derived by empirical means for comparison.

Scholarships

The Austal-UNSW Endowment Scholarship is offered by UNSW to students in Year 3 of a four-year naval architecture degree program. The scholarship is valued at $8500 per year for two years and includes one industry placement with Austal Ships. The award aims to attract naval architecture students to a career with Austal Ships. Applicants are assessed on academic merit and a variety of key personal qualities and skills. The current holder of the Austal-UNSW Endowment Scholarship is Molly McManus in Year 4.

The Civilian Defence Engineering Scholarship is offered by the Department of Defence to students in Year 2 of a four-year naval architecture degree program. The scholarship is valued at $12 000 per year for three years, and includes two 12-week industry placements with the Department of Defence. The award aims to attract engineering students to an Australian Public Service career with the Department of Defence. Applicants are assessed on academic merit and a variety of key personal qualities and skills and they receive professional mentoring for the life of the scholarship. The current holders of the CDE Scholarship are James Heydon in Year 4, and Alistair Smith in Year 3.

The Roads and Maritime Services Undergraduate Engineering Scholarship is offered by NSW Roads and Maritime Services to students in Year 2 of a four-year naval architecture degree program. The scholarship is valued at $15 250 per year for three years and includes two 12-week industry placements with RMS. The award aims to attract naval architecture students to a career with NSW RMS. Applicants are assessed on academic merit and a variety of key personal qualities and skills. The holder of the inaugural RMS Undergraduate Engineering Scholarship is Bryce Waters in Year 3.

Postgraduate and Other News

Construction Progress

Refurbishment of the Mechanical Engineering buildings continues apace.

In August the project team reached a major milestone with the completion of Stage 1: the south end of the Willis Annexe. The space contains a number of laboratories which demonstrate best practice and have been designed for greater flexibility, to future-proof the space for changing laboratory requirements. The new laboratories will also be equipped with many new services which will enable improved teaching, research and industry collaboration.

In J17 (Tutorial Building) the old windows have been removed and replaced. The replacement windows are fitted with 'high performance' glass. This glass will help to reduce thermal heat loss and gain through the building's windows, resulting in less energy consumption to both heat and cool the building. This is one of many environmentally-sustainable design initiatives which have been integrated into the design and construction of the Precinct.

Inside J17 North, the new office and teaching spaces are

taking shape. Many of the walls of the new spaces are being constructed, whilst remediation work to the ceilings has also taken place. The ceilings have been carefully restored to their former glory, emphasising their unique crenellations.

The Link Wing which connects J17 North to the existing Computer Science and Engineering Building (K17) has reached its maximum height, with the final seventh-floor slab poured during October. As the formwork and scaffolding is removed, the impressive crenellated shape of the façade is being revealed. This will be clad with terracotta and double-glazed glass panels which will complement the existing John Lions Garden. Internally, fit-out works are continuing, and the new 350 seat lecture theatre is beginning to take shape. In the floors above, the fit-out of the computer labs and breakout areas is well under way.

The team continues to make good progress on Stage 3, Willis Annexe North, with the demolition process now complete. All machinery and equipment in the laboratories was carefully moved out of the space, allowing the building to be stripped back to its shell and then refurbished. A major milestone was reached recently with the installation of the new roof on Willis Annexe North. With protection from the elements, the internal fit-out works can now commence in earnest. Stage 3 will contain specialist laboratories for mechanical and manufacturing engineering research, as well as an undergraduate teaching laboratory for up to 120 students.

Classes have continued as normal during 2014 as the construction work proceeds.

During the refurbishment, you can view all the work on both buildings on two webcams:

http://129.94.82.77//view/viewer_index.shtml?id=129

and

http://129.94.82.79/view/viewer_index.shtml?id=43

All is said to be on track for commencing Semester 1 in 2015 in our two refurbished buildings, with a 350 seat theatre, all our CATS rooms in our own building, two 100-seat computer laboratories, and all-new laboratories in the Willis Annexe.

Phil Helmore

Mech Engg building from the main walkway near the Red Centre with the new windows in place and the scaffolding starting to come down
(Photo courtesy Martin Grimm)

Artists impression of the new Link Wing and Lecture Theatre from the John Lions Garden
(Photo courtesy Martin Grimm)

Thirtieth Symposium on Naval Hydrodynamics

This conference is run under the auspices of the Office of Naval Research (ONR) in Washington and takes place every two years. On this occasion, the symposium was held in Hobart from 2 to 7 November 2014. The standard five-day format was followed. There was an evening reception on Sunday 2 November, followed by a series of presentations delivered on 3, 4, 6 and 7 November. A technical tour was arranged for Wednesday 5 November and the banquet took place on the evening of 6 November. In addition to the ONR, the Australian Maritime College (AMC), the US Naval Sea Systems Command, Osaka University, and Chalmers University of Technology participated on the Papers Committee. The local organising committee consisted of A/Prof. Paul Brandner, Dr Bryce Pearce and Prof. Neil Bose from the AMC, and Mr Brendon Anderson from the Defence Science and Technology Organisation (DSTO).

A total of 75 papers on all aspects of ship hydrodynamics was presented. This total included four keynote speeches. On this occasion, there were six Australian contributions. This is the largest ever in this series of ONR symposia. The number of registered attendees was 104.

Em/Prof. Lawrence Doctors (UNSW), together with co-authors (principally from the University of Michigan), Dr Andrew Wiggins, Dr Steven Zalek, Prof. Marc Perlin, Prof. Steven Ceccio, Dr Robert Etter, and Mr Robert Wilson, presented their research *Experiments on the Resistance and Lift of a Surface-Effect-Ship Bow Seal*, which had been conducted at the Large Cavitation Channel in Memphis, Tennessee. The work covered in their paper included the resistance and vertical force experienced by the bow-seal finger elements of a surface-effect ship, due to the incoming water flow. These two force components were correlated with previously-developed theoretical analyses of the bow seal.

Experimental and Numerical Study of a Generic Conventional Submarine at 10-degrees Yaw, was authored by C. Fureby, M. Johansson and K. Petterson, from the Swedish Defense Research Agency, in Sweden, and B. Anderson, D. Clarke, L. Erm, M. Giacobello, S. Henbest, D. Jones, M. Nguyen, M. Jones, C. Kumar, S.-K. Lee, P. Manovski, D. Norrison, G. Seil, B. Woodyatt and S. Zhu, from the Defence Science and Technical Organization, in Victoria. Their work

entailed a computational fluid dynamics (CFD) study of the hydrodynamics of a deeply-submerged submarine, together with a comparison with the data from a parallel experimental investigation. With eighteen authors, this paper has set a new record for the number of research participants in a technical project presented at an ONR Symposium on Naval Hydrodynamics.

Skin-friction Drag Measurements on Ship Hull Coating Systems, was prepared by J.M. Walker from the University of Tasmania, and M.P. Schultz, K.A. Flack, and C.N. Steppe from the US Naval Academy (USNA) in Annapolis, Maryland. This practical research project was centred on measuring the frictional resistance of biofouled plate specimens in the High-Reynolds-Number Turbulent-Channel Flow Facility at the USNA. The impact of the increased frictional drag on full-scale vessels could be assessed from the results of this investigation.

Mitigation of Slamming of Large Wave-piercing Catamarans, by J.R. Shahraki, B. Shabani, G.A. Thomas, W.A.I. Amin, from the AMC, and M.R. Davis, J.A. Mehr, and J. Lavroff, from the University of Tasmania, was based on experiments on a segmented model catamaran. The model was instrumented for the determination of the internal forces when sailing in extreme waves. The slam forces for different tunnel heights and bow configurations were measured and correlated with the strip theory developed by the authors. The influence of the ride-control system was also considered in this study.

High-speed Full-field Deflection Measurements on a Hydrofoil Using Digital Image Correlation, was presented by D.B. Clarke from the DSTO, D. Butler and P.A. Brandner from the AMC, and B. Crowley from QinetiQ Engineering Services, Australia. Commercial digital-image correlation software was used to measure deflections of hydrofoils tested in a cavitation tunnel. In addition, results from hydrofoils with identical geometries constructed from homogenous and non-homogenous materials were presented.

Transient Slam Load Estimation by RANSE Simulation and by Dynamic Modeling of a Hydroelastic Segmented Model, by J. McVicar, J. Lavroff, and M.R. Davis from the University of Tasmania, and G. Davidson from Revolution Design, was another paper based on computational fluid dynamics (CFD). This work was used to support the parallel project on slamming referred to earlier in this report.

Further information can be obtained on this conference from Em/Prof. Doctors at l.doctors@unsw.edu.au. The next conference in the series, namely the Thirty-First Symposium on Naval Hydrodynamics, will take place in Monterey, California, from 11 to 16 September 2016.

Lawrence Doctors

Participants in the Thirtieth Symposium on Naval Hydrodynamics, including
Prof. Lawrence Doctors, UNSW, third row, third from right, Prof. Neil Bose, AMC, front row, third from right
A/Prof. Paul Brandner, AMC, front row, seventh from right, Dr Bryce Pearce, AMC, second last row, extreme left
Prof. Michael Davis, UTas, second row, extreme right, Dr Patricia Gruber, Technical Director, ONR Global, front row, fifth from right
Dr Ki-Han Kim, Program Manager, ONR, front row, sixth from right
(Photo courtesy Lawrence Doctors)

Australian Maritime College

University of Tasmania Awards Stuart Cannon

DSTO's Dr Stuart Cannon has been recognised by the University of Tasmania at the recent Vice Chancellor's awards ceremony held on 30 October.

Stuart was awarded the Vice Chancellor's Award for Outstanding Contributions by Adjunct and Clinical Title Holders in recognition of outstanding service to the University through leadership in the teaching and research programs of the Australian Maritime College (AMC) and collaborations with DSTO.

The award recognises Stuart's achievments in supervising both undergraduate and post-graduate students, assisting with developing junior staff, chairing the centre's industry advisory bord, and facilitating links with international Defence organisations such as DSTL in the UK and through MARIN's Cooperative Research Navies program.

"I am extremely honoured to be awarded by the University in this way" Stuart said.

"It is the enthusiasm and passion of the staff and students at AMC that makes working as a volunteer so enjoyable and rewarding"

Stuart currently holds the position of Adjunct Professor within the National Centre for Maritime Engineering and Hydrodynamics at the AMC, University of Tasmania. He is also the Relationships Manager for the DSTO–UTAS partnership. Stuart is also Research Leader of the Naval Architecture branch in the Maritime Division of DSTO.

Dr Stuart Cannon after the award ceremony
(Photo courtesy AMC)

Student Sub Designs Take the Plunge

Submarines are notoriously difficult to design and construct, but a group of maritime engineering students is putting their skills to the test doing just that.

The submarine design project is part of a fluid mechanics subject which the students must complete in their second year of study at AMC. They are split into teams and must design, build, test and evaluate a model submarine using a standard set of equipment.

Lecturer Dr Jessica Walker said that the vessels were required to operate in a range of environments, presenting unique design issues that needed to be resolved.

"Submarines must operate both on and below the surface, in coastal waters and deep oceans, which means that they experience large external pressures and varying stability conditions," she said.

"Due to the nature of these forces and the operating conditions, subs are very sensitive to small internal and external changes which can adversely affect stability and structural integrity."

The models must be watertight to a depth of one metre and will be assessed on criteria including their stability, navigation and diving abilities.

The students were fortunate this year to receive invaluable mentoring support from Danielle Hodge, an AMC graduate who is now an engineer on the SEA1000 Future Submarine Project at the Defence Materiel Organisation.

"They've really taken her advice on board and produced some innovative designs, incorporating streamlined hull shapes and novel control surfaces," Dr Walker said.

"This project is a great example of some of the hands-on learning experiences which the students receive to better prepare them for life as maritime engineers. Not only are they applying the technical fluid mechanics knowledge which they've learnt this semester, but they are also gaining vital team work and communication skills."

AMC students with a model submarine
(Photo courtesy AMC)

Student Society at Forefront of Maritime Robotics

Three Royal Australian Navy midshipmen studying for their Bachelor of Engineering (Naval Architecture) degrees at the Australian Maritime College are breaking new ground in the design and application of autonomous surface and underwater vehicles.

So impressed with the unexplored capabilities of these devices and so dedicated to being part of the future development of these technologies were the young students that they formed the AMC Autonomous Technology Society (AMCATS) last year with just a handful of members. AMCATS inaugural President, Midshipman Harry Hubbert, said that the interest in this subject and the society's activities has grown substantially over the past year.

"AMCATS now has 35 members and it is growing," MIDN Hubbert said.

"This year James took over as President and Emily as the society's secretary," he said, referring to MIDN James Keane and MIDN Emily O'Brien.

MIDN Keane said that drones were expanding their roles in both military and research applications. He particularly hopes to see their deployment for natural disaster response.

"In a similar way, much of the work we are doing is applying existing autonomous technologies to maritime platforms," he said.

There is significant interest being generated around the work AMCATS is doing, with AMCATS devices being deployed in Antarctica and involvement in a range of international and national competitions and conferences.

"We have been invited to present papers at conferences in both Australia and New Zealand and are building valuable relationships with the Defence Science and Technology Organisation, DMO, the US Office of Naval Research, the Warren Centre for Advanced Engineering and the CSIRO," MIDN Hubbert said.

"As well as the support available here at AMC, we have also been collaborating with Flinders University, which has a great robotics division.

"In October 2014 we will be one of 15 teams competing in an international robotics competition in Singapore (www.robotX.org). Hosted by the US Office of Naval Research, this competition entails an autonomous surface vessel navigating, avoiding obstacles and detecting underwater objects.

"We are very grateful for the help provided by the US Office of Naval Research, the AMC, DSTO and Flinders University which are enabling us to attend this prestigious event.

"Considering that we started with nothing just a year ago and now have access to research vessels worth over $1 million, we have come a long way."

The impressive aspect of AMCATS is that it is student run. However, the students insist that they have had tremendous support from the AMC's National Centre for Maritime Engineering and Hydrodynamics, vital mentoring from expert Dr Alex Forrest and Mark Symes has seen the AMCATS members publish and present at national and international conferences.

Not only is the research potentially valuable to the future use of autonomous maritime vessels, but the trio is also learning additional valuable lessons in project management through the establishment of, and their ongoing involvement with, AMCATS. This includes organisational skills, budgeting and resource allocation, negotiation and presentation skills.

The students aim to continue their research into this field of engineering, setting up a strong link between Defence, DSTO, AMC and AMCATS.

Program Builds Practical Engineering Skills

A hands-on approach to engineering studies is paying huge dividends to both students and industry partners of the Australian Maritime College.

Co-operative Engineering Program coordinators David Harte and Mark Symes described the course as an integrated model of higher education in which motivated students could combine university studies with practical experience.

Students alternate periods of full-time study with periods of paid full-time employment in industry. These work placements, totalling up to 17 months over the course of the five-year degree, are fulfilled under the supervision of professional engineers.

The program is available to students undertaking a Bachelor of Engineering in Ocean Engineering, Naval Architecture, or Marine and Offshore Engineering who have a minimum ATAR of 85 and maintain a credit average.

"The program has wide-ranging benefits to both students and their prospective employers. It's an opportunity for industry to trial a student and to see if they're a good fit, and the student also gains an understanding of the culture of the company. There is a mutual understanding and it's a better transition — the company knows the graduate and they know the company," Mr Harte said.

The Co-op Program, which has been offered since 2011, is continually being improved to ensure that it develops the skillsets required to meet the ever-changing needs of industry.

"We've refined the structure of the program to include an eight-week engineering practicum in the first year. This unit will be delivered through TAFE and gives students the opportunity to learn practical engineering skills such as welding, sheet metal work and machining," Mark Symes said.

"This year's engineering practicum project will see the students design and build a vice. They'll be able to work on the project from the concept stage using AMC's CAD (computer-aided design) software right through to building the physical model at TAFE. The aim is to show students the relationship between what they're learning at university and its practical application. We're developing their practical skills for their first work placement, which comes a year later."

The Co-op Program is seeking accreditation through Engineers Australia and takes graduates one step further towards achieving chartered status than a standard degree. In addition to the Stage 1 competencies that are automatically achieved upon graduation, students are able to show how they've applied their knowledge in the workplace and reflect on what they've learnt, which is a Stage 2 competency.

"We're developing a logbook to record the assessment tasks and student reflections, which means that, when the students apply to be chartered, their logbooks will demonstrate the reflective practices required to achieve Stage 2 competencies," David Harte said.

Looking ahead, there are talks underway to further expand the course by developing a University Co-op Program, whereby a pool of universities which offer work-integrated learning in their engineering degrees share work placements around the country.

Mark Symes recently met with teaching staff from the University of Central Queensland and Swinburne University to discuss how such an agreement might work.

In the meantime, the chief priority is to continue forging close ties with the government and private organisations which provide competitive work-placement opportunities for the students.

"The idea is that the students are starting to hone where they want to go with their career in the final work term. Then

they'll bring their industry clients back to AMC to do their final-year thesis and design project," Mr Harte said.

"Both AMC and the students are building this relationship with industry — it's a three-way partnership."

Mark Symes

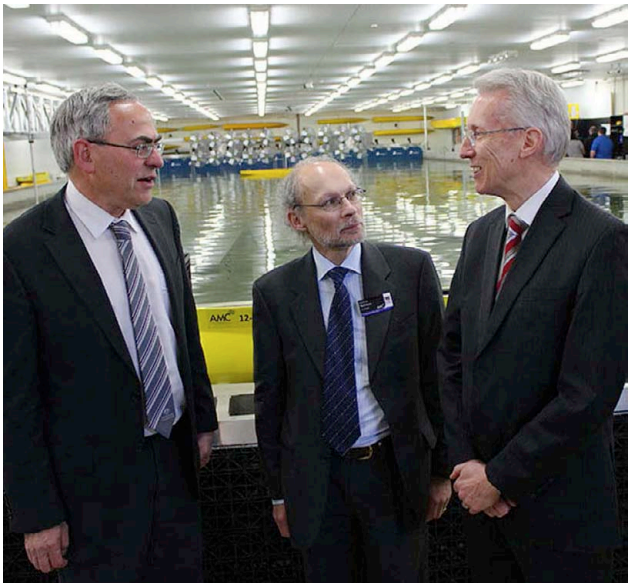
AMC to Play a Key Role in Future of Naval Shipbuilding

The Australian Maritime College officially launched the ARC Training Centre for Transforming Australia's Naval Manufacturing Industry in the model test basin on 22 August 2014.

The $3.8 million centre, funded through the Australian Research Council's Industrial Transformation Training Centres scheme, is a collaboration between the University of Tasmania, the University of Wollongong, Flinders University, ASC Pty Ltd, Babcock International, the Defence Science and Technology Organisation, the Defence Materials Technology Centre, Thales Australia and PMB Defence Engineering.

The centre will deliver research solutions by supporting and connecting postdoctoral and postgraduate candidates with industry, university and defence. It provides an opportunity for 10 research higher-degree students and three postdoctoral fellows to undertake a combination of research and professional training in an industrial environment.

These researchers will focus on developing advanced techniques to efficiently design, construct and sustain the new fleets of submarines, future frigates and patrol boats as part of Australia's multi-billion dollar naval shipbuilding program.



Australian Research Council Professor Brian Yates, AMC Principal Professor Neil Bose and DSTO Deputy Chief Scientist Dr Ian Sare at the launch in the model test basin
(Photo courtesy AMC)

AMC Principal Professor Neil Bose said that the centre provided an important boost to the college's mission to shape how the Australian maritime industry responds to the world through research, education and training.

"We are proud to be building on a long history of maritime defence-driven research and, together with the partnering companies, look forward to playing a significant role in the future of naval defence design and manufacturing in Australia," Professor Bose said.

"Having our researchers work alongside these companies will not only increase the impact of their research, but will also provide future opportunities for our graduates."

The launch was attended by representatives from the Australian Government, Australian Research Council, Department of Defence, DSTO, the partnering universities and other key stakeholders.

DSTO Maritime Chief Awarded Honorary Degree

Defence Science and Technology Organisation Maritime Division Chief Janis Cocking's outstanding contribution to the field of maritime engineering has been recognised with an honorary degree from the University of Tasmania at its mid-year graduation ceremony.

The University Council confers honorary degrees on people who are distinguished scholars and have given exemplary service to the Commonwealth, the State or the University. Dr Cocking accepted her degree at a graduation ceremony held at Albert Hall, Launceston on Saturday 23 August.

DSTO Maritime Division Chief Dr Janis Cocking with her honorary Doctor of Engineering degree from the University of Tasmania
(Photo courtesy University of Tasmania)

"Conferral of the degree of Doctor of Engineering *honoris causa* is a well-deserved and fitting acknowledgment of Janis Cocking's outstanding contributions to the University and to the State of Tasmania," University of Tasmania Vice-Chancellor Professor Peter Rathjen said.

"Dr Cocking has played a substantial and active role in enhancing the interests, capabilities and international

connections of the Australian Maritime College and the University. She has been the champion and major driver behind much of the extensive interaction between DSTO and AMC for many years. Her high-level support has culminated in important strategic outcomes, including Commonwealth Government support for major AMC facility upgrades and collaborative research projects. This has enhanced the reputations of both AMC and the University within the international defence community."

Dr Cocking is an acknowledged international expert in the field of undersea technology and has more than 30 years' experience managing science and technology research projects.

She has a degree in Metallurgy from the University of Melbourne and joined DSTO after graduation, undertaking research into high-temperature alloys for hot-end gas turbine blades in RAAF aircraft engines.

Following this success, Dr Cocking was posted to the US Naval Research Laboratory in Washington DC, where she developed a research program into ceramic thermal barrier coatings. Returning to Australia, she established an Australian research program into ceramic materials and was appointed national leader for an international collaboration between Australia, the USA, Canada, the United Kingdom and New Zealand on ceramic materials.

In 1989, she led the research program on air-independent propulsion for submarines and, in 1995, she was appointed Director of DSTO's Maritime Program Office. With the team, she undertook a review of the maritime program which resulted in the establishment of the Maritime Platforms Division.

In 1999, Dr Cocking was promoted to Research Leader and developed the Future Submarine Technology Workshops. The results of these workshops helped shape the decisions for the next generation of undersea warfare.

In her current role as DSTO Maritime Division Chief, Dr Cocking has led the scientific and technological support program for the Collins-class submarines and demonstrated how unmanned underwater systems can complement manned submarines in delivering enhanced defence capability.

The honorary degree conferral follows the signing of a five-year Defence Science Partnering Deed between DSTO and the University, designed to establish a collaborative alliance for mutually-beneficial activities.

The objectives of the partnership are many but include improving mutual access to world-class research infrastructure and programs, developing capabilities and technologies, collaboration in niche areas of expertise, and contributing to the promotion of science, technology, engineering and mathematics in schools and the tertiary sector.

Ocean Wave-energy Study Gathers Momentum

Research into the optimal design for ocean-wave energy converters is set to enter the next phase thanks to a partnership between Perth-based Bombora Wave Power and the Australian Maritime College.

In conjunction with Bombora's financial commitment, a $256 000 Australian Research Council Linkage Program funding injection will support a significant increase in research effort, starting with a series of complex physical scale-model experiments in AMC's shallow-water model test basin which started in October.

Bombora Director Shawn Ryan said that the company had developed a unique system which converts wave energy into cost-effective electricity and has many other addressable markets in food, water, shelter and recreational applications.

"Waves are an abundant, inexhaustible and untapped source of renewable energy which is significantly less variable and more predictable than other renewable resources such as wind or solar," he said.

"Our system features a sturdy, seabed-mounted structure with a flexible membrane which enables it to withstand storms and harness a greater proportion of the available wave energy. The system's flexible membrane and simple valving squeezes air through a closed circuit and extracts energy with a central air turbine to generate electricity."

Mr Ryan said that each unit was rated at 1.5 MW and had the potential to supply renewable electricity to 500 homes, equivalent to producing 1 GL of desalinated water each year or taking 825 cars off the road.

AMC researchers Dr Irene Penesis, Dr Gregor Macfarlane and Dr Alan Fleming have been collaborating with Bombora to investigate the performance of their innovative ocean-wave energy converter systems since 2012.

"We expect that the research outcomes will help Bombora to realise and expand upon its existing development, calibrate its computer modelling, and further advance the understanding of the hydrodynamic characteristics of the system," Dr Macfarlane said.

"Bombora has been heavily involved in program development to date, providing input into the definition of tank testing objectives and the initial design of the test equipment. This investment will continue with their assignment as partner organisation on the ARC Linkage project."

Dr Macfarlane said that the company had also been a strong supporter of the undergraduate program over the past couple of years, contributing to three design projects untaken by final-year maritime engineering students.

Plans for further collaboration on another ARC Linkage Project in the 2015 round are already underway. It is hoped that this new project will see additional collaborators from Edith Cowan University and Curtin University join the project team.

Antarctic Modelling Research helps Break the Ice

Navigating safe passage through the frozen waters of Antarctica is a challenging task for even the most experienced icebreaker pilots.

Antarctic ice is often covered with snow which makes it so tacky in consistency that it is referred to as "superglue" or "honey ice". These characteristics mean that Antarctic ice is much harder to break through than its Arctic counterpart.

Pilots use radar systems to find the best path or "lead" through the ice — but with more than 90% of an iceberg's mass located underwater, looks can be deceiving. To add another layer

of difficulty, when ice is broken it refreezes and the break becomes thicker than the surrounding ice. Pilots must try to avoid these areas by identifying leads before they freeze over again.

Research underway at the Australian Maritime College's Centre for Maritime Simulations at the University of Tasmania is striving to better prepare icebreaker crews for these conditions by training them in a risk-free virtual environment.

In a world first, maritime trainer and researcher Paul Brown will model the P&O vessel *Aurora Australis* and the Antarctic sea ice for his project *Can Maritime Simulation Capabilities be Developed to Provide a Valid Antarctic Ice-training Environment?*

Mr Brown said that virtual training provided a raft of educational, economic and environmental benefits.

"It would be too costly for the crew to do their ice training in Antarctica," he said.

"*Aurora Australis* uses 24 000 L of fuel a day and that amount doubles to 45 000 L per day when she is ice breaking. As well as that cost, there is the wear and tear on the ship and the impact on the environment to take into account."

A key area of focus for the research will be on risk management and contingency planning — for example, what to do if the ship gets stuck in ice. This scenario was all-too-real for international research vessels *Akademik Shokalisky* and *Snow Dragon* when both became trapped in the Antarctic sea ice in January 2014.

Aurora Australis was able to come to their rescue and evacuate the 52 scientists and tourists onboard one week later, causing delays to its research program and increasing food and fuel costs.

"There's no risk in programming this sort of training scenario in the simulator — the hazards are there but the ship doesn't get damaged and there is no loss of income," Mr Brown said.

Research supervisor Prof. Margareta Lutzhoft said that the project had four main elements — the ship modelling, ice modelling, land modelling and weather modelling — and how these interacted to make a valid whole.

"The novelty lies in the combination of technical and human elements; most of the research being done is of a more technical or environmental type and no-one's really looking at the role of the humans and how we can support them to be safe, to save fuel and, of course, to protect the environment," Prof. Lutzhoft said.

"They can prepare for conditions which are very unusual but could be difficult to handle, and they can prepare for driving the ship so that she doesn't get damaged as much through the ice and spends the least amount of resources."

The ship modelling has been completed and was tested and validated in the main bridge simulator by the *Aurora Australis* captain and chief mate.

The next step is for Paul Brown to head to Antarctica to see firsthand how the vessel handles in different conditions and record this data for input into the simulated model. He is collaborating with other government and research organisations to access as much real data on sea ice, weather patterns and bathymetry as possible to ensure that all the models and training conditions are realistic. Both Mawson and Davis ports in Antarctica will also be modelled.

Mr Brown's three-year project is well-timed to meet the future training needs of companies such as P&O, which must comply with a new international code of safety for ships operating in polar waters that is expected to be introduced in 2016. The International Maritime Organization's Polar Code has mandatory training requirements including that an experienced ice pilot be on board during all polar voyages.

As this project is the first of its kind, there is potential for the baseline data to be useful to simulator manufacturers around the world because it opens up another branch of technical development and a new group of clients. The main beneficiaries will be the shipping crews who will be able to test their skills virtually before applying them in the real world.

"It's all about being prepared before you go, and being able to repeat training in a risk-free environment; to get experience without actually being there," Mr Brown said.

Curtin University

CMST has recently coordinated a benchmarking study into the accuracy of ship wave-induced motion codes in shallow water, in co-operation with Flanders Hydraulics Research, the University of Ghent and DNV GL. The codes assessed were AQWA, GL Rankine, MOSES, OCTOPUS, PDSTRIP and WAMIT. Zero-speed and forward-speed cases were studied. Results were compared with model test results from Flanders Hydraulics Research for a Panamax bulk carrier, Panamax container ship and 6000 TEU container ship. The same IGES files were used in all codes to ensure accurate representation of the model geometry. The results will be presented and published in the Offshore Mechanics and Arctic Engineering conference in June 2015.

In June, Tim Gourlay attended the OMAE 2014 conference in San Francisco and presented a paper entitled *ShallowFlow: a Program to Model Ship Hydrodynamics in Shallow Water*. The ShallowFlow code produced very accurate results in a blind validation against 2013 model tests from the Duisburg and Hamburg towing tanks, and the results from this benchmarking have now been published.

A Curtin final-year student, Cam Algie, has been using ShallowFlow and Flotilla to model sinkage, trim and resistance of frigate/destroyer-type hulls at high speed in shallow water. Tim Gourlay has recently written an article for the RAN newsletter on this topic. Tim has also been asked to write a chapter on under-keel clearance for a new book *Navigational Accidents and their Causes* being published by the Nautical Institute.

Consulting work on ship under-keel clearance continues to be busy, and CMST has also recently applied its wave-induced motion expertise to several mooring studies. Recent mooring studies have calculated coupled ship-line-fender calculations for single or multiple vessels. Calculations were done using CMST in-house software, combined with WAMIT for linear motions and loads, or MOSES for non-linear time-domain motions and loads.

Tim Gourlay

Aluminium Boats in Voluntary Administration

The Brisbane-based shipbuilder Aluminium Boats Australia has been placed into voluntary administration after the fire in HMAS *Bundaberg* in their yard in August.

The fire, which occurred at the company's Hemmant dockyard, started on board the patrol boat during maintenance at the yard. Though an investigation into the cause of the fire is continuing, and an insurance claim has been lodged, the builder said the incident has made voluntary administration necessary. The future of the severely-damaged patrol boat has not yet been announced.

Aluminium Boats Australia Director Roy Whitewood said that the voluntary administration process would help the company, which manufactures and maintains commercial, luxury and defence vessels for clients across the world, address its current financial challenges. "It is my strong hope and desire to return the business to financial health, and I will be working closely with the administrators to try and achieve this," he said.

John Park and Kelly Trenfield from global business advisory firm FTI Consulting Group have been appointed administrators for the company.

BMT Appoints New Canberra Business Unit Manager

On 5 November, BMT Design & Technology (BMT), a subsidiary of BMT Group Ltd, the international maritime design, engineering and risk-management consultancy, announced the appointment of Heidi Garth as Business Unit Manager for the Canberra office.

Appointed specifically to manage and grow the business interests of BMT in the Canberra area, Heidi will support the strategic development and delivery of professional consulting services tailored to clients' specific requirements.

Heidi has over 10 years' experience in the defence sector and is widely recognised as an advocate for the Australian defence industry. Having graduated from RMIT University in Melbourne with an honours degree in aerospace engineering, Heidi gained experience in engineering, project management, business strategy and business development, and was recognised as an Australian Industry and Defence Network Victoria (AIDN-Vic) Young Achiever.

As part of her role as a design engineer at GKN Aerospace Engineering Services (now Quest Global Engineering) Heidi contributed to several major aerospace programs, including the F-35 Joint Strike Fighter. Following this, Heidi led and managed a number of high-value projects to secure investment funding for Victoria-based aerospace and defence manufacturers.

Gordon MacDonald, Managing Director at BMT Design & Technology, commented: "We are delighted to welcome Heidi to the team at BMT. She has significant understanding of the customer requirements, constraints and decision drivers which must be managed to deliver successful project and task outcomes. At the same time, Heidi understands the importance of having a shared vision for a sustainable Australian defence sector.

"These attributes will help secure increased market share for BMT while delivering added value for our Canberra-based clients."

Based in Melbourne, Australia, BMT Design & Technology is an independent professional engineering organisation with considerable experience in the provision of analysis and evaluation services to the commercial maritime and defence industries. The consultancy offers a dedicated, highly-motivated and qualified workforce, whose core skills and experience deliver tailored solutions to customer requirements for naval architecture, marine engineering, safety engineering, ILS, costing analysis, project management and capability definition services. The company draws upon the experience of individuals with backgrounds in Australian and UK navies, government defence agencies, commercial maritime engineering and related industries.

Heidi Garth, BMT's new Canberra Business Unit Manager
(Photo courtesy BMT)

Forgacs Acquires Broens

The management of Broens and Forgacs have announced that, effective from 11 August 2014, Broens has become part of the Forgacs Group.

The acquisition adds a stable platform for the future of Broens. The company is committed to delivering

innovative and value-adding engineering solutions to its diverse customer base.

The managements of both organisations are confident that the acquisition will deliver significant benefits and act as a springboard for the future as Broens focuses on providing its customers with a more-comprehensive and competitive service.

The company intends to build on its current capabilities to offer the following services:

- component design and manufacture;
- precision tooling supply;
- sub-assembly production;
- small to large scale fabrication;
- prime turnkey equipment supply;
- through life support and
- after market part manufacturing.

Broens is an innovative engineering-solutions provider supplying precision-engineered products, tools and services to both Australian and international companies in defence, aerospace, mining, oil and gas, and other sectors.

It was established in 1979 and operates sites at Ingleburn in New South Wales and Elizabeth in South Australia. It currently employs approximately 100 people — of which most are highly-skilled tradesmen.

Broens is engaged in the joint strike-fighter global supply chain and is supplying specialised tooling to major joint strike-fighter contractors. This involvement in the F35 project should result in the company being part of the future defence hub solution in Williamtown where the F35s will be based and maintained.

SSI Releases ShipConstructor 2015

The release of ShipConstructor 2015 CAD/CAM software is a key part of SSI's new plan to increase flexibility, security, convenience and simplicity for its clients in the shipbuilding and offshore markets.

Catalogue Additions and Changes

ShipConstructor 2015 contains a significant augmentation which will immediately be of benefit: the addition of several new catalogues. These catalogues will help users quickly and accurately model components to correct specifications, increasing productivity and quality; both are significant concerns of management and employees downstream in production. These catalogue additions and changes include the following XML standard templates:

- added PipeCatalog-ASME-CarbonSteel.XML;
- added ImperialWeldStandards.XML; and
- added MetricWeldStandards.XML.

Of particular note are the details related to the addition of the catalogue for ASME Carbon Steel Pipe. It covers the standardisation of dimensions of welded and seamless wrought steel pipe for high and low temperatures and pressures. The catalogue contains a wide range of Schedule 40/80 carbon steel pipes, elbows, tees, caps, connectors, crosses and reducers from the ASME B 16.5, 16.9, 16.11 and 36.10 standards. It also includes a set of end treatments (flanges, butt welds, saddles, socket welds, sockolets and plain), including flanges and couplings from Class 150 and 300.

EnterprisePlatform Compatibility

An exciting new capability of ShipConstructor 2015 is its integration with SSI's new EnterprisePlatform line of products. SSI EnterprisePlatform enables the enormous wealth of engineering information available in a product data model, such as the ShipConstructor Marine Information Model (MIM), to be efficiently shared with, and easily accessed by, multiple individuals, software applications and production equipment utilised in the shipbuilding process. This includes people, programs and processes outside of the Engineering Department. The SSI EnterprisePlatform generates information in the correct format and representation needed for varying-use cases and brings a product-focused approach to enterprise-wide availability of engineering data that is cost-effective, scalable, configurable, consistent, and transparent. PublisherLT is the first in the SSI EnterprisePlatform line of products and is being released at the same time as ShipConstructor 2015.

Modernised Licensing Technology

SSI has modernised the licensing technology for ShipConstructor 2015. This means that it will utilise purely software-based licensing rather than hardware locks/ licenses. The advantages of this newer technology are:

- Faster turnaround time for replacement of corrupted files.
- State-of-the-art encryption and piracy protection.
- Capability for future support of some of the latest licensing capabilities:

  (a) Roaming licensing and the management of roaming licenses.

  (b) Fallback/Failsafe/redundant servers.

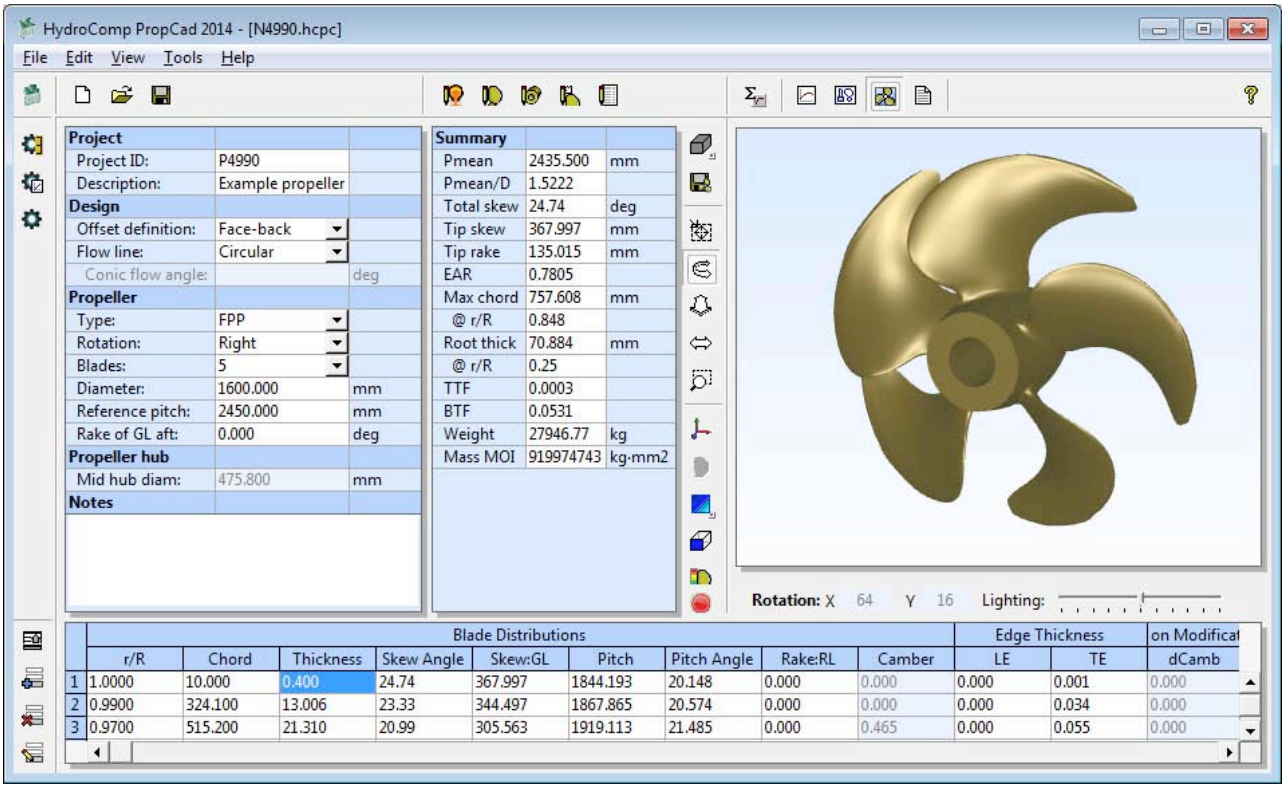
  (c) Check-In and Check-Out of licenses.

HydroComp PropCad® 2014 Released

HydroComp PropCad is the industry-standard software for geometric modelling of marine propellers for design and manufacture. This tool provides automatic preparation of 2D design drawings, 3D offsets, thickness classification reports, and CAD/CAM data. Manufacturers, researchers and designers rely on PropCad for their modeling needs. The tool is widely used in over 40 countries for quickly generating propellers and design variants, from small outboard production lines to large merchant- ship propellers. The latest 2014 release of PropCad features a new table-driven interface, updated classification society rules, expanded 3D CAD exports, new smoothing tools, and more.

Updated Interface and Enhanced User Experience

For the past three years, HydroComp has been developing enhancements to the PropCad software in order to update and expand the propeller design capabilities. A substantial effort has focused on data entry and visualization. As a result, PropCad has moved to a table-driven interface which allows users to quickly enter and modify data in their designs. The content of the interface has been consolidated so that principal dimensions, radial distributions, and 2D section offsets are now all visible on the main screen. A new summary table displays the derived characteristics of the design, including weight, mass moment of inertia, total



Main screen of PropCad 2014

skew, and mean pitch. The display mode enables graphing of any radial distribution, such as chord, skew, or pitch angle. One-click graphing allows quick visualization of blade outlines, thickness profiles, and 2D section offsets.

New Capabilities and Expanded Parametric Control

PropCad 2014 features an improved, fully-parametric Builder which allows users to define radial distributions of parameters from HydroComp's library propellers, from user-generated distribution files, or by entering the data directly into the sections spreadsheet. In 2014, the Builder includes presets for standard propeller designs. The Builder includes new options, including radial control of leading and trailing edge thickness, chordwise position of maximum thickness for Gawn-type sections, a CAD-friendly tip correction, and additional control of cup (with the ability to set the cup sweep angle, enable face-only cupping, and allow cup around the tip). These added settings give PropCad users an unprecedented level of control in their designs.

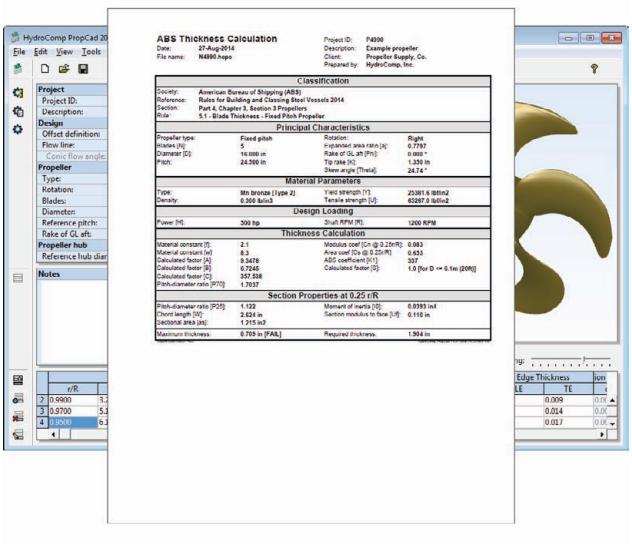
PropCad's table-driven entry supports cell formulas for on-the-fly calculations, while improved data tools allow users to quickly visualise and smooth user-entered data. The 3D window includes hardware-accelerated anti-aliasing, smoothed 3D renders, new visualisation modes, and even video recording. Users can also now add root fillets between the blade and hub, detect required hub length, and automatically set the blade position relative to the hub.

Updates

In addition to new features, PropCad 2014 includes updates to existing classification society and 3D CAD exports. CCS, NK, and Swedish/Finnish rules for propeller thickness have been added to PropCad 2014. Additionally, ice-class designations are available for ABS Steel, BV/RINa, LR Ship and LR Naval, and Swedish/Finnish rules. The classification thickness reports have been overhauled to include all intermediate calculations and data in addition to the required calculations for submission and approval.

All 3D CAD exports have been updated for compatibility with the latest versions of the major CAD tools. A new export dialog allows the user to select the exported surfaces (face/back, root, tip, LE, TE, and root fillet) and to increase the density of the model without altering the design. Lastly, a new IGES export has been included for universal CAD compatibility.

For further information visit www.hydrocompinc.com.



Class Report screen of PropCad 2014

Whole-life Warship Capability Management Course by BMT

On 17 November BMT Design & Technology (BMT), an operating company of BMT Group, a leading international design, engineering and risk-management consultancy, announced its pioneering whole-life warship capability-management training course. Building on the long-term success of the multi-national BMT submarine training course, this four-day course gives unprecedented insight into the technical processes supporting the capability-systems life cycle for warships, from identification of a need, through to acquisition and sustainment.

Designed to suit a variety of delegates' needs, from those considering a future career in capability development, warship design and engineering and/or sustainment programs, through to those from nations reforming defence capability development and procurement, the course provides fundamental knowledge of whole-life capability management of warship programs. The programme draws on BMT's considerable depth and breadth of knowledge and covers the integration of the key engineering activities and disciplines associated with capability development, warship design, procurement and sustainment processes.

Participants will be provided with an overview on the technical factors which are involved in the process-management of warship projects as well as the key engineering activities and disciplines relating to ship design. The course also covers topic areas including requirements management, the design process, naval architecture, weapon systems, power and propulsion, mechanical and electrical systems, production, cost engineering, standards, regulation and safety, and warship sustainment.

The four-day course is scheduled to run in the first quarter of 2015 and will be held in Canberra, ACT (price on application). BMT also offers other customised defence training courses delivered in-company, in-government or in-country.

Wärtsilä Low Loss Hybrid-energy System

Wärtsilä recently launched its new Low Loss Hybrid (LLH) system. The Wärtsilä LLH utilises different power sources in combination with energy-storage devices to operate the prime movers closest to their optimum performance. In addition to annual fuel savings of up to 15 per cent, depending on the type and configuration of the engine and mission profile, the LLH ensures a substantial reduction in exhaust gas emissions.

The overall hybrid control system is the key element in the total control and stability of the ship's electrical system and the energy flows. The Wärtsilä LLH system is integrated with the inverter control units and interfaces with the conventional power-management system. The total energy storage system is approved according to the new DNV-class rules for battery power. The Wärtsilä LLH is suitable for application in a variety of market segments, including offshore vessels, tugs, ferries and coastal vessels, for new construction as well as upgrade of existing installations.

A key feature of the Wärtsilä LLH is its ability to reduce transient engine loads which cause increased fuel consumption and added emissions. Furthermore, by increasing the power redundancy, the system allows the engine to operate closer to its optimum design point where it has highest efficiency and least emissions. Reduced maintenance and increased system performance through rapid response from the energy storage system are also among the benefits offered.

"Fuel efficiency and a reduced environmental footprint are central to the current and future needs of the entire marine sector. The Wärtsilä Low Loss Hybrid system supports both of these aims and is an important enabler for energy and cost efficient shipping," said Juhani Hupli, Vice President, Electrical and Automation, Wärtsilä Ship Power.

The Wärtsilä LLH was installed and tested earlier this year aboard the platform supply vessel *Viking Lady*. A comprehensive measurement programme which monitored transit mode in heavy weather conditions, critical operations, and standby mode confirmed actual fuel savings of 15 per cent. For this particular vessel, such savings would give an estimated payback time of less than four years. Emission reductions were also substantial, with local emissions in harbour virtually eliminated.

Wärtsilä's test facility is equipped to carry out full scale testing of the LLH integrated with the Wärtsilä distribution system. (Photo courtesy Wärtsilä)

Class Approval for Wärtsilä WST-14 Steerable Thruster

In October DNV GL approved the design of the Wärtsilä WST-14 thruster, thus indicating that the design fully complies with the classification rules. This is an exceptional case since the approval has been granted based on a thruster design that has yet to be introduced into full series production.

The approval by DNV GL follows the release of Wärtsilä's next generation of thrusters at the end of 2013 (see *The ANA* November 2013, p.49). The new WST-14 is part of the Wärtsilä Steerable Thruster (WST) compact series, which is aimed primarily at tugs, anchor-handling vessels, and coastal and inland waterway cargo vessels. The key benefits of the series include superior performance, easy installation, a high level of integration, and ice-class compatibility. The series is also designed to comply with the latest environmental regulations, such as the US EPA VGP 2013 requirements.

The approval is an important step towards obtaining type approval for the WST-14 thruster. Type approval means that the thruster will not have to be certified for each individual

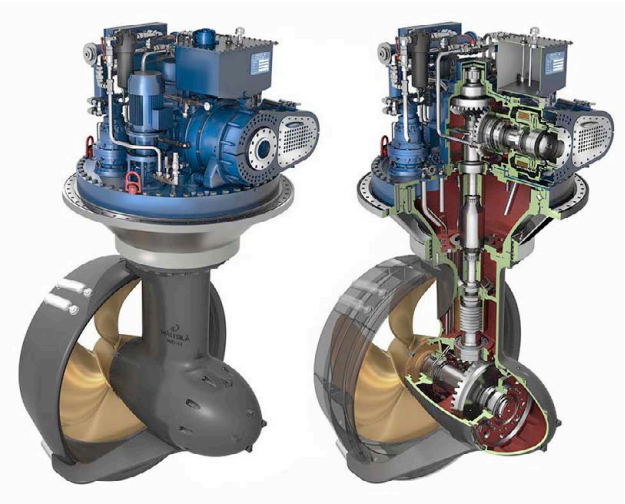
vessel or hull number. Wärtsilä has earlier acquired type approval for several thruster products. However, for the newest Wärtsilä Steerable Thruster portfolio, Wärtsilä has begun the process for type approval from the earliest possible moment. It is estimated that the certification will produce savings which can be counted in millions of euros, as well as considerable reductions in production time.

The early DNV GL approval of the Wärtsilä WST-14 prototype design provides evidence of the integrity of the product design, and is an important step towards full type approval. This approval also confirms that the design calculations meet the classification society's requirements regarding standard operations, as well as for operations in ice conditions (ice class certification).

"This exceptional approval provides further evidence of the quality of Wärtsilä's technology development. The fact that the WST-14 thruster design has already been approved will serve as an assurance to the customer that he is buying a product that already meets classification requirements. Furthermore, the approval emphasises the design quality of our entire new thruster portfolio, and is a clear signal to the market of the robustness built into each Wärtsilä thruster," said Wim Knoester, Director, Sales and Project Management, Propulsion Business Line, Wärtsilä Ship Power.

A prototype of the Wärtsilä WST-14 thruster is being built at the company's dedicated manufacturing facilities in Wuxi, China, and will be shipped to Tuusula, Finland, for testing and validation at the Wärtsilä Propulsion Test Centre.

The WST-14 thruster represents a small part of Wärtsilä's largest-ever thruster development programme covering all possible thruster applications. Wärtsilä's current offering will be expanded with additional new products within the coming months. All thrusters will be designed for mild ice-going applications but a true ICE portfolio is also being developed within this programme.



The Wärtsilä WST-14 thruster
(Image courtesy Wärtsilä)

Wärtsilä and MAN Diesel & Turbo initiate HERCULES-2 Research Project

The HERCULES R&D programme to develop large-engine technologies, which was initiated in 2004 as a joint vision by the two major European engine manufacturing groups, Wärtsilä and MAN Diesel & Turbo, is to continue with a new HERCULES-2 project, pending approval under the Horizon 2020 EU Framework Programme for Research and Innovation.

The HERCULES-2 project is aimed at developing a fuel-flexible marine engine which is optimally adaptive to its operating environment. The work will focus on four areas of integrated R&D divided into Work Package Groups (WPG), as follows: WPG 1 — a fuel-flexible engine; WPG II — new materials (for engine applications); WPG III — an adaptive powerplant for lifetime performance; and WPG IV — a near-zero emissions engine.

This work will build upon and surpass the targets of the previous HERCULES projects by going beyond the limits set by the regulatory authorities. By combining the very latest technologies, and through the use of integrated solutions, the new project aims to achieve significant reductions in fuel consumption and exhaust emissions. The project includes several full-scale prototypes and shipboard demonstrators which will speed the development of commercially-available products. This co-operation between Wärtsilä and MAN Diesel & Turbo will also involve a number of other European companies, as well as universities and research institutions. The project will further accelerate the shipping industry's transition to better fuel efficiency and a significantly reduced environmental footprint, while strengthening the position of the participating partners in the market place.

The consortium is made up of 32 partners, of which 30% are industrial and 70% are universities and research institutes. The budget is divided between industry and the universities on a 63% – 37% basis respectively.

The original HERCULES programme was conceived in 2002 to develop new technologies to increase marine engine efficiency. The three previous projects within this programme ran from 2004 until 2014.

Wärtsilä Receives AIP Certificate for its New LNGPac System

The new Wärtsilä LNGPac, the upgraded version of the company's successful LNG fuel-handling system, has been granted an AIP (Approval in Principle) Certificate from the classification society DNV GL. The AIP Certificate covers Wärtsilä's innovative improvements to the original LNGPac. The new solution has removed the heating media skid and its pumps, and includes an improvement to the Wärtsilä Cold Recovery solution. The certificate is based on technical material and safety analyses, and includes documentation concerning normal operation of the system and a presentation of risk scenarios. In effect, it means that the system is judged to be safe and reliable and that it will be approved by classes in actual projects.

"This is an important step in making this new feature of the Wärtsilä LNGPac available to the marine market, and represents an expected verification of the technical aspects which have gone into the development of this system," said Jaakko Eskola, Senior Executive Vice President and President, Ship Power, Wärtsilä Corporation.

"The presentation of this approval in principle marks another chapter in a longstanding and successful cooperation

between Wärtsilä and DNV GL. The development of the first LNGPac and its installation onboard *Bit Viking*, the first LNG conversion of a vessel in service, were milestones in the uptake of LNG as a ship fuel, and this upgraded LNGPac is another significant step forward," said Dr Gerd-Michael Würsig, DNV GL Business Director for LNG-fuelled ships.

"As DNV GL's experience with LNG has grown over the years, so too has our conviction that LNG can make a significant and positive contribution to the efficiency and sustainability of the maritime industry as a whole. To keep this momentum for the use of LNG as a ship fuel, DNV GL will continue to work with partners like Wärtsilä to ensure that owners and yards can be confident that this technology meets strict safety and reliability standards," he said.

The heating media skid, a complete circuit of heat exchangers, pumps and piping, was earlier used to evaporate LNG for pressurising the storage tank and to provide the engine with the correct gas temperature. In looking beyond the gas fuel system, Wärtsilä has demonstrated its ability to integrate multiple interfaces within the LNGPac. Instead of the heating media skid, the new LNGPac system directly utilises the engine's cooling water, which results in fewer interfaces and less installation work for the shipyard. By eliminating electrical consumers, Wärtsilä enables the vessel to become even more environmentally friendly.

Innovative solutions have been applied to almost every aspect of the new, compact and easy-to-install gas fuel system. Besides the removal of the heating media skid and improvements to the Cold Recovery solution, the new LNGPac features innovations such as an integrated airlock and control cabinet, a more-compact bunkering station, an enclosed or integrated gas valve unit, and maximised LNG storage volume. Several of the features have been patented by Wärtsilä.

The Wärtsilä LNGPac system installed in a platform supply vessel (Image courtesy Wärtsilä)

NOMINATIONS FOR DIVISION COUNCIL

Nominations are invited from Members (MRINA or FRINA) and Associate Members (AMRINA) for election to the Division Council for a term of two years from March 2015. The majority of these elected members must be Corporate Members. Nominations, which must be in writing and include the signatures of the proposer, seconder and nominee, should be received by the Secretary no later than Friday 19 December 2014.

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

MEMBERSHIP

Australian Division Council

The Council of the Australian Division of RINA met on Wednesday 24 September 2014 by teleconference based in Fremantle. The Division President, Jim Black, chaired the meeting. Some of the more-significant matters raised or discussed during the meeting are outlined below.

Election of new President

The Council considered the resignation of Jim Black as President, due to his being unable to devote sufficient time and attention to the position. In reluctantly accepting Jim's resignation, the Council gratefully accepted the Vice President's willingness to take over and appointed Dr Tony Armstrong as President. Dr Martin Renilson was appointed to the resulting vacant position on Council and elected as Vice President. The election of Dr Armstrong and the resulting appointment of Dr Renilson are for the term ending in March 2016.

The Council expressed its appreciation for the substantial contribution Jim Black had made to the Institution during his term as President of the Australian Division.

Archiving Policy

Council formally adopted an archiving policy developed to reflect the discussion on the subject at the June Council meeting.

The Walter Atkinson Award for 2014

The recommendations of the panel appointed to assess nominated papers were accepted and endorsed. Arrangements are to be made for presentation of the award.

London RINA Council Meeting

In hearing the outcome of the Institution's Council meeting on 5 July, the Council noted that all members registered with the Engineering Council would need to be prepared for the routine inspection of their Continuing Professional Development records as is now required by the EC.

Senate Inquiry into Naval Shipbuilding

The Council agreed that the Division should make a submission to Part II of the Senate Economics References Committee inquiry on this subject. As the deadline for the submission is 1 December, members' contributions to that submission are welcome and should be forwarded to the Secretary as soon as possible.

Soft-copy Distribution of *The Australian Naval Architect*

As a result of the trial and associated survey conducted in relation to the August issue of *The ANA*, Council considered the results of the survey and decided that:

1. There was insufficient support to persevere with a YuDu edition in view of the editing cost associated with this format.

2. The production of a PDF edition of future issues should be continued.

3. The Secretary should contact all members to advise that future hard-copy issues will only be on request for no additional cost (this option not available to Student Members). Hard-copy will continue for members not providing an email address.

4. The shortfall of advertising revenue in covering the cost of producing *The ANA* should be covered by funds received from income arising from Pacific International Maritime Conferences.

5. These arrangements will be reviewed every two years.

Accordingly, members will have received emails from the Secretary inviting them to request continuation of hard-copy in accordance with Item 3 above.

Visit by RINA President

Council noted that arrangements for the visit by Mr Bruce Rosenblatt in February–March 2015 were being developed and Sections would be informed as details become available.

Next Meeting of Council

The next meeting of the Australian Division Council will be held on Thursday 4 December at 1500 Eastern Summer Time (1200 Western Standard Time).

Rob Gehling
Secretary

Changed Contact Details?

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

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

RINA London		hq@rina.org.uk
Aust. 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

HMAS *Arunta* enjoying life in the Southern Ocean on 28 October, enroute to Albany, Western Australia
(RAN photograph)

NAVAL ARCHITECTS ON THE MOVE

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

Trent Adams has taken up a position as a Senior Naval Architect in the Fremantle office of One2three Naval Architects.

Matthew Addison moved on from Offshore Marine Services in 2010 and took up the position of Vessel Manager at Mermaid Marine Australia in Fremantle.

Michael Andrewartha has moved on from One2three Naval Architects and has taken up the position of Senior Mechanical Design Engineer at VEEM Gyro, on the design of new range of powerful high-quality marine-vessel gyro-stabiliser products, in Perth.

Nathan Atkinson moved on from Independent Offshore Solutions many moons ago and, after some time as a structural engineer at Technip Oceania, has taken up the position of Naval Architect/Marine Warranty Surveyor at London Offshore Consultants in Perth.

Campbell Baird has taken up a position as a Senior Naval Architect in the Fremantle office of One2three Naval Architects.

Andrew Baker continues consulting as AB Marine in Fremantle.

Alex Bishop has moved on from Naval Architects Australia and has taken up a position as a naval architect with Taylor Bros in Hobart.

Nick Browne moved on from Practising Naval Architects two years ago and has taken up the position of Project Manager with the Australian Antarctic Division in Hobart.

Gillian Carter moved on from Dubois Naval Architects many moons ago and, after some time at Felham Enterprises, Azure Naval Architects and Pacific Marine Design, has taken up the position of Project Manager Engineering at Oceanco in Rotterdam, the Netherlands.

Phil Christensen has moved on within Bentley Systems and re-located to the San Diego, USA, office from where he will continue to manage the Marine Solutions operation and become involved in their new cloud-computing venture.

Peter Crosby moved on from the Royal New Zealand Navy back in 2003, and has taken up the position of Collins Planning and Support Manager at ASC Pty Ltd in Adelaide.

Richard Dreverman has moved on from Austal Ships and has taken up the position of Sales Manager at Rolls-Royce Marine in Perth.

Rob Dunbar has moved on with Australian Marine Technologies and has taken up the position of Chief Operating Officer with ThyssenKrupp Marine Systems in Melbourne.

Peter Edmonds continues consulting as Peter Edmonds Marine Design in Perth.

Gerard Engel has moved on from ONA Engineers and has taken up the position of Naval Architect/Marine Warranty Surveyor with London Offshore Consultants in Perth.

Raymond Fagerli, a recent graduate of the University of New South Wales, has taken up a position as a naval architect at One2three Naval Architects in Sydney.

Ming Fang, a recent graduate of the University of New South Wales, has taken up a position as a property consultant with H&T Realty in Sydney.

Riley Graham has moved on from BMT Design and Technology and has taken up a position as a naval architect with ThyssenKrupp Marine Systems Australia in Melbourne.

Michael Halkes continues as Managing Director of Daiyat.com and has founded another company, Shnug Design, a company harnessing technology to create timeless designer furniture, in Hong Kong.

Braden Holgate, a recent graduate of the University of New South Wales, has taken up a position as a worksite protection officer with Multi-City Rail, contracting to the State Rail Authority. However, he is heading off in early December for a position in the ski-fields at Lake Tahoe, California/Nevada, to kick-start a year in the USA.

Hugh Hyland is, and has been since 2000, Assistant Director of Engineering in the Department of Defence at Garden Island in WA.

Ruth Jago has moved on from Lundin Malaysia and has taken up the position of Senior Engineer Mooring and Installation at BW Offshore in Singapore.

Zoran Jaksic has moved on from Roll-Royce Australia Services and has taken up the position of Project Engineer with Thales Australia at Garden Island in Sydney.

Andrew Jeffs has moved on from Austal Ships and is now consulting as a maritime specialist available for marketing/market research in Perth.

Andrew Joyce has moved on from Archer Capital and has co-founded two new companies in Sydney, Mad Hat Mobiles which supplies refurbished iPhones online through www.madhatmobiles.com.au, and Toolbox Technology which provides customised mobile-device solutions to organisations around Australia, including device sourcing, customisation, management, tracking and support across iOS and Android.

Jude Kennedy has moved on from the Defence Materiel Organisation and has taken up the position of Shipbuilder Certification Manager at ASC Pty Ltd in Adelaide.

Nick Kitching has moved on from BAE Systems and has taken up a position as a naval architect at Azimut yachts in Sydney.

David Lyons has moved on from consulting and has taken up the position of lecturer and enrolled in a PhD program investigating composite structures in the School of Mechanical and Manufacturing Engineering at the University of New South Wales.

Scott McErlane completed a Diploma in Marine Surveying and took up a position as a Marine Surveyor with Florida Nautical Surveyors in Fort Lauderdale, Florida, USA, in 2009. He also takes on the occasional stint as chief engineer on luxury motor yachts, currently on MY *Mylin IV*, a 61 m Feadship built for the late Ted Arison, founder of Carnival Cruise Lines and still owned by his son Micky Arison, now Chairman and CEO of Carnival Corporation.

Todd Maybury has moved on from Kellogg Brown and

Root Inc. and has taken up the position of Principal Naval Architect at Serco in Sydney.

Adam Podlezanski has moved on from Worley Parsons and is now consulting as Apcon in Brisbane.

Roger Ramsey has moved on within BAE Systems and has taken up a position with BAE Systems (Aerospace) at Williamtown, NSW, airport.

Peter Roberts has moved on from ASC Pty Ltd and has taken up the position of Director at Navtech in Adelaide.

Kalevi Savolainen moved on from consulting three years ago and has taken up the position of Stability Manager at BAE Systems in Fremantle.

Glen Seeley has moved on from the Australian Maritime Safety Authority and has taken up the position of Platform Certification Manager in the Hydrographic System Program Office, contracting to the Department of Defence, in Cairns.

Greg Seil moved on from Sinclair Knight Merz in 2012 and, after some time at Pacific Environment, is now contracting to AVT Services, in the area of computational fluid dynamics modelling, in Sydney.

Rob Skerman has moved on from ASC and is now consulting as Blackwattle Marine in Sydney.

Alistair Smith, a student at the University of New South Wales, has commenced working part-time at One2three Naval Architects in Sydney while he completes the requirements for his degree.

Dusko Spalj has moved on from TAFE NSW and is now consulting as Adria Marine Consulting in Sydney.

Tim Speer moved on within the Austal Ships organisation back in 2009 and has taken up the position of Technical Manager in Fremantle.

Michael Stuart has moved on from Fitzroy Yachts in New Zealand and has taken up a position as a naval architect with Dubois Naval Architects in Lymington, UK.

Dauson Swied, a student at the University of New South Wales, has commenced working part-time at One2three Naval Architects in Sydney while he completes the requirements for his degree.

Giles Thomas has moved on from the Australian Maritime College and has taken up the position of BMT Chair of Maritime Engineering at University College London in England.

David Whittaker moved on from Thales Australia five ago, and has now taken up the position of Principal Naval Architect in the Air Warfare Destroyer Alliance in Adelaide.

Dominic Worthington moved on from Mermaid Marine Australia two years ago and has taken up the position of First Engineer with Maersk Drilling in Brisbane.

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

Australia's new LHDs *Canberra* (left) and *Adelaide* (right) demonstrating their bulk alongside at BAE Systems' Williamstown yard shortly before NUSHIP *Canberra* sailed for Sydney and commissioning on 28 November
(RAN photograph)

FROM THE ARCHIVES

Starting the Tradition — HMAS *Sydney* (I)

John Jeremy

On 9 November 2014, the centenary of the first naval battle of the RAN, the engagement between the cruiser HMAS *Sydney* and the German cruiser SMS *Emden*, was commemorated on Cocos Island in the Indian Ocean by the unveiling of two replica bells, one of *Sydney* and one of *Emden*.

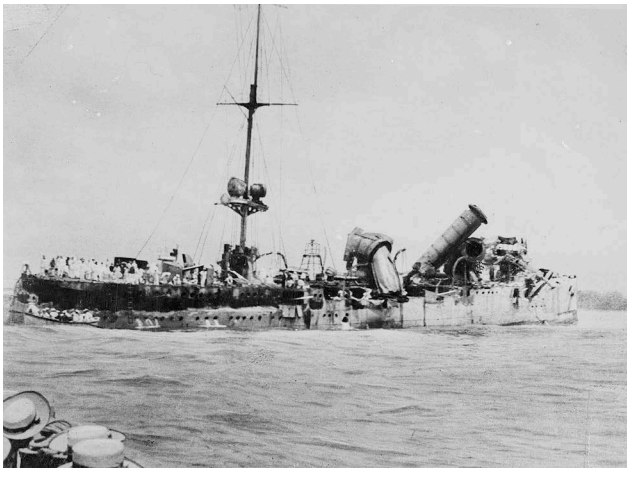
The Governor-General, His Excellency the Honourable Sir Peter Cosgrove, AK, MC (Retd), accompanied by Chief of Navy, Vice Admiral Tim Barrett, AO, CSC, RAN, and Ambassador of the Federal Republic of Germany, His Excellency Dr Christoph Müller ring the replica bells of HMAS *Sydney* (I) and SMS *Emden* atop the friendship mast on Cocos Island
(RAN photograph)

The German cruiser had proved to be a very successful commerce raider, beginning with the capture of the British cargo ship *Indus* on 10 September 1914. In six weeks *Emden* captured or destroyed 82 398 tons of shipping. In October her commander, Fregattenkapitän Von Müller, decided to destroy the British cable and wireless station at Direction Island in the Cocos group. *Emden* entered the Indian Ocean via the Sunda Strait at the beginning of November.

Meanwhile, the first convoy carrying Australian and New Zealand troops to the Middle East had departed from King George Sound in Western Australia on 1 November. The escort included the Australian Cruisers HMAS *Sydney* (commanded by Captain John Glossop RN), HMAS *Melbourne* and the Japanese cruiser *Ibuki*. *Emden*, near the Cocos Islands, monitored the signal traffic between the escort leader HMS *Minotaur* and Cocos and, when *Minotaur* was detached by the Admiralty to the Cape of Good Hope, assumed that his enemy was moving further away.

The convoy was, however, maintaining wireless silence and Von Müller was unaware of the presence of the other cruisers. His attack on Direction Island began early in the morning. The station staff managed to send a general call warning of the approaching warship and sent a cable describing the approaching landing party. *Emden's* attempts to jam the signal were detected by HMAS *Sydney* and HMAS *Melbourne* tried to establish contact with Direction Island. Von Müller, who detected the signal traffic, thought that the ships were further away than they actually were and continued his operation.

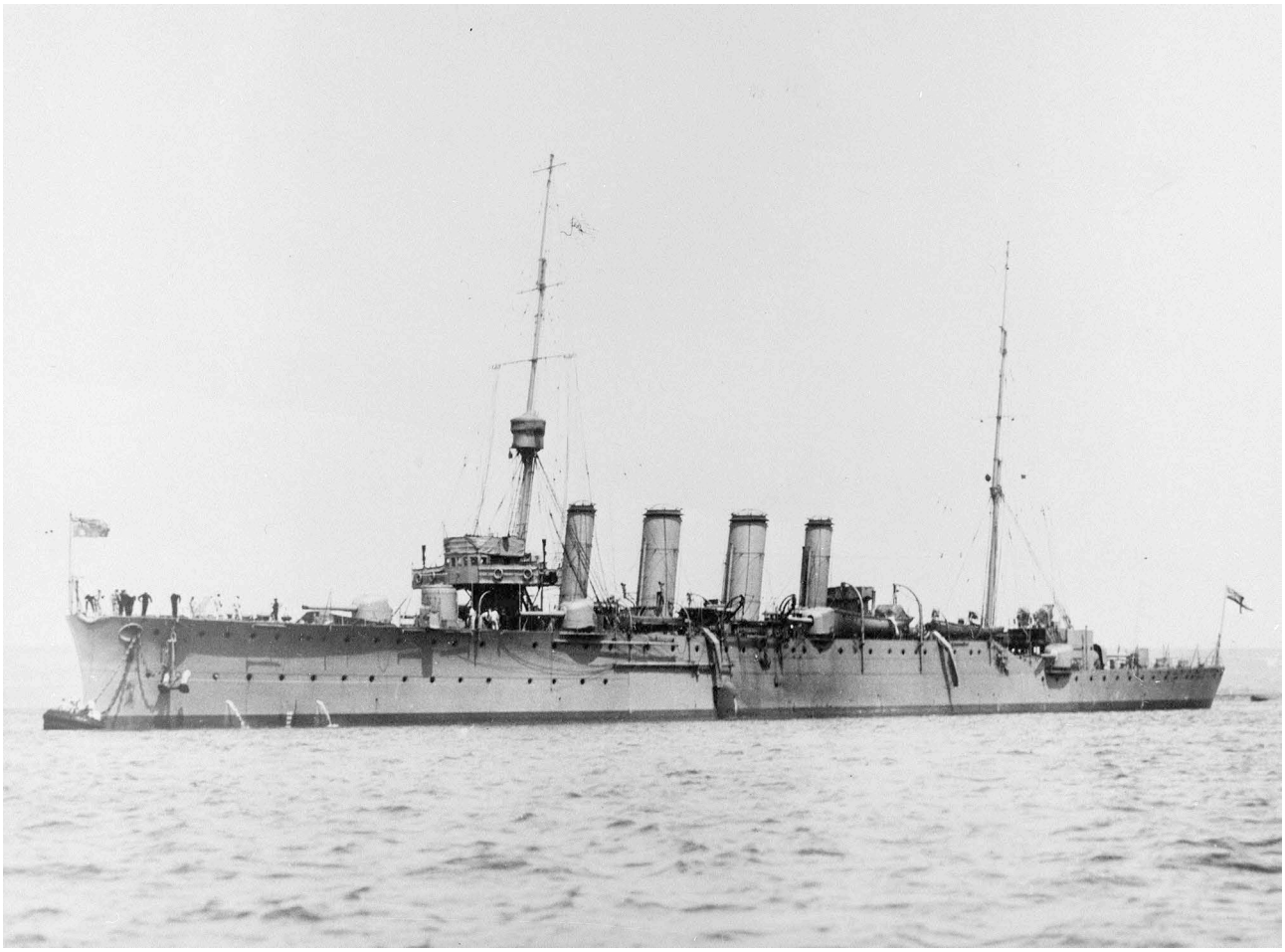
HMAS *Sydney* was detached at speed to investigate, and managed to exceed her trial speed as she approached. *Emden*, sighting *Sydney's* funnels and masts, realised that she was about to confront a warship, got under way and was soon steaming at 20 kn despite her fouled hull. The action soon began, and *Emden* managed to hit *Sydney* with her second salvo. *Sydney* soon returned her fire and had the advantage of 6-inch (152 mm) guns compared to *Emden's* 105 mm (4.1 inch) main armament. *Sydney* was hit by fifteen of *Emden's* shells but the final outcome was inevitable and, by 11 am, *Emden* had only one gun in action which soon ran out of ammunition. Von Müller beached her on North Keeling Island in the hope of saving the lives of some of his crew. His ship was destroyed.



SMS *Emden* ashore on North Keeling Island after the action
(RAN Historical Collection)

HMAS *Sydney* fired 670 rounds and one torpedo in the action and managed speeds up to 27 knots. After a pursuit of *Emden's* collier, *Sydney* returned and sought *Emden's* surrender. Communication was difficult and *Sydney* fired two more salvos before Von Müller finally had *Emden's* ensign lowered bringing the action to a conclusion with the loss of at least 134 of *Emden's* crew.

This action by HMAS *Sydney* earned her a special place in



HMAS *Sydney* in 1914
(RAN Historical Collection)

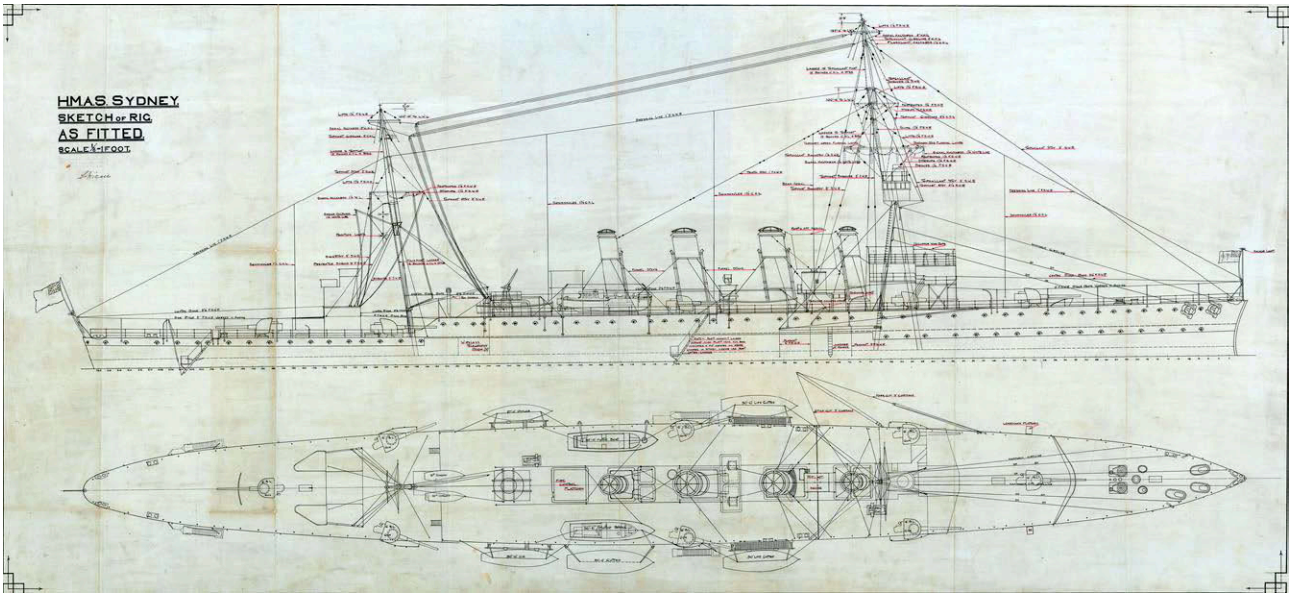
the history of the young Royal Australian Navy and long-lasting public esteem.

HMAS *Sydney*, HMAS *Melbourne* and their Australian-built sister, HMAS *Brisbane,* were built to the design of the Chatham-class cruisers of the Royal Navy as the cruiser component of the RAN's Fleet Unit which first entered Sydney Harbour on 4 October 1913. With a displacement of about 5500 t they were 457 feet (139.3 m) long overall with a beam of 50 feet (15.24 m). They were intended to be capable of long-range cruising and were armed with eight 6-inch (152 mm) guns, one 3-inch (76 mm) gun, four 3-pounders, ten smaller guns and two submerged 21-inch (533 mm) torpedo tubes. Steam turbines of 25 000 SHP (18 643 kW) on four shafts gave them a designed maximum speed of 25.5 kn. Burning coal or oil, they had a range of about 4000 n miles and they had a crew in wartime of about 450 men.

After her battle with SMS *Emden*, HMAS *Sydney* saw service in the North and South Atlantic and, later, with the Grand Fleet in the North Sea. In 1917 she was fitted with a tripod foremast and a revolving aircraft-launching platform from which she successfully launched a Sopwith Pup fighter on 8 December 1917. HMAS *Sydney* was present at the surrender of the German High Seas Fleet in November 1918, returning to Australia in 1919 as escort to some of the J-class submarines which had been given by Britain to Australia.

After the war, HMAS *Sydney* carried out routine duties with the Australian Squadron. She was finally decommissioned on 8 May 1928 and was broken up at Cockatoo Island in Sydney in 1929. Many relics of the famous warship survive.

The 1917 foremast of HMAS *Sydney* on Bradleys Head in Sydney. The tripod legs are original
(Photograph John Jeremy)



HMAS Sydney Sketch of Rig (As Fitted). Note the tripod foremast which was fitted in 1917
(NAA: MP551/1, 73/43/2)

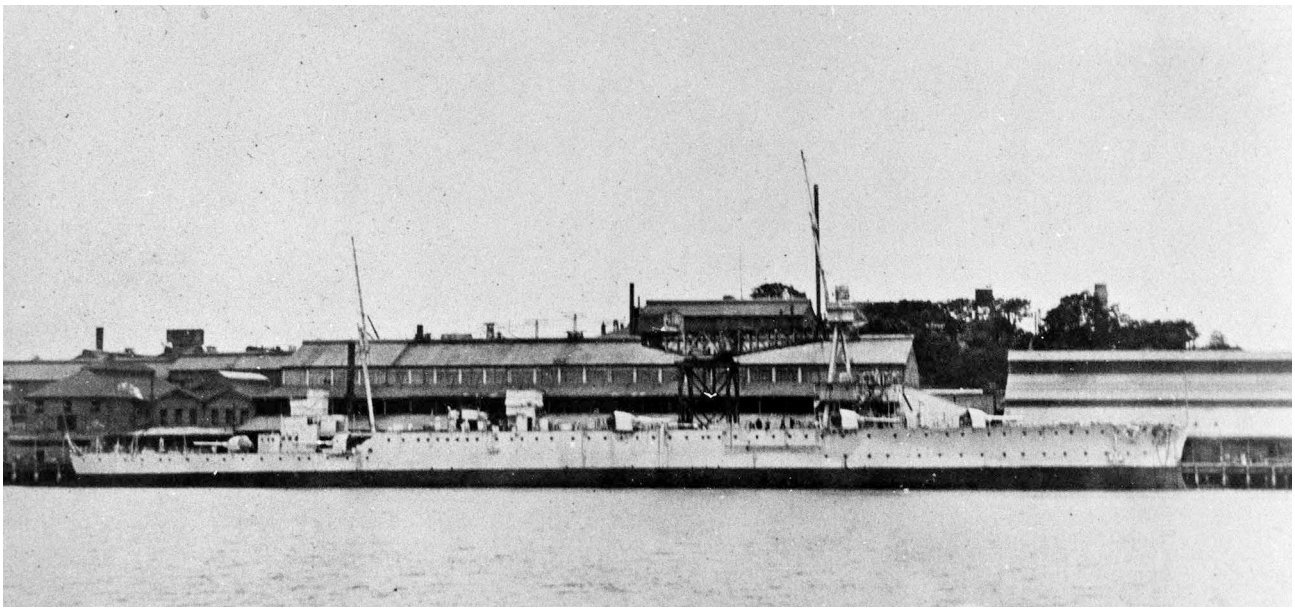
Her foremast was erected on Bradley's Head in 1934 where, today, it flies the Australian White Ensign as a memorial to RAN ships lost in war. Part of her bow is in the sea wall under the northern end of the Sydney Harbour Bridge and her chart table is in the Royal Sydney Yacht Squadron. Many other relics can be found in museums and private collections.

The memory of the famous cruiser is maintained through the continuing service of an HMAS *Sydney* in the RAN. The latest, and fourth, is the guided-missile frigate HMAS *Sydney* which will soon come to the end of her service. The name will then pass to the third of Australia's new air-warfare destroyers, HMAS *Sydney* (DDG 42). All ships have served the RAN with distinction.

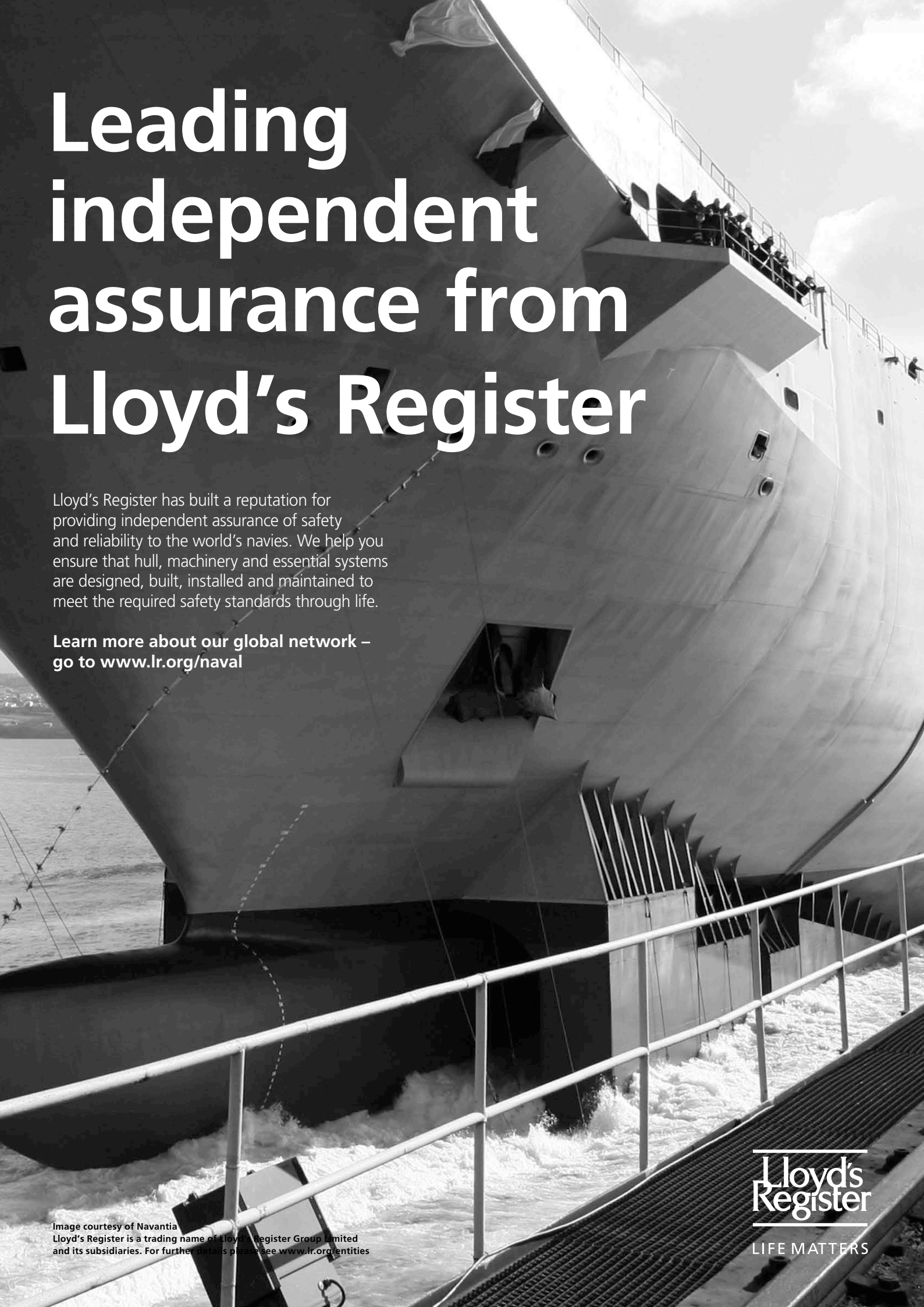
This cigarette box was made from timber salvaged from HMAS *Sydney* when she was broken up in 1929. It is one of many surviving relics of the famous warship
(Photograph John Jeremy)

References

1. Stevens, D. (2014), *In All Respects Ready*, Oxford University Press, Melbourne.
2. Bastock, J. (1975), *Australia's Ships of War*, Angus and Robertson, Sydney.



HMAS *Sydney* being dismantled at the Cruiser Wharf at Cockatoo Island in 1929
(RAN Historical Collection)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